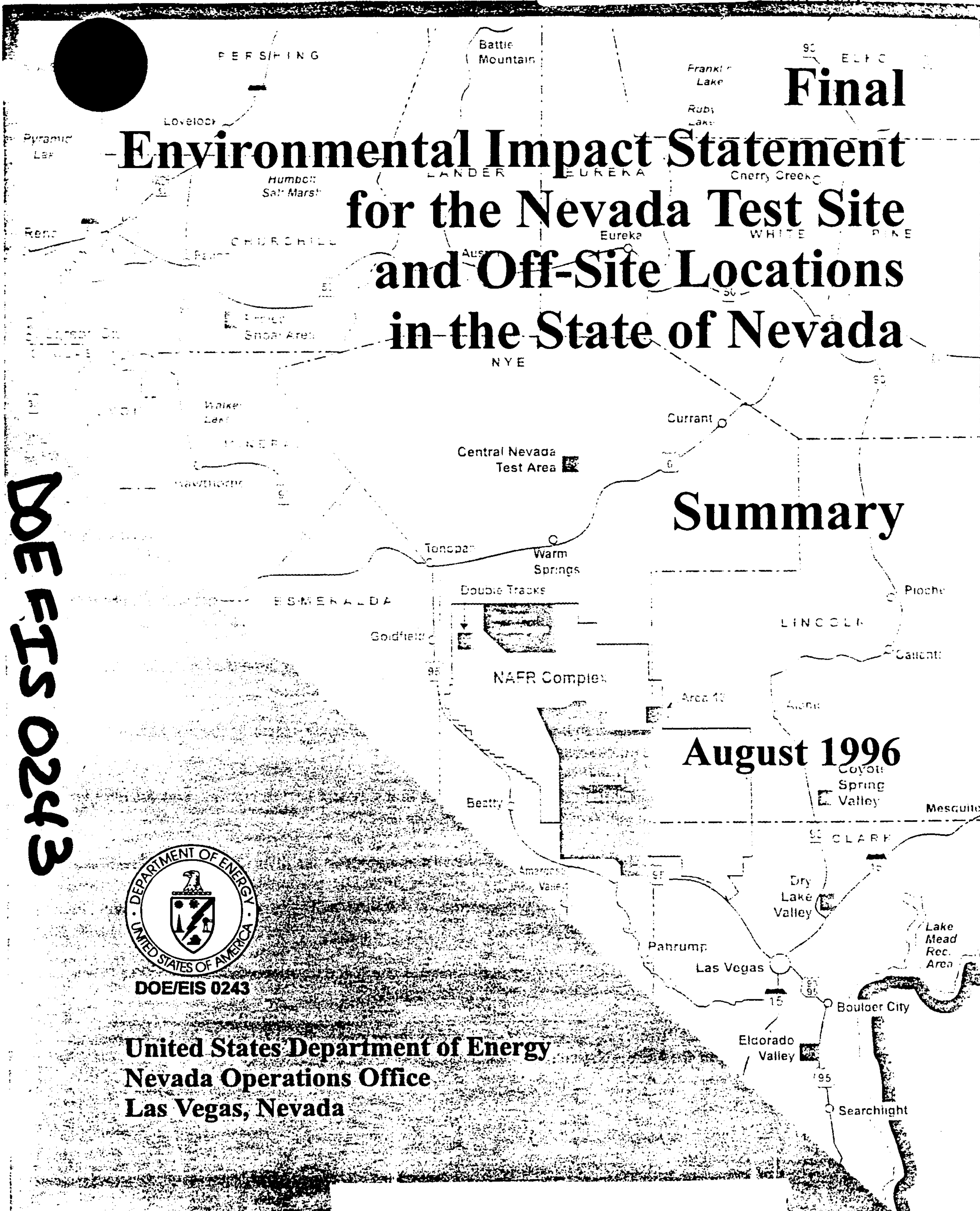
MOL.20010727.0190

QA: N/A

Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada

Summary

August 1996



DOE/EIS 0243

DOE EIS 0243

United States Department of Energy
Nevada Operations Office
Las Vegas, Nevada

THE NEVADA TEST SITE

The U.S. Department of Energy (DOE) coordinates and administers the energy functions of the federal government, including the nuclear weapons program, research and development of energy technologies, and basic science research. The Nevada Test Site (NTS) has been the continental location of the U.S. nuclear weapons testing program for over 40 years, because following World War II, a suitable site was needed to conduct nuclear weapons tests. The NTS occupies 3,496 square kilometers (1,350 square miles) in southern Nevada and is located approximately 105 kilometers (65 miles) northwest of Las Vegas.

The DOE also manages several other sites located in central Nevada. The sites include the Tonopah Test Range, Central Nevada Test Area, and Project Shoal Area located southeast of Fallon, Nevada. The Central Nevada Test Area and Project Shoal Area were nuclear underground test sites in the 1970s. The Tonopah Test Range is an active research facility managed by the DOE and operated by Sandia National Laboratories. This facility is jointly used by the DOE and U.S. Air Force.

Most work on the NTS has been and continues to be related to national defense; however, there is growing emphasis on environmental restoration and waste management programs. Current NTS missions are:

- Support the Threshold Test Ban Treaty and the Peaceful Nuclear Explosives Treaty verification mission, and support the ongoing Comprehensive Test Ban Treaty negotiations

- Provide the capability to respond to nuclear emergencies, such as lost or stolen nuclear weapons and special nuclear materials, nuclear bomb threats, and radiation dispersal threats

- Demonstrate the capability to provide alternate energy sources, including solar energy, to meet power needs for the southwestern United States

- Maintain a state of readiness to conduct underground nuclear testing through the conduct of treaty compliance and permitted experiments and activities

- Maintain the nation's stockpile of nuclear weapons in a safe and secure manner, and fulfill other nonproliferation and national security related missions

- Manage wastes generated on the NTS and at other DOE-approved facilities across the United States

- Perform site characterization and environmental restoration activities required to minimize or eliminate the impacts of past operations

- Supervise operations of non-DOE entities performing research and development related to the safety aspects of hazardous chemicals and liquefied gaseous fuels

- Serve as an outdoor laboratory where scientists and students can conduct research on environmental issues as part of the DOE - National Environmental Research Park Network.

Final
Environmental Impact Statement

for
the Nevada Test Site and Off-Site Locations
in the State of Nevada

Summary

U.S. Department of Energy
Nevada Operations Office
Las Vegas, Nevada

Copies of this document are available
(while supplies last) upon written request to:

U.S. Department of Energy
Nevada Operations Office
Environmental Protection Division
P.O. Box 98518
Las Vegas, NV 89193-8518

or by phone to:
(702) 295-4652

Department of Energy
Nevada Operations Office
P.O. Box 98518
Las Vegas, NV 89193-8518

Dear Interested Party

The Final Environmental Impact Statement (EIS) for the Nevada Test Site (NTS) and Off-Site Locations in the State of Nevada has been completed. This Summary is provided to familiarize the reader with the EIS and its content. The entire document is available and may be obtained by calling (702) 295-4652. The EIS examines existing and potential impacts to the environment that have resulted, or could result, from current and future Department of Energy activities in southern Nevada. The EIS analyzes four alternatives for managing the activities of Department of Energy programs at the NTS, the Tonopah Test Range, portions of the Nellis Air Force Range Complex, the Central Nevada Test Area, and the Project Shoal Area. In addition, proposed Solar Enterprise Zone facilities in Dry Lake Valley, Eldorado Valley, Coyote Spring Valley and the NTS are also examined.

The EIS identifies the Preferred Alternative as the Expanded Use Alternative (Alternative 3) plus the public education activities from Alternative 4, Alternate Use of Withdrawn Lands. This Preferred Alternative is the most comprehensive alternative in supporting statutory mission responsibilities while providing for a diversification of use to include nondefense, interagency, public, and private uses of the resources and capabilities available. Details on this preferred alternative can be found in the Summary and in Volume 1, Section 3.6, of this EIS. A framework for a Resource Management Plan is included as Volume 2 of this EIS and represents the development of an ecosystem management-based planning process closely integrated with the National Environmental Policy Act process.

The Department of Energy appreciates your participation in the development of this EIS and looks forward to your continued participation in the development of the Resource Management Plan and other activities of the Department of Energy.

Terry A. Vaeth
Acting Manager

Side bar notation indicates a change to the text.

COVER SHEET

RESPONSIBLE AGENCY: U.S. Department of Energy

COOPERATING AGENCIES: Federal: U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, Defense Nuclear Agency; and U.S. Air Force; Local Governments: Nye County, Nevada

TITLE: Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (DOE/EIS-0243)

FOR FURTHER INFORMATION:
Donald R. Elle, Ph. D.; EIS Program Manager
Office of the Assistant Manager for Technical Support
U.S. Department of Energy
Post Office Box 98518
Las Vegas, Nevada 89193-8518
Telephone: (702) 295-4652 or (800) 405-1140

FOR GENERAL INFORMATION ON DOE'S PROCESS FOR IMPLEMENTING THE NATIONAL ENVIRONMENTAL POLICY ACT, CONTACT:
Ms. Carol M. Borgstrom, Director
Office of NEPA Policy and Assistance
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington, D.C. 20585
Telephone: (202) 586-4600, or leave a message at (800) 472-2756

ABSTRACT: This sitewide EIS evaluates the potential environmental impacts of four possible land-use alternatives being considered for the Nevada Test Site (NTS), the Tonopah Test Range, and the formerly operated DOE sites in the state of Nevada: the Project Shoal Area, the Central Nevada Test Area, and portions of the Nellis Air Force Range Complex. Three additional sites in Nevada—Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley—are evaluated for colocation of solar energy production facilities. The four alternatives include **Continue Current Operations** (No Action, continue to operate at the level maintained for the past 3 to 5 years); **Discontinue Operations** (discontinue operations and interagency programs); **Expanded Use** (increased use of NTS and its resources to support defense and nondefense programs); and **Alternate Use of Withdrawn Lands** (discontinue all defense-related activities at NTS; continue waste management operations in support of NTS environmental restoration efforts; expand nondefense research). Environmental impacts were assessed for each alternative by analyzing, to the extent possible, the discrete and cumulative environmental impacts associated with Defense Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs. A framework for a Resource Management Plan is included as Volume 2 of this EIS and represents the development of an ecosystem based planning process closely integrated with the National Environmental Policy Act process. This EIS, among other things, analyzed the impacts of transportation of low level waste, and site characterization activities related to the Yucca Mountain Project but did not analyze the suitability of the site as a repository. This EIS does not analyze the suitability of the Yucca Mountain site as a repository as this is an action beyond the scope of the EIS. The **Preferred Alternative** is identified as **Expanded Use** plus the public education activities from **Alternate Use of Withdrawn Lands.** Volume 3 of this EIS contains the public comments and the responses to the comments.

TABLE OF CONTENTS

List of Figures

List of Tables

SUMMARY

Introduction

The U.S. Department of Energy (DOE) proposes to continue managing the Nevada Test Site (NTS) and off-site locations in Nevada and their resources, in a manner that meets evolving DOE missions and responds to the concerns of affected and interested individuals and agencies. The DOE has prepared this Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act of 1969, the Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508), and the DOE National Environmental Policy Act Implementing Procedures (10 CFR Part 1021).

This Environmental Impact Statement (EIS) analyzes the impacts from DOE programs at the following sites: the NTS, the Tonopah Test Range, portions of the Nellis Air Force Range Complex (NAFR Complex), the Central Nevada Test Area, and the Project Shoal Area. These programs include ongoing activities for the stewardship of the nation's nuclear weapons stockpile, management of radioactive waste, and environmental restoration. Also examined in this EIS are newer programs, such as the proposed Solar Enterprise Zone facility sites at the NTS, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.

A key element of DOE's decisionmaking is a thorough understanding of the environmental impacts that may occur during the implementation of a proposed action. This EIS examines existing and potential impacts to the environment that have resulted, or could result, from current and future DOE operations in Nevada during the next 10-year period. The DOE prepared this EIS to assess various management alternatives and to provide the necessary background, data, and analyses to help decisionmakers and the public understand the potential environmental impacts of each alternative considered. This Summary presents a brief overview of these important points from this EIS.

In addition to the NTS EIS, the DOE is preparing several other program-level National Environmental Policy Act documents. Decisions made on these programs may affect the NTS since it is considered as an alternative site for the actions under consideration. These National Environmental Policy Act documents, along with NTS-specific Environmental Assessments, are listed in the information box on page S-5.

No sooner than 30 days after this Final EIS is issued, the DOE will issue a Record of Decision that explains all factors considered in reaching its decision and specifies which alternative or alternatives are considered to be environmentally preferable. If mitigation measures, monitoring, or other conditions are adopted as part of the DOE's decision, these actions will be summarized in the Record of Decision and will be included in a Mitigation Action Plan that will be prepared following the issuance of the Record of Decision. These documents will be made available to interested parties and be placed in public reading rooms.

It is a regulatory requirement of the DOE (10 CFR Part 1021) to review a sitewide EIS of multi-facility sites at least every 5 years. The DOE/NV proposes to accomplish this review in conjunction with the *Resource Management Plan* process. Although a framework for the *Resource Management Plan* is included as Volume 2 of this EIS, the *Resource Management Plan* will take longer to complete than this EIS. In the future, the Plan will be an integral part of the National Environmental Policy Act process on the NTS. The DOE is committed to completing the *Resource Management Plan* within 2 years. The 5-year sitewide review required by DOE policy will utilize the *Resource Management Plan* as part of the review of the NTS EIS and in determining whether (1) the existing NTS EIS remains adequate, or (2) a new NTS EIS should be prepared or the existing NTS EIS supplemented. A more detailed discussion on the relationship between the *Resource Management Plan* and the NTS EIS is presented in the *Framework for the Resource Management Plan* (Volume 2, Section 1.4 of the NTS EIS).

This Final NTS EIS is organized into three volumes. Volume 1 contains the main text of the analysis and the appendices that contain the technical support information. Volume 2 is the framework for a *Resource Management Plan* for the NTS. Volume 3 is the compilation of comments received on the Draft NTS EIS and comment responses.

Public Comment Process on the Draft NTS Environmental Impact Statement

The Draft NTS EIS was developed after a series of public scoping meetings. The scoping process and issues raised during the scoping phase are described in the Final Implementation Plan (DOE/NV, 1995). The Draft NTS EIS was distributed for review and comment to congressional members and committees; the State of Nevada; tribal governments; several county governments; other federal agencies; and the general public. During the 90-day comment period (February 2 to May 3, 1996), the DOE invited comments to correct factual errors or to provide insights on any other matter related to this environmental analysis. Public hearings were held in St. George, Utah; Reno, Pahrump, and Las Vegas, Nevada; and additional workshops were held in Caliente, Tonopah, Boulder City, and North Las Vegas, Nevada during the period March 26 to April 30, 1996. In addition, the public was encouraged to provide comments via mail, fax, e-mail, and telephone (toll-free 800 number).

In response to public feedback critical of the DOE's traditional hearing format, the public hearings and workshops held on the Draft NTS EIS were conducted using various formats selected by representatives of the host community. The formats chosen allowed for a two-way interaction between the DOE and the public; increased public awareness and understanding on project-related impacts discussed in the Draft NTS EIS; and encouraged informed public input and comments on the document. Community facilitators were present at the workshops to direct and clarify discussions and comments.

All public hearing and workshop comments received by mail, fax, e-mail, or telephone during the public comment period are presented in Volume 3 of this EIS, the Public Comment Response Document. Volume 3 describes the public comment process in detail, presents broad issue summaries and responses, and includes copies of all comments received.

The DOE provided the Draft Appendix J, "Classified Supplement: Project-Specific Environmental Impact Analysis (Lyner Complex)," for review by appropriately cleared staff of the Environmental Protection Agency and the State of Nevada. Neither party had any recommendations for changes to the classified supplement.

Summary of Significant Public Comments

A total of 1,784 comments were received from federal, state, and local agencies; members of the public and other stakeholders; and American Indian tribes on the Draft NTS EIS. Although the comments covered a range of topics, most comments can be summarized as falling into 12 issues of broad concern. The following discussions, although not all inclusive, are representative of the majority of comments received during the public comment period.

1. Exclusion of the Yucca Mountain Project: Many comments questioned the exclusion from the NTS EIS of the possible disposal of spent nuclear fuel and high-level radioactive waste in a deep geologic repository at Yucca Mountain. Concern was expressed over the separation of the analysis of DOE actions at Yucca Mountain and the NTS, especially waste disposal and transportation issues. Commentors strongly urged that these impacts be evaluated and included as part of the NTS EIS. Yucca Mountain-related transportation issues included routing and notification of waste shipments.

2. General Anti-Nuclear Sentiments: Many comments expressed a general opposition to nuclear weapons, weapons testing, the generation of electricity by nuclear power, and the land disposal of nuclear waste. Some comments opposed the proposed conduct of subcritical experiments and expressed concern about the relationship between subcritical experiments and the successful completion of

the ongoing negotiations of the Comprehensive Test Ban Treaty. Other comments reflected support for the testing program, for the positive economic benefit to the surrounding rural communities from NTS activities, and for future stockpile activities to be located at the NTS.

3. American Indian Claims to Withdrawn Lands - Ruby Valley Treaty: Many comments referenced the long-standing claims, by the Western Shoshone Indians, to 24 million acres of land in Nevada, including the western half of the NTS. Some comments asserted that these lands should be returned to the Western Shoshone Indians, and that the federal government has no right to use the land for any purpose whatsoever, including those potential uses addressed in the NTS EIS.

4. Use of Lands Withdrawn from the Public Domain: Several comments questioned the inclusion and consideration of potential activities and operations on the NTS that are viewed as inconsistent with the original purpose and use of the withdrawn lands. These comments expressed the concern that because the land withdrawals for the NTS are for the purpose of nuclear testing, other activities such as waste management, the construction and operation of solar power generating facilities, and the defense and heavy industrial facilities described in the NTS EIS are inconsistent with the Public Land Orders.

5. Land Use under Interagency Memorandums of Understanding or Agreements: Some comments asked about the interagency and intra-agency land-use agreements that cover use of lands discussed in the NTS EIS. These comments focus more directly on the interrelationship and significance of the agreements between the Department of Defense and between the DOE/NV and the Yucca Mountain Site Characterization Office. Some comments questioned the authority of the DOE to enter into such agreements; others argued that the DOE cannot authorize the use by other federal agencies of lands under its jurisdiction.

6. Route Selection for Radioactive Waste: Many comments raised issues relating to the transport of radioactive wastes from other DOE facilities and operations to the NTS. These comments range from demands for the DOE to select transportation routes in the NTS EIS to the suggestion that the DOE should contractually obligate selected carriers to specific rest stop locations along specified routes. Transportation comments included requests for additional institutional interaction and communication. State, county, and municipal governments also recommended specific mitigations regarding enhanced communication and training, and provision and maintenance of equipment.

7. Role and Authority of the Resource Management: Several comments requested additional information on the role and authority of the NTS *Resource Management Plan* in shaping the future use of the NTS. Comments included questions on how the *Resource Management Plan* will be developed and the public's ability to provide input in its formulation, challenges to DOE's concept of the principles of "ecosystem management," and suggestions that the *Resource Management Plan* would have little or no authority to protect natural resources on the NTS.

8. Release of Withdrawn Lands: Several comments suggested that all DOE activities and operations at the NTS should cease and the withdrawn lands which comprise the NTS, or portions of the site, should be returned to the state of Nevada, the public, the Western Shoshone, or Bureau of Land Management. Many comments emphasized that environmental restoration should occur prior to release.

9. Perception Based Impacts on Regional Prosperity and Economic Development: Several comments alleged a direct link between the public's perception of activities conducted at, or in relationship to, the NTS and regional prosperity and economic development. These activities included shipment of waste to Nevada and especially through Las Vegas, disposal of radioactive waste, and defense related nuclear activities. Many comments asserted adverse

impacts, such as loss of jobs for Las Vegas and the state of Nevada, while others concluded that beneficial impacts, as the result of economic diversification and increased employment opportunities, were likely.

10. Residual Radioactive Contamination - Source Term: Several comments questioned the accuracy of estimated levels of residual radioactive contamination on the land surface, in the underground environment, and in groundwater resources beneath the NTS. Challenges were raised concerning the methodology and data used to make these estimates, alleging that the low values used resulted in an underestimate of potential risks to public health and safety. Many comments indicated that confidence in the estimates provided in the NTS EIS could be developed if the DOE released classified information on historical nuclear weapons testing.

11. Hydrology and Water: Several comments expressed concern about the impacts of the proposed action on the regional groundwater flow system especially with respect to drinking water supplies in Amargosa Valley and the environmentally sensitive areas of Ash Meadows, Devils Hole, and Death Valley. Other comments requested clarification of water rights issues concerning actions that are not perceived to be within the DOE's mission.

12. Radioactive Waste Shipments and Waste Types: Several commentors noted differences between the radioactive waste volumes and resulting waste shipment estimates presented in the Draft Programmatic Waste Management EIS, the Baseline Environmental Management Report, and those presented in the Draft NTS EIS. Comments noted that these differences in the data also resulted in different risk assessment results. Commentors also questioned the relationship between various terms used to refer to low-level waste in the Draft NTS EIS. Commentors were confused by the terms "greater-than-Class C," "similar to greater-than-Class C," "inappropriate for shallow land disposal," and "special case waste," and questioned whether the Draft NTS EIS had devoted adequate attention to waste represented by these terms. In particular, commentors criticized the Draft NTS EIS for its lack of any mention of special case waste, and the lack of analysis of disposal of greater-than-Class C waste, in view of a recent announcement that the DOE is studying the co-disposal of greater-than-Class C waste with DOE special case waste that is similar to greater-than-Class C waste.

Chapter 1 of Volume 3 summarizes the DOE's responses to these broad issues.

Summary of Significant Changes

Volume 3 of this EIS, the Public Comment Response document, contains copies of the comments on this EIS and the DOE's responses. Below is a summary of changes made in Volumes 1 and 2 as a result of the comments and other considerations cited above[1]:

With regard to the defense program, the rationale for conducting subcritical experiments, as well as the basis for inclusion of subcriticals in the No Action Alternative has been clarified. Information has been added to explain the historical basis for having conducted the tests in the past and to better define the program for the future. The relationship to current Comprehensive Test Ban Treaty negotiations is also clarified. Changes have been made in various sections of Chapters 2, 3, and 4 to clarify the nature of these experiments.

With regard to waste management, the waste volume and shipment numbers have been updated and clarified. Although some numbers have changed in the Final NTS EIS, overall conclusions are not affected. Questions about waste categories and what is disposed of on the NTS have been addressed and clarifying language has been added to the text. Changes have been made in various sections of Chapters 2, 3, 4, and 5 and Appendices A, H, and I of this EIS to clarify numbers used and discussions of the impacts.

Additional information has been provided about the development of the source term and the models used

[1]Sidebar notation indicates a change to the text.

in the evaluation of groundwater contaminant transport. This information has also been referenced in the Human Health Risk Assessment (Appendix H) to better clarify the results of impact assessments in the public environment off the NTS/NAFR Complex controlled lands. These changes have been made in Sections 4.1.4.2 and 4.1.5.2 of this EIS.

Comments regarding the impacts to biological resources have been addressed by adding clarifying information to the text. The recently completed Biological Opinion provided by the U.S. Fish and Wildlife Service has been referenced as well. These changes have been made in the text in various sections of Chapters 5 and 8 of this EIS.

The Consolidated Group of Tribes and Organizations has continued its evaluation of the NTS EIS and development of information pertaining to the DOE activities and conclusions. Appendix G has been revised and additional assessments have been incorporated. These assessments have been added, in italics, to the text of the NTS EIS.

There were many comments on the cumulative impacts assessment. Chapter 6 has been revised to incorporate more information and to better reflect the role of DOE activities as contributing to the overall impacts of the region.

Waste transportation activities and transportation-related issues have been addressed through revisions to the Transportation Study, incorporating the transportation of defense program materials as well as hazardous materials in relation to activities at the NTS. The concerns of the local governments and the public have been addressed as well. American Indian concerns will be identified and addressed through a recently initiated American Indian Transportation Study and continued government-to-government consultation.

Purpose and Need

As a result of the changing mission priorities, the DOE has focused on new national security, energy, and environmental issues challenging the nation, and a redefined role for the NTS within the DOE complex.

Planned, ongoing, or recently completed National Environmental Policy Act actions related to the NTS EIS:

- **Draft Programmatic EIS for Waste Management (August, 1995)**
- **Draft Programmatic EIS for the Stockpile Stewardship and Management (February, 1996)**
- **Draft Programmatic EIS for the Storage and Disposition of Weapons-Usable Fissile Materials (February, 1996)**
- **Draft EIS for the Continued Operations of the Pantex Plant and Associated Storage of Nuclear Weapons Components (March, 1996)**
- **Disposition of Surplus Highly Enriched Uranium Final EIS (June, 1990)**
- **Sitewide EIS for the Los Alamos National Laboratory (in preparation)**
- **Medical Isotopes Production Project: Molybdenum 99 and Related Isotopes Final EIS (May, 1996)**
- **EIS for a Potential Repository at Yucca Mountain, Nevada (proposed)**

Ongoing or recently completed National Environmental Policy Act actions for specific activities at the NTS and surrounding areas:

- **Draft Environmental Assessment for Double Tracks Test Site, Nye County, Nevada**
- **Draft Environmental Assessment for the Liquid Waste Treatment System at the NTS, Nye County, Nevada**
- **Environmental Assessment for the Solid Waste Disposal, NTS, Nye County, Nevada**
- **Environmental Assessment for the Device Assembly Facility Operations, NTS, Nye County, Nevada**
- **Environmental Assessment for the Sewage Lagoon System Area 5, NTS, Nye County, Nevada**
- **Environmental Assessment for Hazardous Materials Testing at the Liquefied Gaseous Fuels Spill Test Facility, Frenchman Flat, NTS (currently called the Spill Test Facility)**

The NTS has a long history of supporting national security objectives through the conduct of underground nuclear tests and other nuclear and non-nuclear activities. In recent years the nuclear testing policies have changed, causing significant changes in NTS programs. Since October 1992, there has been a moratorium on underground nuclear testing. Presently, the primary mission of the DOE at the NTS is to maintain a readiness to conduct tests, and, in an unlikely circumstance, to conduct tests if so directed by the President.

In addition to its primary mission, and because of its favorable environment and infrastructure, the NTS supports DOE national security related research, development and testing programs, and waste management activities. The NTS also provides opportunities for various environmental research projects. The underground nuclear testing moratorium has resulted in the need for the DOE to redefine mission priorities and manage land use at the NTS to support current and future activities mandated by statute, Presidential direction, and Congressional authorization and appropriation.

The DOE manages all of its lands and facilities as valuable national resources with stewardship based on the principles of ecosystem management and sustainable development. This has resulted in the need for a comprehensive plan for the NTS to guide land- and facility-use decisions and integrate mission, economic, ecologic, social, and cultural factors.

Programs Considered

The projects and activities at the NTS are categorized into five programs: Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. Services such as common utilities, fire protection, and communications for each of these programs are provided through the NTS support services infrastructure. Brief summaries of each program are presented in the following discussion.

Defense Program. The primary mission of the Defense Program is to help ensure the safety and reliability of the nation's nuclear weapons stockpile. Stewardship of the stockpile includes maintaining the readiness and capability to conduct underground nuclear tests, and conducting such tests, if so directed by the President. Other aspects of the program include treaty compliant and permitted conventional high-explosive tests, dynamic experiments, including subcritical experiments and hydrodynamic testing. Although the term "subcritical" is not used in previous EISs for the NTS, some tests or experiments conducted over the past decades as well as the impacts of those tests or experiments, are substantially the same as those contemplated by the new terminology. The term "subcritical experiments," rather than defining a new form of activity, is intended instead to clarify and emphasize the fact that such experiments involving the use of special nuclear material would not achieve the condition of criticality. The nation's nuclear emergency response capability, its ability to respond to nuclear emergency, and search and identification tasks have also been a part of the Defense Program mission of the NTS.

Waste Management Program. The NTS presently serves as a disposal site for low-level waste generated by DOE-approved generators and also as a storage site for a limited amount of transuranic mixed wastes. Managed radioactive waste disposal operations began at the NTS in the early 1960s, and low-level, transuranic, mixed, and classified low-level wastes have been disposed of in selected pits, trenches, landfills, and boreholes on the NTS.

Environmental Restoration Program. The goal of the Environmental Restoration Program is to ensure that risks to human health and safety, and to the environment, posed by inactive and surplus facilities and sites, are either eliminated or reduced to protective levels. Achieving this goal includes characterizing and cleaning up contaminated sites and facilities to minimize the impacts of past activities on the NTS and other DOE locations within Nevada. The Environmental Restoration Program for the NTS and off-site locations under Nevada Operations Office responsibility has been formally established as the Nevada Environmental Restoration Project.

Nondefense Research and Development Program. Historically, the DOE has supported a variety of research and development activities in cooperation with universities, industry, and other federal agencies. The National Environmental Research Park program, research on the safety aspects of handling hazardous fluids and liquids, and evaluation of solar energy options are examples of this kind of activity.

Work for Others Program. Historically, the DOE has hosted projects by other federal agencies, especially the Department of Defense, that require the large, remote, and secured areas offered by the NTS. These activities include the shared use of certain facilities and resources for co-use of NTS airspace, training exercises, and research and development projects. Support is also provided in the areas of nonproliferation and verification of international treaties.

Alternatives

Four alternatives are evaluated in this Final NTS EIS: (1) Continue Current Operations (No Action Alternative), (2) Discontinue Operations, (3) Expanded Use, and (4) Alternate Use of Withdrawn Lands.

These alternatives have been designed to analyze and compare the potential effects of a wide range of use options. The alternative (development scenario) the DOE ultimately selects, however, may not be one of the alternatives in its entirety, but rather a hybrid created by selecting specific options from among the various alternatives.

As part of the planning process related to each alternative, land-use maps have been developed to illustrate the general zoning that would be implemented for each alternative and the selected activities within the alternative. The land-use maps indicate existing land status to the extent that past or present activities might influence future land use.

Alternative 1 - Continue Current Operations (No Action). The U.S. Department of Energy, Nevada Operations Office (DOE/NV) and interagency programs, activities, and operations in the five mission categories would continue in the same manner and degree as they have during the past 3 to 5 years.

The Environmental Restoration Program would continue in the form of characterization and remediation of contaminated areas and facilities; these activities would continue in the Project Shoal Area, the Central Nevada Test Area, the NAFR Complex, and the Tonopah Test Range. Current institutional controls would remain in force.

Two nuclear testing scenarios for the Defense Program are analyzed under Alternative 1. In the first scenario, the President would not direct any nuclear testing, and the DOE's nuclear testing-related activities would be limited to maintaining a readiness to test. This scenario emphasizes the NTS's science-based stockpile stewardship experiments and operations. These experiments include dynamic experiments and hydrodynamic tests: some of the former involve special nuclear material (so-called "subcritical" experiments). See Volume 1, Section 2.4 for a discussion of these terms. In the second scenario, which the DOE believes unlikely but consistent with the site's historical mission, there is a contingent possibility that the President, through an end of the moratorium or through the "supreme national interest" clause of a test ban treaty, would direct the DOE to conduct one or more nuclear tests in order to achieve a high level of confidence in the safety and reliability of the weapon type in question. These types of stockpile tests would be conducted on Pahute Mesa or on Yucca Flat, which are the only locations considered for future nuclear testing in this EIS. All Defense Program activities at the Tonopah Test Range would continue at the current level of effort. The Work for Others Program and the Nondefense Research and Development Program would continue as it has during the past 3 to 5 years.

Alternative 2 - Discontinue Operations. Under Alternative 2, DOE/NV and interagency programs, activities, and operations at the NTS would be discontinued. Only those environmental monitoring and security functions necessary for human health, safety, and security would be maintained. Control of the NTS would be maintained by the DOE. All facilities would be placed in cold standby after operations have ceased. Defense Program activities associated with stockpile stewardship would continue at the Tonopah Test Range.

Alternative 3 - Expanded Use. The Expanded Use Alternative would include support for ongoing DOE/NV mission categories as described under Alternative 1 and provide for increased use of the NTS and its related resources and capabilities. The NTS and Tonopah Test Range Defense Program activities associated with stockpile stewardship would proceed at an increased level of effort. Waste management activities would be increased to a level consistent with those identified in the centralized alternative for low-level waste and a regionalized alternative for mixed waste of the Draft Waste Management Programmatic EIS. Environmental Restoration projects at all DOE/NV sites would continue and would be accelerated. The NTS would be more available to both public and private institutions for purposes of demonstrating and testing new environmental remediation technologies. Solar Enterprise Zone facilities would be constructed at the NTS and at least at one of the three other sites in southern Nevada: Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley. Use of the NTS and Tonopah Test Range airspace and certain lands by the military for training and defense-related research and development would increase as part of the Work for Others Program. Other defense-related projects also would be located at the NTS and the Tonopah Test Range.

Alternative 4 - Alternate Use of Withdrawn Lands. All defense-related activities and most Work for Others Program activities would be discontinued at the NTS except for possible increased use of airspace by the U.S. Air Force. Current radioactive waste management operations would continue, with the restriction that wastes would only be accepted from DOE sites within Nevada. The Environmental Restoration Program would continue at current or accelerated rates at all DOE/NV sites. Certain portions of the NTS could be returned to the public domain and portions of the NTS would be available for purposes of public education and recreation. As in Alternative 3, Solar Enterprise Zone facilities would be constructed at the NTS and at one of the other three southern Nevada sites. The Defense Program associated with stockpile stewardship would continue at the Tonopah Test Range.

Specific projects and activities associated with all four alternatives are presented in Tables S-1 through S-4.

Preferred Alternative. The DOE Preferred Alternative is Alternative 3, Expanded Use, plus the public education activities from Alternative 4. The Expanded Use Alternative represents a continuation of the multi-purpose, multi-program use of the site and further represents a continuation and diversification of the DOE/NV and interagency programs and operations at the NTS. The Expanded Use Alternative includes support for ongoing DOE/NV program categories defined in the Continue Current Operations (No Action Alternative), and also provides for increased use of the NTS and its related resources and capabilities. This alternative would also make the NTS more available to both public and private institutions for purposes of demonstrating new technologies.

Public education activities from Alternative 4 include establishing educational tour routes on the NTS and promoting the concept of creating a nuclear era museum that highlights the NTS testing activities. Tours would allow the public to see firsthand some of the history and impacts of past nuclear testing. These activities would be an important contribution to public understanding of the nation's nuclear testing and Cold War Era history.

Other Projects and Alternatives. Prior to the public scoping period, the DOE determined that a number of projects outside the 5 to 10 year timeframe or potential projects that are not yet sufficiently developed for meaningful review, would not be considered in this EIS. The potential Yucca Mountain repository construction, operation, and closure is an example of such a project.

A number of site management alternatives and options were suggested during public scoping for this Draft NTS EIS. The DOE considered these alternatives and dismissed them as unreasonable for such reasons as taking too long to implement, being prohibitively expensive, being too speculative in

Table S-1. Comparison of Defense Program Activities for the Alternatives

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Stockpile Stewardship - Maintain Readiness to Test - Conduct Underground Nuclear Weapons Testing (if directed) - Conduct Dynamic Experiments, including Subcritical Experiments, and Hydrodynamic Tests - Conduct Conventional High-Explosive Testing - Destroy Damaged Nuclear Weapons **Nuclear Emergency Response** - Nuclear Emergency Search Team - Federal Radiological Monitoring and Assessment Center - Aerial Measuring System - Accident Response Group - Radiological Assistance Program - Internal Emergency Management Program **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests	**Stockpile Stewardship** - Discontinue All Activities **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests	**Stockpile Stewardship** - Maintain Readiness to Test - Conduct Underground Nuclear Weapons Testing (if directed) - Conduct Dynamic Experiments, including Subcritical Experiments, and Hydrodynamic Tests - Conduct Conventional High-Explosive Testing - Construct Nuclear Weapons Simulators - National Ignition Facility (if selected in Stockpile Stewardship and Management Programmatic EIS) - Destroy Damaged Nuclear Weapons **Stockpile Management** - Store Nuclear Weapons - Disassemble Nuclear Weapons - Assemble Nuclear Weapons - Modify and Maintain Nuclear Weapons - Test Weapons Components for Quality Assurance - Provide Interim Storage of Pits **Nuclear Emergency Response** - Nuclear Emergency Search Team - Federal Radiological Monitoring and Assessment Center - Aerial Measuring System - Accident Response Group - Radiological Assistance Program - Internal Emergency Management Program **Storage and Disposition of Weapons-Usable Fissile Materials** - Store Weapons-Usable Fissile Material - Disposition Weapons-Usable Fissile Material - Construct New or Modify Tunnel Complexes - Increase Robotic Technology Experiment - Construct New or Modify Existing Structures - Heavy Industrial Facility **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests	**Stockpile Stewardship** - Discontinue All Activities **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests

Table S-2. Comparison of Waste Management Program Activities for the Alternatives

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Area 3 Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste Closure: - Disposal Crater Complex UE3ax/bl - Disposal Crater Complex UE3ah/at **Area 5** Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste - Nevada Generated Mixed Waste - Greater Confinement Waste Storage: - Nevada Generated Mixed Waste - Transuranic Waste - Mixed Transuranic Waste - Hazardous Waste Closure Activities: - Close Designated Low-Level Waste Disposal Units - Close Designated Mixed Waste Disposal Units - Close Designated Greater Confinement Disposal Units **Area 6** Storage Activities: - PCB Waste Disposal Activities: - Hydrocarbon Landfill **Area 11** Treatment Activities: - Explosive Ordnance Disposal Unit	No Activity	**Area 3** Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste Closure: - Disposal Crater Complex UE3ax/bl - Disposal Crater Complex UE3ah/at Construction: - Future Low-Level Waste Disposal Pit - Building 3-302 (expansion) - Area 3 Truck Decon Station **Area 5** Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste - Nevada Generated Mixed Waste - Greater Confinement Waste Storage: - Nevada Generated Mixed Waste - Transuranic Waste - Mixed Transuranic Waste - Hazardous Waste Facility Construction Activities: - Breaching and Sampling Facility - Real-Time Radiography - Transuranic Waste Certification Facility - Transuranic Waste Handling and Loading Facility - Mixed Waste Storage Pad - Mixed Waste Disposal Units - Low-Level Waste Disposal Units - Greater Confinement Disposal Units - Hazardous Waste Storage Pad (expansion) - Water Supply Line - Access Control Building - Maintenance Building - 5-01 Road Reconstruction (may not be necessary) - 5-07 Road Reconfiguration (may not be necessary) - 500-Year Flood Protection - Low-Level Waste Storage Facility - Fire Protection Utilities - Telephone System Closure Activities: - Close Designated Low-Level Waste Disposal Units - Close Designated Mixed Waste Disposal Units - Close Designated Greater Confinement Disposal Units Treatment Facility: - Cotter Concentrate Mixed Waste **Area 6** Storage Activities: - PCB Waste Treatment Activities: - Low-Level Liquid Waste Treatment Facility - Mixed Liquid Waste Treatment Facility Disposal Activities: - Hydrocarbon Landfill **Area 11** Treatment Activities: - Explosive Ordnance Disposal Unit	**Area 3** Disposal: - Nevada Generated Low-Level Waste Closure: - Disposal Crater Complex UE3ax/bl - Disposal Crater Complex UE3ah/at **Area 5** Disposal: - Nevada Generated Low-Level Waste Storage: - Transuranic Waste - Mixed Transuranic Waste - Hazardous Waste Closure Activities: - Close Designated Low-Level Waste Disposal Units - Close Designated Mixed Waste Disposal Units - Close Designated Greater Confinement Disposal Units Facility Construction Activities: - Water Supply Line - Access Control Building - Maintenance Building - 5-07 Road Reconfiguration - 500-Year Flood Protection - Fire Protection Utilities - Telephone System Treatment Facility: - Cotter Concentrate Mixed Waste **Area 6** Storage Activities: - PCB Waste Treatment Activities: - Low-Level Liquid Waste Treatment Facility Disposal Activities: - Hydrocarbon Landfill **Area 11** Treatment Activities: - Explosive Ordnance Disposal Unit

Table S-3. Comparison of Environmental Restoration Program Activities for the Alternatives

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Underground Test Area Corrective Action Unit - Continue Groundwater Monitoring - Continue Drilling Characterization Wells - Evaluate and Implement Remediation Strategies **Soils Media Corrective Action Unit and Part of NAFR Complex** - Continue Studies to Identify, etc. Alternate Remedial Measures - Remove Contaminated Soils on NTS and Nellis Lands - Dispose of Contaminated Soils in Permitted Facilities - Select Alternate Remedial Action Method and Implement **Industrial Sites Corrective Action Unit** - Characterize and Dispose of Environmental Restoration Sites - Continue Field Program to Identify Sites - Dispose of Waste in Approved Facilities - Continue to Characterize and Remediate the Resource Conservation and Recovery Act Industrial Sites **Decontamination and Decommissioning Facilities** - Continue Remediation Action and Planning **Defense Nuclear Agency Sites** - Continue Operations to Stop Contaminant Migration - Characterize and Remediate Contaminated Muck Piles and Ponds - Select and Implement Alternate Remedial Action or Redesign **Tonopah Test Range** - Continue Characterization and Remediation **Central Nevada Test Area** - Continue Characterization and Remediation **Project Shoal Area** - Continue Characterization and Remediation	No Activity	**Underground Test Area Corrective Action Unit** - Continue Groundwater Monitoring - Continue Drilling Characterization Wells - Evaluate and Implement Remediation Strategies - Intensify Groundwater Monitoring - Accelerate, Evaluate, and Implement Remediation Strategies - Alternate Uses May Require Stricter Cleanup Levels **Soils Media Corrective Action Unit and Part of NAFR Complex** - Continue Studies to Identify, etc. Alternate Remedial Measures - Remove Contaminated Soils on NTS and Nellis Lands - Dispose of Contaminated Soils in Permitted Facilities - Activities Would Accelerate Above Present Levels - After Studies, Select Alternate Remedial Action Method and Implement - Alternate Uses May Require Stricter Cleanup Levels **Industrial Sites Corrective Action Unit** - Characterize and Disposition Environmental Restoration Sites - Continue Field Program to Identify Sites - Continue to Characterize and Remediate the Resource Conservation and Recovery Act Industrial Sites - Activities Would Accelerate Above Present Levels - Alternate Uses May Require Stricter Cleanup Levels **Decontamination and Decommissioning Facilities** - Accelerate Remedial Actions - Alternative May Require Clean Closure, Not Closure In Place **Defense Nuclear Agency Sites** - Accelerate Operations to Stop Radiation and Hazardous Contaminated Migration - Select and Implement Alternate Remedial Action or Redesign - Alternate Uses May Require Stricter Cleanup Levels - Characterize and Remediate Contaminated Muck Piles and Ponds. **Tonopah Test Range** - Accelerate Characterization and Remediation of Site **Central Nevada Test Area** - Accelerate characterization and remediation **Project Shoal Area** - Continue Characterization and Remediation - Accelerate Characterization and Remediation of Site	**Underground Test Area Corrective Action Unit** - Continue Groundwater Monitoring - Continue Drilling Characterization Wells - Evaluate and Implement Remediation Strategies - Intensify Groundwater Monitoring - Accelerate, Evaluate, and Implement Remediation Strategies - Alternate Uses May Require Stricter Cleanup Levels **Soils Media Corrective Action Unit and Part of NAFR Complex** - Continue Studies to Identify, etc. Alternate Remedial Measures - Remove Contaminated Soils on NTS and Nellis Lands - Dispose of Contaminated Soils in Permitted Facilities - Activities Would Accelerate Above Present Levels - After Studies, Select Alternate Remedial Action Method and Implement - Alternate Uses May Require Stricter Cleanup Levels **Industrial Sites Corrective Action Unit** - Characterize and Disposition Environmental Restoration Sites - Continue Field Program to Identify Sites - Continue to Characterize and Remediate the Resource Conservation and Recovery Act Industrial Sites - Activities Would Accelerate Above Present Levels - Alternate Uses May Require Stricter Cleanup Levels **Decontamination and Decommissioning Facilities** - Accelerate Remedial Actions - Alternative May Require Clean Closure, Not Closure In Place **Defense Nuclear Agency Sites** - Accelerate Operations to Stop Radiation and Hazardous Contaminated Migration - Select and Implement Alternate Remedial Action or Redesign - Alternate Uses May Require Stricter Cleanup Levels - Characterize and Remediate Contaminated Muck Piles and Ponds. **Tonopah Test Range** - Accelerate Characterization and Remediation of Site **Central Nevada Test Area** - Accelerate characterization and remediation **Project Shoal Area** - Continue Characterization and Remediation - Accelerate Characterization and Remediation of Site

Table S-4. Comparison of Nondefense Research and Development, Work for Others, and Site Support Activities for the Alternatives

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Nondefense Research and Development Program			
- Establish Solar Enterprise Zone - Spill Test Facility - Alternate Fuel Demonstration Project (16 vehicles) - Technology Development (normal) - Environmental Research Park	- No Activity	- Establish Solar Enterprise Zone - Construct and Operate Solar Production Facilities - Spill Test Facility - Alternate Fuel Demonstration Project (16 vehicles plus fueling station) - Technology Development (expanded) - Environmental Research Park	- Establish Solar Enterprise Zone - Construct and Operate Solar Production Facilities - Spill Test Facility - Alternate Fuel Demonstration Project (16 vehicles) - Technology Development (expanded) - Environmental Research Park
Work for Others Program			
Treaty Verification - Threshold Test Ban Treaty - Peaceful Nuclear Explosion Treaty - Chemical Weapons Convention Treaty - Treaty on Open Skies **Nonproliferation Projects** **Counterproliferation Research and Development** - Dipole Hail - Big Explosives Experimental Facility - Cut and Cover **Conventional Weapons Demilitarization** **Nondefense Research and Development** - Conduct Munitions Research and Development - Training Exercises	- No Activity	**Increased activity levels for:** **Treaty Verification** - Threshold Test Ban Treaty - Peaceful Nuclear Explosion Treaty - Chemical Weapons Convention Treaty - Treaty on Open Skies **Nonproliferation Projects** **Counterproliferation Research and Development** - Dipole Hail - Big Explosives Experimental Facility - Cut and Cover **Conventional Weapons Demilitarization** **Nondefense Research and Development** - Conduct Munitions Research and Development - Training Exercises	**Treaty Verification** - Treaty on Open Skies No Activity - Increased Use of Airspace by DoD
Site Support Activities			
No change in: - Facilities - Services - Utilities - Communications	- Facilities (cold standby) - Services (minimal) - Utilities (minimal) - Communications (minimal) **Tonopah Test Range** - Maintain Site Support for Stockpile Stewardship	**Expand as necessary:** - Facilities - Services - Utilities - Communications	**Modify as Necessary:** - Facilities - Services - Utilities - Communications

nature, or being encompassed by the four alternatives analyzed in the Draft NTS EIS. A description of these alternatives is provided in Chapter 3 of Volume 1 of this EIS.

Affected Environments

The existing environments are described for the NTS and other locations in Nevada considered in the Final NTS EIS (Figure S-1). The environmental resources discussed include land use, geology and soils, hydrology, biology, air quality, noise, and visual and cultural resources. Existing waste management activities and other resource elements—including airspace, site-support activities, transportation, socioeconomic, occupational and public health and safety, radiological conditions, and Environmental Justice—also are included in the descriptions of environmental conditions. Major elements of the affected environment are summarized in the following discussion.

Land Use. The NTS encompasses 3496 square kilometers (km^2) (1,350 square miles [mi^2]) of land area reserved to the jurisdiction of the DOE. The majority of the NTS is located in Nye County, Nevada, 105 kilometers (km) (65 miles [mi]) northwest of Las Vegas. Area 13 is located partially within Lincoln County. This land area has been withdrawn from all forms of appropriation under public land laws. Mineral leasing is withdrawn or reserved to the discretion of the Secretary of the Interior. The NTS is surrounded by the NAFR Complex on the north, east, and west, and land managed by the U.S. Bureau of Land Management on the south and southwest. The NAFR Complex is used for military training; the U.S. Bureau of Land Management lands are used for grazing, mining, and recreation. Near the eastern boundary of the NTS, the NAFR Complex shares the use of land with the U.S. Fish and Wildlife Service's Desert National Wildlife Refuge.

The Tonopah Test Range was withdrawn for military use in the 1940s. Since 1956, the Tonopah Test Range has been managed by the DOE and its predecessors under a Memorandum of Understanding with the U.S. Air Force. The Tonopah Test Range encompasses 1606 km^2 (620 mi^2) of land located in Nye County, 64 km (40 mi) east of the town of Tonopah. The Tonopah Test Range is used for Defense and Work for Others-related research, design, and testing activities.

The Project Shoal Area was withdrawn from public use for purposes of underground nuclear testing. The Project Shoal Area is a 4-square mile area located in the northern part of the Sand Springs Mountain Range in Churchill County, 48 km (30 mi) southeast of Fallon, Nevada. The site is surrounded by unimproved rangeland. The Project Shoal Area was completed on October 26, 1963. The site is still under withdrawal from the U.S. Bureau of Land Management.

The Central Nevada Test Area is located in the north-central part of Hot Creek Valley, 95 km (60 mi) northeast of Tonopah, in Nye County, Nevada. The Central Nevada Test Area was obtained from the U.S. Bureau of Land Management by the Atomic Energy Commission to develop alternative sites for underground nuclear testing activities. The Project Faultless underground nuclear test occurred on January 19, 1968. Subsequent to the test, the withdrawal of public lands for the Central Nevada Test Area has remained unchanged and under control of the DOE. Cattle grazing and recreation are the main uses in the areas around the site.

Eldorado Valley is southwest of Boulder City, Nevada. The city of Boulder City has annexed 80,000 acres of Eldorado Valley, and has designated 6,000 acres of this land for a Solar Enterprise Zone facility site.

The Dry Lake Valley site is near the Apex Industrial Area, near the intersection of U.S. Highway 93 and Interstate 15 in Clark County, about 40 km (25 mi) northeast of Las Vegas. The Nevada Power Company has identified 3,600 acres for a Solar Enterprise Zone facility site, adjacent to a proposed 21,000-acre industrial-use park.

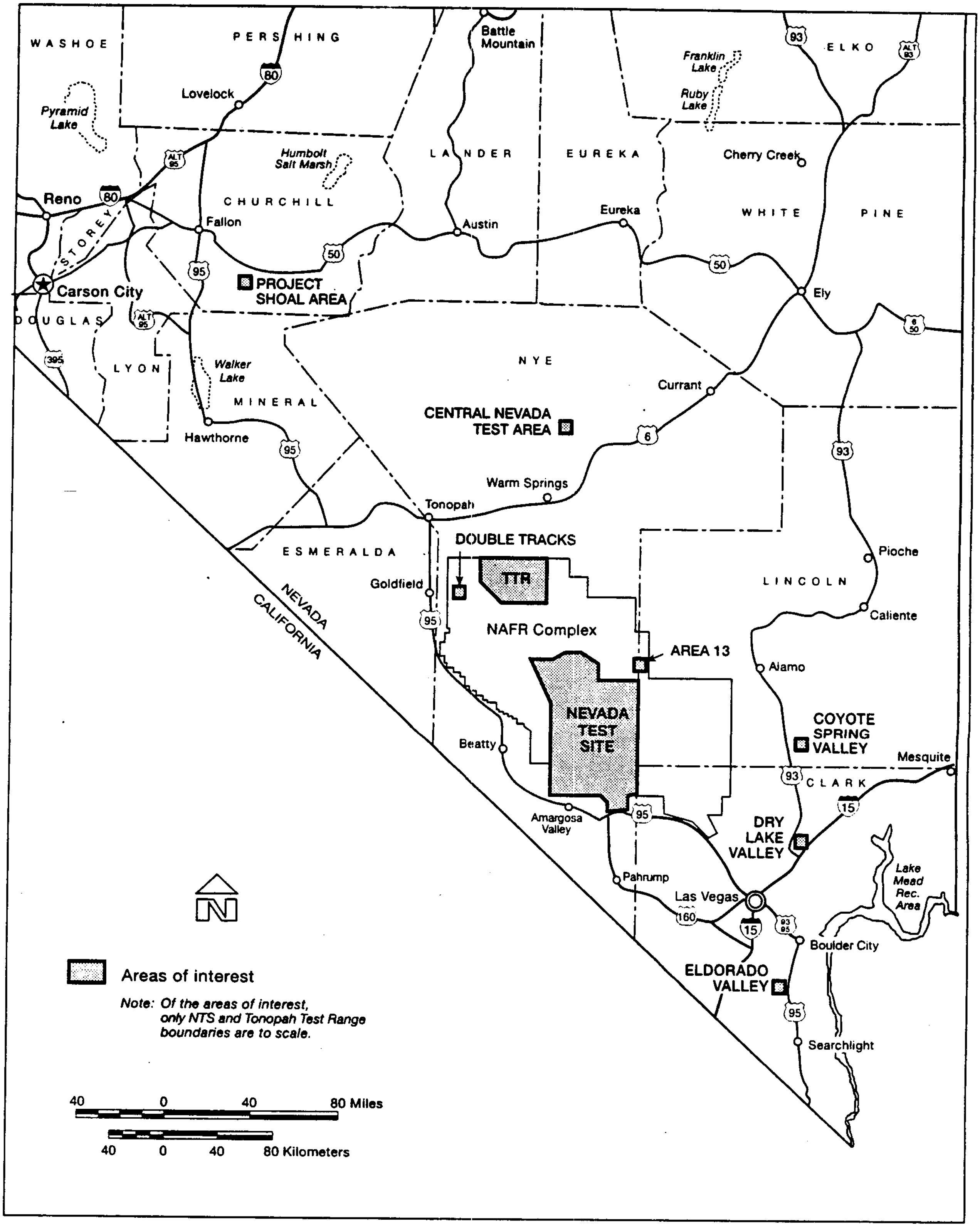


Figure S-1. NTS and selected areas of interest

The Coyote Spring Valley site would be located on 2,760 acres of an over 41,000-acre parcel of private land in the southern portion of Lincoln County, Nevada. The proposed location is east of U.S. Highway 93, 24 km (15 mi) north of State Route 168 and 72 km (45 mi) north of Las Vegas. The site is near or adjacent to U.S. Bureau of Land Management wilderness study areas, portions of which are proposed for wilderness designation by Congress. The U.S. Bureau of Land Management manages several wilderness study areas in this region.

Transportation. Baseline transportation activities are discussed in this EIS with respect to on-site traffic, off-site traffic, transportation of materials and wastes, and other transportation modes such as air and rail.

Defense, Waste Management, and Environmental Restoration Programs contribute most of the activities associated with the transportation of material and waste. All transportation activities associated with materials and waste are conducted in accordance with applicable federal and state regulations.

The Defense Program activities include the transportation of special nuclear materials, high explosives, and other associated materials for the NTS mission. The transportation of these materials is done by safe and secure trailers that have accumulated more than 1.2×10^8 km (7.5×10^7 mi) of over-the-road experience in transporting DOE-owned nuclear material without an accident that resulted in a release of radioactive material.

The Waste Management and Environmental Restoration Programs primarily transport low-level radioactive waste to the NTS for disposal. Other wastes that are transported include hazardous wastes that are being transported on site for storage and off site for ultimate disposition. As of June 1996 there are 14 off-site generators that transport low-level waste to the NTS for disposal. Municipal solid waste generated on the NTS is transported by trucks to permitted on-site landfills for disposal.

Waste Management. Several waste materials are managed at the NTS, including radioactive, mixed (including transuranic), hazardous, non-hazardous and Toxic Substances Control Act types of waste. DOE is committed to preventing pollution and reducing waste generation at the NTS. This is accomplished through establishing partnerships with private industry, and complying with local, state and federal regulations and DOE pollution prevention policies.

Low-level wastes generated at the NTS and at DOE approved off-site generators are disposed of at either the Area 3 or Area 5 Radioactive Waste Management Site. Mixed waste generated on site is disposed of at the Area 5 Radioactive Waste Management Site, which has Resource Conservation and Recovery Act interim status to accept such waste. No off-site generated mixed waste is currently accepted or disposed of at the NTS.

Transuranic, mixed transuranic, mixed waste, hazardous waste, and Toxic Substances Control Act wastes are stored at the NTS. Currently, transuranic waste is stored on the Transuranic Waste Storage Pad or in the classified storage area. Mixed transuranic waste is stored inside the transuranic waste building and mixed waste is stored outside the building on the Transuranic Waste Storage Pad in accordance with a mutual agreement between the State of Nevada and the DOE. These wastes may be stored at this location until the Waste Isolation Pilot Plant in Carlsbad, New Mexico, or another DOE site is available as a treatment, storage, or disposal destination for transuranic waste.

Hazardous waste is stored at the Hazardous Waste Storage Unit before being shipped to off-site treatment, storage, or disposal facilities. The only Toxic Substances Control Act waste generated at the NTS is polychlorinated biphenyl (PCB) waste. PCB waste is temporarily stored at the Area 6 Toxic Substances Control Act waste accumulation unit before being shipped to off-site treatment, storage, or disposal facilities. In addition, there is some radioactively contaminated PCB waste currently in storage on the Transuranic Waste Storage Pad in Area 5.

Under a Resource Conservation and Recovery Act permit, the Explosive Ordnance Disposal Unit at the

NTS treats reactive hazardous wastes (explosives) by detonation. No other hazardous wastes are treated at the NTS. There are no low-level or mixed waste treatment facilities at the NTS.

Waste generated at the Tonopah Test Range from ongoing activities is stored and transported off site for ultimate disposition. No waste management facilities exist in either the Project Shoal Area or the Central Nevada Test Area. Waste generated during the course of environmental restoration activities would be transported either to the NTS or a permitted hazardous waste treatment, storage, and disposal facility.

Socioeconomics. Ninety percent of the NTS workforce resides in Clark County; seven percent resides in Nye County. The remaining three percent reside in other counties or states. Within Clark County, most of the NTS workforce resides in the Las Vegas area.

Eldorado Valley and Dry Lake Valley are located within Clark County, and workforce characteristics would be similar to those for the NTS. Coyote Spring Valley is located in Lincoln County.

Geology and Soils. The topography of the NTS has been altered by historic DOE actions, particularly underground nuclear testing. The principal effect of testing has been the creation of numerous craters in Yucca Flat and on Pahute and Rainier Mesas. Lesser alterations have occurred as a result of road building, sand and gravel mining, and the construction of waste disposal areas, and flood control and drainage improvements.

Underground nuclear testing has resulted in impacts on the physical environment in terms of ground motion, disruption of the geologic media, surface subsidence, and contamination of the subsurface geologic media and surficial soils. Waste disposal operations have also contributed to surface disturbances and placement of materials having long-term impacts on the environment. Table S-5 summarizes baseline information on the remaining radionuclide inventory at the NTS.

Surface Hydrology and Groundwater. Except for the off-site solar enterprise sites, the areas considered in this Final NTS EIS are located within the Great Basin, an area from which no surface water leaves except by evaporation. Streams in the area are ephemeral. Because of the ephemeral nature of surface waters, only limited water quality data are available. Although precipitation is very low in the region, during extreme precipitation events there is some risk of flooding along arroyos and around playa lakes. Throughout the region, springs are the only natural sources of perennial surface water. Surface waters of the NTS, the Tonopah Test Range, and the NAFR Complex are not used for human consumption.

Surface water sources, which include open reservoirs, natural springs, containment ponds or effluents, and sewage lagoons, are routinely sampled for radiological substances at the NTS. With the exception of containment ponds, no annual average concentration in surface waters was found to be statistically different from any other at the five percent significance level. The analytical results from the Area 12 containment ponds showed measurable quantities of radioactivity and displayed identifiable trends.

All water discharges from sanitary sewers at the NTS, the Tonopah Test Range, and the NAFR Complex are regulated by the state of Nevada.

The NTS, Tonopah Test Range, and portions of the NAFR Complex are within the Death Valley Groundwater Flow System. Groundwater under the eastern part of the NTS and under Area 13 of the NAFR Complex flows southward toward the Ash Meadows Discharge Area. It is believed that groundwater under the western NTS and eastern Tonopah Test Range flows toward the Alkali Flat-Furnace Creek discharge area. Groundwater under the western part of the Tonopah Test Range and under the Double Tracks test area of the NAFR Complex is believed to flow toward the Oasis Valley and Sarcobatus Flats discharge areas.

The depth to the water table under the NTS varies from about 160 meters (m) (525 feet [ft]) below the land surface in portions of Frenchman Flat and Yucca Flat to more that 610 m (2,000 ft) under the

Table S-5. Summary of radioactivity on the NTS as of January 1996

Source of Radioactivity	Type of Area	Environmental Media	Major Known Isotopes or Wastes	Depth Range	Amount (curies)
Atmospheric & Tower Tests	Above Ground Nuclear Weapon Proving Area	Surficial Soils & Test Structures	Americium Cesium Cobalt Plutonium Europium Strontium	At Land Surface	Approximately 20
Safety Tests	Above Ground Experimental Areas	Surficial Soils	Americium Cesium Cobalt Plutonium Strontium	Less than 0.9 m (3 ft)	Approximately 35
Nuclear Rocket Development Area	Nuclear Rocket Motor, Reactor, & Furnace Testing Area	Surficial Soils	Cesium Strontium	Less than 3 m (10 ft)	Approximately 1
Shallow Borehole Tests	Underground Nuclear Testing Areas	Soils & Alluvium	Americium Cesium Cobalt Europium Plutonium Strontium	Less than 61 m (200 ft)	Approximately 2,000 at land surface; unknown at depth
Shallow Land Disposal	Waste Disposal Landfills	Soils & Alluvium	Dry Packaged Low-level & Mixed Wastes	Less than 9 m (30 ft)	Approximately 500,000[a]
Crater Disposal	Test induced subsidence crater with sidewalls, cover, & drainage	Soils & Alluvium	Bulk contaminated soils & equipment	Less than 30 m (100 ft)	Approximately 1,250[a] (Approximately 205,000 m^3 [7,250,000 ft^3])[b]
Greater Confinement Disposal	Monitored Underground Waste Disposal Borehole	Soils & Alluvium	Tritium Americium	37 m (120 ft)	Approximately 9.3 million[a] (Approximately 300 m^3 [10,000 ft^3])[b]
Deep Underground Tests	Underground Nuclear Testing Areas	Soils, Alluvium, & Consolidated Rock	Tritium, fission, & activation products	Typically less than 640 m (2,100 ft), but may be deeper	Greater than 300 million

[a] Inventory at time of disposal (not corrected for decay).
[b] Amount of waste that was considered for inventory.

upland portions of Pahute Mesa. At the Tonopah Test Range, the depth to the top of the water table ranges from zero in the Antelope Mine area, and Antelope, Cactus, and Silverbow Springs, to greater than 180 m (590 ft) in the center portion of Cactus Flat.

A considerable amount of groundwater, estimated at 2.7 x 10^9 cubic meters (m^3) (2.2 x 10^6 acre-feet [ac-ft]), is held in recoverable storage beneath the NTS and surrounding region. Currently, drinking water at the NTS is provided by 11 wells. Construction and fire-suppression water is supplied by other non-potable wells. In 1993, the NTS used about 1.9 x 10^6 m^3 (1,530 ac-ft) of water; 1.7 x 10^6 m^3 (1,400 ac-ft) for drinking water and the remainder for construction and industrial use. All hydrologic units that supply drinking water to the NTS are Class II.

Underground nuclear testing has resulted in contamination of groundwater in the immediate vicinity of a number of tests. The quality of the groundwater has been impaired, but is limited to those areas where tests have occurred. No radioactive contamination attributable to DOE activities has been detected in monitoring wells off the NTS. Detection of significant contamination is limited to underground testing areas on the NTS. Potable supply wells on the NTS utilize high quality groundwater, meeting Safe Drinking Water Act Standards.

In addition to the historic and ongoing monitoring, the DOE has developed groundwater models, which continue to be refined, for addressing the concerns for potential groundwater transport of radionuclides. Health effects to the public from subsurface radioactivity have been modeled, based on predictions of future tritium concentrations in well water, even though predicted concentrations are well below current regulatory limits. Any public exposure to elevated tritium concentrations resulting from underground nuclear testing would necessarily occur outside the boundaries of DOE/DoD controlled areas.

At the Project Shoal Area, groundwater occurs about 290 m (951 ft) below ground surface. The Long-Term Hydrologic Monitoring Program samples one spring in the Sand Springs Range and five wells in the adjacent valleys. No contamination related to the Project Shoal Area nuclear test has been detected in these samples. No wells supply potable drinking water in the vicinity of the Project Shoal Area.

At the Central Nevada Test Area, the water table occurs within the alluvium, and groundwater flow is believed to follow the general direction of surface flow. The Project Faultless test in 1968 caused groundwater levels to fall. Water levels began to rise again in 1974. The pre-event water-table level is predicted to be reached by the year 2018. Although radionuclide transport from the chimney was not expected until the water reaches its original level, modeling suggests that transport could be already occurring. The Long-Term Hydrologic Monitoring Program includes sampling of five wells and one spring in Hot Creek Valley outside of the Central Nevada Test Area. No contamination related to the Project Faultless test has been detected in samples from those wells.

All off-site Solar Enterprise Zone facility sites are located in subsystems of the regional Colorado River Flow System. In each of the valleys considered for Solar Enterprise Zone facilities, surface water runoff is very infrequent, occurring as ephemeral flow in streambeds and, even less often, as ponded water on the playas. Surface water is discharged from Coyote Spring Valley into the upper Muddy Springs area through Pahranagat Wash. No surface discharge occurs from the other valleys. Shallow flash flooding occurs over large areas in all three valleys.

Eldorado Valley is situated within the Las Vegas Flow subsystem. Groundwater under Eldorado Valley occurs at depths ranging from 83 to 98 m (275 to 320 ft) below land surface in the north-central part of the basin. Mining is by far the largest water user in Eldorado Valley. Small quantities of water have been appropriated for municipal, stock watering, and industrial use. Water supplies in Eldorado Valley can be augmented by water from Boulder City. Historic analyses of the groundwater from wells in Eldorado Valley indicate that concentrations of total dissolved solids, sulfate, and chloride exceed drinking water standards in some areas.

Dry Lake Valley is situated within the California Wash Flow subsystem. Groundwater under Dry Lake Valley occurs at depths ranging from 70 m (230 ft) to 87 m (285 ft). The only available water resource in Dry Lake Valley is groundwater. There are currently only 6 water supply wells in the valley; however, there are at least 16 applications for either mining or stock-watering water rights. Well yields within the basin are low. The groundwater in Dry Lake Valley exceeds the primary drinking water standard for dissolved solids and sulfate.

Coyote Spring Valley is situated within the California Wash Flow subsystem. Groundwater under Coyote Spring Valley occurs at depths ranging from 3 m (10 ft) below land surface in a perched aquifer in the vicinity of Coyote Spring to 107 to 183 m (350 to 600 ft) below land surface for the water table aquifer throughout the valley floor area. Groundwater quality exceeds the Primary Drinking Water standard for particulates. Samples of water taken from the alluvium have been found to have concentrations of iron and manganese that exceed drinking water standards, and elevated concentrations of fluoride have been reported for wells completed in the carbonate aquifer.

As of 1994, there were no groundwater rights within the Coyote Spring Valley basin. However, there are many existing applications for groundwater appropriations within the basin. These applications have not been acted upon, and there is considerable uncertainty regarding the potential for obtaining approval of any new applications for groundwater to support a Solar Enterprise Zone facility.

Biological Resources. The NTS and the NAFR Complex are located along the transition zone between the Mojave Desert and the Great Basin Desert. As a result, this area exhibits a diverse and complex mosaic of plant and animal communities representative of both deserts, as well as some communities common only in the transition zone. The Tonopah Test Range is within the Great Basin Desert. Plant and animal species occurring in these areas are typical for the identified biomes.

No endangered plant or animal species are known to inhabit the NTS, the Tonopah Test Range or the NAFR Complex. The desert tortoise, which inhabits the Mojave Desert plant communities in the southern half of the NTS, is listed as a federally listed threatened animal. No threatened animal or plant species are known to occur on the Tonopah Test Range or in Area 13 of the NAFR Complex. Two plant species are candidates for the threatened or endangered list near these areas. No animals are listed as candidates.

The Project Shoal Area and Central Nevada Test Area are within the Great Basin Desert. No federally listed threatened, endangered, or candidate species are known to occur at either site.

The Eldorado Valley is within the Mojave Desert. The threatened desert tortoise is the only federally protected species that occurs at the site. However, the site is not designated critical habitat for the desert tortoise. No candidate plant or animal species are known to occur in the area. The banded gila monster, a state-protected reptile, is known to be present at the Eldorado Valley site.

Dry Lake Valley is within the Mojave Desert. The threatened desert tortoise is the only federally protected species in this area. Densities of tortoises there are generally low. No candidate plants or animals are known to occur within the area. Two plant species classified by the state of Nevada as "fully protected" are known to occur in the vicinity of the Dry Lake Valley site.

Coyote Spring Valley is within the Mojave Desert. There are no federally listed threatened, endangered, or candidate plant or animal species within the area designated for consideration as a Solar Enterprise Zone site. The only federally listed animal species known to inhabit Coyote Spring Valley is the threatened desert tortoise. The valley is within the critical habitat for the species. The banded gila monster, a state-protected reptile, may be present in the valley.

Air Quality and Climate. The climate at all of the areas considered in this Final NTS EIS is characterized by limited precipitation, low humidity, and large diurnal temperature ranges. Variations in temperature and precipitation generally follow elevation and latitude. The summers are generally hot, and the winters are mild. Winds are generally out of the north in the winter months and from the south in the summer. Severe weather that may occur in the area includes thunderstorms, lightning, sandstorms, and, infrequently, tornados. Severe thunderstorms may cause flash flooding.

The NTS, the NAFR Complex, and the Tonopah Test Range are located within the Nevada Intrastate Air Quality Control Region, which has been designated attainment with respect to the National Ambient Air Quality Standards.

The Project Shoal Area and the Central Nevada Test Area are located in Air Quality Control Region 147. There are no air-quality monitoring stations in the region. Because there are no significant sources of pollutant emissions in the region, the air quality is good.

Eldorado Valley and Dry Lake Valley are located in Clark County. Except for the Las Vegas Valley, Clark County is a Class II Prevention of Significant Deterioration area. Coyote Spring Valley, located in Lincoln County, is also a Class II area. All three valleys border the Las Vegas Valley Air Quality Nonattainment Area. Because these areas are largely undeveloped, there are few emission sources within these basins.

Cultural Resources. All of the areas considered in this EIS are located within a region with a prehistory that may span the past 10,000 years or more. Known properties range from the early prehistoric period to historic mining and ranching sites. To date, over 2,000 archaeological and historic sites have been identified on the NTS, and 424 sites have been identified on the Tonopah Test Range. Sites determined to be historic properties are described in this EIS.

Numerous sites, areas, and resources also have been identified within the NTS that are culturally important to American Indian people, particularly the Western Shoshone, Owens Valley Paiute, and Southern Paiute people. The lands were shared for religious ceremony, resource use, and social events.

Eleven archaeological sites have been recorded in the vicinity of the Project Shoal Area. Five of these sites have been recommended as eligible for listing on the National Register of Historic Places. This study area is not within the traditional lands of the American Indian people represented by the Consolidated Group of Tribes and Organizations.

Charcoal kilns at Tybo are the only known cultural resources in the Central Nevada Test Area vicinity that are listed on the National Register of Historic Places. Many other sites in the area are likely eligible for inclusion on the National Register of Historic Places. The area contains a number of cultural resources of special interest to the Consolidated Group of Tribes and Organizations.

Prehistoric sites at Eldorado Valley have been recorded around the perimeter of Eldorado Dry Lake. Other sites date to the historic period. Most are isolated occurrences by prospectors or Hoover Dam construction workers passing through the area. Eldorado Valley contains a wide variety of cultural resources of importance to American Indians, including plants, animals, and archaeology sites. The traditional cultural properties associated with the area include trails, sacred sites, plants, and animals in the McCullough and Eldorado Mountains, and in Eldorado Valley.

Eight prehistoric sites have been recorded within the proposed Dry Lake Valley site. Most of these sites are associated with the shoreline of Dry Lake. The Mormon Road, a historic road that traverses Dry Lake Valley, is listed on the National Register of Historic Places. The Dry Lake Valley area contains a wide range of resources important to American Indian cultures, including plants, animals, and archaeological sites.

The Coyote Spring Valley area contains a wide variety of resources culturally important to American Indians. Those resources include plants, animals, trails, and archaeological sites.

Occupational and Public Health and Safety. All work at the NTS and Tonopah Test Range is performed in accordance with the safety and health requirements of the Occupational Safety and Health Administration. A series of DOE orders provide direction for worker safety and health programs. In addition, there are Standard Operating Procedures for the NTS and Tonopah Test Range which cover a range of additional relevant activities. On-site safety services are provided and include the fire department, occupational medicine, radiological safety, and industrial hygiene services. Radioactively contaminated surface areas on the NTS, the NAFR Complex, and the Tonopah Test Range resulted primarily from atmospheric testing of nuclear weapons.

Many on-site and off-site environmental monitoring programs are conducted on the NTS and surrounding areas. Some of these efforts include ecological studies of migratory birds and large animals, study plots of vegetation, and continued studies of base line information. The EPA continues its off-site monitoring of the air and groundwater in the surrounding local communities to the NTS. These studies have not indicated any significant impacts to the surrounding environment and continue to assist the DOE in understanding the ecological environment.

Tritium-contaminated groundwater exists in the subsurface as a result of past underground testing of nuclear weapons. Underground weapons tests were performed within the NTS and at two off-site locations, the Project Shoal Area and the Central Nevada Test Area. The migration of tritium-contaminated groundwater from test locations within the NTS is estimated to be maximized for the flow path from Pahute Mesa to Oasis Valley. Based on the combined results of studies performed by various authors, the estimated range of peak tritium concentrations at the closest uncontrolled use area varies from 5×10^{-4} pCi/L arriving 150 years after the beginning of migration to 3,800 pCi/L arriving in 25 to 94 years. These concentrations are well below the EPA's maximum allowable tritium concentration in drinking water of 20,000 pCi/L. The hypothetical maximally exposed public individual at this location is estimated to have a lifetime probability of contracting a fatal cancer between 8×10^{-13} (about one in one trillion) and 1×10^{-5} (about one in 100,000).

The migration of tritium-contaminated groundwater from the test location at the Project Shoal Area could result in peak concentrations of 280 to 720,000 pCi/L arriving at the controlled area boundary 71 to 206 years after the test. Although no public well currently exists at this location, a hypothetical individual consuming well water at this location for a standard lifetime of 70 years would have a lifetime probability of contracting a fatal cancer between 2×10^{-10} (about one in five billion) and 2×10^{-3} (about one in 500). At the nearest existing public well, a hypothetical maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 4×10^{-24} (essentially zero) and 2×10^{-7} (about one in five million).

The migration of tritium-contaminated groundwater from the test location at the Central Nevada Test Area was predicted to have reached a peak concentration of about 1.2×10^{-8} pCi/L at the southern boundary approximately 8 to 15 years after the test (between the years 1976 and 1983). This predicted concentration has not been confirmed by groundwater sampling and analysis. No public well currently exists at the boundary of the Central Nevada Test Area. But if a well did exist, a hypothetical individual consuming well water at this location for a standard lifetime of 70 years around the time of peak tritium concentrations would have a lifetime probability of contracting a fatal cancer between 1.4×10^{-5} (about one in 70,000) and 5.5×10^{-3} (about one in 200). At the nearest existing public well, a hypothetical maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 1.7×10^{-24} (essentially zero) and 3.2×10^{-10} (about one in three billion).

Comparison of Environmental Consequences

Each program area identified within an alternative was evaluated separately to identify its potential environmental impact. For each of the programs there are resource areas that are of more interest than others, and these major areas are summarized in the following paragraphs.

Defense Program. Additional Defense Program impacts resulting from the alternatives considered in this EIS are potentially significant, although small compared to the impacts of previous testing. These would occur under Alternatives 1 and 3, which include a scenario to conduct one or more underground nuclear tests if directed by the President. Existing drill holes for potential underground tests are isolated from other NTS activities. The construction of new facilities would have a minor, localized impact to the physical environment of the site, and would not lead to significant off-site impacts. The most significant impacts would be the loss of income and jobs resulting from the elimination of the Defense Program activities under Alternatives 2 and 4.

Based on the more than 40 years of operations and information collected, many of the consequences of past Defense Program activities and other activities have been well-documented. More than 800 underground nuclear tests have been conducted at the NTS. As discussed in the *Final Environmental*

Impact Statement, Nevada Test Site, Nye County, Nevada (ERDA, 1977), underground testing has resulted in unavoidable adverse impacts to portions of the land, geologic, and groundwater resources, making them unusable for most purposes. Formation of craters, surface subsidence, and the release of radioactivity into the environment have been the most significant impacts to the physical environment as a result of historical testing operations at the NTS. Pockets of radioactive contamination surround each underground test location. The quantity of radioactivity remaining in the subsurface media can be estimated based on the half-life of the fission products. From data on the number and dates of the underground tests at the NTS, a total quantity of radioactivity remaining underground is estimated to be 3.0×10^8 curies. Much of this radioactivity remains captured in the original cavity, and thus is not available to leach into the groundwater.

The impacts of conducting subcritical experiments underground would be much less than those for nuclear testing since no self-sustaining fission chain reactions occur and much less radioactivity is deposited to the geologic environment. As in the case of nuclear testing, the radioactivity is captured underground

Radioactively contaminated surface areas on the NTS resulted primarily from atmospheric testing of nuclear weapons from 1951 to 1962. Additionally, safety tests conducted at the surface from 1954 to 1963 resulted in the radioactive contamination of the soil. More than 200 radiation-contaminated controlled areas have been identified and mapped on the NTS at the Tonopah Test Range and the NAFR Complex.

The DOE has established a monitoring program on and off the NTS to detect radionuclides in the air. Air monitoring results estimate radiation exposure well below existing standards.

Waste Management Program. The incremental environmental impacts over baseline conditions from waste management activities under Alternatives 1 and 3 would be negligible. Under Alternative 3, some new facilities would create a slight increase beyond the impacts under Alternative 1. Under Alternatives 2 and 4, little change in impact would be seen over present conditions because most of the required land clearing, waste transportation, and geologic disturbance have already occurred.

Waste management has been an integral part of the NTS operations since the establishment of the NTS in 1951. The environmental impacts related to the Waste Management Program are minor compared to those of the other programs. The issues related to waste management are waste transportation and protection of the hydrologic, geologic, and biologic resources.

Low-level waste at the Area 3 Radioactive Waste Management Site is disposed of in subsidence craters formed from past underground nuclear tests. Underground nuclear detonations create underground cavities into which the overlying soil and rock above the cavity then collapse. The final result is a crater on the surface. The craters that are and would continue to be used at the Area 3 Radioactive Waste Management Site represent the unavoidable adverse impacts that resulted from past underground nuclear tests. Use of the craters for waste disposal is a beneficial use of lands that have been significantly and unavoidably impacted by past actions. Additionally, recent hydrological data support the current conceptual hydrogeologic model that no groundwater pathway exists beneath the Area 3 disposal craters. These craters have significantly altered the topography and have significantly impacted the surface drainage. Engineered closure of the waste-filled cells would return portions of the surface topography to a natural grade, help to partially restore drainage patterns, and prevent the downward migration of precipitation into the buried waste.

Waste Management Program operations in Area 5 are more diverse and include facilities for hazardous and mixed waste management in addition to low-level waste management facilities. After 30 years of waste disposal operations, the DOE has not detected any contamination in groundwater monitoring wells recently completed near the Area 5 Radioactive Waste Management Site. In addition, field studies conducted to support the performance assessment models, which include monitoring of soil moisture and chloride ion concentrations, indicate that water falling on the surface (precipitation) in Frenchman Flat does not reach the groundwater. These studies and the absence of contamination support the conclusion that no groundwater pathway exists beneath the Area 5 Radioactive Waste Management Site. Thus, no impact to groundwater from waste management operations in Area 5 would be expected to occur. Expansion of waste management activities under Alternative 3 would occur in an area that has been previously disturbed and previously surveyed for biological and cultural resources; therefore, no impacts would occur to these resources.

The long-term effects of waste disposal operations have been evaluated as a part of the performance assessment process. The performance assessment process has developed scenarios that are used to evaluate the potential for public exposure to radionuclides from the disposed waste. These scenarios consider transport of radionuclides by surface water and groundwater, by air, and by human intrusion pathways. Preliminary results of the Area 5 Radioactive Waste Management Site Performance Assessment indicate that the risk of potential exposure to the public from waste disposal activities through surface water is not significant. Based on results of field studies, the groundwater pathway and air pathways are not considered credible transport mechanisms.

The limiting scenarios identified in the Area 5 performance assessment are the inadvertent intruder scenarios. Maximum individual exposure would occur to a person living on the former waste disposal site consuming food and water (assumed to be contaminated) for a lifetime. Performance assessments address the consequences of disposal of a given radioactive waste at a given site. A waste acceptable for disposal must meet three performance objectives, one of which involves potential dose to an inadvertent human intruder. Performance objectives must be met for a period of 10,000 years. Inadvertent intrusion is not considered to occur during institutional control of the site. Institutional control is generally considered to be in effect for 100 years, and for conservatism in the performance assessment, site recognition and passive barriers are considered to be lost after institutional control. The results of this very conservative approach to estimating exposure are then used to establish design, operation, closure, and waste acceptance criteria for the waste management facilities. The performance assessment is a continuous process used to improve the design and operation of DOE waste management facilities.

Transportation Impacts. Impacts from transportation of materials to and from the NTS have been analyzed in Appendix I and reported in Volume 1, Chapter 5. This includes an analysis of the transport of Defense Program nuclear material and waste management activities related to mixed waste and hazardous matenals.

The majority of the postulated injuries and fatalities would be a result of routine normal traffic accidents and not a result of exposure to the transported waste. Accident scenarios that involve release of radioactive waste were factored into the risk evaluation.

The DOE has over four decades of experience in the safe transportation of hazardous materials and waste. Although accidents involving vehicles containing radioactive material have occurred, no significant releases, exposures, or radiation fatalities have ever occurred. Appendix I, the Transportation Study addresses the risks associated with transport of materials to the NTS.

The expected number of occurrences of cargo-related health effects was calculated for both incident-free and accident scenarios for radioactive and hazardous cargo. Vehicle-related health effects of traffic fatalities and injuries were also calculated. Results of the transportation risk analysis are discussed in Sections 3.2.3 and 3.3.4 of Appendix I.

The results of the transportation risk analysis show that the human health risks from transportation operations are low under any alternative, and are not significant contributors to the total risk from all operations under these alternatives. Along the in-state routes vehicle-related fatalities and injuries dominate the risk, followed by incident-free radiation-induced fatalities. The risks along all in-state routes are low and, within the uncertainty bands of the analysis, so similar, that it is not meaningful to rank routes solely on the basis of risk.

Environmental Restoration Program. Environmental restoration activities would continue at a varying level of intensity under all but Alternative 2. Approximately 7,500 acres of land would be disturbed during the restoration activities under Alternatives 1, 3, and 4. However, after restoration the land would be available for alternative uses. Under Alternative 2, environmental restoration activities would cease. This would result in a condition of noncompliance with environmental requirements and limit the future use of the land.

Nondefense Research and Development Program. Historic impacts from this program have been minimal. The most significant impact from the Nondefense Research and Development Program would occur under Alternatives 3 and 4 and would result from the siting and construction of the Solar Enterprise Zone facilities. These facilities would create jobs, but would require the clearing of more than 2,000 acres of undisturbed habitat, and the consumption of 6.8×10^6 m^3/yr (5,500 ac-ft/yr) of water.

Work for Others Program. The Work for Others Program under Alternatives 1 and 3 is similar to historic activities and not expected to have significant impacts. Under Alternative 2, the program is discontinued, and under Alternative 4, the program is minimal. Table S-6 presents a summary of the environmental consequences described in this section and detailed in Chapter 5 of this EIS.

Health Risk Assessment. In general, human health risks under each of the alternatives are expected to be dominated by occupational injuries to workers engaged in activities such as construction, maintenance, excavation, etc. By conducting activities for ten years under the various alternatives listed in the NTS EIS, it is estimated that the following number of injuries and fatalities would occur: Alternative 1, 204 injuries and 3 fatalities; Alternative 2, 3 injuries and no fatalities; Alternative 3, 775 injuries and 9 fatalities; and Alternative 4, 104 injuries and 1 fatality. As explained in Appendix H and Volume 1, Chapter 5, the estimates of worker injuries and fatalities are based on conservative models that tend to overestimate the actual consequences of proposed NTS activities. Historically, actual injury and fatality rates at the NTS have been lower than the average U.S. industrial rates used in the analysis. Occupational injury and fatality risks are reduced by strict adherence to DOE and OSHA safety standards, formal procedures for conduct of operations, worker training, and internal audits and assessments of work practices and procedures. The Waste Management Program had the greatest number of human health risks associated with it, when compared to all other program areas. It is unlikely that a single fatal cancer or other detrimental health effect would occur as a result of radiation exposure to workers or the public under any of the NTS EIS alternatives. Hazardous chemical spills could result in noncancer health effects to workers in operations conducted under Alternatives 1, 3, and 4.

Impacts Associated with the Maximum Reasonably Foreseeable Accident. The maximum reasonably foreseeable accidents associated with activities under the NTS EIS Alternatives would be as follows:

Under Alternatives 1 and 3, the maximum reasonably foreseeable radiological accident involves a non-nuclear explosion in an Area 27 nuclear weapons storage magazine. The accident has a probability of 1×10^{-7} per year and could result in injuries or deaths to nearby workers due to the physical impacts of the explosion or delayed radiation health effects. Radiation exposure from the accident could result in 13 latent cancer fatalities in the worker population at the next nearest facility, and from 3 to 55 latent cancer fatalities in the off-site population within 50 miles.

The maximum reasonably foreseeable chemical accident involves an airplane crash into the Spill Test Facility. The accident has a probability of 1×10^{-7} per year and could result in injuries or deaths to nearby workers due to the physical impacts of the crash or toxic effects of chemicals. Workers at the next nearest facility could experience non-life threatening health effects from exposure to airborne chemicals. The off-site population within 80 km (50 mi) could experience up to 3 latent cancers as a result of this accident.

The maximum reasonably foreseeable chemical accident involves a multi-container fire at the Area 5 hazardous waste storage unit prior to final shipment of these wastes off site. The accident has a probability of 8×10^{-5} per year. Workers

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 1 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Land Use, Site Support Activities, Airspace			
Minimal land-use impacts would occur from continuation of current operations. All land uses would be consistent with current site and zone designations. Because of the location of the sites analyzed, and because similar land uses generally would be located on the borders of the sites, surrounding land uses would not be affected by this alternative.	Surrounding land-use impacts would be the same as those listed under Alternative 1. Closure without environmental restoration would not meet requirements of federal and state laws and signed agreements and memorandums.	Surrounding land-use impacts would be the same as those listed under Alternative 1. There would be minimal land-use impacts on site from increased intensity of operations and land-use conditions. Land uses at the Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area would be similar to Alternative 1. The new Solar Enterprise Zone facility could result in up to 2,402 acres of new land disturbance.	Potential public uses of relinquished NTS lands would be located in designated areas surrounded by buffer zones. Current defense-related designated areas would be redesignated for nondefense activities. Land uses at the Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area would be similar to those listed under Alternative 1. New Solar Enterprise Zone facility activities could occur at the NTS, Eldorado Valley, Dry Lake Valley, or Coyote Spring Valley; these activities would be compatible with existing land uses. Surrounding land-use impacts would be the same as those listed under Alternative 1. Land-use designations and zones would be incompatible with existing designations and zones.
Site support activities would continue at current levels.	Site support activities would decrease and facilities would be closed.	Site support activities and structures would be modified and expanded, as needed.	Site support activities would be reduced and facilities would be closed.
Airspace activities would be maintained at the current level of air traffic, navigational aid services, and airspace structure.	The NTS and Tonopah Test Range would experience reduced flight operations; otherwise, there would be no impacts to airspace.	Impacts to NTS airspace would be the same as those listed under Alternative 1. Minimal impacts would be experienced at the Tonopah Test Range, Central Nevada Test Area, Project Shoal Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.	Airspace impacts would be the same as those listed under Alternative 1.
Land Disturbance[a]			
10,000 acres	0 acres	21,000 acres	15,500 acres

[a]The total amount of land currently disturbed on the NTS is approximately 60,000 acres. Numbers shown represent additional estimated disturbed acreage under each alternative after 10 years (acres to be reclaimed are not included).

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 2 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Transportation (On-site, Off-site, Transportation of Materials and Waste, Other Transportation)			
Minimal on-site impacts would exist at the NTS, Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area. The NTS would average 3,370 trips per day. This would not change the level of service on affected highways and roads.	A total of 60 one-way vehicle trips per day would occur on the site. This would not change the level of service on affected highways and roads.	A total of 16,310 on-site vehicle trips per day are estimated under this alternative. No roadway would experience any significant traffic congestion. All key NTS roadways would have a capacity exceeding 2,000 vehicles per hour. Minimal impacts would be felt at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.	A total of 12,180 on-site vehicle trips per day are estimated. No roadway would experience any significant traffic congestion. All key NTS roadways have a capacity exceeding 2,000 vehicles per hour. Minimal impacts would be experienced at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.
A total of 1,480 one-way vehicle trips per day would occur off site by 2005. All key roads in the vicinity of the site would continue to operate at level of service C or better. However, while NTS-generated traffic would be relatively minimal, segments of I-15, U.S. Hwy. 95, and U.S. Hwy. 93 within metropolitan Las Vegas could deteriorate to unacceptable levels of service by 2000 because of cumulative traffic growth without state and local governmental transportation improvement projects. Minimal impacts to off-site traffic would be experienced at the Tonopah Test Range, Central Nevada Test Area, and Project Shoal Area.	A decrease over Alternative 1 of 1,480 one-way vehicle trips per day would occur off site by 2005. All key roads in the vicinity of the site would continue to operate at level of service C or better.	An increase over Alternative 1 of 1,030 one-way vehicle trips off site per day would occur by 2005. Most key roads in the vicinity of the site would continue to operate at level of service C or better. While the NTS-generated traffic would be relatively minimal, segments of I-15, U.S. Hwy. 95, and U.S. Hwy. 93 within metropolitan Las Vegas could deteriorate to unacceptable levels of service by 2000 because of cumulative traffic growth without state and local governmental transportation improvement projects.	A decrease from Alternative 1 of 610 one-way vehicle trips off site per day would be experienced by 2005. All key roads in the vicinity of the site would continue to operate at level of service C or better. However, while the NTS-generated traffic would be relatively minimal, segments of I-15, U.S. Hwy. 95, and U.S. Hwy. 93 within metropolitan Las Vegas could deteriorate to unacceptable levels of service by 2000 because of cumulative traffic growth without state and local governmental transportation improvement projects.
Approximately 350,000 m³ (457,783 yd³) of low-level waste and 50,000 m³ (65,398 yd³) of mixed waste would be generated on and off the site in a 10-year period.	Minimal generation of materials and waste would occur under Alternative 2.	Approximately 100,000 m³ (130,795 yd³) low-level waste and 300,500 m³ (393,039 yd³) of mixed waste would be generated on and off the site in a 10-year period.	Approximately150,000 m³ (196,193 yd³) of low-level waste and 500 m³ (654 yd³) of mixed waste would be generated on and off the site in a 10-year period.
Transportation risks along the entire route for low-level radioactive and mixed waste during the 10-year study period from vehicular accidents is expected to be 2 fatalities and 27 injuries. Latent cancer fatalities associated with this level of radioactive waste transport for the 10-year study period would be 0.0025. There would be no impact on direct use of local railroads, air transportation, or other modes of transportation.	There would be no impact on direct use of local railroads, air transportation, or other modes of transportation.	Risks associated with transporting radioactive waste would increase to 8 vehicle-related fatalities, 103 injuries, and 0.075 latent cancer fatality over the 10-year period of study. Minimal impacts would occur on direct use of local railroads, air transportation, or other modes of transportation.	No off-site transportation of radioactive materials and waste would occur. There would be minimal impacts on direct use of local railroads, air transportation, or other modes of transportation.

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 3 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Socioeconomics (Economic Activity, Population, and Housing)			
Total direct employment would be approximately 6,600 in 2005. Unemployment rate: Clark County, 5.8% Nye County, 5.2%. Total personal income in 2005: Clark County, $32,280,885,000 Nye County, $780,701,000. Population in 2005: Clark County, 1,380,920 Nye County, 38,516. Housing demand in 2005: Clark County, 539,422 Nye County, 14,435.	A decrease from Alternative 1 of 6,490 direct jobs in 2005 would occur under Alternative 2. Unemployment rate increase over Alternative 1 in 2005: Clark County, +1.9% Nye County, +2.5%. Total personal income decrease in 2005 from Alternative 1: Clark County, ($884,676,000) Nye County, ($44,609,000). Population decrease from Alternative 1 in 2005: Clark County, -7,946 Nye County, -583. Housing demand decrease from Alternative 1 in 2005: Clark County, -2,928 Nye County, -218.	An increase over Alternative 1 of approximately 4,550 direct jobs in 2005 would occur under Alternative 3. Unemployment rate decrease from Alternative 1 in 2005: Clark County, -1.1% Nye County, -0.05%. Total personal income increase in 2005 over Alternative 1: Clark County, +$632,638,000 Nye County, +$31,457,000. Population increase over Alternative 1 in 2005: Clark County, +10,020 Nye County, +656. Housing demand increase over Alternative 1 in 2005: Clark County, +3,914 Nye County, +246.	A decrease from Alternative 1 of approximately 2,750 direct jobs in 2005 would occur under Alternative 4. Unemployment rate increase over Alternative 1 in 2005: Clark County, +1.1% Nye County, +1.7%. Total personal income decrease in 2005 from Alternative 1: Clark County, ($374,608,000) Nye County, ($18,833,000). No substantial employment level would be triggered; therefore, population and housing demand would not change when compared to Alternative 1.
Geology and Soils			
Testing impacts would include ground motion hazards and secondary seismic effects, soil contamination, alteration of natural drainage paths, and decreased surface stability. Impacts from other activities would include dust creation, soil contamination, and an increase in erosion potential. There would be minimal impacts at the Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area.	Discontinuing operations would result in no additional impacts to geology and soils. However, the media that have been contaminated or altered by underground nuclear test would as in alternatives remain unavailable for unrestricted use. No surface areas contaminated by past activities would be remediated and any present access restrictions based on contamination would continue.	Impacts would be the same as those listed under Alternative 1. Minimal impacts would be experienced at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.	Impacts would include dust creation, soil contamination, and an increase in erosion potential. Minimal impacts would occur at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 4 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Hydrology (Surface Hydrology and Groundwater)			
There would be minimal potential impact from the alteration of existing drainage paths caused by testing.	There would be no new impacts to surface hydrology.	There would be minimal potential impacts from alteration of natural drainage paths caused by new construction.	There would be minimal potential impacts from alteration of natural drainage paths caused by new construction.
Total effects from continuing groundwater withdrawals are expected to be minor. Local effects to the Yucca Flat Basin could be substantial if the annual water demand exceeds the basin's perennial yield.	Water demand would be reduced to that required for environmental monitoring and for potable water for the caretaker workforce.	Because of new program activities other potential impacts would be increased slightly over those listed under Alternative 1. However, the Solar Enterprise Zone has been estimated to require up to 6.8 x 10^6 m^3/yr (5,550 ac-ft/yr) of water. Local effects to the affected basin such as those near Dry Lake Valley could be substantial if the annual water demand exceeds the perennial yield of the basin. Increased waste quantities would not result in impacts.	Other potential impacts generally would be the same as those listed under Alternative 1 except at a decreased level. However, the Solar Enterprise Zone has been estimated to require up to 6.8 x 10^6 m^3/yr (5,550 ac-ft/yr) of water. Local effects to the affected basin such as those near Dry Lake Valley could be substantial if the annual water demand were to exceed the perennial yield of the basin.
There could be localized impacts related to underground tests conducted under or near the water table. Monitoring has revealed few instances of migration of radionuclides beyond the near test environment. No impacts are anticipated from waste management activities.	Contaminated areas would not be restored, resulting in continued possibility of groundwater contamination.	Minimal impacts would be experienced at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.	Minimal impacts are expected at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.
Other potential quality impacts would be minimal. Minimal impacts would occur at the Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area.			
Biological Resources			
Approximately 7,360 acres of generally undisturbed habitat would be disturbed, primarily in support of the Environmental Restoration Program at the NTS, Tonopah Test Range, and Central Nevada Test Area. This would represent approximately 1 percent of total undisturbed habitat in these areas. There would be minimal impact to desert tortoise population viability and on biodiversity or ecosystem functions.	There would be no effect on undisturbed natural habitat. Discontinuation of man-made water sources would change the distribution of horses, deer, and chukar. However, there would be no sitewide ecosystem impacts.	Approximately 10,420 acres of generally undisturbed habitat would be disturbed, primarily in support of the Environmental Restoration Program at the NTS, Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area. This would represent an increase of 3,060 acres over Alternative 1. A portion of this area (3,015 acres) could be desert tortoise habitat. The Solar Enterprise Zone could minimally impact biodiversity or ecosystem functions at Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley. Coyote Spring Valley lies within critical habitat for the desert tortoise.	Approximately 9,275 acres of generally undisturbed habitat would be disturbed, primarily for the Environmental Restoration Program and the Solar Enterprise Zone at NTS. The NTS, Tonopah Test Range, Central Nevada Test Area, and Project Shoal Area impacts would generally be the same as those listed under Alternative 1. The Solar Enterprise Zone could minimally impact biodiversity or ecosystem functions at all sites and areas. Coyote Spring Valley lies within critical habitat for the desert tortoise.

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 5 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Air Quality and Radiological Air Quality			
Pollutant emissions from stationary and mobile sources would be generated on site and off site. These emissions would be dispersed over a wide area. No major air emission sources are planned. Pollutant concentrations related to NTS activities would be well below ambient air quality standards. No substantial increases in air pollution are expected by 2005 and Nye County would continue its present attainment designation for all criteria pollutants. No additional violations of air quality standards would be provided in the nonattainment area of Clark County. The region is expected to conform with the applicable State Implementation Plan for all National Ambient Air Quality Standards (NAAQS). Radiological air quality impacts would not reach the maximum CAP-88 air dose assessment modeled dose. Impacts would be minimal.	Pollutant emissions associated with stationary sources would be essentially eliminated following discontinuance of operations, and mobile source emissions would be substantially reduced. Radiological air quality impacts would be the same as those listed under Alternative 1.	Impacts would be the same as those listed under Alternative 1. Pollutant concentrations related to NTS activities, though higher than the Alternative 1, would remain below ambient air quality standards. Selected values for two pollutants of concern are PM_{10} : 600 tons/ year; less than one percent of regional burden. CO_2 : 224 tons/year of which 90 tons/year would be in the Las Vegas Valley; less than 0.2 percent of Clark County emissions.	Impacts would be the same as those listed under Alternative 1. Pollutant concentrations related to NTS activities would be lower than those of Alternative 1. All pollutants would remain below ambient air quality standards.
Noise			
Transportation noise levels on site would be minimal and would not produce any noise impacts off site. Temporary noise impacts from construction-related noise would occur within the immediate vicinity of construction sites. Noise impacts would be negligible because the sites are located within remote areas. No sensitive receptors are close to construction areas. Noise from other activities would decrease with distance and would be barely distinguishable from background noise levels.	A minor amount of noise would result from operations vehicles. Other noise levels would be a result of noises typically found in uninhabited desert areas.	Impacts would be the same as those listed under Alternative 1.	Impacts would be the same as those listed under Alternative 1, except for the Defense Program, which would have the same impacts as Alternative 2.
Visual Resources			
New land disturbance would be located in areas of scenic quality common to the region, but none would be visible from any public viewpoints. Although there would be short-term, local adverse effects because of environmental restoration, there would be long-term beneficial effects because of revegetation.	There would be little change in the overall appearance of the existing landscape.	Most new land disturbance would be located in areas of scenic quality common to the region. However, the areas proposed for the Solar Enterprise Zone facility in Eldorado Valley, Dry Lake Valley, or Coyote Spring Valley have a high visual sensitivity because they cross major highways. Furthermore, Coyote Spring Valley has extensive panoramic views of linear mountain ranges and valleys.	There would be slight changes in the overall appearance of the existing landscape. New ground disturbance would be located in areas of scenic quality common to the region, but none of these areas would be visible from any public viewpoints. The impacts of the Solar Enterprise Zone would be the same as those listed under Alternative 3.

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 6 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Cultural Resources			
There would be impacts to cultural resources as a result of ground disturbing activities resulting from construction of new facilities, utilities, road upgrades, and decommissioning of existing buildings. Continued visitation and vehicular traffic could indirectly affect recorded archaeological sites and archaeologically sensitive areas. The precise location of these resources is unknown until archaeological survey is conducted. Surveys will be conducted prior to any ground disturbing activities. Modification of existing buildings would include an evaluation of their historic significance, especially in relation to Cold War/nuclear development themes, to minimize impacts. According to the CGTO, under Alternative 1, access to American Indian culturally significant places would continue to be reduced. The potential would exist for unauthorized artifact collection and culturally inappropriate environmental restoration techniques.	Discontinuance of activities would eliminate most impacts to cultural resources. The degree of impact to American Indian cultural sites, as stated by the CGTO, would be less than that associated with Alternative 1.	The amount of acreage disturbed as a result of activities described for Alternative 3 would double as compared to Alternative 1. Approximately 20,930 acres of ground disturbance are anticipated. Construction of new facilities, wells, utilities roads, and burial of contaminated soils may affect cultural resources. Large-scale activities associated with the Solar Enterprise Zone facility could affect cultural resources. Modification of existing buildings would include an evaluation of their historic significance, especially in relation to Cold War/nuclear development themes, to minimize impacts. According to the CGTO, under Alternative 3, access to American Indian culturally significant places would continue to be reduced. Increased visits by students and researchers who collect artifacts, visit sacred areas, and remove plants or animals, and the scraping of land would affect American Indian cultural resources.	Most impacts would be the same as those listed under Alternative 3. Access impacts, according to the CGTO, for American Indians would be less than that experienced under Alternative 1. However, the potential for unauthorized artifact collection would be increased from Alternative 1 because of increased public access.
Land Use Land Zone Areas			
1. Nuclear Test Zone (includes Areas 19 and 20) - 1,120 km^2 (435 mi^2) 2. Nuclear and High Explosive Zone - 180 km^2 (70 mi^2) 3. Research, Test, and Experiment Zone - 45 km^2 (20 mi^2) 4. Radioactive Waste Management Zone - 5 km^2 (2 mi^2) 5. Yucca Mountain Site Characterization Zone (within NTS boundary) - 225 km^2 (90 mi^2) 6. Critical Assembly Zone - 130 km^2 (50 mi^2) 7. Spill Test Impact Zone (within NTS boundary - 15 km^2 (5 mi^2) 8. Reserved Zones on NTS (within NTS boundary) - 1,775 km^2 (685 mi^2)	1. Yucca Mountain Site Characterization Zone (within NTS boundary) 225 km^2 (87 mi^2) 2. Monitored/Restricted Zone (within NTS boundary) - 3,255 km^2 (1,260 m^2)	1. Nuclear Test Zone (includes Areas 19) - 705 km^2 (275 mi^2) 2. Nuclear and High Explosive Zone - 381 km^2 (147 mi^2) 3. Research, Test, and Experiment Zone - 575 km^2 (222 mi^2) 4. Radioactive Waste Management Zone - 5 km^2 (2 mi^2) 5. Yucca Mountain Site Characterization Zone (within NTS boundary) - 225 km^2 (90 mi^2) 6. Solar Enterprise Zone - 34 km^2 (13 mi^2) 7. Spill Test Impact Zone (within NTS boundary - 15 km^2 (5 mi^2) 8. Defense Industrial Zone - 170 km^2 (65 mi^2) 9. Reserved Zones on NTS (within NTS boundary) - 1,375 km^2 (530 mi^2)	1. Non-Defense Research/Development/Testing Zone (includes Areas 19 and 20) - 1,295 km^2 (500 mi^2) 2. Radioactive Waste Management Zone - 5 km^2 (2 mi^2) 3. Yucca Mountain Site Characterization Zone (within NTS boundary) - 225 km^2 (90 mi^2) 4. Solar Enterprise Zone - 35 km^2 (13 mi^2) 5. Spill Test Impact Zone (within NTS boundary) - 15 km^2 (5 mi^2) 6. Reserved Zones (within NTS boundary) - 1,310 km^2 (505 mi^2) 7. Potential Turnback Area (includes Area 22 Solar Enterprise Zone) - 610 km^2 (235 mi^2)

NOTE: CGTO = Consolidated Group of Tribes and Organizations.

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 7 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Occupational and Public Health and Safety (Routine and Accident Operations)			
The health impacts to workers due to occupational exposure and accidents could result in a probability of 1 in 8 of a single latent cancer fatality and 1 in 21 of a single other detrimental health effect in the worker population. The risk of life-threatening noncarcinogenic effects on workers involved with an accidental release of hazardous chemicals has a hazard index of 0.58.	The health impacts to workers due to occupational exposure and accidents could result in a probability of 1 in 47 of a single latent cancer fatality and 1 in 120 of any other detrimental health effect in the worker population. The risk of life-threatening noncarcinogenic effects on workers involved with an accidental release of hazardous chemicals has a hazard index of 0.48.	The health impacts to workers due to occupational exposure and accidents could result in a probability of 1 in 8 of a single latent cancer fatality and 1 in 20 of any other detrimental health effect in the worker population. The risk of life-threatening noncarcinogenic effects on workers involved with an accidental release of hazardous chemicals has a hazard index of 2.4.	The health impacts to workers due to occupational exposure and accidents could result in a probability of 1 in 13 of a single latent cancer fatality and in 1 in 30 of any other detrimental health effect in the worker population. The risk of life-threatening noncarcinogenic effects of workers involved with an accidental release of hazardous chemicals has a hazard index of 0.58.
Health impacts to the public from accidental release of radionuclides could result in a probability of 1 in 18,000 of a single latent cancer fatality and 1 in 40,000 of any other detrimental health effect in the population within 50 miles. Potential public exposure to accident release of hazardous chemicals could result in a probability of 1 in 4,000 of a single incidence of cancer in the population. No noncarcinogenic detrimental health effects are expected.	Health impacts to the public from accidental release of radionuclides could result in a probability of 1 in 20,000 of single latent cancer fatality and 1 in 50,000 of any other detrimental health effect in the population within 50 miles. Potential public exposure to accidental release of hazardous chemicals could result in probability of 1 in 50,000 of a single incidence of cancer in the population. No noncarcinogenic detrimental health effects are expected.	Health impacts to the public from accidental release of radionuclides could result in a probability of 1 in 18,000 of a single latent cancer fatality and 1 in 40,000 of any other detrimental health effect in the population within 50 miles. Potential public exposure to accidental release of hazardous chemicals could result in a probability of 1 in 4,000 of a single incidence of cancer in the population. No noncarcinogenic detrimental health effects are expected.	Health impacts to the public from accidental release of radionuclides could result in a probability of 1 in 20,000 of a single latent cancer fatality and 1 in 43,000 of a single other detrimental health effect in the population within 50 miles. Potential public exposure to accidental release of hazardous chemicals could result in a probability of 1 in 4,000 of a single incidence of cancer in the population. No noncarcinogenic detrimental health effects are expected.
Potential accidental venting of radionuclides from an underground test could result in a probability of 1 in 180 of a single latent cancer fatality and 1 in 400 of any other detrimental health effect in the population within 50 miles.		Potential accidental venting of radionuclides from an underground test could result in a probability of 1 in 180 of a single latent cancer fatality and 1 in 400 of a single other detrimental health effect in the population within 50 miles.	
The maximum reasonably foreseeable radiological accident has a probability of 1 in 10 million years and involves a non-nuclear explosion in a nuclear weapons storage bunker at Area 27. This accident could result in public impacts of 3 to 55 latent cancer fatalities and 1 to 25 other detrimental health effects.	The maximum reasonably foreseeable radiological accident has a probability of 1 in 10 million years and involves a failure of an artillery-fired test assembly at the Tonopah Test Range. This accident would result in only small fractional increases in the probability of latent cancer fatality or other detrimental health effects in the offsite population.	The maximum reasonably foreseeable radiological and chemical accidents are the same as for Alternative 1.	The maximum reasonably foreseeable radiological accident has a probability of 1 in 2 million years and involves an airplane crash into the Area 5 transuranic waste storage unit. This accident could result in public impacts of 1 to 13 latent cancer fatalities and 0 to 6 other detrimental health effects.
The maximum reasonably foreseeable chemical accident has a probability of 1 in 10 million years and involves an airplane crash into the Spill Test Facility. This accident could result in 0 to 3 latent cancers in the offsite population, but no noncancer health effects would be expected.	The maximum reasonably foreseeable chemical accident has a probability of 1 in 13,000 years and involves a multi-container fire at the Area 5 hazardous waste storage unit. This accident would result in only small fractional increases in the probability of latent cancer in the offsite population, and no noncancer health effects would be expected.		The maximum reasonably foreseeable chemical accident is the same as for Alternative 1.
Environmental Justice			
American Indian impacts would only consider American Indian groups and would, therefore, be disproportionately high according to the CGTO's method of defining impacts.	Impacts would be the same as those listed under Alternative 1.	Impacts would be the same as those listed under Alternative 1.	Impacts would be the same as those listed under Alternative 1.

immediately downwind of the fire could be exposed to life-threatening air concentrations of hazardous chemicals. The off-site population within 80 km (50 mi) would not be expected to experience any noncancer health effects, and the likelihood of a single cancer in the population would increase by 0.002 to 0.004.

Under Alternative 2, the maximum reasonably foreseeable radiological accident involves a failure of an artillery fired test assembly at the Tonopah Test Range. The accident has a probability of 1×10^{-7} per year. Nearby workers would be under cover when the device fired, but up to three latent cancer fatalities could occur in workers at the next nearest facility. The off-site population within 80 km (50 mi) would have an increased likelihood of 0.009 to 0.16 of a single latent cancer fatality.

Under Alternative 4, the maximum reasonably foreseeable radiological accident involves an airplane crash into the Area 5 transuranic waste storage unit. The accident has a probability of 6×10^{-7} per year and could result in injuries or deaths to nearby workers due to the physical impacts of the crash or delayed radiation health effects. The worker population at the next nearest facility would have an increased likelihood of 0.04 of a single latent cancer fatality. The off-site population within 80 km (50 mi) could experience 1 to 13 latent cancer fatalities.

The maximum reasonably foreseeable chemical accident is the same as that described for Alternative 1 (airplane crash into the Spill Test Facility).

Environmental Justice. Environmental Justice analysis is conducted in two steps. One is the determination of significant and adverse impacts as a result of the alternative. The other is an evaluation of whether a minority or low-income population is disproportionately affected by these significant and adverse impacts. If there are no significant and adverse impacts, there would be no significant, disproportionately high and adverse impacts experienced by minority and low-income populations. The location of minority or low-income populations is shown on the figures in Section 4.1.12.

The Consolidated Group of Tribes and Organizations (CGTO) has identified impacts to American Indian groups as a result of Alternative 3. While not physically located in Clark, Nye, or Lincoln counties, these groups have traditional ties to the NTS and surrounding areas. Impacts would include continued reduced access to culturally significant areas, the potential for unauthorized artifact collection, and the potential for culturally inappropriate environmental restoration techniques. Because of the expansion of activities under Alternative 3, potential impacts would be greater than those listed under Alternative 1. These impacts would be perceived only by American Indian groups and would, therefore, have a disproportionately high effect on these groups.

No other significant adverse impacts as a result of this alternative were ascertained; therefore, there would be no disproportionately high and adverse impacts to other minority and low-income populations.

Unavoidable Adverse Effects

Unavoidable impacts result from a substantial adverse change to existing environmental conditions that cannot be fully mitigated. Substantive unavoidable impacts resulting from activities addressed in this EIS are discussed in Chapter 5 for each alternative.

Alternative 1 - Continue Current Operations (No Action). All continuing programs and operations at the NTS and NAFR Complex would produce some environmental impacts that may not be possible to mitigate. Impacts from conducting underground nuclear tests, if so directed, remain the largest unavoidable adverse effects of management of the NTS. Past nuclear testing has resulted in the release of large quantities of radioactivity into the subsurface and the formation of subsidence craters. If additional testing at the NTS is directed by the President, an additional increment of these impacts would be added and there would likely be generation of ground motion that could be felt outside of the boundaries of the NTS. Other testing and experimental activity, including subcritical experiments, in support of stockpile stewardship programs would have unavoidable adverse impacts including placement of radioactivity in the subsurface environment.

At the NTS, surface disturbance associated with any remediation, construction and new testing programs would cause unavoidable impacts on habitat. At the NAFR Complex, surface disturbance associated with any remediation programs would cause unavoidable impacts on habitat.

Certain activities, such as off-road training exercises that take place in desert tortoise habitat, could result in tortoise mortality. It is expected that substantially less than one tortoise would be killed by vehicular traffic on roads per year on average.

Geologic media contaminated by radionuclides would remain contaminated and unavailable for use at any site where underground nuclear testing has been conducted. Contaminated groundwater that could not be remediated would be unavailable for use as well.

Alternative 2 - Discontinue Operations. Past nuclear testing has resulted in the release of radioactivity onto the surface and the subsurface, and in the formation of subsidence craters. These conditions would persist if the NTS were closed.

Closure of the NTS would result in unavoidable adverse impacts to the regional socioeconomic conditions. These impacts would be short-term and would include loss of relatively high paying jobs, increases in unemployment, loss of economic diversification, and out-migration of DOE and contractor employees and their families.

Although the rates of desert tortoise or habitat loss would likely decline relative to Alternative 1, there could be some loss because of security and monitoring vehicular activities. In addition, the loss of manmade surface water sources would cause some redistribution and reduction of animals inhabiting the area.

Because no environmental restoration projects would occur under Alternative 2, contaminated areas of the Tonopah Test Range and the NTS would remain contaminated. Potential land uses that are affected by the presence of contamination would continue to be affected.

At the Project Shoal Area and Central Nevada Test Area, evaluations of geologic media and groundwater contaminated by radionuclides would not occur, and these media would remain contaminated and unavailable for use.

Alternative 3 - Expanded Use. At the NTS and NAFR Complex, the unavoidable adverse impacts of Alternative 3 would be similar to Alternative 1 but greater in extent. Construction of new facilities would affect presently undisturbed habitat and eliminate those areas from other land uses. If a Solar Enterprise Zone project is implemented at the NTS, up to 2,400 acres of desert tortoise habitat could be lost from construction activities.

The unavoidable adverse impacts of Alternative 3 at the Tonopah Test Range would be similar to those of Alternative 1.

At the Project Shoal Area and Central Nevada Test Area, geologic media that may be contaminated by radionuclides where underground nuclear testing was conducted would remain contaminated and unavailable for use. Contaminated groundwater that could not be remediated would be unavailable for use as well.

In Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley, present land uses such as land sailing, model aircraft flying, ultralight operations, off-highway vehicle use, and camping would be precluded by the presence of a solar energy generation facility. The loss of these opportunities would be an unavoidable adverse impact.

Construction of gas lines, pipe lines and/or power lines would affect wildlife and vegetation through direct disturbance of the land and habitat fragmentation. Increased traffic and construction activities could result in desert tortoise mortalities and land designated as critical habitat for this species would be disturbed. At Coyote Spring Valley, use of groundwater could affect discharge at Muddy Spring, and therefore, the resident population of Moapa dace, a threatened fish species.

Construction of a solar energy generation facility and associated infrastructure would create considerable change in the visual environment of the valleys.

Alternative 4 - Alternate Use of Withdrawn Lands. Although there would be no development associated with Defense Program activities at the NTS and NAFR Complex, development of facilities for other programs and the Solar Enterprise Zone would occur under Alternative 4. The unavoidable adverse impacts of past underground nuclear testing activities would remain. Termination of the Defense Program activities would result in short-term adverse impacts to the regional economy.

The unavoidable adverse impacts for sites where underground nuclear testing has been conducted are the same as those for Alternative 1.

In Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley, the unavoidable adverse impacts from development of solar energy generating facilities associated with Alternative 4 would be similar to those for Alternative 3.

Cumulative Impacts

Cumulative impact analysis includes the anticipated impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions. When considered from this perspective, activities proposed for the NTS or other areas in Nevada do not result in a significant contribution to the larger impacts because of the expanding economy and growth patterns of southern Nevada. There are local impacts on the NTS that have been identified in this EIS. Potentially cumulative adverse impacts could occur to groundwater quality (under Alternative 3) and to cultural resources (under Alternatives 1, 3, and 4). Table S-7 provides a summary of anticipated cumulative impacts on a resource-specific basis.

Mitigation Measures

This EIS describes a range of potential measures designed to reduce the potential environmental impacts of the actions considered. Where no adverse impacts are identified for a particular resource, no mitigation measures are identified. Resources and issues for which mitigation measures are identified include the following:

- Transportation—Transportation activities include on-site, off-site transportation of materials and waste and other transportation. A full range of mitigation measures are identified under Alternatives 1, 3, and 4. Some of the mitigation measures include: full government- to-government consultation with American Indian tribes; provide parking within the secured area for shipments of hazardous materials and waste during non-duty hours; and provide information to stakeholders concerning waste shipments.

- Geology—Under Alternatives 1 and 3, the established practice of the DOE to minimize impacts from underground nuclear weapons testing through containment design review and implementation will continue for any potential defense program tests involving nuclear materials. Siting, design, operation, and monitoring waste management facilities on the NTS and NAFR Complex are conducted in accordance with relevant regulations. Secondary containment could be used to mitigate contamination by spills. Areas disturbed by grading and excavation would be minimized. Soils disturbed by grading and excavation would be revegetated.

- Surface Water—Under Alternatives 1 and 3, water diversion structures to prevent alteration of natural drainage patterns would be constructed when required. Lined storage or settlement ponds would be used, and contaminated soils would be restored or removed.

- Groundwater—Under Alternatives 1, 3, and 4, activities potentially affecting groundwater quality unavoidably for the long-term (such as potential underground nuclear weapons testing) cannot be mitigated and will continue to be the subject of an extensive monitoring program. If the monitoring program indicates the potential for radionuclide or hazardous

Table S-7. Summary of cumulative impacts (Page 1 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Land Use	Over the period 1996-2005, it is likely that changes in ownership involving the disposal of public lands in the Las Vegas area will continue. As the Las Vegas metropolitan area continues to expand, land-use development and zoning regulations will extend over a larger geographical area. Where land-use zoning regulations are absent, as in Nye County, incompatible land-use patterns may evolve. The number of civilian aircraft operations in the region will increase as the levels of population and economic activity grow. Military aircraft operations associated with activities at Nellis Air Force Base and the NAFR Complex are expected to increase gradually over the next decade.	Activities at the NTS under all alternatives are not expected to effect land-use patterns or land ownership in measurable ways. The majority of DOE and DoD aircraft transiting to and from the NTS/NAFR Complex use existing corridors that are adequate to accommodate future use. These corridors do not conflict with routes flown by commercial aircraft.	Activities at the NTS are expected to have negligible effects on regional land-use patterns and land ownership. Activities at the NTS would have negligible effects on regional airspace and its use.
Transportation	Rapid urban development will continue to place pressure on existing transportation infrastructure. Level of service on key roads within the metropolitan Las Vegas region and on segments of I-15, U.S. Hwy.95, and U.S. Hwy.93 could deteriorate to unacceptable levels by the year 2000. Approximately 4.0 x 10^6 vehicle trips per day are projected for Clark County in the year 2005. Planned highway improvements over the next two decades are expected to meet the increased vehicle use. Impacts of transportation of radioactive materials consist of impacts from (1) historical shipments of radioactive waste and spent nuclear fuel to the NTS, (2) other historical shipments, (3) contributions made by the alternatives evaluated in the NTS EIS, (4) reasonably foreseeable actions that include transportation of radioactive material, and (5) transportation of general radioactive materials that are not related to a particular action.	Virtually all impacts to transportation would occur on site under all project alternatives. Maximum off-site impacts would occur under Alternative 3 as additional workers at the NTS commute over regional highways. Such impacts are expected to be negligible. In the year 2005, NTS-related activities would add approximately 1,030 one-way vehicle trips per day to approximately 4.0 x 10^6 occurring daily in Clark County. Trucks bringing radioactive wastes to NTS would increase from 2 under Alternative 1 to 11 under Alternative 3. The total number of waste shipments from off-site generators could reach 40,000 under Alternative 3. The collective general population dose (person-rem) could reach 154.0.	Impacts to regional transportation facilities associated with NTS activities will comprise a negligible increment. The estimated number of transportation-related latent cancer fatalities attributable to NTS Alternative 3 would be indistinguishable from other latent cancer fatalities. They would comprise 0.0008 percent of the total number of latent cancer fatalities.
Socioeconomics	Population in Clark County is projected to increase to approximately 1.2 x 10^6 persons by the year 2000 and 1.4 x 10^6 by the year 2005. This rapid growth could result in substantial increases in demand for housing, schools, and other public services. Additional expenses associated with construction of new facilities and personnel could produce adverse conditions in the area of public finances for local jurisdictions and service providers.	NTS-related activities under Alternative 3 would add only 10,000 persons to a projected population of approximately 1.4 million in Clark County in the year 2005. This minor (less than 1-percent) increase would not result in adverse socioeconomic impacts. Under Alternative 2, some out-migration of NTS workers and their families from the region could occur. Impacts would be negligible.	In- and out-migration potentially associated with Alternatives 3 and 2, respectively, would contribute only negligible impacts to regional socioeconomic effects.

Table S-7. Summary of cumulative impacts (Page 2 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Geology and Soils	Geological resources include sand and gravel, mineral products, petroleum and natural gas, and geothermal resources. Continued urban development will influence the demand for sand and gravel with the demand for other resources related more to national and international market forces.	Types of activities at the NTS relate to subsurface contamination through underground testing. Restrictions placed on public access to the site adversely impact the use of mineral and geothermal resources.	It is not anticipated that continued inaccessibility of mineral and geothermal resources at the NTS will result in measurable adverse impacts. These resources are widespread in their occurrence and exist in adequate quantities to fulfill anticipated regional needs.
Hydrology	Rapid urban development in the Las Vegas area and southern Nye County has contributed to a state of groundwater overdraft. This condition is likely to be exacerbated as water made available through allocation from the Colorado River is committed.	Groundwater withdrawals on the NTS in excess of historic pumping levels will decrease the water available for future appropriation in the Death Valley flow system. Such increases in withdrawals would be associated with the location of the Solar Enterprise Zone on the NTS. The location of this proposed facility could lower water table levels on the NTS.	Any additional demand for water derived from groundwater sources could exacerbate an existing overdraft condition. Although the development of the Solar Enterprise Zone has the possibility of lowering the water table on the site (or at other potential locations offsite), water withdrawals associated with its operation are not expected to affect downgradient water levels or water quality.
Biological Resources	Development and implementation of the Desert Tortoise Recovery Plan is designed to ensure the sustainability of the species. It is unlikely, however, that the species will survive in large sections of the Las Vegas Valley. The Clark County Desert Conservation Plan authorizes the "take" of all tortoises on 110,000 acres of non-federal land in the county. The Plan designates several recovery units located in areas of prime desert tortoise habitat that are subject to a number of land-use constraints designed to optimize the survival and recovery of the species in these units.	The potential exists for disturbance to as much as 15,600 acres of land at the NTS under Alternative 3. Such a loss represents a small amount of the available habitat, and adverse effects to the desert tortoise are not anticipated.	Activities at the NTS will not add measurably to the loss of desert tortoise habitat.

Table S-7. Summary of cumulative impacts (Page 3 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Air Quality	The Las Vegas metropolitan area is a nonattainment area for PM_{10} and carbon monoxide (CO). It is anticipated that continued rapid urban development will exacerbate these conditions. The Regional Transportation Commission of Clark County has prepared a Regional Transportation Plan which would allow the county to be in conformity with the State Implementation Plan for all National Ambient Air Quality Standards (NAAQS). Nye County is in attainment for all criteria pollutants.	Much of the local impact under Alternative 3 is associated with ground disturbance and the generation of fugitive dust (PM_{10}). The NTS is located in Nye County and, although activities would increase quantities of dust, it is not expected that State and national ambient air quality standards would be exceeded. Only a small portion of the pollutants associated with mobile sources would occur in Clark County. Although this would add approximately 90 tons per year of carbon monoxide (CO) to the projected CO emissions of 47,532 tons per year in Clark County by the year 2000, it would not create additional violations of the CO ambient air quality standard. Marginal improvements in air quality standards could be expected under Alternative 2.	With implementation of the Regional Transportation Plan in Clark County, it is expected that conformity with the State Implementation Plan for all National Ambient Air Quality Standards will be achieved. Effects associated with NTS activities are not expected to hinder this achievement of conformity. It is not expected that ambient air quality standards in Nye County would be exceeded in the near future.
Noise	In areas undergoing urban development, ambient noise levels can be expected to increase. In areas lacking land-use controls to guide development, incompatible land uses could occur.	Noise impacts associated with activities at the NTS have the potential to affect only an extremely small number of persons because of constraints that exist for access to the site by the general public.	Activities associated with implementation of Alternative 3 would not add measurably to regional noise levels.
Visual Resources	The visual character of areas would change as urban development and mineral extraction activities continue.	No significant changes are expected to occur to existing facilities at the NTS under Alternatives 1, 3, and 4. Under Alternative 2, deterioration of facilities could occur that would marginally degrade the visual environment.	Facilities at the NTS are not accessible to the general public, and impacts would have a negligible impact on regional visual resources
Cultural Resources	As a result of ground-disturbing activities and unauthorized artifact collecting, over 12,000 sites, 12 percent of which (1,460) may be eligible for the National Register of Historic Places, will be adversely affected. Cultural resources found on private lands may be destroyed without data recovery, resulting in a serious loss of the information value inherent in these nonrenewable resources.	Ground-disturbing activities at the NTS could result in the potential loss of an additional 670 sites under Alternative 3. Of these, about 80 may be eligible for the National Register of Historic Places.	The addition of these NTS-related impacts to those attributable to all other activities could raise the number of potentially lost sites to between 12,200 and 12,900. Of these sites, between 1,460 and 1,550 could be eligible for the National Register of Historic Places.

Table S-7. Summary of cumulative impacts (Page 4 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Occupational and Public Health and Safety	With the number of persons residing and working in the region, the number of injuries and fatalities will increase. However, injury and mortality rates should remain unchanged, or decrease, assuming the continued enforcement of occupational and public health and safety regulations.	Activities at the NTS could result in up to 775 injuries and 9 fatalities over the period 1996-2005. Occupational radiation exposure to the worker population at the NTS could be 380 person-rem, resulting in 0.128 latent cancer fatalities and 0.096 other detrimental health effects in the worker population.	Activities at the NTS contribute extremely small increments to the risks to which the general population is exposed on a daily basis and should not increase injury and mortality rates in the region.
Environmental Justice	The non-NTS programs and projects account for approximately 284,000 acres of land disturbance. Land disturbance of this size could have adverse impacts on Americans Indians who have expressed concerns about holy land violations and the continued survival of their culture.	Concerns that representatives of American Indian groups have expressed relative to activities at the NTS include holy land violations, perceived risks from radiation, and the continued survival of their culture. Land disturbance at the site could have adverse impacts in these areas of concern.	Land disturbance in the region, attributable to changes in use away from an undeveloped state, could potentially raise environmental justice concerns. The increment to such land disturbance contributed by proposed actions at the NTS would be minimal and would not add measurably to the level of concern.

material migration beyond the NTS boundaries, large-scale groundwater withdrawals may be implemented to preclude further migration. Although off-site migration of contaminants is not expected to occur during the 10-year period of this EIS, the potentially adverse effects of this migration could be mitigated through management of recharge and discharge areas. Other activities under these alternatives will include both physical controls in the design of the facilities and administrative controls in the operation of the activities to avoid or minimize potential changes in water quality.

- Biology—Under Alternatives 1, 3, and 4, impacts to listed threatened or endangered species would be mitigated by implementing all reasonable and prudent measures required by the U.S. Fish and Wildlife Service. Habitat disturbance may be partially mitigated by revegetation. Careful planning of activities, pre-activity biological surveys, fire-suppression procedures, and implementation of a *Resource Management Plan* would also mitigate impacts to biological resources.

- Air Quality—Under Alternatives 1, 3, and 4, impacts to air quality would continue to be mitigated by use of central parking facilities and car-pooling of workers to and from remote sites, proper vehicle maintenance, imposing speed limits on unpaved roads, and applying water to construction areas for dust control.

- Cultural Resources—Under all alternatives, pre-activity cultural resource surveys would be conducted in undisturbed areas and, whenever possible, historic properties would be avoided. Appropriate data recovery or other mitigation plans prepared in consultation with the State Historic Preservation Officer and Advisory Council on Historic Preservation would be implemented.

The DOE will continue to consult on a government-to-government basis with Native Americans through the Consolidated Group of Tribes and Organizations and will evaluate study proposals to fund those studies, subject to funding, scheduling, and the requirements of existing agreements with state, federal, and local agencies, which address their concerns.

Consultation and Coordination

The DOE invited four federal agencies and one county government to be cooperating agencies in preparation of this EIS. Federal cooperating agencies are the U.S. Air Force, the Defense Nuclear Agency, the U.S. Fish and Wildlife Service, and the U.S. Bureau of Land Management. As the host county of the NTS, Nye County, Nevada, is also a cooperating agency.

In addition, American Indian tribes and groups participated in preparation of this EIS. The DOE invited representatives of the Consolidated Group of Tribes and Organizations (CGTO) to write sections of this EIS so that their concerns and viewpoints regarding the alternatives and the technical analyses would be presented. In many instances, viewpoints of the American Indians differ widely from the DOE's. The Consolidated Group of Tribes and Organizations' viewpoints are included in the text of the NTS EIS as italicized sections. The full text of American Indian concerns related to the alternatives evaluated in this EIS is included in Appendix G of this EIS.

Appendix G, the Native American Resource Document, is a summary of opinions expressed by the CGTO regarding the Environmental Impact Statement for the Nevada Test Site and other off-site test locations within the state of Nevada. The document contains general concerns regarding long-term impacts of the DOE operations on the NTS and a synopsis of specific comments made by the American Indian Writers Subgroup for various chapters of the NTS EIS.

The Native American Resource Document was produced in response to consultation required for the NTS EIS, in accordance with DOE Order 1230.2, American Indian Tribal Government Policy. The consultation focused specifically on four alternative management decisions concerning the future mission of the NTS and related off-site locations in Nevada. However, the present CGTO's response to this consultation is not limited to NTS EIS alternatives, but also integrates relevant *recommendations made by Indian people for previous DOE projects in which American Indians participated.*

The CGTO has a long history of relationships with the DOE. In 1985, the DOE began long-term research concerning the inventory and evaluation of American Indian cultural resources on the NTS area. This research was designed to comply with the American Indian Religious Freedom Act, which specifically reaffirms the First Amendment of the United States Constitution, rights of American Indian people to have access to lands and resources essential in the conduct of their traditional religion. These rights are exercised not only in tribal lands but beyond the boundaries of a reservation (Stoffle et al., 1994).

To reinforce their cultural affiliation rights and to prevent the loss of ancestral ties to the NTS, 19 tribes and organizations aligned themselves together to form the CGTO. This group is formed by officially appointed representatives who are responsible for representing their respective tribal concerns and perspectives. The primary focus of the group has been the protection of cultural resources. The DOE and the CGTO have participated in cultural resource management projects for the NTS, including the Yucca Mountain Project, the Underground Weapons Testing Project, and ongoing consultation in compliance with the Native American Graves Protection and Repatriation Act of 1990.

While the American Indian Resource Document provides recommendations that target the preservation of American Indian religion, culture, society, and economy, many of the comments presented here focus heavily on cultural resources. This emphasis is the product of continued cultural resource management consultation between the DOE and the CGTO, which has reinforced Indian people's awareness of the wealth of cultural resources present at the NTS. On the other hand, the potential impacts of NTS actions on other essential aspects of Indian life, such as health and socioeconomics, are virtually undocumented. This is due to the absence of consultation and research on the long-term effects of radiation exposure, nuclear waste transportation and storage on the life of Indian communities. Being a minority group, American Indians have also been overlooked in regard to issues of Environmental Justice. The CGTO recommends that these issues be systematically evaluated by the federal government. The opportunity given to the CGTO to contribute their written comments to the NTS EIS is a highly positive step the DOE has taken toward voicing Indian concerns.

References

Regulation, Order, Law

10 CFR Part 1021 — U.S. Department of Energy (DOE), "Energy: Compliance with the National Environmental Policy Act," *Code of Federal Regulations,* Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1992.

40 CFR Part 1500-1508 — Council on Environmental Quality (CEQ), "Protection of the Environment: Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act," *Code of Federal Regulations,* Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.

DOE Order 1230.2 — DOE, "American Indian Tribal Government Policy," Washington, DC, 1992.

General

DOE/NV, 1995 — U.S. Department of Energy, Nevada Operations Office (DOE/NV), *Implementation Plan for the Nevada Test Site Environmental Impact Statement (Final),* DOE/NV-390, Pp. 3 and 4, 3-14, Las Vegas, NV, 1995.

ERDA, 1977 — U.S. Energy Research and Development Administration *(ERDA) Nevada Test Site, Nevada Final Environmental Impact Statement,* Report No. ERDA-1551, Washington, DC, 1977.

Stoffle et al., 1994 — Stoffle, R.W., M.J. Evans, D.B. Halmo, M.E. Dufort, and B.K. Fulfrost, "Native American Cultural Resources on Pahute and Ranier Mesas, Nevada Test Site," Desert Research Institute Technical Report No. 84, BARA, University of Arizona, Tucson, AZ, 1994.

This Page Intentionally Left Blank

*U.S. GOVERNMENT PRINTING OFFICE: 1996-785-718

This Page Intentionally Left Blank

This Page Intentionally Left Blank

About NEPA

The National Environmental Policy Act (NEPA) was enacted to ensure that Federal decisionmakers considered the effects of proposed actions on the human environment and to lay their decisionmaking process open for public scrutiny. NEPA also created the President's Council on Environmental Quality (CEQ) to establish a NEPA review process. DOE's NEPA regulations (10 CFR 1021) augment the CEQ regulations (40 CFR 1500- 1508).

An environmental impact statement (EIS) documents a Federal agency's analysis of the environmental consequences that might be caused by major Federal actions, defined as those proposed actions that might result in a significant impact to the environment. An EIS:

- Explains the purpose and need for the agency to take action
- Describes the proposed action and the reasonable alternative courses of action that the agency could take to meet the need
- Describes what would happen if the proposed action were not implemented — the "No Action" (or Status Quo) Alternative
- Describes what aspects of the human environment would be affected if the proposed action or any alternative were implemented
- Analyzes the changes, or impacts, to the environment that would be expected to take place if the proposed action or an alternative were implemented, compared to the expected condition of the environment if no action were taken.

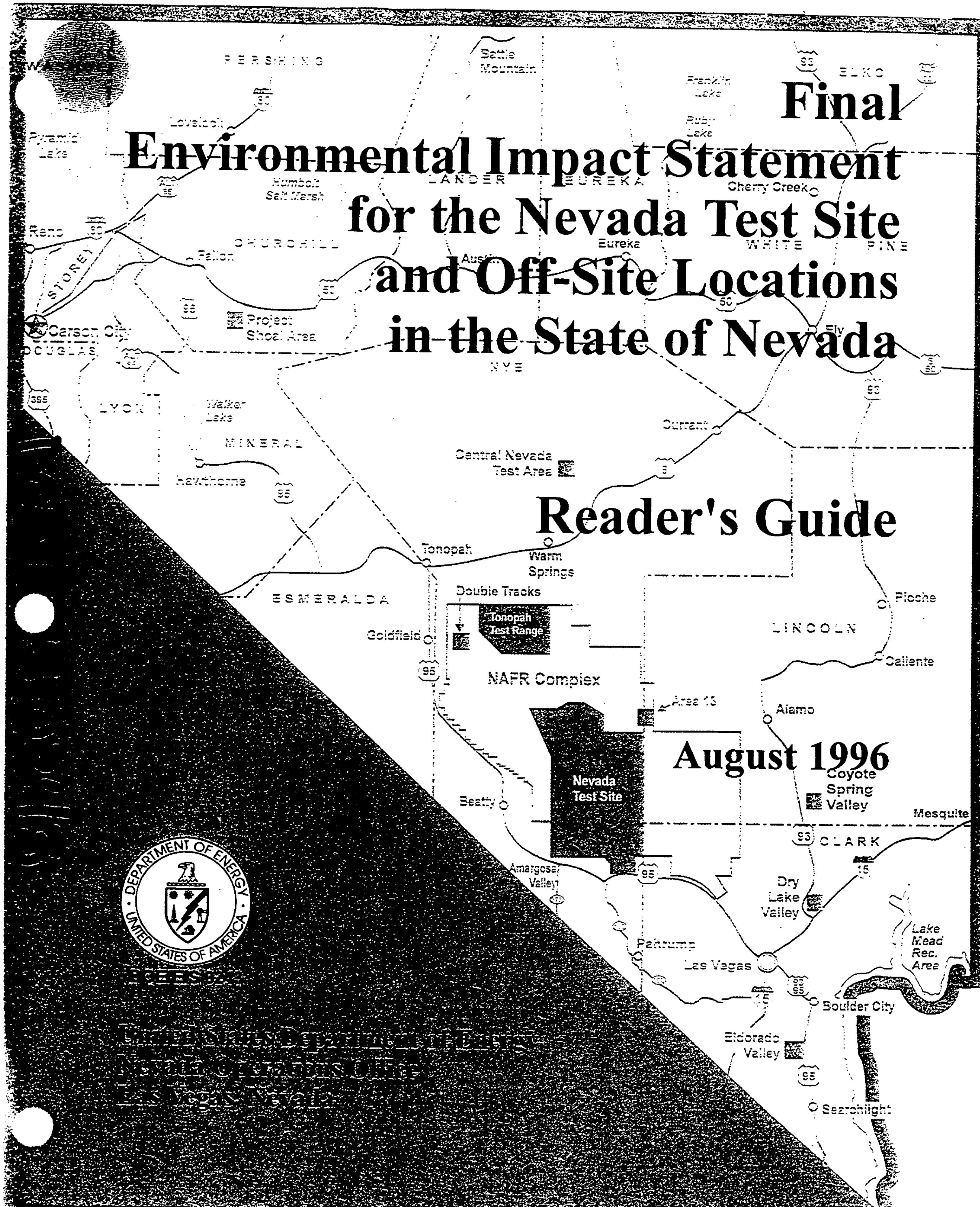
The DOE EIS process follows these steps:

- Notice of Intent, published in the *Federal Register*, identifies potential EIS issues and alternatives and asks for public comment on the scope of the analysis
- Public scoping period, with at least one public meeting
- Implementation Plan, which gives the results of public scoping and provides a "roadmap" of how the EIS will be prepared
- Draft EIS, issued for public review and comment, with at least one public hearing
- Final EIS, which incorporates the results of the public comment period on the draft EIS
- Record of Decision, which states:
  - — The decision
  - — The alternatives that were considered in the EIS, and the environmentally preferable alternative
  - — All decision factors, such as cost and technical considerations, that were considered by the agency along with environmental consequences
  - — Mitigation measures designed to alleviate adverse environmental impacts.
- Mitigation Action Plan, which explains how the mitigation measures will be implemented and monitored.

Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada

Reader's Guide

August 1996



United States Department of Energy
Nevada Operations Office
Las Vegas, Nevada

Section 1

Introduction

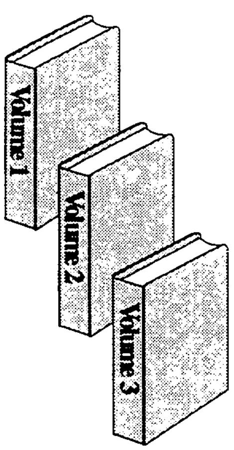
This Reader's Guide is designed to help you find information in the U.S. Department of Energy's (DOE) Nevada Test Site Environmental Impact Statement (NTS EIS).

This Guide is divided into four sections:
☞ an introduction to the NTS EIS
☞ specific topics
☞ number conversions and scientific notations
☞ public reading room locations.

DOE will be making important management decisions regarding the future mission of the NTS and related operational areas within the state of Nevada. These decisions will focus on the types of programs and project activities to be located at the NTS and the other sites within Nevada and how the economic, infrastructural, and natural resources will be used.

DOE has prepared this NTS EIS to:
☞ assess the impacts of past, current, and proposed activities
☞ establish a baseline from which to tier future National Environmental Policy Act reviews
☞ evaluate four future-use alternatives
☞ comply with National Environmental Policy Act and the Council on Environmental Quality and DOE regulations implementing the Act.

The NTS EIS is a three-volume document



Volume 1 analyzes the four alternatives, including the No Action Alternative, as they relate to the Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs. In addition, Volume 1 contains a Summary that gives a general description of the purpose of the NTS EIS, explains what will be accomplished, and identifies the environmental laws with which activities at the NTS must comply. An index has been compiled to assist you in locating topics within the NTS EIS.

Volume 2 identifies the framework for the Resource Management Plan.

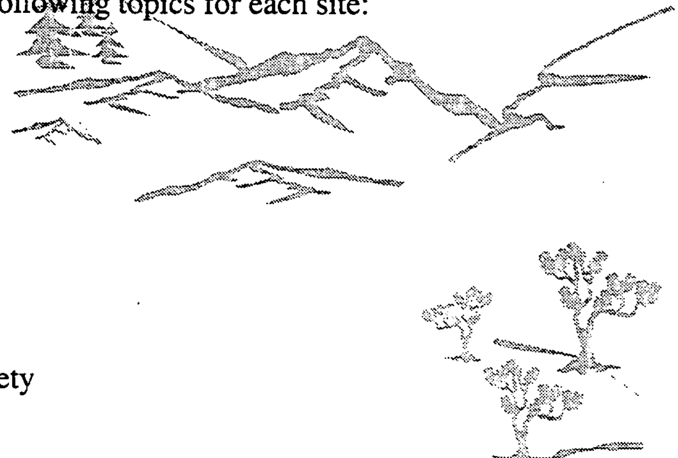
Volume 3, summarizes public comments on the Draft NTS EIS and includes DOE responses to comments.

The NTS EIS incorporates other broader program-oriented EISs by reference. This EIS addresses the proposed activities at the NTS and the other sites within Nevada. Side bar notation indicates a change to the text.

Section 2

Specific Topics

In this EIS, each alternative discusses the following topics for each site:



- Land use
- Transportation
- Socioeconomics
- Geology and soils
- Hydrology
- Biological resources
- Air quality
- Noise
- Visual resources
- Cultural resources
- Occupational and public health and safety
- Environmental Justice

The NTS EIS contains an American Indian perspective contributed by the Consolidated Group of Tribes and Organizations (CGTO). These sections are italicized in their entirety in the body of this EIS.

Alternative 1 - Continue Current Operations (No Action)

The current DOE mission and activities would continue. These would include activities and projects that support the Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs.

Alternative 2 - Discontinue Operations

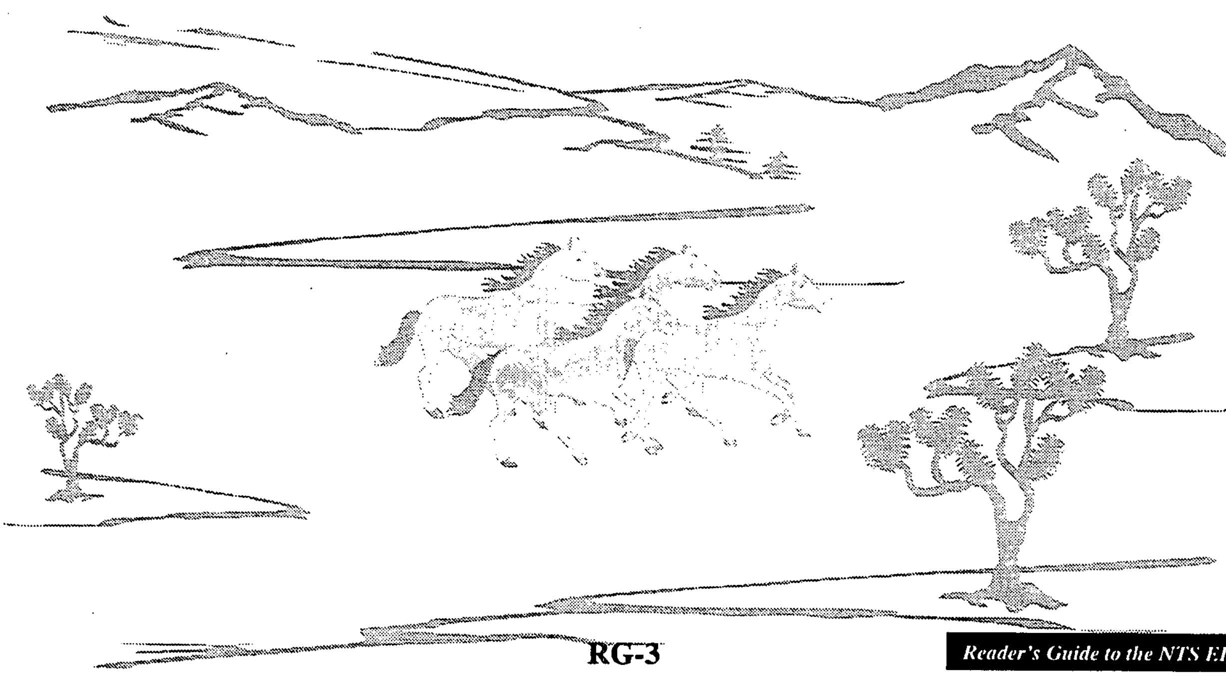
All current and planned programs and activities would be discontinued. Only those monitoring and site security functions necessary for human health, safety, and security would be maintained.

Alternative 3 - Expanded Use

The NTS and its resources would support national programs of both a defense and nondefense nature. The alternative includes support for ongoing U.S. Department of Energy, Nevada Operations Office, mission activities and provides for increased use of the NTS and its resources and capabilities by other federal and non-federal agencies and organizations.

Alternative 4 - Alternate Use of Withdrawn Lands

Programs and activities not currently included in the NTS mission responsibilities would be located at the NTS. The DOE would discontinue all defense-related and most Work for Others Program activities at the NTS. Waste Management Program operations would continue in support of ongoing NTS Environmental Restoration Program activities and waste-generating operations associated with projects sited at the NTS. Non-defense research programs would be expanded.



Where Are the Sites in Nevada?

- Nevada Test Site - approximately 1,350 square miles of land area located in Nye County in southern Nevada, with its southernmost point about 65 miles northwest of Las Vegas, Nevada.

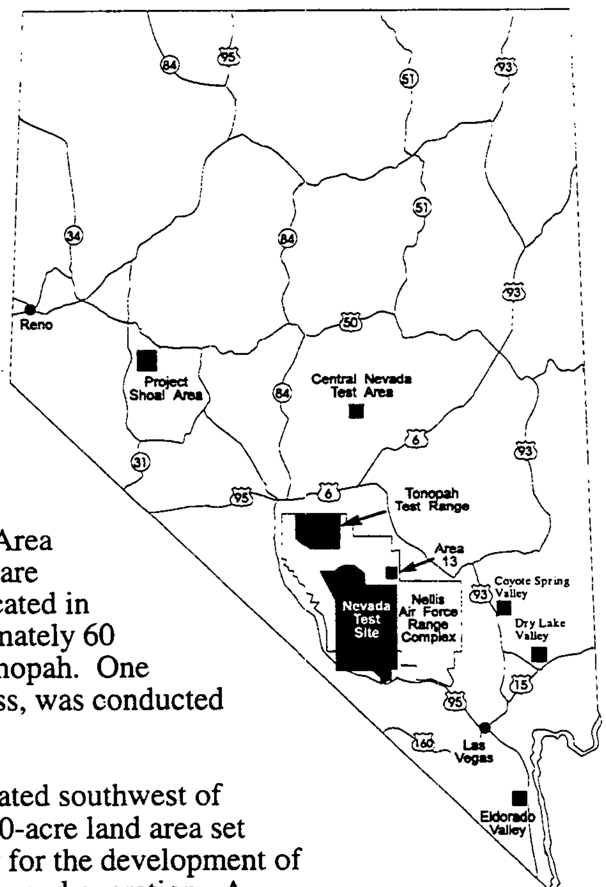
- Area 13 of the Nellis Air Force Range - approximately 4 square miles of land area, located off the northeast corner of the NTS. Area 13 is the site of Project 57, a nuclear safety test.

- Tonopah Test Range - approximately 602 square miles of land area, located in the northwestern portion of the Nellis Air Force Range. The Tonopah Test Range is used primarily as a research, design, and testing grounds for defense-related activities by the DOE.

- Project Shoal Area - approximately 4 square miles of land area located in Churchill County and approximately 30 miles southeast of Fallon, Nevada. Project Shoal was conducted in 1963 as part of the Plowshare Program to develop peaceful applications of nuclear testing.

- Central Nevada Test Area - approximately 4 square miles of land area, located in Nye County, approximately 60 miles northeast of Tonopah. One event, Project Faultless, was conducted at this site in 1968.

- Eldorado Valley - located southwest of Boulder City. A 6,000-acre land area set aside by Boulder City for the development of solar power generation and operation. A consortium, including the DOE, the non-federal Corporation for Solar Technology and Renewable Resources, the solar industry, Nevada stakeholders, and the university systems, would develop the solar-generating facilities.



- Dry Lake Valley - located near the Apex Industrial Area, several miles northeast of the U.S. Highway 93 and Interstate 15 intersection. A 3,600-acre area has been set aside for the development of solar power generation and operation by the Nevada Power Company. A consortium, including the DOE, the non-federal Corporation for Solar Technology and Renewable Resources, the solar industry, Nevada stakeholders, and the university systems, would develop the solar-generating facilities.

- Coyote Spring Valley - a 2,400-acre land area, located in Lincoln County. It is a possible site for the development of solar power generation and operation.

Number Conversions and Scientific Notations

Explanation of Number Conversions

The following rules were used in the conversion and rounding of numbers for this EIS.

1. Original numbers were converted from metric to English equivalents (or vice versa) according to standard conversion factors.

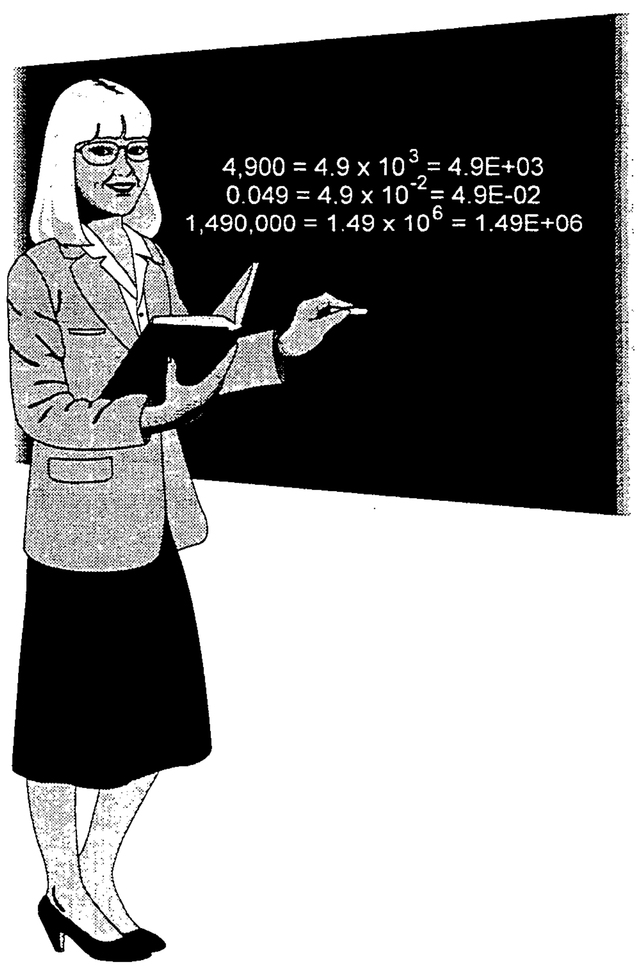
2. Original numbers were not rounded before they were converted.

3. Converted numbers were rounded to their appropriate level of precision; normally they were rounded to 2 significant figures, including decimals or numbers below 10,000. Numbers greater than 10,000 were normally rounded to 3 significant figures.

4. Figures were expressed in scientific notation to 3 significant figures (e.g., 1,450,000 would be expressed as 1.45×10^6).

5. Metric units are referred to first, with English units in parentheses, regardless of which was the original number.

Note: Slight variations in the same number used in different sections may occur because different computer spreadsheet software rounds or truncates numbers differently or because the analysts rounded the numbers before or after calculations.



Use of Scientific Notation

Very small and very large numbers are sometimes written using "scientific notation" or "E notation" rather than as decimals or fractions. Both types of notation use exponents to indicate the power of 10 as a multiplier (i.e., 10^n, or the number 10 multiplied by itself "n" times; 10^n or the reciprocal of the number 10 multiplied by itself "n" times).

For example: $\mathbf{10^3 = 10 \times 10 \times 10 = 1{,}000}$

$$10^{-2} = \frac{1}{10 \times 10} = 0.01$$

In scientific notation, large numbers are written as a decimal between 1 and 10 multiplied by the appropriate power of 10:

4,900 is written $4.9 \times 10^3 = 4.9 \times 10 \times 10 \times 10 = 4.9 \times 1{,}000 = 4{,}900$
0.049 is written 4.9×10^{-2}
1,490,000 or 1.49 million is written 1.49×10^6

A positive exponent indicates a number larger than or equal to one; a negative exponent indicates a number less than one.

In some cases, a slightly different notation ("E-notation") is used, where "× 10" is replaced by "E" and the exponent is not superscripted. Using the above examples:

$4{,}900 = 4.9 \times 10^3 = 4.9E{+}03$
$0.049 = 4.9 \times 10^{-2} = 4.9E{-}02$
$1{,}490{,}000 = 1.49 \times 10^6 = 1.49E{+}06$

Copies of the NTS EIS have been placed in the following public reading rooms:

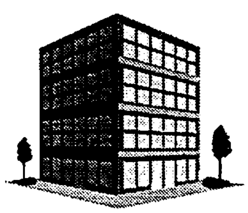
DOE Public Reading Room
2621 Losee Road, Bldg. 1
North Las Vegas, NV 89030

Las Vegas Public Library
533 N. Las Vegas Blvd.
Las Vegas, NV 89101

Carson City Public Library
900 N. Roop St.
Carson City, NV 89701

Tonopah Public Library
171 Central Street
Tonopah, NV 89019

Doris Shirkey Library
2101 E. Calvada Blvd.
Pahrump, NV 89041



Caliente Branch Library
100 Depot Ave.
Caliente, NV 89008

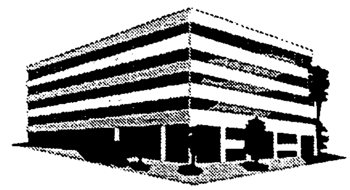
University of Nevada, Reno
Noble H. Getchell Library
Reno, NV 89557

University of Nevada, Las Vegas
James Dickenson Library
4505 S. Maryland Parkway
Las Vegas, NV 89154

Freedom of Information Reading Room
Forrestal Bldg.
1000 Independence Ave., S.W.
Washington, DC 20585

Fallon Public Library
Churchill County Library
553 S. Main
Fallon, NV 80406-8887

Washington County Library
50 S. Main
St. George, UT 84770



White Pine Library
950 Campton
Ely, NV 89301

Goldfield Library
P.O. Box 430
Goldfield, NV 89013

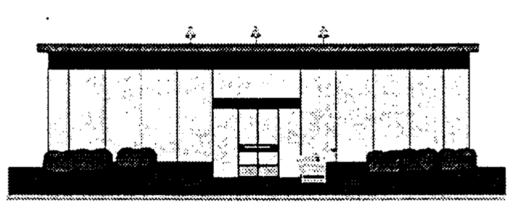
Dyer Public Library
P.O. Box 105
Dyer, NV 89010

Silver Peak Library
P.O. Box 128
Silver Peak, NV 89047

Community College of Southern Nevada
Cheyenne Campus
3200 E. Cheyenne
Las Vegas, NV 89117

Henderson Campus
700 College Dr.
Henderson, NV 89015

West Charleston Campus
6375 W. Charleston Blvd.
Las Vegas, NV 89102



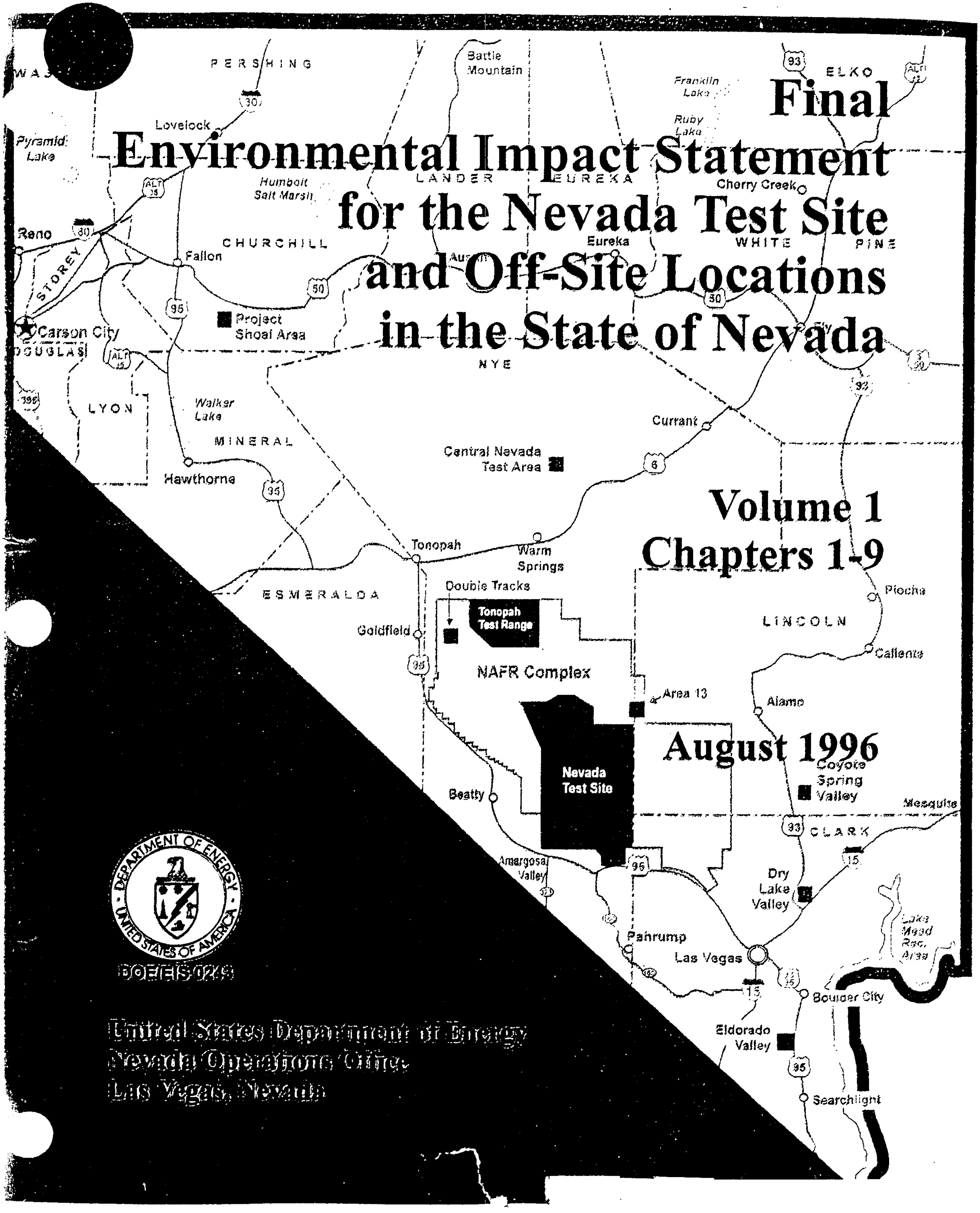
This Page Intentionally Left Blank

*U.S. GOVERNMENT PRINTING OFFICE: 1996-785-718

Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada

Volume 1
Chapters 1-9

August 1996



DOE/EIS-0243

United States Department of Energy
Nevada Operations Office
Las Vegas, Nevada

THE NEVADA TEST SITE

The U.S. Department of Energy (DOE) coordinates and administers the energy functions of the federal government, including the nuclear weapons program, research and development of energy technologies, and basic science research. The Nevada Test Site (NTS) has been the continental location of the U.S. nuclear weapons testing program for over 40 years, because following World War II, a suitable site was needed to conduct nuclear weapons tests. The NTS occupies 3,496 square kilometers (1,350 square miles) in southern Nevada and is located approximately 105 kilometers (65 miles) northwest of Las Vegas.

The DOE also manages several other sites located in central Nevada. The sites include the Tonopah Test Range, Central Nevada Test Area, and Project Shoal Area located southeast of Fallon, Nevada. The Central Nevada Test Area and Project Shoal Area were nuclear underground test sites in the 1970s. The Tonopah Test Range is an active research facility managed by the DOE and operated by Sandia National Laboratories. This facility is jointly used by the DOE and U.S. Air Force.

Most work on the NTS has been and continues to be related to national defense; however, there is growing emphasis on environmental restoration and waste management programs. Current NTS missions are:

- Support the Threshold Test Ban Treaty and the Peaceful Nuclear Explosives Treaty verification mission, and support the ongoing Comprehensive Test Ban Treaty negotiations
- Provide the capability to respond to nuclear emergencies, such as lost or stolen nuclear weapons and special nuclear materials, nuclear bomb threats, and radiation dispersal threats
- Demonstrate the capability to provide alternate energy sources, including solar energy, to meet power needs for the southwestern United States
- Maintain a state of readiness to conduct underground nuclear testing through the conduct of treaty compliance and permitted experiments and activities
- Maintain the nation's stockpile of nuclear weapons in a safe and secure manner, and fulfill other nonproliferation and national security related missions
- Manage wastes generated on the NTS and at other DOE-approved facilities across the United States
- Perform site characterization and environmental restoration activities required to minimize or eliminate the impacts of past operations
- Supervise operations of non-DOE entities performing research and development related to the safety aspects of hazardous chemicals and liquefied gaseous fuels
- Serve as an outdoor laboratory where scientists and students can conduct research on environmental issues as part of the DOE - National Environmental Research Park Network.

NEPA TEAM

Department of Energy
Nevada Operations Office
P.O. Box 98518
Las Vegas, NV 89193-8518

Dear Interested Party

The Final Environmental Impact Statement (EIS) for the Nevada Test Site (NTS) and Off-Site Locations in the State of Nevada has been completed. This EIS examines existing and potential impacts to the environment that have resulted, or could result, from current and future Department of Energy activities in southern Nevada. The EIS analyzes four alternatives for managing the activities of Department of Energy programs at the NTS, the Tonopah Test Range, portions of the Nellis Air Force Range Complex, the Central Nevada Test Area, and the Project Shoal Area. In addition, proposed Solar Enterprise Zone facilities in Dry Lake Valley, Eldorado Valley, Coyote Spring Valley and the NTS are also examined.

The EIS identifies the Preferred Alternative as the Expanded Use Alternative (Alternative 3) plus the public education activities from Alternative 4, Alternate Use of Withdrawn Lands. This Preferred Alternative is the most comprehensive alternative in supporting statutory mission responsibilities while providing for a diversification of use to include nondefense, interagency, public, and private uses of the resources and capabilities available. Details on this preferred alternative can be found in the Summary and in Volume 1, Section 3.6, of this EIS. A framework for a Resource Management Plan is included as Volume 2 of this EIS and represents the development of an ecosystem management-based planning process closely integrated with the National Environmental Policy Act process.

The Department of Energy appreciates your participation in the development of this EIS and looks forward to your continued participation in the development of the Resource Management Plan and other activities of the Department of Energy.

Terry A. Vaeth
Acting Manager

NEPA TEAM

Side bar notation indicates a change to the text.

COVER SHEET

RESPONSIBLE AGENCY: U.S. Department of Energy

COOPERATING AGENCIES: Federal: U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, Defense Nuclear Agency; and U.S. Air Force; Local Governments: Nye County, Nevada

TITLE: Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (DOE/EIS-0243)

FOR FURTHER INFORMATION:

Donald R. Elle, Ph. D.; EIS Program Manager
Office of the Assistant Manager for Technical Support
U.S. Department of Energy
Post Office Box 98518
Las Vegas, Nevada 89193-8518
Telephone: (702) 295-4652 or (800) 405-1140

FOR GENERAL INFORMATION ON DOE'S PROCESS FOR IMPLEMENTING THE NATIONAL ENVIRONMENTAL POLICY ACT, CONTACT:

Ms. Carol M. Borgstrom, Director
Office of NEPA Policy and Assistance
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington, D.C. 20585
Telephone: (202) 586-4600, or leave a message at (800) 472-2756

ABSTRACT: This sitewide EIS evaluates the potential environmental impacts of four possible land-use alternatives being considered for the Nevada Test Site (NTS), the Tonopah Test Range, and the formerly operated DOE sites in the state of Nevada: the Project Shoal Area, the Central Nevada Test Area, and portions of the Nellis Air Force Range Complex. Three additional sites in Nevada—Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley—are evaluated for colocation of solar energy production facilities. The four alternatives include **Continue Current Operations** (No Action, continue to operate at the level maintained for the past 3 to 5 years); **Discontinue Operations** (discontinue operations and interagency programs); **Expanded Use** (increased use of NTS and its resources to support defense and nondefense programs); and **Alternate Use of Withdrawn Lands** (discontinue all defense-related activities at NTS; continue waste management operations in support of NTS environmental restoration efforts; expand nondefense research). Environmental impacts were assessed for each alternative by analyzing, to the extent possible, the discrete and cumulative environmental impacts associated with Defense Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs. A framework for a Resource Management Plan is included as Volume 2 of this EIS and represents the development of an ecosystem based planning process closely integrated with the National Environmental Policy Act process. This EIS, among other things, analyzed the impacts of transportation of low level waste, and site characterization activities related to the Yucca Mountain Project but did not analyze the suitability of the site as a repository. This EIS does not analyze the suitability of the Yucca Mountain site as a repository as this is an action beyond the scope of the EIS. The **Preferred Alternative** is identified as **Expanded Use** plus the public education activities from **Alternate Use of Withdrawn Lands.** Volume 3 of this EIS contains the public comments and the responses to the comments.

This report has been reproduced from the best available copy.
Available in paper copy and microfiche.

Number of pages in this report: 2290

DOE, DOE contractors, and the public can obtain copies of this report from:

Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831
(615) 576-8401

This report is publicly available from:

The Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650

NEPA TEAM

Final
Environmental Impact Statement

for
the Nevada Test Site and Off-Site Locations
in the State of Nevada

Volume 1

U.S. Department of Energy
Nevada Operations Office
Las Vegas, Nevada

TABLE OF CONTENTS

Glossary

Acronyms

Conversion

Index

Appendices

List of Figures

List of Tables

This Page Intentionally Left Blank

Chapter 1

INTRODUCTION

CHAPTER 1
INTRODUCTION

The U.S. Department of Energy (DOE) proposes to continue managing the Nevada Test Site (NTS) and its resources in a manner that meets evolving DOE missions and that responds to the concerns of affected and interested individuals and agencies.

This sitewide Environmental Impact Statement (EIS) is a type of programmatic EIS, in that it analyzes the impacts from DOE programs at the following sites: the NTS, the Tonopah Test Range, portions of the Nellis Air Force Range Complex (NAFR Complex), the Central Nevada Test Area, and the Project Shoal Area. These programs include ongoing activities for the stewardship of the nation's nuclear weapons stockpile, management of radioactive waste, and environmental restoration. Also examined in this EIS are newer programs, such as the proposed Solar Enterprise Zone facilities at the NTS, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley. In addition, Appendices F and J provide project specific analyses for the Big Explosives Experimental Facility and the activities conducted in the Lyner Complex, respectively.

This EIS examines existing and potential impacts to the environment that have resulted, or could result, from current and future DOE operations in Nevada during the next 10-year period. This 10-year planning period accounts for both short-term (0 to 5 years) and long-term (5 to 10 years) potential projects. However, it is a regulatory requirement of the DOE (10 CFR Part 1021) to review a sitewide EIS of multifacility sites at least every 5 years. The DOE Nevada Operations Office (DOE/NV), proposes to accomplish this review through the Resource Management Plan process. Although a framework for the *Resource Management Plan* is being published in conjunction with the NTS EIS, the *Resource Management Plan* will take longer to complete than the NTS EIS. In the future, it will be an integral part of the National Environmental Policy Act process on the NTS. The DOE is committed to completing the *Resource Management Plan*, which is estimated to take approximately 2 years. The 5-year sitewide review required by DOE policy will utilize the *Resource Management Plan* as part of the review of the EIS and in determining whether (1) the existing EIS remains adequate, or (2) a new EIS should be prepared or the existing EIS supplemented. A more detailed discussion on the relationship between the *Resource Management Plan* and the EIS is presented in the *Framework for the Resource Management Plan* (Volume 2, Section 1.4 of the EIS).

In September 1977, the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada*, a broadly scoped NTS EIS, was published (ERDA, 1977). Pursuant to the DOE's mission responsibilities at that time, the 1977 EIS focused on an evaluation of the environmental impacts of underground nuclear tests with yields of less than one megaton. An analysis of other intermittent nuclear and non-nuclear activities that were conducted—and continue to be conducted—at the NTS was included in this earlier EIS. In recent years, nuclear testing policy changes have occurred. These policy changes have caused significant changes in NTS programs. These changes, together with the favorable environmental and infrastructure characteristics at the NTS, have resulted in additional DOE and non-DOE activities being proposed for siting at the NTS. These proposed changes in operations at the NTS, and the DOE policy of reviewing sitewide National Environmental Policy Act documents, have resulted in the preparation of a new NTS EIS. Preparing an EIS at this time responds to public concern and allows for a full dialogue among the DOE and state, tribal, county and municipal governments; other federal agencies; and the general public.

Initially, the DOE/NV planned to prepare two EISs to be separated along programmatic lines. The DOE/NV Environmental Restoration and Waste Management EIS was to address restoration and waste management activities at the NTS and other off-site test areas within Nevada. The sitewide NTS EIS was to address the future mix of Defense Program missions/activities, stockpile stewardship, and alternative uses of the NTS.

The Manager, DOE/NV, decided on May 15, 1994, that one EIS should be prepared for the Defense, Environmental Restoration, and Waste Management Programs, and other potential activities considered for the NTS. Work then began on the preparation of a Notice of Intent (NOI) for this EIS. The NOI was subsequently published in the *Federal Register* on August 10, 1994.

On June 28, 1994, the state of Nevada filed a Complaint for Declaratory Judgment and Injunction against the DOE in the U.S. District Court in Nevada. In its complaint, the state of Nevada sought declaratory judgments that the DOE has failed to comply with National Environmental Policy Act requirements at the NTS, and that the DOE must initiate a single sitewide EIS for all major federal actions at the NTS. Nevada also sought orders to halt shipments of low-level waste from Fernald (a DOE site located in Ohio), as well as all other transportation, receipt, storage, and disposal of mixed waste, hazardous waste, and other DOE approved waste to the NTS. In its complaint, Nevada sought to stop the DOE from pursuing any "Weapons Complex" activities, including nuclear testing, research, and development that would significantly impact the environment, until publication of the NTS EIS.

On July 14, 1994, the state of Nevada amended its original complaint to focus on enjoining only the receipt, disposal, and waste management activities related to off-site waste. The U.S. District Court in Nevada issued an Order on January 12, 1995, that dismissed Nevada's claims regarding shipment of Fernald low-level waste to the NTS based on a pre-enforcement review bar under the Comprehensive Environmental Response, Compensation and Liability Act. The Court also dismissed claims regarding preparation of an Environmental Impact Statement because of mootness since this NTS EIS was underway. Claims regarding the contents of the new EIS were also dismissed as not yet ripe for adjudication. However, the Court did not dismiss Plaintiff's claims seeking injunctive relief from the disposal of low-level waste from other off-site disposal facilities.

On April 29, 1996, the parties filed a Joint Stipulation to Stay Proceedings requesting court approval of their agreement that the complaint should be administratively dismissed from the docket until thirty days following the issuance of the NTS Record of Decision. The DOE agreed to store and dispose of all low-level waste not originating from Fernald at Area 5, rather than Area 3, of the NTS until 30 days following the issuance of the Record of Decision for this EIS. The parties also agreed that, thirty days following issuance of the Record of Decision, they would develop a schedule for filing a Third Amended Complaint, responding to such complaint if one is filed, preparing the Administrative Record and filing summary judgement briefings to the court. At a Status Conference on May 15, 1996, the Court approved the joint Stipulation to Stay Proceedings and scheduled a further Status Conference for Friday, August 30, 1996.

1.1 Organization of This Environmental Impact Statement

This EIS is organized into three volumes. Volume 1 contains the EIS, and Volume 2 presents the framework within which a *Resource Management Plan* will be developed. Volume 3 contains a compilation of comments received on the Draft NTS EIS and responses to those comments.

Volume 1 is organized into 9 chapters and 10 appendices. Chapter 2 provides a description of the purpose and need for the action analyzed in this EIS. Chapter 3 provides a description of the four alternatives analyzed in this EIS and brief reviews of the alternatives eliminated from further consideration, and identifies the DOE's preferred alternative. Chapter 3 also provides a comparative summary of the impacts of the alternatives on the local communities and the natural environment. Chapter 4 contains a description of the affected environments under current conditions, and provides a baseline for analyzing the impacts of the alternatives. The results of the environmental impact analysis are presented in Chapter 5. Chapter 6 contains the cumulative impacts discussions. Chapter 7 presents mitigation measures. Chapter 8 contains the list of individuals and organizations consulted during the preparation of this EIS. Chapter 9 contains the list of NTS EIS preparers and contributors. References are listed at the end of the chapter in which they are cited. A glossary and an index follow Chapter 9.

In addition to the body of this EIS, the following appendices are included:

- Appendix A - Detailed Project and Activity Information
- Appendix B - Notice of Intent
- Appendix C - Relevant Regulatory Requirements
- Appendix D - Distribution of the Final EIS
- Appendix E - Impact Assessment Methods
- Appendix F - Project-Specific Environmental Analysis (Big Explosives Experimental Facility)
- Appendix G - American Indian Assessments: Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada
- Appendix H - Human Health Risk and Safety Impacts Study
- Appendix I -Transportation Study
- Appendix J - Classified Supplement: Project-Specific Information for Activities Conducted at the Lyner Complex.

As part of the process for this EIS, guidance on addressing American Indian concerns, provided in an Executive Policy Memorandum (DOE, 1994), was considered. For this EIS, the DOE implemented the executive policy by inviting representatives of the Consolidated Group of Tribes and Organizations to write sections of the document so that their concerns and viewpoints regarding the alternatives and the technical analyses would be presented. In many instances, viewpoints of the American Indians differ widely from the DOE's. To facilitate review, the viewpoints of the Consolidated Group of Tribes and Organizations are included in the text of the NTS EIS as italicized sections. The full text of American Indian concerns related to the alternatives evaluated in this EIS is located in Appendix G.

Two additional studies were undertaken in support of this EIS: the Human Health Risk and Safety Impacts Study, and the Transportation Study. These studies are published as Appendices H and I of this EIS and contain the detailed information and analyses that led to the transportation, human health effects, and safety impacts conclusions contained in this EIS.

As part of this EIS the DOE prepared two project-specific appendices. Appendix F is a project-specific environmental analysis for the Big Explosive Experimental Facility and Appendix J is a classified appendix containing information on the activities conducted at the Lyner Complex. The Big Explosive Experimental Facility is an existing facility in Area 4 of the NTS and has appropriate National Environmental Policy Act compliance review for its ongoing bunker-certification tests and shaped-charge experiments (described as Alternative 1 in Appendix F). The project-specific impact analysis in Appendix F has been incorporated into Chapter 5 of the NTS EIS. This EIS is intended to complete the National Environmental Policy Act requirements for the Big Explosive Experimental Facility by evaluating the potential impacts resulting from the alternatives of ongoing or expanded use of the facility.

The classified appendix was completed concurrently with the unclassified portion of this NTS EIS. It discusses the potential for adverse impacts to the environment under routine operating conditions during experiments with special nuclear material at the Lyner Complex. The classified appendix contains information on material quantities and design concepts that are classified by the DOE for nonproliferation and national security reasons. The environmental impacts and public safety and health risks associated with these experiments are not classified and are included in Chapter 5, Environmental Consequences, under Defense Program activities.

1.2 Alternatives Analyzed

This EIS analyzes the environmental impacts associated with managing the NTS and its resources. The alternatives are structured to provide scenarios of current and future uses of the DOE facilities in Nevada that range from discontinued use to expanded use. The use alternatives have been designed to allow the DOE to analyze and compare the potential environmental effects of a wide range of use options. The use the DOE ultimately selects, however, may not be one of the alternatives described in its entirety, but a hybrid created by selecting specific options from within the alternatives analyzed.

This EIS identifies the impacts of past, current, and potential programs of the DOE. The programs are included in one or more of the four alternatives and fall into three basic levels: (1) current activities, (2) planned projects, and (3) proposed projects. Current activities are those that are presently part of the normal operations of the NTS, the Tonopah Test Range, portions of the NAFR Complex, and other areas considered in this EIS, such as the Area 5 Radioactive Waste Management Site. Planned projects are those that are within the 5-year planning cycle and are likely to be implemented, such as a Solar Enterprise Zone facility. These projects are not yet included in the 5-year planning window, but have undergone sufficient conceptual development to allow a reasonable assessment. The most reliable data are clearly derived from ongoing activities. Planned projects would present slightly less reliable data. Data for proposed projects would be the least defined, but were determined to be essential to a full and open evaluation and disclosure of the potential effects of the alternative. To provide an adequate analysis, conservative assumptions and parameter values were used to evaluate potential impacts of the less-defined activities.

Four alternatives are presented in this EIS:

- Alternative 1 - Continue Current Operations (No Action) - Ongoing DOE and interagency programs and activities at the NTS and other associated areas in Nevada would be continued under this alternative
- Alternative 2 - Discontinue Operations - All current and planned program activities and NTS operations would be discontinued under this alternative. Only the environmental monitoring and site-security functions necessary for human health, safety, and security would be maintained
- Alternative 3 - Expanded Use - The NTS and its resources would be made available for increased use to support national programs of both a defense and nondefense nature
- Alternative 4 - Alternate Use of Withdrawn Lands - All defense-related activities and most Work for Others Program activities would be discontinued at the NTS. Certain programs and activities that are not currently included in NTS mission responsibilities are also evaluated. This alternative could include other activities, such as the relinquishment of portions of the NTS, that would be dependent upon future land-use designations and withdrawal status.

1.3 Laws and Regulations

This document was prepared in accordance with the National Environmental Policy Act of 1969; the Council on Environmental Quality (CEQ) regulations, which implement the Act (Title 40 Code of Federal Regulations [CFR] Parts 1500-1508), and the DOE's implementing regulations for the National Environmental Policy Act (10 CFR Part 1021).

Appendix C identifies and summarizes the primary federal and state laws, regulations, executive orders, and DOE orders that may apply to the proposed action and alternatives at the NTS. It also provides information on the current status of permits and regulatory compliance for the NTS and DOE off-site locations in Nevada.

1.4 Relationship of This Environmental Impact Statement and Other Statements

The DOE is preparing several other National Environmental Policy Act documents that may affect the scope of this EIS because they include the

NTS as an alternative location for the action under consideration. The documents are discussed in the remainder of this section. In addition, Section 3.2.6.1 addresses the EIS that the DOE plans to prepare for the Yucca Mountain Repository Project.

The NTS EIS is a sitewide EIS. A sitewide EIS is intended to support decisionmaking at a given geographic location; this EIS addresses environmental impacts that occur as a result of past, present, and reasonably foreseeable future activities at the site. In some circumstances, a sitewide EIS must take into account proposals originating elsewhere (such as in other DOE program-level documents) that may affect facilities management or land use planning at the site. Such external proposals would be subject to separate National Environmental Policy Act review and decisionmaking processes, but would be identified, and their impacts incorporated in the sitewide EIS.

When the NTS has been proposed and analyzed as an alternative in one of these DOE program-level documents, the impact of additional activities is included as part of the Alternative 3, Expanded Use impacts of this sitewide EIS. The discussion of cumulative impacts in this EIS incorporates the analysis presented in other geographically-related environmental documents, and is intended to reflect the maximum expected impacts for each of the four alternatives considered in this EIS. The National Environmental Policy Act reviews considered for analysis in the NTS EIS include those discussed in the following paragraphs.

Waste Management Programmatic EIS—The Waste Management Programmatic EIS provides a department-wide evaluation of management alternatives for treating, storing, and disposing of radioactive and hazardous waste. The NTS is a site considered for the central or regional management for DOE wastes; 13 other sites are also being considered. Under other options, the NTS would manage only its own wastes or ship some, or all, of its wastes to another DOE site. The Final Waste Management Programmatic EIS, which is in preparation, will more clearly define the role of the NTS within the DOE Waste Management Complex.

Stockpile Stewardship and Management Programmatic EIS—The Stockpile Stewardship and Management Programmatic EIS addresses the activities required to ensure the safety and reliability of the nation's nuclear weapons stockpile and the maintenance, evaluation and repair or replacement of weapons and associated components. This programmatic EIS provides information to assess the environmental impacts of alternatives for conducting the stockpile stewardship and management program, assist with decisions to identify specific capabilities and facilities for conducting the program, and help determine the configuration (or sites for facilities) of the nuclear weapons complex that would most efficiently implement the program.

Stockpile stewardship activities for which the NTS has been identified as an alternative, although not as part of the Preferred Alternative, include the National Ignition Facility and the next generation of nuclear weapons simulators. The next generation of simulators cannot be defined to the degree necessary to perform meaningful environmental analysis. However, two conceptual facilities are analyzed in this EIS for land-use planning purposes only: (1) Next Generation Radiographic Facility and (2) Next Generation Magnetic Flux Compression Generation Facility. In the Stockpile Stewardship and Management Programmatic EIS, these facilities are described as the Advanced Hydrotest Facility and the High-Explosive Pulsed Power Facility, respectively. Under stockpile management activities, the NTS Device Assembly Facility, and the P-Tunnel, located on Rainier Mesa, are proposed as alternative sites for weapons assembly and disassembly. The DOE began the Stockpile Stewardship and Management Programmatic EIS in June 1995 (60 FR 31291), and issued the Draft Programmatic EIS in February 1996. The Final NTS EIS is currently being prepared.

Disposition of Surplus Highly Enriched Uranium EIS—The Disposition of Surplus Highly Enriched Uranium EIS evaluates the disposition alternatives of surplus highly enriched uranium. The NTS is a candidate for receipt of low-level waste generated by blending high-enriched uranium with low-enriched uranium. The Draft Highly

Enriched Uranium EIS was issued in October 1995; the final Highly Enriched Uranium EIS was issued in June, 1996. There are no functions or facilities for the NTS identified in the Preferred Alternative of this EIS. Decisions related to the disposal of any low-level waste generated by blending will be consistent with the Record of Decision issued after completion of the Waste Management Programmatic EIS.

Storage and Disposition of Weapons-Usable Fissile Materials Programmatic EIS—The Storage and Disposition of Weapons-Usable Fissile Materials Programmatic EIS evaluates sites for the storage and several technologies considered for the dispositioning of plutonium and other weapons-usable fissile materials, except the surplus of highly enriched uranium. This programmatic EIS included consideration of strategic reserves of special nuclear materials; because the storage of strategic reserves is covered in both the Storage and Disposition of Weapons-Usable Fissile Materials Programmatic EIS and the Stockpile Stewardship and Management Programmatic EIS, the decision for location of storage of the strategic reserves will not be made until completion of both EIS documents, in a Record of Decision which will jointly consider both proposals.

The NTS is a candidate site for two of the storage alternatives considered in the Storage and Disposition of Weapons-Usable Fissile Materials Programmatic EIS; Consolidation of Plutonium Alternative and Collocation of Plutonium and Highly Enriched Uranium Alternative. The programmatic EIS also evaluates the technology or technology mix to be employed for achieving the Spent Fuel Standard for disposal. For the purpose of analysis, the programmatic EIS considered the NTS as a location for a disposal technology or technology mix including Pit Disassembly/ Conversion Facility, Mixed Oxide Fuel Fabrication Facility, and an Evolutionary Light Water Reactor. However, the record of decision for the Storage and Disposition of Weapons-Usable Fissile Materials Programmatic EIS would only select the technology, not the site. This Draft Programmatic EIS was issued in February 1996. The Final Programmatic EIS is currently being prepared.

Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapons and Components Draft EIS—The Pantex Sitewide EIS addresses continued operations of the DOE's Pantex Plant, located near Amarillo, Texas, as well as the possible relocation of the interim storage of these plutonium pits. A decision on the interim storage of pits is being considered as a contingency and will not be necessary if a decision on the long-term storage and disposition of plutonium is made following the Fissile Materials Programmatic EIS. An expanded Device Assembly Facility and the P-Tunnel, both located on the NTS, have been proposed as candidate sites for the interim relocation of up to 20,000 pits although not as part of the Preferred Alternative. The DOE began this EIS in May 1994 (59 FR 26635). The Draft NTS EIS was issued for review in 1996.

Los Alamos National Laboratory Sitewide EIS—The Los Alamos National Laboratory Sitewide EIS addresses continued operations of the Los Alamos National Laboratory in New Mexico. The EIS may also evaluate the use of the NTS facilities for disposal in the waste management section of the document. The DOE began this EIS in May 1995 (60 FR 25697).

Medical Isotopes Production Project: Molybdenum-99 and Related Isotopes. In the Final NTS EIS, the DOE proposed to create a domestic source for the production of medical isotopes for maintaining a stable supply to the United States' health care community. These isotopes would be produced in concert with the DOE's national laboratories. The NTS was identified as the preferred location for the disposal of approximately 100 drums of low-level waste generated each year under this proposed medical isotope production project. The Final Molybdenum-99 and Related Isotopes EIS was issued in May 1996.

Nellis Air Force Range Legislative EIS—In addition to the National Environmental Policy Act documents that the DOE is preparing, the U.S. Air Force will be preparing a legislative EIS for the NAFR Complex. This document will include a discussion of all activities on the Tonopah Test Range. The Tonopah Test Range will be evaluated as part of the 2001 land withdrawal review of the NAFR Complex. Under Public Law 99-606 (which consolidated the NAFR Complex under one withdrawal order) over 3 million acres of land in Clark, Nye, and Lincoln counties were withdrawn. The withdrawal and reservation terminates on November 6, 2001. Renewal actions require an EIS to address the environmental impacts of continued land withdrawal. The land withdrawal alternatives evaluated in the NAFR Complex Legislative EIS may result in proposed changes that could affect DOE operations, such as the use of Pahute Mesa by the DOE . It is anticipated that the NTS EIS will provide baseline information and will be used in the cumulative impact analysis section for the NAFR Complex Legislative EIS.

1.5 Public Comment Process on the Draft NTS Environmental Impact Statement

The Draft NTS EIS was developed after a series of public scoping meetings. The scoping process and issues raised during the scoping phase are described in the Final Implementation Plan (DOE/NV, 1995). This Draft EIS was distributed for review and comment to congressional members and committees; the state of Nevada; tribal governments; several county governments; other federal agencies; and the general public. The DOE invited comments to correct factual errors or to provide insights on any other matter related to this environmental analysis. During the comment period, public hearings were held in St. George, UT; Reno, Pahrump, and Las Vegas, NV; and additional workshops were held in Caliente, Tonopah, Boulder City, and North Las Vegas, NV. In addition, the public was encouraged to provide comments via mail, fax, e-mail, and telephone (toll-free 800 number).

In response to public feedback critical of DOE's traditional hearing format, the public hearings and workshops held on the Draft NTS EIS were conducted using various formats selected by representatives of the host community. The formats chosen allowed for a two-way interaction between the DOE and the public; increased public awareness and understanding on project-related impacts discussed in the Draft NTS EIS; and encouraged informed public input and comments on the document. Community facilitators were present at the workshops to direct and clarify discussions and comments.

All public hearing and workshop comments received by mail, fax, e-mail, or telephone during the public comment period are presented in Volume 3 of this EIS, the comment response document. Volume 3 describes the public comment process in detail, presents broad issue summaries and responses, and includes copies of all comments received.

The DOE provided the draft classified Appendix J, "Classified Supplement: Project-Specific Environmental Impact Analysis (Lyner Complex)," for review by appropriately cleared parties. The parties included the EPA and the state of Nevada. Neither party had any recommendations for changes to the classified supplement.

1.6 Changes from the Draft Sitewide Environmental Impact Statement

The DOE has revised the Draft NTS EIS in response to comments received from the state of Nevada, the Consolidated Group of Tribes and Organizations and Indian Tribes, local governments and federal agencies (including the Department of the Interior and the Environmental Protection Agency), nongovernmental organizations, the general public, and the DOE and laboratory reviewers. The text of the NTS EIS has been changed in some areas to provide additional environmental baseline information, to correct inaccuracies and make editorial corrections, and provide additional discussion of technical considerations to respond to comments and to clarify text. In addition, the DOE has updated coverage due to events or decisions made in other documents since the Draft NTS EIS was provided for public comment in January, 1996. Finally, the DOE has identified a preferred alternative. New and changed text has been identified by a side-bar on the modified text.

1.6.1 Alternatives

DOE has provided additional information to clarify the alternatives, including repeating material from Alternative 1 in Alternative 3.

1.6.2 Preferred Alternative

Alternative 3 has been identified as the DOE's Preferred Alternative, with the addition of public education options from Alternative 4. This Preferred Alternative is viewed as the alternative which best meets the objectives of the DOE, and addresses comments from the public regarding other uses for the NTS. The Preferred Alternative satisfies the purpose and need cited as the reason DOE needs to take action. The Record of Decision may select this alternative or a combination of this alternative and the other alternatives for DOE's future activities at the Nevada Test Site and off-site locations in the state of Nevada.

1.6.3 Summary of Significant Changes

Volume 3 of this EIS, the comment response volume, contains responses to individual comments. The comments can be grouped based on their content, and the changes resulting from them can be summarized. Below is a summary of changes made in Volumes 1 and 2 as a result of the comments and other considerations cited above:

With regard to the Defense Program, there were comments which questioned the rationale for conducting subcritical experiments, as well as the characterization of subcritical experiments as part of the No-Action Alternative. Information has been added that explains the historical basis for having conducted the tests in the past and defines the program for the future. The relationship to current Comprehensive Test Ban Treaty negotiations is also clarified. Changes have been made in various sections of Chapters 2, 3 and 4 to clarify the nature of these experiments.

With regard to waste management, many comments noted the differences in waste volume numbers cited in this EIS and in other DOE documents. The waste volume numbers have been updated and clarified. Changes in the waste volumes have resulted in changes in the values used in the Transportation Study (Appendix I) and the Human Health Risk and Safety Impacts Study Assessment (Appendix H) as well. Questions about waste categories and what is disposed on the NTS have been addressed and clarifying language has been added to the text. Changes have been made in various sections of Chapters 2, 3, 4, and 5 and Appendices A, H, and I of the NTS EIS.

Commentors raised questions about the radioactive source term data discussed in the groundwater and public health impacts sections. Additional information has been provided about the development of the source term and the models used in the evaluation of groundwater contaminant transport. This information has also been referenced in the Human Health Risk and Safety Impacts Study Assessment (Appendix H) to better clarify the results of consequence and impact assessments in the public environment off the NTS/NAFR Complex controlled lands. Changes have been made in Section 4.1.4.2 of the NTS EIS.

Comments regarding the impacts to biological resources have been addressed by adding clarifying information to the text. The recently completed Biological Opinion provided by the U.S. Fish and Wildlife Service has been referenced as well. Changes have been made in the text in various sections of Chapters 5 and 8 of the NTS EIS.

The Consolidated Group of Tribes and Organizations have continued their evaluation of the NTS EIS and development of their information pertaining to the DOE activities and conclusions. The American Indian Assessments: Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (Appendix G), has been revised and additional assessments have been incorporated. These assessments have been added, in italics, to the text of the NTS EIS.

There were many comments on the cumulative impacts assessment. Chapter 6 has been revised to incorporate more information and to better reflect the role of DOE activities as contributing to the overall impacts of the region.

Many comments were received on DOE's waste transportation activities and transportation-related issues. These issues have been addressed through revisions to the Transportation Study, and by fully incorporating and assessing the full scope of transporting defense program materials as well as hazardous materials in relation to activities at the NTS. The concerns of the local governments and the public have been addressed as well. American Indian concerns will be identified and addressed through a recently initiated American Indian Transportation Study and continued government-to-government consultation. The DOE will continue all dialogue initiated through the transportation study development.

1.7 Next Steps

The Record of Decision will explain all factors, including environmental impacts, that the DOE considered in reaching its decision (see inside back cover). The Record of Decision will also identify the environmentally preferred alternative, or alternatives. If mitigation measures, monitoring, or other conditions are adopted as part of the DOE's decision, these will be summarized in the Record of Decision, as applicable, and will be included in a Mitigation Action Plan that would be prepared following the issuance of the Record of Decision. The Mitigation Action Plan would explain how and when mitigation measures would be implemented and how the DOE would monitor the mitigation measures over time to judge their effectiveness. The Record of Decision and the Mitigation Action Plan will also be placed in the DOE Reading Room in Las Vegas and made available to interested parties upon request.

The DOE is committed to completing the *Resource Management Plan* in accordance with the Final Framework as described in Volume 2 of this Final EIS. During the *Resource Management Plan* process, consultation with federal agencies and sovereign nations, and interaction with local governments and interested members of the public will continue.

1.8 References

REGULATION, ORDER, LAW

10 CFR Part 1021	U.S. Department of Energy (DOE), "Energy: Compliance with the National Environmental Policy Act," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1992.
40 CFR Part 1500-1508	Council on Environmental Quality (CEQ), "Protection of the Environment: Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
59 FR 26635	DOE, "Preparation of an Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components, Notice of Intent," *Federal Register*, Washington, DC, 1994.
60 FR 25697	DOE, "Notice of Intent to Prepare a Sitewide Environmental Impact Statement for the Los Alamos National Laboratory," *Federal Register*, Washington, DC, 1995.
60 FR 31291	DOE, "Stockpile Stewardship and Management Programmatic Environmental Impact Statement, Notice of Intent," *Federal Register*, Washington, DC, June 14, 1995.

GENERAL

DOE, 1994	DOE, Memorandum for the Heads of Executive Departments and Agencies, Government-to-Government Relations with Native American Tribal Governments, Washington, DC, 1994.
DOE/NV, 1995	U.S. Department of Energy, Nevada Operations Office (DOE/NV), *Implementation Plan for the Nevada Test Site Environmental Impact Statement* Revision O, DOE/NV-390, pp. 3 and 4, 3-14, Las Vegas, NV, 1995.
ERDA, 1977	U.S. Energy Research and Development Administration (ERDA), *Nevada Test Site, Nye County, Nevada Final Environmental Impact Statement*, Report No. ERDA-1551, Washington, DC, 1977.
MLWA, 1986	Military Lands Withdrawal Act of 1986, Public Law 99-606.
NEPA, 1969	National Environmental Policy Act (NEPA), Public Law 91-190, 42 U.S.C. 4341, et seq., amended by Public Laws 94-52 and 94-83, 1969.

Chapter 2

PURPOSE AND NEED FOR DOE ACTION

CHAPTER 2
PURPOSE AND NEED FOR DOE ACTION

Among the major responsibilities of the DOE are the continued stewardship of the nation's nuclear weapons stockpile and the maintenance of a testing capability. The purpose and need for the proposed actions analyzed in this EIS arise in part from those responsibilities. The DOE proposes to continue managing the NTS and its many resources in a manner consistent with national needs during a period in which the missions of the DOE and the NTS continue to evolve.

2.1 Background

Historically, the primary mission of the NTS was to conduct nuclear weapons tests. Since the current moratorium on testing began in October 1992, this mission has changed to maintain a readiness to conduct tests, if so directed, in the future. The NTS, because of its favorable environment and infrastructure, has also supported DOE waste management, as well as other national-security-related research, development, and testing programs. With the end of the Cold War, the United States is now challenged with a complete re-evaluation of its national security needs and priorities in a way that emphasizes the nation's commitment to a comprehensive ban on nuclear weapons testing and reduction of the global nuclear danger.

This EIS is being prepared pursuant to DOE regulations (10 CFR Part 1021) and is part of a long-term management process. The first step in this process is evaluating all actions planned for the NTS, defining the baseline environment, and identifying potential impacts that might occur as a result of the planned actions. Beyond these elements common to all EISs, this document also serves as the framework for developing a long-term *Resource Management Plan* for the NTS.

This EIS represents one level of a tiered management process. Tiering refers to the coverage of general matter in broader environmental impact statements, such as national program statements,

Evolution of National Policy

The alternatives considered in this EIS reflect the importance of the NTS within the overall national defense policy. Over the last 4 years, major shifts in policy have occurred. These shifts are highlighted below.

DATE	*EVENT/POLICY CHANGE*
September 1991	**The President made the first of three announcements on significant reductions in the nuclear weapons stockpile.**
September 1992	**The last underground nuclear test was performed at the NTS.**
October 1992	**The President signed a 9-month moratorium, stopping all nuclear testing until July 1993.**
July 1993	**The President announced an extension of the moratorium and directed the DOE to develop alternative means for a stockpile stewardship program.**
November 1993	**Congress, through the National Defense Authorization Act (Public Law 103-160) instructed the Secretary of Energy to "establish a stewardship program to ensure the preservation of the core intellectual and technical competencies of the United States in nuclear weapons."**
May 1995	**The Nonproliferation Treaty was extended indefinitely.**
August 1995	**The President announced the decision to seek a zero-yield Comprehensive Test Ban Treaty and established the conduct of a science-based stockpile stewardship program as a condition of the United States' entry into the treaty. Maintenance of a safe and reliable stockpile is considered "a supreme national interest of the United States."**

with subsequent narrower environmental statements or analyses, such as project or site-specific statements. The narrower statement incorporates by reference the general discussions of the broader statement and concentrates solely on the issues specific to the statement subsequently prepared. For the NTS EIS, such documents as the Waste Management Programmatic EIS or the Stockpile Stewardship and Management Programmatic EIS address broader national issues and include the NTS as a potential location for implementing an action considered in the program. The NTS EIS evaluates the impacts of those potential decisions. Similarly, actions considered in the NTS EIS may, at a later time, be more explicitly analyzed in an environmental assessment which could address only the narrower topic being considered without restating information contained in the NTS EIS.

Between the issuance of this EIS as a final document and the first planned review, there will, no doubt, be new activities identified that were not considered. Each of these actions will be evaluated on a case-by-case basis, and a tiered National Environmental Policy Act document will be prepared if necessary. Tiered documents include supplemental EISs and environmental assessments. As a hypothetical example, during the planned investigations of the Underground Testing Area's Corrective Action Unit, it might be necessary to conduct some type of land-disturbing test that was not considered in this EIS. If the hypothetical test required the collection of deep seismic data using shallow boreholes and high explosives, the specific impacts and consequences of performing the seismic study would be evaluated and documented in a tiered report. If the environmental consequences were projected to be significant, a supplemental EIS might be prepared that would address only the specific proposed test and its alternatives.

On the other hand, some new actions could trigger a National Environmental Policy Act review as a result of regulatory requirements, and a tiered National Environmental Policy Act document might not be sufficient. In such instances, a National Environmental Policy Act compliance review would be performed and, if necessary, a separate EIS prepared. In other instances, the new action might be included in future reviews and updates of this EIS.

This EIS provides tiered project-specific National Environmental Policy Act documentation for two facilities at the NTS. Appendix F analyzes the continued and potential expanded use of the Big Explosives Experimental Facility. Appendix J presents classified information for activities conducted at the Lyner Complex. The environmental impacts of the activities are not classified and are discussed in the appropriate sections of Chapter 5.

In addition to National Environmental Policy Act documents, other analyses that deal with the human environment are used to support DOE decisionmaking and public participation processes. These other documents include Safety Analysis Reports, Safety Evaluation Reports, Hazard Analyses, Human Health Risk Assessments, Transportation Studies, Environmental Restoration Assessments, Performance Evaluations, and Performance Assessments. Some of these studies perform very focused and specific functions with respect to decisionmaking, and are triggered when an appropriate stage of the project is reached. When these other studies precede or are concurrent with a National Environmental Policy Act document and are relevant to the analysis, their findings are incorporated into the National Environmental Policy Act document. These analytical processes and their relationship to the NTS EIS are discussed further in Section 2.5 with the exception of the Safety Analysis Reports, Safety Evaluation Reports, and Hazard Analysis. These three analyses are designed to identify and resolve sources of potential injury to workers and are disclosed in National Environmental Policy Act documents.

2.2 Policy Considerations

In responding to the nation's need to ensure the safety, security, and reliability of the nuclear weapons stockpile, the DOE must consider national deterrence and stockpile stewardship policies. The NTS plays an integral part in helping the DOE meet this mission, and the policies outlined below are a major factor in developing the long-term management framework for the NTS.

A moratorium on nuclear weapons testing is currently in effect. In September 1992, Congress imposed a 9-month moratorium on underground nuclear weapons testing. President Clinton has extended the moratorium on three occasions. The latest extension occurred in January 1995, and continues the moratorium through September 1996. Under the moratorium, President Clinton directed the DOE to maintain the capability to conduct nuclear tests. On August 11, 1995, President Clinton reaffirmed this commitment and announced his intention to seek a zero-yield Comprehensive Test Ban Treaty. A zero-yield Comprehensive Test Ban Treaty would ban any nuclear weapon test explosion or any other nuclear explosion. President Clinton also established specific safeguards that define the conditions under which the United States can enter into a Comprehensive Test Ban Treaty. These safeguards are as follows:

- The conduct of a science-based stockpile stewardship program to ensure a high level of confidence in the safety and reliability of nuclear weapons in the active stockpile, including the conduct of a broad range of effective and continuing experimental programs

- The maintenance of modern nuclear laboratory facilities and programs in theoretical and exploratory nuclear technology that would attract, retain, and ensure the continued application of our human scientific resources to those programs upon which continued progress in nuclear technology depends

- The maintenance of the basic capability to resume nuclear test activities prohibited by the Comprehensive Test Ban Treaty should the United States cease to be bound to adhere to such a treaty

- The continuation of a comprehensive research and development program to improve treaty-monitoring capabilities and operations

- The continuing development of a broad range of intelligence gathering and analytical capabilities and operations to ensure accurate and comprehensive information on worldwide nuclear arsenals, nuclear weapons development programs, and related nuclear programs

- The understanding that if the President of the United States is informed by the Secretary of Defense and the Secretary of Energy, advised by the Nuclear Weapons Council, the Directors of DOE's nuclear weapons laboratories, and the Commander of the U.S. Strategic Command, that a high level of confidence in the safety and reliability of a nuclear weapon type that the two Secretaries consider to be critical to our nuclear deterrent could no longer be certified, the President, in consultation with Congress, would be prepared to withdraw from the Comprehensive Test Ban Treaty under the standard "supreme national interest" clause in order to conduct whatever testing might be required.

The NTS has a demonstrated or potential role in implementing each of these Comprehensive Test Ban Treaty safeguard elements. For example, the NTS's role in the implementation of the first of these safeguards is to participate in full partnership, for a common purpose, with the scientific and academic communities, business and industry, and stakeholders to advance the NTS as a valued national resource. The NTS provides the modern nuclear laboratory platform for theoretical and exploratory nuclear technology that can attract and retain the human scientific resources required for continued progress in nuclear technology development. As the nation moves away from full-scale nuclear testing, the DOE must enhance its capability to use other tools to predict weapons safety, performance, and reliability. In particular, the DOE must enhance its capability to perform zero-yield science-based stockpile stewardship. Uncertainty in the behavior of aging stockpiled weapons will continue to increase with time and in the absence of testing (Thorn and Westervelt, 1987). To ensure continued confidence in the safety and reliability of the United States' nuclear weapons stockpile, the DOE needs to maintain the basic capability to conduct underground nuclear testing activities should a situation arise from unanticipated technical problems in the enduring stockpile. To maintain this capability, the National Laboratories have identified 33 already drilled vertical holes, which are an inventory of potential sites for stockpile stewardship exercises and experiments. The DOE also needs to enhance its capability to perform dynamic experiments (including subcritical experiments involving special nuclear materials) and hydrodynamic tests to assess the condition and behavior of nuclear weapons.

The NTS, through its Work for Others Program, has supported the stewardship programs since their inception. For example, in support of improved treaty-monitoring capabilities, chemical explosions at the NTS are being used to develop and calibrate seismic and hydrodynamic detection and analysis techniques (e.g., Chemical Kiloton and Kuchen experiments). Sensitive isotope analysis techniques, derived from nuclear chemistry applications to tests, are being developed for treaty monitoring and intelligence analysis. Development is being advanced by analysis of underground test residue and environmental studies at the NTS. Ongoing NTS activities that support the development of intelligence gathering and analytic capabilities include projects conducted at the Spill Test Facility, a demonstrated test bed for developing remote sensors for nonproliferation, environmental, and other national security programs. Non-nuclear high-explosive experiments at the NTS support design calculations for technologies that would disarm improvised nuclear devices, thereby preventing nuclear yield (see Appendix F).

In its Programmatic EIS for the Stockpile Stewardship and Management Program, the DOE is examining the future missions and configurations of the nuclear weapons complex (60 FR 31291). The Programmatic EIS will address the long-term capabilities required to carry out the DOE's Stockpile Stewardship and Management Program, as well as site the locations of these activities. Under this Programmatic EIS, the NTS is a candidate for future increased missions, as well as continuing operations. Until the Record of Decision for that Programmatic EIS is issued and the decisions are implemented, the DOE must continue its defense mission in light of the changes in stockpile stewardship and the continued moratorium on nuclear weapons testing.

Environmental restoration and waste management have been part of NTS operations since the beginning of the nation's nuclear testing program. Early restoration efforts were focused on cleaning detonation locales in order to reuse them for subsequent tests. The generated debris was disposed of through the on-site Waste Management Program. A formalized Waste Management Program commenced at the NTS in 1961. An inventory of radioactive waste has accumulated at numerous sites throughout the DOE complex through several decades of the Cold War. Beginning in 1976, some Defense Program radioactive waste generated at the Mound, Ohio, site was disposed of at the NTS. Increasing attention to the complexwide inventory brought more waste from a greater number of DOE sites to the NTS for disposal. Low-level waste has been generated through the weapons development, testing, and production activities at DOE facilities as well as the environmental cleanup and restoration programs. As DOE missions have changed, there has been an increasing volume of waste generated through the environmental restoration activities. This increase will continue into the future.

While the NTS does not currently accept transuranic or mixed waste from other sites, the management of low-level, mixed, and transuranic wastes generated at the NTS and other DOE-approved facilities across the United States has been an ongoing mission of the NTS. Wastes have been and are now generated as a result of a variety of DOE activities, including nuclear energy research, defense projects, and, more recently, as a result of environmental restoration activities. This waste must be disposed of in accordance with applicable regulations and DOE orders. The DOE has a need to continue providing the practical, cost-effective, and environmentally sound means of low-level waste disposal offered by the NTS.

Another change in NTS mission priorities is evidenced by an increase in environmental restoration efforts. Environmental restoration activities are planned for various sites at the NTS and other test locations in Nevada. Through 1992, there have been 928 nuclear tests conducted on the NTS; no nuclear tests have been conducted since entering into the moratorium. Defense research and weapons-test verification activities were also conducted at the

Project Shoal Area and the Central Nevada Test Area. From 1957 to 1963, several safety tests were conducted at sites at the NTS, the NAFR Complex, and the Tonopah Test Range to test the safety of nuclear weapons in accident situations. Because these tests were not contained and used special nuclear materials and chemical explosives, they resulted in the release of radioactive materials and surface contamination. The DOE must develop site remediation goals and cleanup levels for the NTS and off-site test areas based on future land use and management goals for the protection of environmental resources. The DOE is working in cooperation with other agencies to define remediation and cleanup levels to ensure that the disposition of withdrawn lands is consistent with the controlling agencies' existing land-use or resource management plans.

2.3 Purpose and Need for DOE Action

As a result of the changing mission priorities discussed in the preceding sections, the DOE has a need to focus on new national security, energy, and environmental issues challenging the nation and to redefine the role of the NTS within the DOE complex.

Other changes in DOE policy regarding land and facility use require the DOE to manage all its land and facilities as valuable national resources, with stewardship based on the principles of ecosystem management and sustainable development. This policy has resulted in the need for a comprehensive plan for the NTS that will guide land- and facility-use decisions and integrate mission, economic, ecologic, social, and cultural factors. As the first step in the development of such a comprehensive plan, the DOE has developed the framework of a *Resource Management Plan* for the NTS that will benefit from the public participation and review afforded by the National Environmental Policy Act process (see Volume 2).

The purpose of the *Resource Management Plan* document is to publicize how the DOE/NV proposes to develop and use a *Resource Management Plan* for the NTS so the public can comment on and assist with:

- Developing the methods for creating and using the plan
- Identifying the values people place on manmade and natural resources found on the NTS
- Developing the goals DOE/NV will use to guide the conservation and use of those resources
- Identifying the management actions needed to meet constraints and resource management goals
- Incorporating the principles of ecosystem management into land and resource management on the NTS.

The framework for the *Resource Management Plan* is being developed in conjunction with the NTS EIS to take advantage of the extensive data collection and public participation activities associated with the National Environmental Policy Act. Following receipt of public information during the comment period for the Draft NTS EIS, the DOE/NV revised this description of the *Resource Management Plan* in order to publish the revision with the Final NTS EIS. The revision includes the goals the DOE/NV has developed for managing resources and land-use constraints. The revision also includes the final plans for developing the *Resource Management Plan*. These plans will guide the DOE/NV as it develops a *Resource Management Plan* in the coming years.

2.4 Nevada Test Site Programs

For review purposes, the projects and activities at the NTS have been categorized into five programs: Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. Services, such as fire protection and communications, for each of these programs are provided through the NTS support services infrastructure. Brief summaries of each program are presented in this section.

Programs Conducted at the NTS

The DOE accomplishes its mission at the NTS through the management of activities that are organized into five programs:

Defense - The primary mission of this program is stockpile stewardship, including the maintenance of readiness to conduct underground nuclear tests, if directed.

Waste Management - This program provides for the safe and permanent disposal of waste through either disposal on the NTS or to off-site commercial waste treatment or disposal facilities.

Environmental Restoration - The goal of this program is to identify contaminated areas and clean-up those areas, as appropriate.

Nondefense Research and Development - This program includes original research efforts by the DOE, universities, industry, and other federal agencies.

Work for Others - This program provides for the use of NTS areas and facilities by other groups and agencies for activities such as military training exercises.

2.4.1 Defense Program

The primary mission of the Defense Program at the NTS is to help ensure the safety and reliability of the nation's nuclear weapons stockpile. The NTS has a long history of participating in the Stockpile Stewardship Program. This stewardship program includes maintaining the readiness and capability to conduct underground nuclear weapons tests and conducting such tests if so directed by the President or Congress. Other aspects of stockpile stewardship include conventional high-explosive tests, dynamic experiments (including subcritical experiments), and hydrodynamic testing. Although the term "subcritical" was not used in previous EISs for the NTS, some tests or experiments conducted over the past decades, as well as the impacts of those tests or experiments, are substantially the same as those contemplated by the new terminology. The term "subcritical experiments," rather than defining a new form of activity, is intended instead to clarify the fact that such experiments involving the use of special nuclear material would not achieve the condition of criticality.

Historically, the nation's nuclear emergency response capability has been based at the NTS. The Nuclear Emergency Search Team maintains the readiness to respond to any type of nuclear emergency, including search and identification for lost or stolen weapons, and conducts training exercises related to nuclear bomb threats and radiation dispersal threats.

The NTS has also been a key site for past efforts in the areas of nuclear nonproliferation and verification of international treaties. This work was exemplified recently by the Joint Treaty Verification Project, a cooperative effort between the United States and the former Soviet Union.

2.4.2 Waste Management Program

The NTS presently serves as a disposal site for low-level waste generated by DOE defense-related facilities and also as a storage site for a limited amount of transuranic mixed wastes pending opening of the Waste Isolation Pilot Plant in New Mexico. Waste Management Program activities are conducted in four primary NTS areas: Areas 3, 5, 6, and 11. Areas 3 and 5 are the two existing radioactive waste management sites at the NTS.

- The Area 3 Radioactive Waste Management Site accepts bulk and packaged low-level waste for disposal.
- The Area 5 Radioactive Waste Management Site accepts low-level waste and NTS-generated mixed waste for disposal, and packaged transuranic and NTS generated transuranic mixed waste for storage.
- Area 6 includes a waste accumulation building for polychlorinated biphenyl (PCB) wastes and a landfill. Area 6 is also the identified site for the Liquid Waste Treatment System. (See Appendix A for a detailed description.)
- The Area 11 Explosive Ordnance Disposal Unit is not a disposal unit. It is a thermal treatment unit where explosive wastes are detonated or

treated. (See Appendix A for a detailed description.)

Radioactive waste disposal operations began at the NTS in 1961. Radioactive (low-level, transuranic, mixed, and classified low-level) wastes were disposed of in selected pits, trenches, landfills, and greater confinement (deeper) disposal boreholes on the NTS. Near-surface burial (3 to 18 meters [m] deep [10 to 60 feet (ft)]) of low-level waste and low-level mixed waste in subsidence craters, pits, and trenches has been the historical practice at the NTS (Areas 3 and 5 Radioactive Waste Management Sites). In 1981, the DOE adopted the concept of greater confinement burial (21 to 37 m deep [70 to 120 ft]) for wastes that are not appropriate for near-surface disposal because of their radioactive exposure levels. Specifically, these waste types include a waste similar to greater-than-Class C low-level waste; certain high-specific activity low-level waste (for example, fuel rod claddings and sealed sources); transuranic waste; and some classified wastes. The term "similar to greater-than-Class C low-level waste" indicates that the waste disposed of at the Area 5 Radioactive Waste Management Site was DOE-generated, not commercially generated waste subject to Nuclear Regulatory Commission (NRC) regulations.

The Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240) made the federal government responsible for the disposal of greater-than-Class C waste generated by licensees of the NRC. Such disposal must be performed in a facility licensed by the NRC. Implementation of this provision may not occur for 20 years or more, and although the DOE is currently studying possible approaches for disposal of this waste, the DOE has not yet formulated a proposal for action. Therefore, disposal of greater-than-Class C waste is not addressed in this EIS.

Questions were raised in comments on the Draft EIS regarding DOE's handling of "special case wastes." "Special case waste" is not a formal technical waste category in the same sense as

Waste Definitions

Radioactive Waste — Solid, liquid, or gaseous material that contains radioactive nuclides regulated under the Atomic Energy Act of 1954, as amended, and of negligible economic value considering costs of recovery.

Specific Activity — The concentration of radioactivity, given as the number of Becquerels (Bq) or curies (Ci) per unit mass.

Transuranic Waste — Radioactive waste containing alpha-emitting radionuclides having an atomic number greater than 92 and half-lives greater than 20 years, in concentrations greater than 100 nanocuries (nCi) per gram.

Low-Level Waste — Radioactive waste not classified as high-level waste, transuranic waste, or spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic elements is less than 100 nCi per gram.

High-Level Waste — The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing of and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation.

Byproduct Waste — Tailings or waste produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.

Greater-Than-Class C Waste — Low-level waste that is generated by the commercial sector and that exceeds U.S. Nuclear Regulatory Commission concentration limits for Class-C low-level waste as specified in 10 CFR Part 61. DOE is responsible for the disposal of greater-than-Class C wastes from commercial sources.

Hazardous Waste — Wastes that are designated as hazardous by the Environmental Protection Agency (EPA) or State of Nevada regulations. Hazardous waste, defined under the Resource Conservation and Recovery Act, is waste from production or operation activities that poses a potential hazard to human health or the environment when improperly treated, stored, or disposed. Hazardous wastes that appear on special EPA lists or possess at least one of the following characteristics: (1) ignitability, (2) corrosivity, (3) reactivity, and (4) toxicity.

Waste Definitions (Cont.)

Mixed Waste — Waste containing both radioactive and hazardous components, as defined by the Atomic Energy Act and the Resource Conservation and Recovery Act, respectively. Mixed waste intended for disposal must meet the Land Disposal Restrictions as listed in Title 40 CFR Part 268. Mixed waste is a generic term for specific types of mixed waste such as low-level mixed waste, and transuranic mixed waste.

Low-Level Mixed Waste — Low-level waste that also includes hazardous components, as identified in 40 CFR Part 261, Subparts C and D.

Transuranic Mixed Waste — Waste containing both transuranic and hazardous components, as identified in 40 CFR Part 261, Subparts C and D.

Radioactive Waste Management Site — Designated location where radioactive waste handling, storage, or disposal operations are conducted under management control.

Classified Waste — Although not a regulatory term, includes weapons components and assemblies designated by the U.S. Government, pursuant to Executive Order, statute, or regulation, that require protection against unauthorized information or material disclosure for reasons of national security. Additional security and safeguards management activities are required in the handling of these materials.

"transuranic waste" or "low-level waste"; rather, "special case waste" is a temporary, informal designation used by the generator to identify wastes that exhibit characteristics which indicate that greater analysis may be necessary to properly categorize it, or which may require special handling, storage, or disposal methods. For this reason, the term "special case waste" is not included in the sidebar definitions of the various waste types. The DOE intends to clarify its use of the term "special case waste" in the Final Waste Management Programmatic Environmental Impact Statement. This clarification will update the use of the term to reflect the dynamic nature of DOE's special case waste inventory. It will also reflect the DOE's intent to manage this waste within existing waste categories as options arise and plans are developed.

Since the 1980s, hazardous waste generated on the NTS has been shipped off site to commercial facilities. Receipt of transuranic waste for disposal at the NTS ceased in 1988; receipt of mixed waste for disposal from off-site generators ceased in 1990. Certain mixed waste generated from activities on the NTS can be disposed of at the disposal facilities on the NTS while others must be stored on the state-authorized storage pad, pending identification of treatment technologies for the hazardous constituents (see definition). Historically (since the mid-1960s), the Area 3 Radioactive Waste Management Site was used primarily for the disposal of contaminated waste generated from the NTS Atmospheric Testing Debris Disposal Program, which involved the cleanup of atmospheric testing sites. Today, Area 3 is used for the disposal of bulk and packaged low-level waste from on-site and off-site DOE-approved generators. Current waste disposal cells at the Area 3 Radioactive Waste Management Site comprise four subsidence craters (U-3ax, U-3bl, U-3ah, and U-3at), with areas between craters U-3ax and U-3bl and between craters U-3ah and U-3at excavated to make two oval-shaped landfill units. Conventional landfill methods are used to dispose of waste in each cell; each layer of waste is covered with 1 m (3 ft) of fill before additional waste materials are disposed. The U-3ax/bl disposal cell contains low-level mixed waste; this cell is inactive, temporarily covered, and awaiting closure. The U-3ah/at cell is currently being used for low-level waste disposal; mixed waste is not accepted. Three additional subsidence craters have been reserved for use as low-level waste cells: U-3bh, U-3bg, and U-3az.

In 1961, the Area 5 Radioactive Waste Management Site was established for the disposal of low-level waste and classified low-level waste from both on-site and off-site DOE generators. The developed waste area within the Area 5 Radioactive Waste Management Site consists of 17 landfill cells (pits and trenches), 13 greater confinement disposal boreholes, and the transuranic waste storage pad. The low-level waste and low-level mixed waste disposal units within the Area 5 Radioactive Waste Management Site include the following:

- Pits for the disposal of low-level waste and on-site generated low-level mixed waste
- Trenches for the disposal of low-level waste and classified low-level waste.

The 13 greater confinement disposal boreholes contain low-level waste, low-level mixed waste, waste similar to greater-than-Class C low-level waste, high-specific-activity low-level waste, transuranic waste, transuranic mixed waste, and classified waste. The transuranic waste storage pad is a Resource Conservation and Recovery Act compliant unit for the storage of mixed waste (low-level and transuranic). Additional information can be found in Chapter 4, Affected Environments. Section 4.1.1.5 contains a description of existing Waste Management Program activities, and Section 4.1.2.3 identifies out-of-state waste generators.

DOE is committed to preventing pollution and reducing waste generation at the NTS. This is accomplished through establishing partnerships with private industry, and complying with local, state, and federal regulations. The elements of the DOE/NV Waste Minimization/Pollution Prevention Program addresses reporting requirements, compliance costs, waste reduction costs, employee concerns, environmental liability, training, and the reduction, recycle, and reuse of commodities. Appendix C.6 provides a description of the DOE/NV Waste Minimization/Pollution Prevention Program.

2.4.3 Environmental Restoration Program

As noted previously, the Environmental Restoration Program and its predecessors have been effectively working toward the decontamination of the NTS since the inception of testing. Prior to the early 1980s, the major focus of environmental restoration was the decontamination of testing areas for future use and the identification of contaminated areas that required restricted access.

Starting in the 1980s, environmental restoration at the NTS grew significantly. Characterization, remediation, and closures were primarily driven by the Resource Conservation and Recovery Act. Abandoned underground storage tanks and PCBs were removed. Hazardous waste disposal trenches were closed using the Resource Conservation and Recovery Act process.

The DOE is committed to the goal of remediating contaminated sites in accordance with the requirements of the responsible agencies. Current operations will comply with environmental regulations, and the health and safety of employees and the public will be safeguarded. An ongoing assessment to identify and remediate contamination will continue in pursuit of these goals.

The goal of the Environmental Restoration Program (a detailed discussion of which can be found in Appendix A) is to ensure that risks to the environment and to human health and safety, as posed by inactive and surplus facilities and sites, are either eliminated or reduced to protective levels. Protective levels are determined through site conditions, risk assessments, and consultation with federal and state regulatory authorities.

Specific investigations and risk assessments are being conducted for each corrective action unit (grouping of environmental restoration sites) to determine the levels and extent of contamination, to ascertain the potential human health or environmental exposure to that contamination, and to compare that exposure to established standards for protection of human health and the environment.

Factors Related to Prioritization of Environmental Restoration Program Activities:

- **Risk Assessment**
- **Available Technology**
- **Cost (Funding Appropriated by Congress)**
- **Future Land and Resources Use**
- **Geographic Location**
- **Interdependency of Actions**
- **Optimization of Resources**
- **DOE, Defense Nuclear Agency, State Priorities**
- **Presence of Cultural Resources or Sensitive Species**
- **Regulatory Requirements**
- **Scheduling (Optimizing Labor and Equipment)**
- **Stakeholder Concerns**
- **Time Required to Complete Action**
- **Waste Management Concerns (Adequate Facilities)**

Based on the information gathered and in consideration of the factors listed in the sidebar, the DOE/NV will prioritize environmental restoration activities through interaction with the state of Nevada and interested members of the public. A major driver for this process is the Federal Facility Agreement and Consent Order (State of Nevada, 1996), which has been signed.

2.4.4 Nondefense Research and Development Program

The DOE has historically supported a variety of research and development activities at the NTS and at other locations in Nevada in cooperation with universities, industry, and other federal agencies. The DOE continues to support ongoing nondefense research and development projects. The National Environmental Research Park Program supports environmental research activities at the NTS. Research on the safety aspects of handling, shipping, and storing hazardous fluids and liquefied gaseous fuels are conducted at the Spill Test Facility. The Corporation for Solar Technology and Renewable Resources, with development funding provided by the DOE, continues to study the feasibility of locating and constructing a solar energy facility in Nevada; it is proposed that these solar power generating facilities should be collocated at the NTS and at one or more of the three other Nevada locations under evaluation: Eldorado Valley, Dry Lake Valley, or Coyote Spring Valley.

The Environmental Management and Technology Development project continues to conduct research and development focused on overcoming major obstacles to progress in cleaning up the DOE sites. The principal mission of the Tonopah Test Range is to provide research and development test support for DOE-funded weapons projects. However, the Tonopah Test Range represents a unique test environment, both in location and capabilities, and is available for use by other government agencies and their contractors. The Tonopah Test Range management schedules a broad spectrum of tests to make effective use of range capabilities for multiple users.

2.4.5 Work for Others Program

The Work for Others Program is hosted by the DOE and includes the shared use of certain facilities and resources. Historically, the DOE has hosted projects by other federal agencies, especially the Department of Defense (DoD), that require the large, remote, and secured areas offered by the NTS. Typical past uses under this program have included co-use of NTS airspace, training exercises, and research and development projects.

2.5 Evaluation of Environmental Impacts and Risk

In addition to the NTS EIS, several DOE studies are in progress that address the consequences and risks associated with the DOE's operations at the NTS and other Nevada locations. Although all of these studies relate to the risk or the consequences of DOE activities, each of these studies has a unique scope and purpose. It is important to understand the differences in study scopes, how these different studies relate to each other, and how the information gained from them has been used in this EIS. Several of these other studies are discussed in the following sections. Figure 2-1 illustrates the scope and purpose of each of these studies and describes their relationship to the NTS EIS.

2.5.1 Nevada Test Site Environmental Impact Statement

The NTS EIS identifies the environmental consequences or impacts that could occur as a result of implementing various resource management alternatives at the NTS. These alternatives encompass a range of resource uses, including current level of operation (Alternative 1), minimum resource use (Alternative 2), maximum use of resources (Alternative 3), and alternative uses of NTS resources (Alternative 4). Consequences resulting from the various alternatives are described as physical impacts (e.g., surface disturbance, degradation of air quality, and availability of water resources). These impacts are assessed and reported for each alternative to inform the decisionmakers of

NTS ENVIRONMENTAL IMPACT STATEMENT

- Analyzes the effects of major programs
- Identifies and records baseline conditions
- Identifies impacts of present and planned actions
- Determines consequences of impacts
- Relies on transportation study and human and health risk assessment for defining existing risks
- Relies on technical data from Performance Assessments and Evaluations
- Will be revised as necessary based upon results of Environmental Restoration and Performance Assessments

DRAFT TRANSPORTATION STUDY

- Part of the sitewide EIS
- Includes various transportation routes
- Evaluates traffic-related risks
- Evaluates cargo-related risks
- Evaluates accident scenarios

HUMAN HEALTH RISK ASSESSMENT

Risk To:	Risk From:
NTS Workers	Routine Scenarios
Off-Site Work Crews	Accident Scenarios
Off-Site Population	Natural Disaster Scenarios

- Part of the sitewide EIS
- Covers past and future nuclear testing
- Covers NTS actions and soil cleanup at Tonopah Test Range
- Evaluates consequences of accident scenarios
- Evaluates risks for each alternative

ENVIRONMENTAL RESTORATION

- Provides data to EIS
- Specific to defined corrective action units
- Defines levels and extent of release
- Determines doses to receptors
- Compares risks against standards

PERFORMANCE ASSESSMENT AND EVALUATIONS

- Uses same technical, site characterization, and facility data as EIS
- Specific to single facility or disposal site
- Evaluates potential or calculated releases
- Compares calculated releases to health and safety standards
- Sets the maximum disposal limits

Figure 2-1. NTS studies that were used in the EIS analysis the associated environmentalimpacts and any potential actions that may be required to mitigate those impacts.

The foundation for the impact analysis conducted in this EIS is the technical data developed and used in the studies and reports noted above and discussed later in this section. Site characterization data, facility information, environmental data, and other information from these other studies, as well as the most current technical information about site uses, were used to perform the impact analyses reported in this EIS.

2.5.2 Human Health Risk Assessment

In addition to describing the physical impacts to the environment that have resulted from past NTS operations and could result from a range of future NTS uses, the NTS EIS includes a human health risk assessment (see Appendix H). The risk assessment quantifies the potential chance of occupational injuries and facilities, cancer deaths, and detriment to workers and the public that could result from the overall operation of the NTS as defined in each alternative. Underlying the assessment of each alternative are the historical operations and their consequences that contribute to the current environmental conditions, or baseline, of the NTS. Thus, the risk assessment encompasses risks contributed from past operations and the risk potentially contributed from each of the future-use alternatives. This EIS considered the consequences of events that have a low probability of occurrence but have high consequences should they occur. There are many events or scenarios that have a very low probability of occurring, but the consequences of such an event are so high that even remotely credible scenarios are considered and evaluated. The results of these analyses provide additional information that was used in this EIS.

2.5.3 Transportation Study

Of utmost importance to the DOE's stakeholders and the sovereign nations regarding the transportation of radioactive material are the human health risks associated with exposure to ionizing radiation. The health risks of transporting low-level

Performance Assessment and Risk Evaluation Terms

Receptors – Plants, animals, and people that may be exposed to contamination. A receptor can be exposed via the air and soil pathways (for example, by inhalation, ingestion, and contact), and the surface and groundwater pathways (by contact and ingestion).

Pathway – The route by which a contaminant reaches a human receptor. Common pathways considered in performance assessments include, but are not limited to, air, groundwater, and surface water.

Limiting Concentrations – The radioactivity that remains in a waste after treatment, that poses a limitation or bounding condition to disposal options. The radionuclide that tends to be most mobile, or has the highest potential to affect human health and the environment, becomes the limiting factor for the disposal facility.

Residuals – The composition and form of a waste after treatment. For example, solidified incineration ash would be a residual.

Carbon-14 – An isotope of carbon that occurs both naturally and from the decay of certain radioactive isotopes. Carbon-14 is a well-known tool used to date archaeological finds. Carbon-14 can be generated from wastes as a gas and can rise upward to the surface if precautions are not taken.

Human Intruder – A hypothetical individual (in a future scenario) who unknowingly contacts the waste(s) in a disposal unit(s) after the loss of institutional control and with no prior knowledge of the waste disposal activities at the site. Intrusion scenarios include, but are not limited to, drilling into the waste or farming on or near the waste disposal facility.

Groundwater Recharge – Water that infiltrates the land surface and is not lost to evaporation or consumed by plants can percolate downward and replenish the groundwater aquifers. This deep percolation is called recharge. Much of the recharge at the NTS is from mountainous areas as much as 48 km (30 mi) away.

Infiltration – Water that falls on the land surface that does not run off but percolates into the ground. Some of this water evaporates, some is used by plants, and some percolates downward to the groundwater.

Unsaturated Zone – The subsurface zone between the land surface and the top of the groundwater. The unsaturated zone at the NTS is thick, ranging from 160 m (525 ft) to almost 914 m (3,000 ft) in some areas.

waste, mixed waste, and nuclear material to and on the NTS were evaluated in a transportation risk analysis (see Appendix I). The transportation study identifies the risks to the public resulting from traffic deaths and exposure to radiation from the shipments along the various routes. The transportation study uses current and future projections of the sources and movements of materials and wastes to the NTS. The results of the transportation analyses are incorporated in the appropriate impact analysis section of this EIS.

2.5.4 Environmental Restoration Assessments

A different type of risk assessment is performed as part of studies conducted for the Environmental Restoration Program. First, a risk assessment that defines the nature and extent of the release of contaminants from a source area is performed for each corrective action unit. Next, the pathways whereby the contamination could lead to an exposure to a worker or off-site resident are identified. The doses to these potential receptors are then estimated for each pathway, and the risk associated with that dosage is evaluated. If the dose exceeds a regulatory standard, some action could be required either to remediate the contamination or otherwise protect the receptor. The available technical information used in these types of assessments is used as appropriate in the NTS EIS and forms the basis for the larger restoration program assessments that are discussed in this EIS. Because these assessments are performed on a project or Corrective Action Unit basis, the assessments will be developed by the DOE in cooperation with the state of Nevada to identify the preferred closure actions. The results will also be incorporated into the National Environmental Policy Act document that analyzes the closure proposal.

2.5.5 Performance Evaluation

The Federal Facility Compliance Act of 1992 requires the DOE to work with its regulators and with members of the public to establish plans for treatment of DOE's low-level mixed waste. Although the Federal Facility Compliance Act does not specifically address the disposal of treated low-level mixed waste, both the DOE and the States recognize that disposal issues are an integral part of treatment discussions. The performance evaluation concept was developed by the DOE and the States to address this concern. The performance evaluation process started by identifying DOE sites across the defense complex which were managing mixed waste, and then developed a screening process that eliminated all but 15 sites from consideration as a disposal site. The NTS is one of the remaining sites. The Performance Evaluation of the Technical Capabilities of DOE Sites For the Disposal of Mixed Low-Level Waste, prepared by Sandia National Laboratories (SNL, 1996) contains a description of how sites were eliminated, and contains information on the results of the performance evaluation for the NTS.

The process and technical approach for the performance evaluations were presented to State regulators at several joint State and DOE meetings facilitated by the National Governors' Association. The technical process, methodology, and data used for the performance evaluations have been continuously reviewed by an independent senior review panel made up of nongovernment experts from academia and industry. The principal goal in developing the performance evaluation was to determine the limiting concentrations of radionuclides in residuals resulting from treatment of low-level mixed waste that can be disposed of at various DOE sites.

A performance evaluation is a screening tool. Its objective is to estimate permissible concentrations of radionuclides in low-level mixed waste disposal facilities so that releases of radionuclides to the environment would not result in exposures to humans at levels greater than some predetermined performance measures. Calculations of release for three pathways (water, atmospheric, and hypothetical inadvertent intruder) form the foundation of the performance evaluation. The technical data and information used in performance evaluations is the same information available for the analyses reported in the NTS EIS. The performance evaluation is not intended to be a substitute for the detailed analysis of a performance assessment, nor is it intended for siting or permitting.

Based on the results of the performance evaluation analysis (SNL, 1996), low-level mixed waste disposal at the NTS is almost exclusively limited by the intrusion scenario. Only the radionuclide carbon-14 shows more restrictive waste limits from the atmospheric pathway. The extremely dry conditions at the NTS, where infiltration is negligible and distance to the groundwater is great, inhibit the migration of radionuclides by means of the water pathway.

Transport of radionuclides downward along a groundwater pathway does not appear to be a mechanism for movement in the subsurface at the NTS Radioactive Waste Management Sites. This conceptual model is based on hydrologic studies performed at the NTS which concluded that groundwater recharge at the Area 5 Radioactive Waste Management Site is negligible. In addition, the performance assessment for disposal of low-level waste at Area 5 demonstrates and concludes a "no groundwater pathway" conceptual model for the site hydrologic conditions during the 10,000-year performance period considered in the performance evaluation.

The performance evaluation is a means for the DOE and the States to begin evaluating options for disposal of low-level mixed waste treatment residuals that have been treated pursuant to the requirements of the Federal Facility Compliance Act of 1992. The ultimate identification of sites that might host low-level mixed waste disposal activities will follow state and federal regulations for siting and permitting, and will include public involvement in the decisionmaking. Site-specific performance assessments for the two existing Radioactive Waste Management Sites at the NTS, as described in the following sections, will also be completed.

2.5.6 Performance Assessment and Composite Analysis

The DOE orders for low-level waste and EPA regulations for transuranic waste disposal require that each radioactive waste disposal site prepare and maintain a site-specific radiological performance assessment. A performance assessment is a systematic analysis of potential risks, posed by waste management systems, to the public and to the environment and a comparison of those risks to established performance objectives. A performance assessment is an iterative process that proceeds sequentially from site characterization to conceptual model development, to outcome modeling, and back to site characterization, as necessary. The results of performance assessment analyses are used to guide site characterization activities and to refine subsequent analyses. The process ends when further site characterization would not yield information that could change the decision regarding safety of the site.

The site characterization data used in the performance assessments conducted for the NTS facilities have been used in the impact analyses performed for this EIS. The technical data and information used in the preparation of these performance assessments have also been used in the preparation of the NTS EIS. The technical conclusions of both documents are the same, and the technical data and information used remain relevant to both documents.

The DOE is responsible for disposing of a variety of radioactive wastes, including low-level, transuranic, and high-level waste. Low-level waste disposal is governed by DOE Order 5820.2A, which establishes policies and guidelines for the disposal of radioactive waste in general. The U.S. Nuclear Regulatory Commission regulations in 10 CFR Part 61 include similar requirements for performance assessment of shallow-land burial of commercial radioactive waste. Most low-level waste is disposed of using near-surface burial techniques. Disposal operations at the NTS are described in greater detail in Chapter 4, Section 4.1.1.5. Disposal of transuranic waste must meet the standards established by the EPA in 40 CFR Part 191. While transuranic waste is planned for disposal generally at the Waste Isolation Pilot Plant near Carlsbad, New Mexico, a few tens of cubic meters of transuranic waste were disposed of in the past at the NTS, and the DOE is in the process of assuring that this disposal is consistent with 40 CFR Part 191. Congress has directed the DOE to study the suitability of Yucca Mountain as a potential permanent repository for spent nuclear fuel and high-level radioactive waste from commercial and DOE-owned sources.

The DOE/NV has conducted, and continues to conduct, performance assessments of low-level waste disposal units at the NTS. The first performance assessment conducted on NTS disposal units was a draft for the Area 5 Radioactive Waste Management Sites prepared by Idaho National Engineering Laboratory (dated August 1, 1988). This performance assessment was prepared prior to the issuance of DOE Order 5820.2A, which contains the requirement for preparing a performance assessment. The performance assessment has been, and continues to be, revised; the next publication is scheduled for the fall of 1996. The first draft performance assessment for the Area 3 Radioactive Waste Management Sites was prepared by Oak Ridge National Laboratory/Grand Junction and was completed in September 1991. Several revisions of the Area 3 performance assessment have occurred, and a major revision is scheduled for completion in 1998.

The performance assessments for the Areas 3 and 5 RWMSs address the post-1988 low-level radioactive waste disposal source term (Shott et al., 1995) for each respective facility, as required under DOE Order 5820.2A. The Order specifies that performance assessments are required only for waste disposed after the effective date of the Order, September 26, 1988. In response to the Defense Nuclear Facilities Safety Board Recommendation 94-2, that the scope of performance assessments be expanded to account for past, present, and future inventories of low-level radioactive waste at the site, the DOE is developing a comprehensive environmental management systems approach to ensure long-term protection from all sources of radioactive materials left in the ground after remediation and disposal programs are completed. The comprehensive approach will include requirements that integrate DOE's land-use planning, facility decommissioning, environmental restoration, and waste disposal efforts.

Specifically, the long-term radioactive impact of the disposal operations will be analyzed by combining performance assessments under DOE Order 5820.2A for the post-1988 waste source term, with a composite analysis of the pre-1988 waste source terms, as well as other sources of radioactive contamination in the ground that are potentially interactive with the low-level waste facility (DOE, 1996). The composite analysis guidance and review criteria are to include 100 millirem (mrem) and 30 mrem in a year as criteria for evaluating results at site-determined compliance points and boundaries. The composite analysis serves as a long-term management planning tool.

Two types of performance assessments are conducted at the NTS: (1) low-level waste performance assessments pursuant to DOE Order 5820.2A for the Areas 3 and 5 Radioactive Waste Management Sites, and (2) transuranic waste performance assessments in the Area 5 Radioactive Waste Management Site pursuant to the EPA's regulations at 40 CFR Part 191. The following is a brief description of the low-level waste performance assessments and composite analysis in peer review or under development, their purpose, and the tentative schedule for completion. The transuranic waste performance assessments are discussed in Appendix A, Section A.2.

2.5.6.1 Low-Level Waste Performance Assessments

Two low-level waste performance assessments are in review or preparation stages: (1) the Area 5 Radioactive Waste Management Site Performance Assessment and (2) the Area 3 Radioactive Waste Management Site Performance Assessment. Each performance assessment must evaluate facility operation based on four performance objectives (DOE Order 5820.2A):

1. Protect public health and safety in accordance with standards specified in applicable environmental health orders and DOE orders, specifically DOE Order 5400.5, Radiation Protection of the Public and the Environment.

2. Assure that external exposure to the waste and concentrations of radioactive material that might be released into surface water, groundwater, soil, plants, and animals result in an effective dose equivalent that does not exceed 25 mrem per year (mrem/yr) to any member of the public. Releases to the atmosphere must meet the requirements of 40 CFR Part 61, the National Emission

Standards for Hazardous Air Pollutants. Releases of radioactivity in effluent to the general environment must be maintained using the "as-low-as-reasonably-achievable" process. (NV/YMP Radiological Control Manual, DOE/NV, 1994.)

3. Assure that the committed effective dose equivalents received by individuals who inadvertently intrude into the waste after loss of institutional control (100 years) will not exceed 100 mrem/yr for continuous exposure or 500 mrem for a single acute exposure (a 10,000-year compliance period).

4. Protect groundwater resources consistent with federal, state, and local regulations and requirements.

Area 5 Radioactive Waste Management Site Performance Assessment—The Area 5 Radioactive Waste Management Site Performance Assessment (Shott et al., 1995) addresses the post-1988 waste source term for the facility and was submitted to the DOE peer review panel in August 1995 for technical review and recommendation. Panel review is now concluding and a final publication is scheduled for submittal to DOE Headquarters by January 1997 (DOE, 1996). Depending on the extent of the panel's review comments and recommendations, the Area 5 report should be published by January 1997 or earlier. The next update of the Area 5 Radioactive Waste Management Site Performance Assessment will include the pre-1988 waste source-term and composite analysis, as stated in the Draft Implementation Plan, Defense Nuclear Facilities Safety Board Recommendation 94-2 (DOE, 1995).

The total estimated dose to the general public from all pathways was predicted to be approximately 0.6 mrem/yr. This estimate was obtained through analysis of several scenarios and represents an increase in annual dose of one-sixth of one percent. This compares favorably to the 25 mrem/yr performance objective dose limit for members of the general public set in DOE Order 5820.2A. Appendix A provides additional details on this and other on-going NTS performance assessments.

Area 3 Radioactive Waste Management Site Performance Assessment—The Area 3 Radioactive Waste Management Site Performance Assessment will address the post-1988 waste disposal source term and is scheduled for submittal to DOE/HQ in March 1998 (DOE, 1996). Site characterization of the facility is ongoing to acquire additional subsurface information to support performance assessment analyses in Fiscal Year 1997.

Site characterization of Area 3 in 1996 focuses on completion of exploratory boreholes beneath subsidence craters U-3bh (a reserve low-level waste cell at the Area 3 Radioactive Waste Management Site), U-3ah/at, and U-3ax/bl. The primary objective of the exploratory borehole in Area 3 is to characterize the physical and hydrologic properties of the chimney and to assess the potential for downward groundwater movement and radionuclide transport. The underground shot cavity beneath the subsidence craters at approximately 189 m (620 ft) is much deeper than active hydrologic surface processes (infiltration, redistribution, and evapotranspiration) operating beneath the waste unit, from the ground surface to a depth of approximately 30 m (100 ft). Current scientific hypotheses suggest that the rubble chimney beneath the low-level waste unit does not enhance or promote vertical groundwater flow between the waste unit (subsidence crater) and the deep shot cavity (see Chapter 4, Section 4.1.5.2). This conceptual model was confirmed by recent hydrologic data (Van Cleave, 1996). Given the proximity of Area 5 to Area 3 (23 km [14 mi]) and very similar hydrogeologic conditions, the defensible conceptual hydrogeologic model for Area 5 will be tested and validated for the Area 3 Radioactive Waste Management Site.

2.5.6.2 Composite Analyses

The long-term impact of the disposal operations at the Areas 3 and 5 Radioactive Waste Management Sites will be analyzed by combining the site-specific performance assessments for the post-1988 waste source term with complementary composite analyses taking into account the pre-1988 waste source terms, and other sources of proximal radioactive contamination in the ground (DOE, 1996). The Area 3 Radioactive Waste Management Site

Composite Analysis is scheduled to be submitted to DOE Headquarters together with the Performance Assessment by March 1998. The corresponding Area 5 Radioactive Waste Management Site Composite Analysis is due to DOE Headquarters by September 1999.

2.6 Summary

The purpose of the actions addressed in this sitewide EIS is to provide a management framework for the continued operation of the NTS. The actions are influenced by policy considerations, history, and the ongoing activities of the various programs as discussed in this chapter.

The NTS is a critical facility in the DOE's efforts to meet the nation's need to safely maintain the nuclear weapons stockpile, to retain the capability to conduct underground tests, and to focus on new and challenging issues of national security, energy, and the environment.

The DOE has historically performed rigorous evaluations of any actions that pose a threat to worker safety, public health, or the environment. The results of these studies have been used in the impact analyses conducted for this EIS. These evaluations will continue to be conducted as appropriate, and their results will be disclosed and incorporated in future National Environmental Policy Act documents. These evaluations include the detailed safety analysis done by the Defense Program, the comprehensive performance assessments developed in conjunction with the operation of waste management facilities, and the safety planning and risk assessments performed by the Environmental Restoration Program during the characterization and remediation of sites on the NTS. These activities were summarized in Section 2.4.

This sitewide EIS is not the "final word" and is not designed to cover all potential future activities at the NTS. Rather, this EIS includes only those actions and alternatives that are reasonably foreseeable at this time. Any new actions or projects will receive National Environmental Policy Act reviews prior to their implementation and will be supported through an additional tiered National Environmental Policy Act document. These reviews will include updated information on the various ongoing studies and assessments, as appropriate.

2.7 References

REGULATION, ORDER, LAW

10 CFR Part 61	U.S. Nuclear Regulatory Commission, "Energy, Licensing Requirements for Land Disposal of Radioactive Waste," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
10 CFR Part 1021	U.S. Department of Energy (DOE), "Energy: Compliance with the National Environmental Policy Act," *Code of Federal Regulations*, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1994.
40 CFR Part 61	U.S. Environmental Protection Agency (EPA), "Protection of Environment: Nation Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations*, Office of Federal Registrar, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
40 CFR Part 191	U.S. Environmental Protection Agency (EPA), "Protection of Environment: Environmental Standards for the Management and Disposal of Spent Nuclear Fuel High-Level and Transuranic Radioactive Wastes," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1992.
40 CFR Part 261	EPA, "Protection of Environment: Identification and Listing of Hazardous Waste," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
40 CFR Part 268	EPA, "Protection of Environment: Land Disposal Restrictions," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
60 FR 31291	U.S. Department of Energy (DOE), "Stockpile Stewardship and Management Programmatic Environmental Impact Statement," *Federal Register*, Washington, DC, 1995.
DOE Order 5400.5	DOE, "Radiation Protection of the Public and the Environment," Washington, DC, 1990.
DOE Order 5820.2A	DOE, "Radioactive Waste Management," Washington, DC, 1988.

GENERAL

DOE, 1995	DOE, *Implementation Plan, Defense Nuclear Facilities Safety Board Recommendation 94-2, Conformance with Safety Standards at Department of Energy Low-Level Nuclear Waste and Disposal Sites*, Washington, DC, 1995.
DOE, 1996	DOE, *Implementation Plan Defense Nuclear Facilities Safety Board Recommendation 94-2,* Conformance with Safety Standards at Department of Energy Low-level Nuclear Waste and Disposal Sites, (Rev. 1), 1996
DOE/NV, 1994	DOE/NV, *NV/YMP Radiological Control Manual, Revision-1,* (Controlled Copy Edition), DOE/NV 10630-59, 1994.
SNL, 1996	Sandia National Laboratories (SNL), *Performance Evaluation of the Technical Capabilities of DOE Sites for Disposal of Mixed Low-Level Waste*, SAND 96-0721/1, Albuquerque, NM, 1996.
Shott et al., 1995	Shott, G.J., C.J. Muller, L.E. Barker, D.E. Cawlfield, F.T. Lindstrom, D.G. Linkenheil, M.J. Sully, D.J. Thorne, and L. McDowell-Boyer, *Performance Assessment for the Area 5 Radioactive Waste Management Site at the Nevada Test Site, Nye County, NV*, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1995.
State of Nevada, 1996	State of Nevada, *Federal Facility Agreement and Consent Order,* Department of Conservation and Natural Resources, Division of Environmental Protection, Carson City, NV, 1996.
Thorn and Westervelt, 1987	Thorn, R.N. and D.R. Westervelt, *Hydronuclear Experiments*, LA-10902-MS, Los Alamos National Laboratory, Los Alamos, NM, 1987.
Van Cleave, 1996	Van Cleave, K.K., letter report to Stephen A. Mellington, Acting Director for the Nevada Operations Waste Management Division, regarding the potential for groundwater recharge below UE3ax/bl, Las Vegas, NV, 1996.

This Page Intentionally Left Blank

Chapter 3

DESCRIPTION OF ALTERNATIVES

CHAPTER 3
DESCRIPTION OF ALTERNATIVES

This chapter contains the descriptions of the alternatives that are being evaluated for the NTS, Project Shoal Area, Central Nevada Test Area, Tonopah Test Range, and the DOE sites located on the NAFR Complex. Solar Enterprise Zone projects proposed for the NTS, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley are also described. Section 3.1 contains the alternatives and the associated land-use descriptions. Specific projects and activities included under each alternative are described in greater detail in Appendix A. Section 3.2 lists the alternatives the DOE is no longer considering and the reasons for their elimination. Section 3.3 provides a comparison of the alternatives and their environmental impacts based on analyses from the remainder of the NTS EIS. Sections 3.4 and 3.5 are the American Indian overview of Environmental Impacts and Responses to the NTS Action Alternatives. Section 3.6 identifies the DOE Preferred Alternative.

Chapters 4 and 5 of this EIS identify the impacts of past, present, and proposed future programs, projects and activities of the DOE/NV. Projects and activities are included in one or more of the four alternatives and fall into three basic levels: (1) current activities, (2) planned projects, and (3) proposed projects. Current activities are those that are presently part of the normal operations of the NTS, the Tonopah Test Range, portions of the NAFR Complex, and other areas considered in this EIS. Planned projects are those that are within the 5-year planning cycle and are likely to be implemented. Projected projects are not yet included within the 5-year planning window, but have undergone sufficient conceptual development to allow a reasonable assessment. The most reliable data are clearly derived from ongoing activities. Planned projects would present slightly less reliable data. Data for projected projects would be the least defined, but were determined to be essential to a full and open evaluation and disclosure of the potential effects of the alternative. To provide an adequate analysis, conservative assumptions and parameter values were used to evaluate potential impacts of the less-defined activities. In addition, site-support activities are analyzed for each of the environmental resources and resource elements.

3.1 Alternatives

Four use alternatives are evaluated in this EIS: Alternative 1, Continue Current Operations (No Action Alternative); Alternative 2, Discontinue Operations; Alternative 3, Expanded Use; and Alternative 4, Alternate Use of Withdrawn Lands. Each alternative is described with respect to the five program categories representing DOE/NV's primary mission: Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others (defense-related research, development, and testing).

These alternatives are structured to provide scenarios of current and future uses of DOE facilities in Nevada that range from discontinued use to expanded use. The use alternatives have been designed to allow the DOE to analyze and compare the potential environmental effects of a wide range of use options.

The Tonopah Test Range has been managed by DOE/Albuquerque and operated by Sandia National Laboratories as a remote research and testing facility since the 1950s. In 1995, the DOE/NV and the DOE/Albuquerque entered into a memorandum of agreement, transferring the management of Environmental, Safety and Health responsibilities of the Tonopah Test Range to the DOE/NV. This action also transferred some of the operational management of the Tonopah Test Range to the DOE/NV with the exception of DOE/Albuquerque Stockpile Stewardship and Management Program and other weapons-related responsibilities for the DOE's mission.

Following the description of each alternative are the site and zoning category definitions and a land-use map that illustrates the zoning that would be implemented for each alternative. The land-use maps identify the locations of waste management, industrial, research, and support sites and define the general physical and political boundaries of activities conducted on the NTS. These zones can include compatible defense and nondefense research development and testing projects and activities as well. The Continue Current Operations Alternative (Alternative 1) is considered as the baseline land-use condition. Alternatives 2, 3, and 4 are variations developed to represent and support the uses described in each alternative.

3.1.1 Alternative 1, Continue Current Operations (No Action Alternative)

Alternative 1 is defined as the continuation of the DOE/NV and interagency programs and operations in the five program categories of: Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. Under Alternative 1, these activities would continue in the same manner and degree as they have within the past 3 to 5 years. Site-support activities would also continue in the same manner and degree as they have for the past 3 to 5 years. Current institutional controls would continue.

3.1.1.1 Defense Program under Alternative 1. Defense Program operations would continue at the NTS under the conditions of the ongoing nuclear testing moratorium and the negotiations of the Comprehensive Test Ban Treaty as described in Chapter 2. Two scenarios were evaluated. In the first scenario, the President would not direct any nuclear testing and the DOE's nuclear testing-related activities would be limited to maintaining a readiness to test. This scenario emphasizes the NTS's science-based stockpile stewardship experiments and operations. In the second scenario, which the DOE believes unlikely but consistent with the site's historical mission, there is a contingent possibility that the President, through an end of the moratorium or through the "supreme national interest" clause of a test ban treaty, would direct the DOE to conduct one or more nuclear tests in order to achieve a high level of confidence in the safety and reliability of the weapon type in question. These types of stockpile tests would be conducted on Pahute Mesa or on Yucca Flat, which are the only nuclear testing locations considered in this EIS. The first scenario would comprise the following current Defense Program operations at the NTS. The second scenario would include the same operations, plus the contingent possibility of conducting underground nuclear tests.

- Stockpile stewardship, including the following:

  First Scenario:

  - Maintaining readiness to conduct underground nuclear tests
  - Performing treaty compliant and permitted dynamic experiments (including subcritical experiments)[1] and hydrodynamic tests (subcritical experiments would be conducted only where containment is assured)
  - Conducting high explosive tests and experiments
  - Destroying damaged nuclear weapons.

  Second Scenario:

  - Conducting underground nuclear testing if directed by the President. This contingent possibility would occur only under the second scenario.

- Nuclear Emergency Response. The Site provides widespread flexible support to the following programs for training and exercises:
  - Nuclear Emergency Search Team
  - Federal Radiological Monitoring and Assessment Center
  - Aerial Measuring System
  - Accident Response Group
  - Radiological Assistance Program
  - Internal Emergency Management Program.

The primary mission of Defense Program activities at the Tonopah Test Range is to ensure that the

[1] The term "Subcritical Experiments," does not define a new form of activity. It is intended instead to clarify the fact that dynamic experiments that involve the use of special nuclear materials do not achieve the condition of criticality.

nation's nuclear weapons systems meet the highest standards of safety and reliability. The primary activities include:

- Stockpile stewardship:
  - Assess the surety condition of existing systems, verifying required modification to existing systems, and verifying and maintaining surety of systems
  - Conducting experiments with special nuclear materials where containment is assured.

All testing activities are non-nuclear.

3.1.1.2 Waste Management Program under Alternative 1. Radioactive waste has been generated by the weapons development, testing, and production activities at DOE facilities as well as the environmental cleanup and restoration of these facilities. As DOE missions have changed, there has been an increasing volume of waste generated through the environmental restoration activities. This increase will continue into the future. Although no new initiatives or projects would be pursued or added under Alternative 1, the following ongoing waste management activities, as described in Chapter 2, would continue at the NTS:

- Providing low-level and mixed waste disposal capability to the NTS generators and low-level waste disposal capability to currently approved waste generators. This includes disposal in existing cells as well as creating new cells. Low-level waste includes those waste streams that may be inappropriate for shallow land disposal
- Continuing to study and pursue capabilities that lead to the development of disposal units
- Storing transuranic and existing transuranic mixed waste, pending the development of DOE off-site treatment, certification, handling, and disposal facilities
- Accepting no off-site transuranic mixed waste for storage
- Storing hazardous waste pending off-site shipment for treatment, storage, and/or disposal
- Storing mixed waste, pending development of treatment options and/or certification for disposal
- Continuing closure activities of inactive waste sites, as planned
- Storing PCB waste, pending off-site shipment for treatment, storage, and/or disposal
- Treating explosives at the Explosive Ordnance Disposal Unit
- Providing disposal capability for on-site generated solid waste
- Continuing the Waste Minimization/Pollution Prevention Program.

3.1.1.3 Environmental Restoration Program under Alternative 1. Environmental Restoration Program activities would continue in the form of characterization and remediation of contaminated areas or facilities, as identified in the recently completed site inventory (DOE, 1994). Environmental restoration is not considered a land use, but an activity necessary for reuse or disposition of land and facilities. The Environmental Restoration Program projects in Nevada that would continue under Alternative 1 are as follows:

- Underground Test Area Corrective Action Unit
- Soils Media Corrective Action Unit (including portions of the NAFR Complex)
- Industrial Sites Corrective Action Unit
- Decontamination and decommissioning facilities
- Tonopah Test Range

- Central Nevada Test Area
- Project Shoal Area
- Defense Nuclear Agency sites.

The Defense Nuclear Agency sites are being identified as part of the Environmental Restoration Program activities because Defense Nuclear Agency site activities are environmental remediations. However, it should be noted that the Defense Nuclear Agency is responsible for the operation and the funding. In this sense, it is a Work for Others project.

3.1.1.4 Nondefense Research and Development Program under Alternative 1. The DOE would continue supporting ongoing program operations, but no new program initiatives would be pursued. Ongoing and planned nondefense research and development operations and activities at the NTS that would continue under this alternative are as follows:

- Support for the Solar Enterprise Zone concept
- Demonstration projects
- Spill Test Facility activities
- Environmental Management and Technology Development Programs
- National Environmental Research Park Program activities.

3.1.1.5 Work for Others Program under Alternative 1. The Work for Others Program is hosted by the DOE and includes the shared use of certain facilities and resources at the NTS and the Tonopah Test Range. Under Alternative 1, the DOE would continue to host the projects and activities of other federal agencies (for example, DoD) at activity levels not exceeding those of the past 3 to 5 years.

Work for Others Program activities that would be expected to continue include the following:

- Treaty verification
- Nonproliferation projects
- Counterproliferation
  - researching, developing, and characterizing counterproliferation technologies
- Conventional weapons demilitarization
- Defense research and development, land navigation training, exercises, and use of air space.

3.1.1.6 Land Use and Zones under Alternative 1. The following information describes the site and zone categories (for the NTS) under Alternative 1. The zone categories are depicted on the land use map in Figure 3-1.

Industrial, Research, and Support Site—An industrial site is used for the manufacturing, processing, and/or fabrication of any article, substance, or commodity. A research site is used for projects and conventional laboratory operations for the development, quality assurance, or reliability of materials and equipment under controlled conditions to verify theories or concepts. Support sites are used for office space, training, equipment storage, maintenance, security, feeding and housing, fire protection services, and health services.

Waste Management Site—These sites are used for the disposal, storage, and/or treatment of wastes.

Nuclear Test Zone—This land area is reserved for dynamic experiments, hydrodynamic tests, and underground nuclear weapons and weapons-effects tests.

Nuclear and High Explosive Test Zone—This land area is designated within the Nuclear Test Zone for additional underground and surface high-explosive tests or experiments.

Research, Test, and Experiment Zone—This land area is designated for small-scale research and development projects for the development, quality assurance, or reliability of materials and equipment under controlled conditions.

Radioactive Waste Management Zone—This land area is designated for the management of radioactive waste.

Critical Assembly Zone—This land area is used for conducting nuclear explosives operations. Operations generally include assembly, disassembly or modification, staging, storage, repair, retrofit, and surveillance.

Spill Test Facility Impact Zone—This downwind geographic area, or footprint, would define the impacts of the largest planned tests of any material released.

Reserved Zone—This land area includes areas and facilities that provide widespread flexible support for diverse short-term testing and experimentation. The Reserved Zone is also used for short-duration exercises and training, such as the Nuclear Emergency Search Team and Federal Radiological Monitoring and Assessment Center training and DoD land-navigation exercises and training.

No designated land-use zones currently exist at the Tonopah Test Range. Activities on this range are conducted in industrial and testing areas.

3.1.2 Alternative 2, Discontinue Operations

Alternative 2 is defined as the discontinuation of the DOE/NV and interagency programs and operations at the NTS. Site-support activities would be maintained, but would be limited to environmental monitoring and security functions necessary for human health and security. Control of the NTS would be maintained by the DOE, but no activities would take place. All facilities, after decommissioning operations have ceased, would be placed in cold standby.

3.1.2.1 Defense Program under Alternative 2. Under Alternative 2, the DOE/NV would not maintain a state of readiness for nuclear testing, and there would be an overall discontinuation of other defense-related activities at the NTS. The Tonopah Test Range would continue hosting Stockpile Stewardship activities as described under Alternative 1.

3.1.2.2 Waste Management Program under Alternative 2. Under Alternative 2, the DOE/NV would maintain only minimum low-level and mixed waste disposal capability until NTS waste-generating activities are completely shut down. After shutdown, monitoring and security functions on the NTS would be reduced and become part of the sitewide monitoring activity. Transuranic and transuranic mixed waste would be shipped to other DOE facilities for certification, handling, and disposal. Active waste sites would be covered with approximately 3 m (10 ft) of soil prior to shutdown.

3.1.2.3 Environmental Restoration Program under Alternative 2. Under Alternative 2, the currently inventoried Environmental Restoration Program sites would be discontinued and left abandoned as is. All reports, studies, field investigations, characterization, and decommissioning and/or decontamination would cease. All remediation projects under way would be discontinued, with the goal of progressing to a suitable conclusion within one calendar year of the decision to pursue this alternative.

3.1.2.4 Nondefense Research and Development Program under Alternative 2. Under Alternative 2, the DOE would discontinue support of ongoing program operations. The National Environmental Research Park Program would be terminated. The Spill Test Facility would be abandoned. The Environmental Management and Technology Development Program would be discontinued at the NTS. New DOE projects, such as a Solar Enterprise Zone facility, would not be sited on the NTS.

3.1.2.5 Work for Others Program under Alternative 2. Under Alternative 2, the DOE would not host the projects and activities of other federal agencies. The use of NTS airspace and certain lands by branches of the military would be discontinued. Any subsequent airspace restrictions

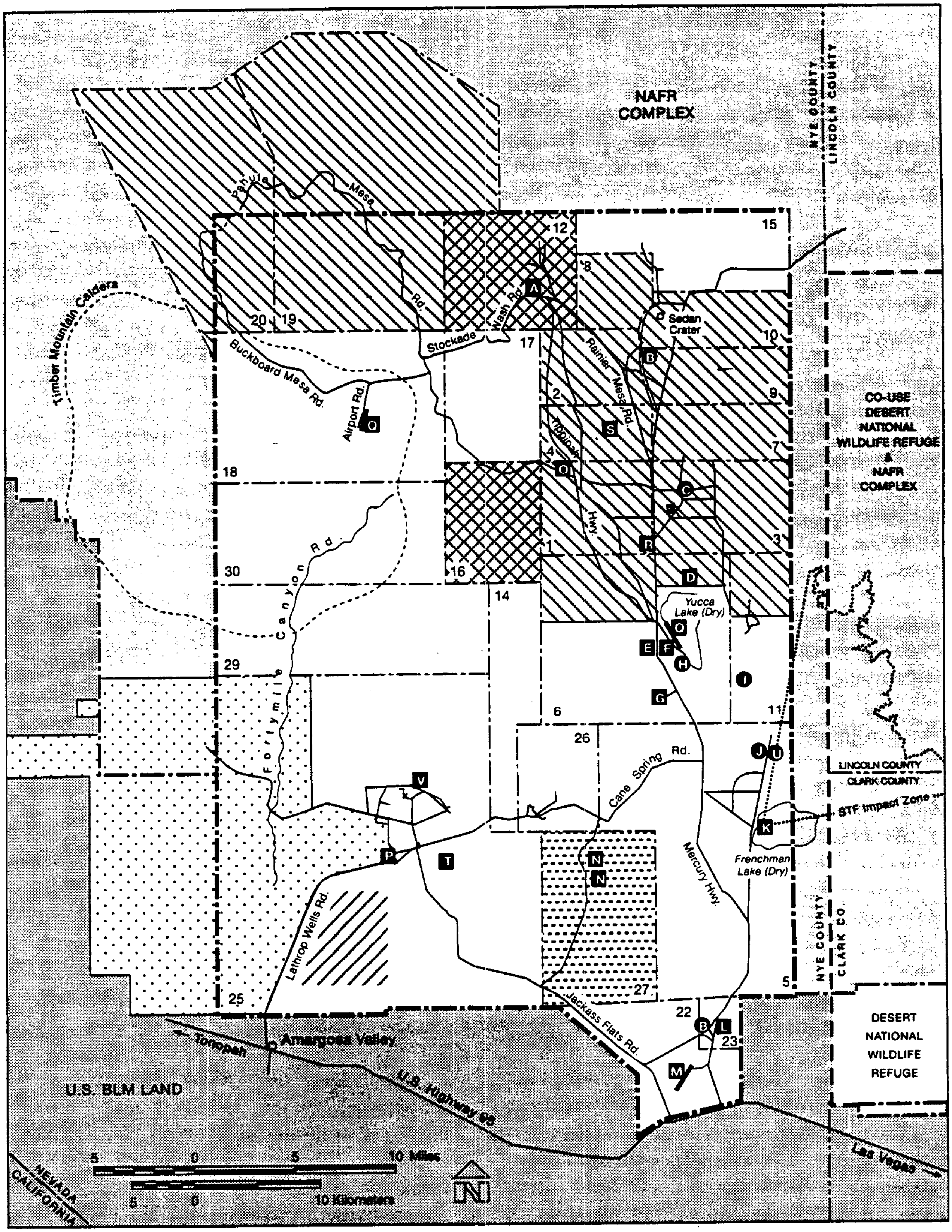


Figure 3-1. NTS Alternative 1 land use map

LEGEND

- Nuclear Test Zone
- Nuclear and High Explosive Test Zone
- Research, Test, and Experiment Zone
- Radioactive Waste Management Zone
- Yucca Mtn. Site Characterization Zone
- Reserved Zone (within the NTS areas)
- Critical Assembly Zone
- U.S. Bureau of Land Management (BLM)
- NAFR Complex
- Co-Use Desert National Wildlife Range and NAFR Complex
- Desert National Wildlife Refuge Boundary
- Spill Test Facility (STF) Impact Zone Boundary
- County Line
- NTS Boundary Line
- NTS Area Boundary Line

- ● Waste Management Site
- ■ Industrial, Research, and Support Site
- A Area 12 Camp (closed)
- B Sanitary Landfill
- C Area 3 Radioactive Waste Management Site (Zone)
- D Area 6 Construction Facilities
- E Control Point
- F Yucca Lake Facilities
- G Device Assembly Facility
- H Hydrocarbon Contaminated Soils Disposal Site
- I Explosive Ordnance Disposal Site
- J Area 5 Radioactive Waste Management Site
- K Spill Test Facility
- L Mercury
- M Desert Rock Airport
- N Area 27 Assembly/Staging Facilities
- O Area 1 Industrial Complex
- P Area 25 Central Support Site
- Q Airstrip
- R Lyner Complex
- S Big Explosives Experimental Facility
- T BREN Tower
- U Hazardous Waste Storage Site
- V Treatability Test Facility

Figure 3-1 (continued). Legend for NTS Alternative 1 land use map

would be required to allow for overflights and inspections of the NTS in accordance with international arms control treaties, such as the Open Skies Treaty.

3.1.2.6 Land Use and Zones under Alternative 2. The following information describes the site and zone categories depicted on the land use map (Figure 3-2) under Alternative 2.

Security and Monitoring Operations Control Point—The site is used as the base of operations location for environmental monitoring and security patrols.

Industrial, Research, and Support Sites—An industrial site is used for manufacturing, processing, and/or fabricating any article, substance, or commodity. A research site is used for projects and conventional laboratory operations for the development, quality assurance, or reliability of materials and equipment under controlled conditions to verify theories or concepts. Support sites are used for office space, training, equipment storage, maintenance, security, feeding and housing, fire protection services, and health services.

Closed Site—These sites are industrial, research, or support sites that are no longer in use or maintained.

Closed Waste Management Site—This site is a waste management site that is no longer in use or maintained.

Monitored and Restricted Zone—Public access to this land area is restricted. Visits, patrols, and/or data collection on a periodic basis is conducted to provide for human health and safety and for the protection of assets and the environment.

3.1.3 Alternative 3, Expanded Use

The scope of Alternative 3 (Expanded Use) in this EIS is defined as including all currently planned and proposed projects, and all currently ongoing DOE/NV and interagency programs and operations described in Alternative 1, Continue Current Operations (No Action Alternative) and the potential project activities resulting from other DOE EISs. These additional project activities include the modification and/or expansion of existing facilities, and the construction of new facilities. In the case of potential activities resulting from other DOE EISs, this alternative identifies the action to reserve land and infrastructure pending a programmatic decision. An analysis of the environmental impacts associated with siting these potential projects is included in the consequences analysis (Chapter 5) for this alternative.

The following is a program-by-program description under Alternative 3, Expanded Use. To clarify the differences between Alternative 1 and Alternative 3 activities, asterisks are used to identify those activities that represent the expanded uses described by Alternative 3.

3.1.3.1 Defense Program under Alternative 3. Defense Program operations would continue at the NTS under the conditions of the ongoing nuclear testing moratorium and the negotiations of the Comprehensive Test Ban Treaty. These operations would emphasize NTS science-based stockpile stewardship experiments and operations to maintain the safety and reliability of the stockpile without underground nuclear testing. In addition, because there can be no absolute guarantee of the complete success in the development of enhanced experimental and computational capabilities, this alternative includes those activities necessary to maintain the capability to conduct nuclear tests under a "supreme national interest" provision in the anticipated Comprehensive Test Ban Treaty. These activities include maintaining the necessary infrastructure, and more importantly, exercising the research and engineering disciplines of the nation's nuclear weapons programs to assure the continued competence of its technical staff. Defense Programs activities would include:

- Stockpile Stewardship and Management
  - Performing treaty compliant and permitted dynamic experiments (including subcritical experiments)[2], and

[2] The term "Subcritical Experiments," does not define a new form of activity. It is intended instead to clarify the fact that dynamic experiments which involve the use of special nuclear materials do not achieve the condition of criticality.

hydrodynamic tests (subcritical experiments would be conducted only where containment is assured)

- Maintaining readiness to conduct underground nuclear tests

- Conducting high explosive tests and experiments to include hydrodynamic tests and pulse power experiments. These tests and experiments may contain potentially hazardous materials such as beryllium, depleted uranium, deuterium, and tritium. At the Big Explosives Experimental Facility no experiments utilizing special nuclear materials would be performed

- Disposition of damaged nuclear weapons

* Reserve land and infrastructure for a large, heavy-industrial facility

- Conducting underground nuclear testing if directed by the President under a "supreme national interest" provision in the anticipated Comprehensive Test Ban Treaty

* Reserve land and infrastructure for next generation nuclear weapons simulators pending programmatic decisions

* Reserve land and infrastructure for nuclear weapon assembly/disassembly operations and associated storage of strategic reserves of special nuclear materials as proposed in the Pantex Sitewide EIS. Interim storage of nuclear weapons components (pits) as proposed as an alternative in the Pantex Sitewide EIS, pending programmatic decisions.

- Materials Disposition

  * Reserve land and infrastructure for long-term storage and facilities for the disposition of weapons-usable fissile material pending programmatic decisions

- Nuclear Emergency Response

Although no land area is specifically dedicated to Nuclear Emergency Response activities, the NTS provides a broad support base for the National Emergency Response Programs. The NTS provides an excellent test bed for training and exercise activities, and provides technical, operational, and logistical expertise in planning and deployment operations of the following programs.

- Nuclear Emergency Search Team

- Federal Radiological Monitoring and Assessment Center

- Aerial Measuring System

- Accident Response Group

- Radiological Assistance Program

- Internal Emergency Management Program.

The primary mission of Defense Program activities at the Tonopah Test Range is to ensure that the nation's nuclear weapons systems meet the highest standards of safety and reliability. These activities include several activities:

- Stockpile Stewardship

  - Assess surety conditions of existing systems, verifying required modification to existing systems, and verifying and maintaining surety of systems

  - Conducting experiments with special nuclear materials where containment is assured.

3.1.3.2 Waste Management Program under Alternative 3. Waste Management operations would continue to support DOE research and environmental cleanup and restoration programs. The DOE's Waste Management objective for the NTS would be to conduct proper disposal and monitoring of wastes generated from the NTS and other DOE sites. The specific waste management

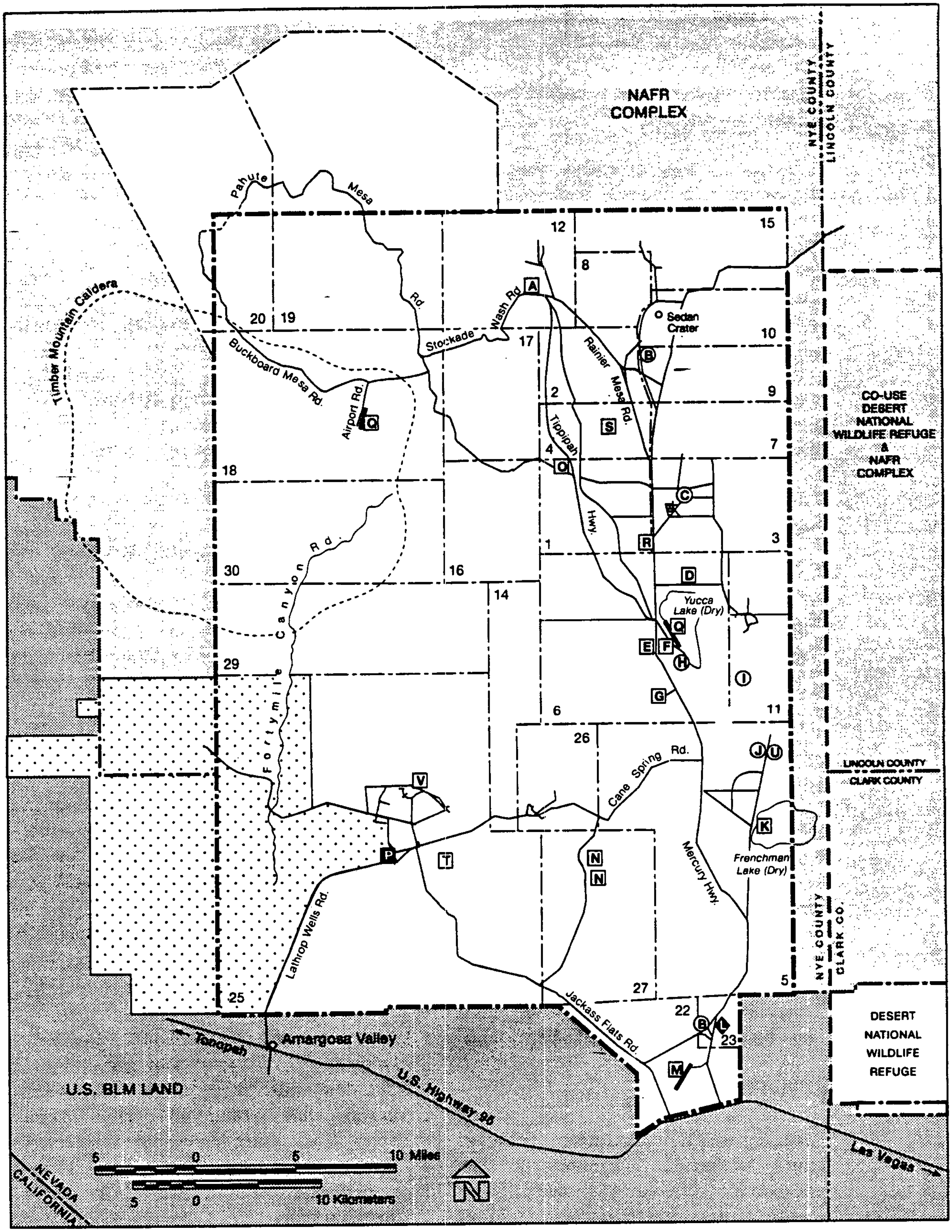


Figure 3-2. NTS Alternative 2 land use map

LEGEND

◆	Security and Monitoring Operations Control Point
■	Industrial, Research, and Support Site
□	Industrial, Research, and Support Site (closed)
○	Waste Management Site (closed)
	Yucca Mtn. Site Characterization Zone
	Monitored and Restricted Zone (within the NTS areas)
	U.S. Bureau of Land Management (BLM)
	NAFR Complex
	Co-Use Desert National Wildlife Range and NAFR Complex
	Desert National Wildlife Refuge Boundary
	County Line
	NTS Boundary Line
	NTS Area Boundary Line

A	Area 12 Camp
B	Sanitary Landfill
C	Area 3 Radioactive Waste Management Site (Zone)
D	Area 6 Construction Facilities
E	Control Point
F	Yucca Lake Facilities
G	Device Assembly Facility
H	Hydrocarbon Contaminated Soils Disposal Site
I	Explosive Ordnance Disposal Site
J	Area 5 Radioactive Waste Management Site
K	Spill Test Facility
L	Mercury
M	Desert Rock Airport
N	Area 27 Assembly/Staging Facilities
O	Area 1 Industrial Complex
P	Area 25 Central Support Site
Q	Airstrip
R	Lyner Complex
S	Big Explosives Experimental Facility
T	BREN Tower
U	Hazardous Waste Storage Site
V	Treatability Test Facility

Figure 3-2 (continued). Legend for NTS Alternative 2 land use map

activities proposed in Alternative 3 are listed in Table 3-4. The following Waste Management activities would occur in appropriately designated Waste Management zones or sites:

- Providing low-level and mixed waste disposal capability to approved waste generators. This includes expanding and creating new disposal units. Low-level waste includes waste streams inappropriate for shallow land burial.

- Storing transuranic and transuranic mixed waste, pending the development of the DOE off-site treatment and disposal facilities

* Construct and operate on-site facilities for the certification and handling of transuranic and transuranic mixed waste for off-site treatment and disposal

* Expanding the existing capacity for the storage of hazardous waste pending off-site disposal

- Storing mixed waste, pending development of treatment options and/or certification for disposal

* Constructing and operating a mixed waste storage pad

- Continuing closure activities of inactive waste sites, as planned

- Storing PCB waste pending off-site disposal

* Constructing and providing storage capability for low-level waste

* Constructing and operating treatment facilities for on-site generated low-level and mixed waste

- Treating explosives at the Explosive Ordnance Disposal Unit

* Constructing and operating additional disposal facilities for solid waste generated on the NTS and in adjacent rural counties.

3.1.3.3 Environmental Restoration Program under Alternative 3. Environmental Restoration Program activities would continue in the form of characterization and remediation of contaminated areas or facilities, as identified in the recently completed site inventory. Environmental Restoration is not considered a land use, but an activity necessary for reuse or disposition of land and facilities. The Environmental Restoration Program subprojects in Nevada that would continue under Alternative 3 include:

- Underground Test Area Corrective Action Unit

- Soils Median Corrective Action Unit (including sites on the NAFR Complex)

- Industrial Sites Corrective Action Unit

- Decontamination and decommissioning facilities

- Tonopah Test Range

- Central Nevada Test Area

- Project Shoal Area

- Defense Nuclear Agency sites.

3.1.3.4 Nondefense Research and Development Program under Alternative 3. Under Alternative 3, the DOE would continue supporting ongoing program operations and pursue new initiatives. New initiatives would include constructing and operating a solar power production facility and siting an Alternative Fuels Demonstration Project at the NTS. Alternative 3 reserves land and infrastructure for public and private institutions to use portions of the NTS for compatible research, development, and testing activities. For example, the Kistler Aerospace Corporation identified during the public comment period of this EIS their interest in a commercial satellite delivery system as a future activity in this program area. Nondefense research, development, and testing activities that would continue or be pursued at the NTS would include:

- Supporting the Solar Enterprise Zone facility concept

* Reserve land on the NTS as a Solar Enterprise Zone facility. Construct and operate a solar power generation facility on the selected site

* Increased Spill Test Facility (Hazardous Materials Spill Center) activities

* Increased Environmental Management and Technology Development Programs

- National Environmental Research Park Program activities

- Additional demonstration projects.

Solar Enterprise Zone facility land use area is proposed under Alternative 3. In addition to a facility at the NTS, three sites in southern Nevada are being considered: Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.

The Tonopah Test Range activities that would be pursued include programs in the field of robotics technology, infrastructure maintenance, and transportation.

3.1.3.5 Work for Others Program under Alternative 3. Use of NTS airspace and certain lands by branches of the military for training and for defense-related research and development would increase under Alternative 3. The DOE would continue to host projects and activities of other federal agencies (for example, DoD) and share use of certain facilities and resources at the NTS and the Tonopah Test Range. This alternative reserves land and infrastructure for other federal agencies to use portions of the NTS for compatible activities. Work for Others Program activities that would continue include the following:

- Treaty verification

- Increased nonproliferation projects

- Expanded counterproliferation projects

  – Researching, developing, and characterizing counterproliferation technologies

* Additional conventional weapons demilitarization projects

* Expanded defense-related research and development, land navigation training, exercises, and use of airspace.

Furthermore, under Alternative 3, various facilities at the NTS would be used to conduct research and development of advanced conventional weapons technologies, including the Big Explosives Experimental Facility (see Section A.1.1.1.3 and Appendix F).

Tonopah Test Range airspace and the use of certain lands by the military for training and defense-related research and development would increase.

3.1.3.6 Land Use and Zones under Alternative 3. The following information describes the site and zone categories depicted on the land use map (Figure 3-3) under Alternative 3.

Waste Management Site—These sites are used for the disposal, storage, and/or treatment of wastes.

Industrial, Research, and Support Site—An industrial site is used for manufacturing, processing, and/or fabricating any article, substance, or commodity. A research site is used for projects and conventional laboratory operations for the development, quality assurance, or reliability of materials and equipment under controlled conditions to verify theories or concepts. Support sites are used for office space, training, equipment storage, maintenance, security, feeding and housing, fire protection services, and health services.

Nuclear Test Zone—This land area is reserved for dynamic experiments, hydrodynamic tests, and underground nuclear weapons and weapons-effects tests. This zone includes compatible defense and nondefense research, development and testing projects and activities.

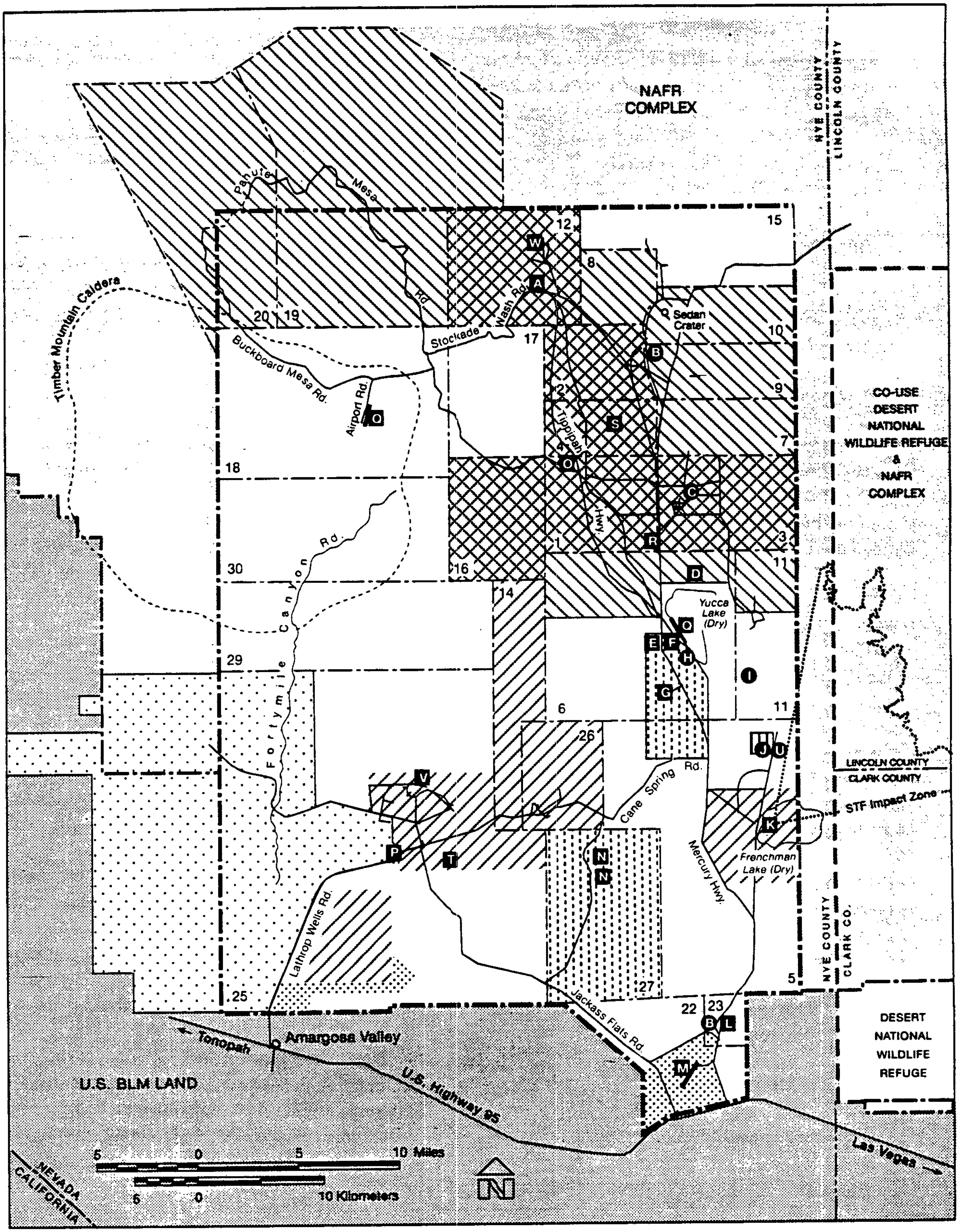


Figure 3-3. NTS Alternative 3 land use map

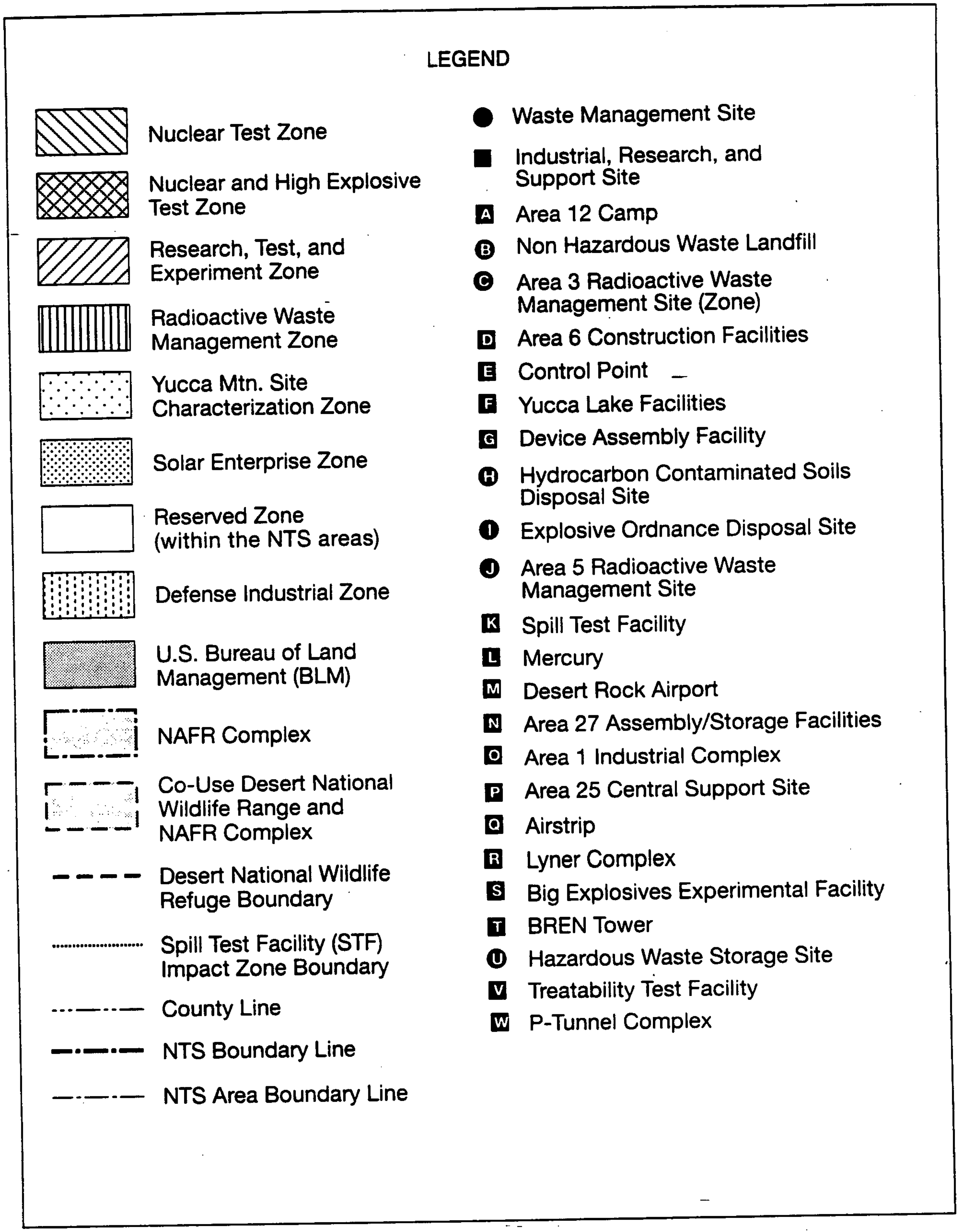


Figure 3-3 (continued). Legend for NTS Alternative 3 land use map

Nuclear and High Explosive Test Zone—This land area is designated within the Nuclear Test Zone for additional underground and outdoor high-explosive tests or experiments. This zone includes compatible defense and nondefense research, development and testing projects and activities.

Research, Test, and Experiment Zone—This land area is designated for small-scale research and development projects; demonstrations; pilot projects; outdoor tests; and experiments for the development, quality assurance, or reliability of materials and equipment under controlled conditions. This zone includes compatible defense and nondefense research, development and testing projects and activities.

Radioactive Waste Management Zone—This land area is designated for the management of radioactive wastes.

Solar Enterprise Zone—This land area is designated for the development of a solar energy power-generation facility, and light industrial equipment and commercial manufacturing capability.

Spill Test Facility Impact Zone—This downwind geographic area would confine the impacts of the largest planned tests of any material released.

Defense Industrial Zone—This land area is designated for stockpile management of weapons, including production, assembly, disassembly or modification, staging, repair, retrofit, and surveillance. Also included in this zone are permanent facilities for stockpile stewardship operations involving equipment and activities such as radiography, lasers, materials processing, and pulsed power.

Reserved Zone—This land area includes areas and facilities that provide widespread flexible support for diverse short-term testing and experimentation. The reserved zone is also used for short-duration exercises and training, such as the Nuclear Emergency Search Team and Federal Radiological Monitoring and Assessment Center training and DoD land-navigation exercises and training.

3.1.4 Alternative 4, Alternate Use of Withdrawn Lands

Under Alternative 4, the DOE would discontinue all defense-related activities at the NTS and most Work for Others Program activities. The U.S. Air Force could increase its use of airspace. The continuation of waste management operations in support of NTS environmental restoration and waste-generating activities associated with projects sited at the NTS would be the primary activities under this alternative.

3.1.4.1 Defense Program under Alternative 4. The DOE would not maintain a state of readiness for nuclear testing, and there would be an overall down scaling and discontinuation of other defense-mission activities. However, the DOE would be required to provide for overflights and inspections of the NTS in accordance with international arms control treaties. Tonopah Test Range activities associated with maintaining readiness would be in accordance with treaty requirements consistent with the Tonopah Test Range mission.

3.1.4.2 Waste Management Program under Alternative 4. Waste Management Program operations and construction would include all the activities listed under Alternative 3, with the restriction that these services be provided solely for DOE waste generated within Nevada.

3.1.4.3 Environmental Restoration Program under Alternative 4. The Environmental Restoration Program would continue at current or accelerated rates. More stringent remediation levels greater than protection of human health and the environment may be implemented (where applicable), based on designated land use and/or the potential return of some lands to public domain.

3.1.4.4 Nondefense Research and Development Program under Alternative 4. Under Alternative 4, Nondefense Research and Development Program activities would include those described under Alternative 3, but with a reduction in the scope of the Alternative Fuels Demonstration Projects.

3.1.4.5 Work for Others Program under Alternative 4. Under Alternative 4, it is anticipated that portions of the restricted NTS airspace would be relinquished. Conventional weapons demilitarization activities would not be sited at the NTS under this alternative, and defense-related research and training by other government agencies would not be conducted at the NTS. The DOE would be required to provide for overflights and inspections of the NTS and the Tonopah Test Range in accordance with international arms control treaties such as the Open Skies Treaty.

3.1.4.6 Potential Public Uses of NTS Lands under Alternative 4. The activities described in the following sections are other potential public uses of the NTS.

- Public Education:

  Educational tour routes would be established for the public. Tours would allow the public to see firsthand some of the history of the Nuclear Era and impacts of past nuclear testing. A Nuclear Era museum at the NTS that highlights the testing activities would be an important contribution to understanding the nation's nuclear history.

  Educational field trips to the NTS have occurred to a limited extent. This type of education would allow students to see firsthand some of the impacts of nuclear testing and contrast this destruction to the pristine and relatively undisturbed ecosystems that exist on the NTS.

- Public Recreation:

  Recreation on the NTS could focus on natural scenic areas, such as Timber Mountain and the isolated forested areas. The Timber Mountain Caldera is a national natural landmark and, with all its associated volcanic features, is one of the best examples of a caldera. This area is also the location of American Indian petroglyphs.

  The road system on the NTS would provide a location for such events as foot races, marathons, closed-circuit bicycle and car races, and other similar activities. The desert terrain and the existing facilities make Alternative 4 attractive.

  Deer herds and other game animals on the NTS have not been actively hunted for many decades. Consequently, a limited trophy deer hunt could be established similar to the bighorn sheep trophy hunt, as on the NAFR Complex, with a drawing to select a limited number of hunters. Each hunter must attend a one-day training session. The Nevada Division of Wildlife manages the bighorn sheep trophy hunt.

3.1.4.7 Land Use and Zones under Alternative 4. The following information describes the site and zone categories depicted on the land use map (Figure 3-4) under Alternative 4:

Waste Management Site—These sites are used for the disposal, storage, and/or treatment of wastes.

Industrial, Research, and Support Sites—An industrial site would be used for the manufacturing, processing, and/or fabrication of any article, substance, or commodity. A research site would be used for projects and conventional laboratory operations for the development, quality assurance, or reliability of materials and equipment under controlled conditions to verify theories or concepts. Support sites are used for office space, training, equipment storage, maintenance, security, feeding and housing, fire protection services, and health services.

Closed Site—These are closed industrial, research, and support sites that are no longer in use or maintained.

Radioactive Waste Management Zone—This land area is designated for the management of radioactive waste.

Spill Test Facility Impact Zone—This downwind geographic area would confine the impacts of the largest planned tests of any material released at the Spill Test Facility.

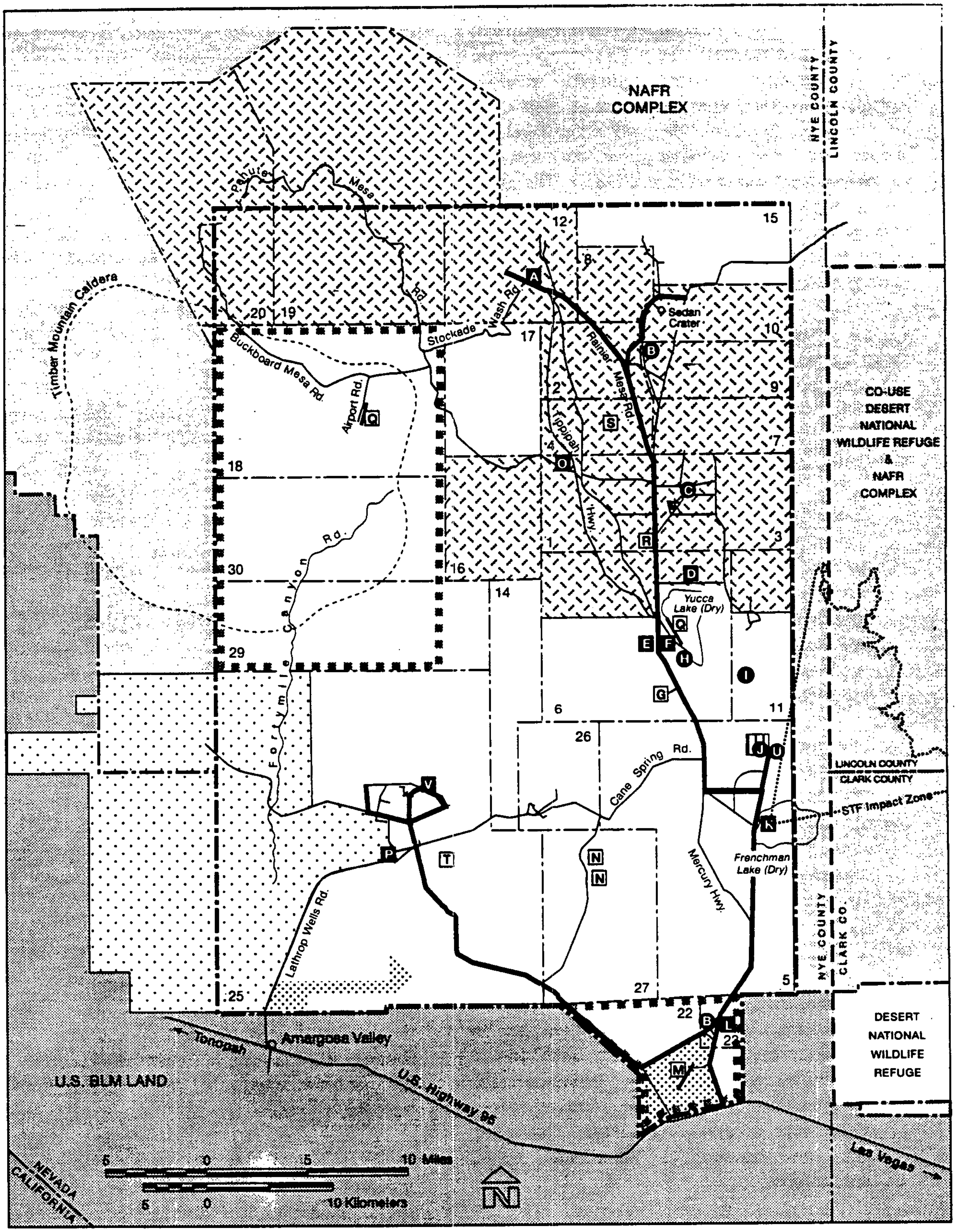


Figure 3-4. NTS Alternative 4 land use map

LEGEND

- Nondefense Research, Development, and Testing Zone
- Radioactive Waste Management Zone
- Solar Enterprise Zone
- Potential Turn-Back Area
- Yucca Mtn. Site Characterization Zone
- Reserved Zone (within the NTS areas)
- U.S. Bureau of Land Management (BLM)
- NAFR Complex
- Co-Use Desert National Wildlife Range and NAFR Complex
- Desert National Wildlife Refuge Boundary
- County Line
- NTS Boundary Line
- NTS Area Boundary Line
- Spill Test Facility (STF) Impact Zone Boundary
- Nuclear Era Tour Route

- Industrial, Research, and Support Site
- Waste Management Site
- Industrial, Research, and Support Site (Closed)
- A Area 12 Camp
- B Sanitary Landfill
- C Area 3 Radioactive Waste Management Site (Zone)
- D Area 6 Construction Facilities
- E Control Point
- F Yucca Lake Facilities
- G Device Assembly Facility
- H Hydrocarbon Contaminated Soils Disposal Site
- I Explosive Ordnance Disposal Site
- J Area 5 Radioactive Waste Management Site
- K Spill Test Facility
- L Mercury
- M Desert Rock Airport
- N Area 27 Assembly/Staging Facilities
- O Area 1 Industrial Complex
- P Area 25 Central Support Site
- Q Airstrip
- R Lyner Complex
- S Big Explosives Experimental Facility
- T BREN Tower
- U Hazardous Waste Storage Site
- V Treatability Test Facility

Figure 3-4 (continued). Legend for NTS Alternative 4 land use map

Reserved Zone—The reserved zone includes areas and facilities that provide widespread flexible support for diverse short-term nondefense research, testing, and experimentation.

Nondefense Research, Development, and Testing Zone—This monitored restricted-access land area has been designated for nondefense-related research, development, and testing activities.

Potential Turn Back Area—This zone encompasses the land area designated for potential return to the U.S. Bureau of Land Management who would determine the proper management prescription for the land consistent with area land use policies.

3.2 Alternatives Eliminated from Further Consideration

A National Environmental Policy Act review specifies the purpose and need for an agency to take action, describes the action that the agency proposes to meet for that purpose and need, and identifies reasonable alternatives to meet all or part of the purpose and need. A potential alternative might be eliminated from detailed consideration if the alternative would take too long to implement, or would be prohibitively expensive, or highly speculative in nature and thus is considered unreasonable. During scoping for the NTS EIS, commentors suggested several alternatives that could be considered in the document. The DOE considered those alternatives, but did not analyze them in detail in this EIS. This section identifies the alternatives that were eliminated from further consideration and provides a brief explanation of the reason for elimination. These alternatives include the following:

- Site uses defined by the program
- Site closure with full environmental restoration
- Site closure with direct turn back of surplus lands to the sovereign nations, public, county, and state
- No Action Alternative that excludes receipt of waste from out-of-state waste generators
- Other alternatives within the range of alternatives considered
- Alternatives including rail routes for waste transport.

3.2.1 Site Uses Defined by Program

As an alternative to managing the NTS to support multiple programs, the DOE considered, but dismissed as unreasonable, the alternatives that would dedicate the NTS to a single program. The most commonly cited alternatives included the five programs evaluated in this EIS: Defense, Environmental Restoration, Waste Management, Nondefense Research and Development (including alternative energy research), and Work for Others. In each alternative, only one program would be conducted at the NTS, with the NTS being fully dedicated to conducting the program under consideration. The NTS has historically been a multipurpose facility because of its remote location, arid climate, controlled access, and size. For these reasons, this alternative fails to meet the DOE's need for a site that can support evolving DOE missions.

3.2.2 Site Closure with Complete Environmental Restoration

The DOE considered, but dismissed as too speculative, the alternative to fully remediate and close the NTS in the next 10-year period. In accordance with the DOE's National Environmental Policy Act EIS policy, the NTS EIS evaluates site uses for the next 5- to 10-year period and because of the unique nature of past NTS activities (nuclear weapons tests), complete site characterization and subsequent remediation activities could not be completed before the year 2035. Additionally, technologies to fully and economically remediate certain areas of the NTS (such as the underground testing areas) do not currently exist and are not anticipated to be available in the next 10-year period.

3.2.3 Site Closure with Direct Relinquishment of Surplus Lands to the Sovereign Nations, the Public, Nye County, or the state of Nevada following Remediation

The DOE considered, but dismissed as unreasonable, the alternative of relinquishing the withdrawn NTS land directly to the sovereign nations, the state of Nevada, Nye County, or the public. This alternative would require a redirection of the policies of the U.S. Bureau of Land Management, which administers the federal lands that are withdrawn for use by the DOE. Current U.S. Bureau of Land Management policies and regulations require lands that were formerly withdrawn from the public domain, and are no longer needed, to be relinquished to the U.S. Bureau of Land Management. For this reason, this alternative was considered too speculative and outside the scope of the NTS EIS. Alternative 4 addresses, to the extent reasonable, the identification of possible surplus land within the NTS and the return of that land to the U.S. Bureau of Land Management for public use.

3.2.4 Other Alternatives within the Range of Alternatives Considered

Several alternatives were identified by sovereign nations, stakeholders, and the public that fall within the range of the four alternatives being evaluated in this EIS. Such alternatives involved varying combinations of the five major programs (Defense, Environmental Restoration, Waste Management, Nondefense Research and Development, and Work for Others). Such alternatives included expanding nondefense research and development and minimizing waste management; continuing current operations except excluding receipt of waste from outside generators; and, expanding defense activities to include all stockpile stewardship and management functions. The DOE believes that the range of alternatives considered in this EIS bounds these other suggested alternatives. At one end of the spectrum, the alternatives include site closure with no activities other than monitoring; the opposite extreme is the expanded use of NTS resources. Encompassed within these extremes are the continuation of current operations (no action) and a reduced level of resource use that eliminates all defense-related activities and that limits waste management activities to support the environmental restoration of the NTS.

3.2.5 Alternatives Including Rail Routes for Waste Transport

Several stakeholders urged that rail routes for the transport of all waste types, including high-level waste and spent nuclear fuel, should be included in one or more of the alternatives. The DOE considered the inclusion of rail routes as part of the alternatives. As stated earlier, no action to construct rail access to the NTS is considered in this EIS or in the Record of Decision. The DOE/NV recognizes, however, that a rail option would be a feasible alternative should the NTS be named the sole low-level waste disposal site for the DOE complex and defers any decision to such time that a decision is made in the Waste Management Programmatic Environmental Impact Statement. The Transportation Study undertaken to support this EIS presents and analyzes, for purposes of comparison, the rail routes and highway truck transportation routes that could support low-level waste shipments only (see Appendix I).

The Yucca Mountain Project Repository EIS will evaluate the potential consequences associated with the construction and operation of a rail spur to ship spent nuclear fuel and high-level waste. The implications of such a spur for the NTS will be addressed as part of the cumulative impacts analysis in the Repository EIS. Should the DOE decide to construct and operate a rail spur, the DOE/NV would perform additional evaluations associated with the use of this resource by low-level waste generators.

3.2.6 Alternatives Considered But Eliminated from Consideration Prior To Scoping

Prior to the public scoping period, the DOE determined that a number of issues would not be considered in this EIS. The eliminated alternatives are considered to be outside the scope of this EIS because they will be evaluated in other EISs or because they represent policy decisions on actions defined by mechanisms outside the DOE/NV or the

DOE control including the Yucca Mountain Repository construction, operation, and closure.

3.2.6.1 Yucca Mountain Repository Construction, Operation, and Closure. The NTS EIS addresses operations and activities at the Nevada Test Site that could potentially occur over a 10-year period. These proposed operations and activities are the responsibility of the DOE Nevada Operations Office (DOE/NV). The Yucca Mountain Project is governed by the provisions of the Nuclear Waste Policy Act of 1982, as amended, and is under the Office of Civilian Radioactive Waste Management, a separate DOE office whose mission is distinct from that of the DOE/NV. The Yucca Mountain Project is currently engaged in activities which characterize the mountain to determine its suitability for development as a repository. The evaluations include analyzing the anticipated performance of such a repository, if it were constructed, over many thousands of years. Even if Yucca Mountain is eventually found suitable for development as a repository, and Congress authorizes such development, construction would not begin within the 10-year timeframe addressed in the NTS EIS.

The Council on Environmental Quality's National Environmental Policy Act regulation, Title 40 CFR Part 1501.7(a)(5), instructs the DOE, as lead agency, to indicate any public EISs that will be prepared and that are related to, but are not part of, the scope of the impact statement under consideration. The Office of Civilian Radioactive Waste Management is currently preparing an EIS, the Yucca Mountain Project Repository EIS, to evaluate the potential environmental impacts from the construction, operation, and eventual closure of a repository at Yucca Mountain for the geologic disposal of commercial and DOE-owned spent nuclear fuel and high-level radioactive waste (60 FR 40164, August 7, 1995).

During the scoping process for the Yucca Mountain Project Repository EIS, the DOE identified the construction, operation, and closure of a Yucca Mountain spent nuclear fuel and high-level radioactive waste repository as outside the scope of this EIS. Section 113 of the Nuclear Waste Policy Act, (NWPA, 1983) as amended, categorizes the current site characterization activities at Yucca Mountain as "preliminary activities" and specifically excludes them from the requirement of preparing an EIS. However, the NTS EIS includes these activities as part of the description of the existing environment at the NTS (see Chapter 4) as well as in the discussion of cumulative impacts (in Chapter 6). The Repository EIS will consider other relevant information and analyses, including the NTS EIS and other EISs prepared by the DOE to address other proposed actions. The Repository EIS will incorporate information from the NTS EIS, as appropriate, in its description of the existing environment as well as in its analysis of cumulative impacts. The analysis of cumulative impacts will include the combined effects of transporting waste to the repository and to the NTS. In this way, DOE will ensure that the cumulative effects from all activities taking place or contemplated at the NTS are considered in its decisionmaking process, along with the public's comments on these activities.

3.2.6.2 Monitored Retrievable Storage of Spent Nuclear Fuel and High-Level Radioactive Waste at the NTS or in Lincoln County, Nevada. The Nuclear Waste Policy Act of 1982, as amended, directed the DOE to work with interested states and sovereign nations to identify a host for the monitored retrievable storage facility. However, that provision has now expired. In addition, the Nuclear Waste Policy Act of 1982, as amended, prohibits the siting by the Secretary of a monitored retrievable storage facility for the interim storage of spent nuclear fuel in the state of Nevada (Section 145(g)). Although bills have been introduced into Congress that may eliminate or nullify this prohibition, attempting to predict the outcome of such legislative proposals would be highly speculative, at best. Therefore, the DOE considered the inclusion of a facility for the interim storage of spent nuclear fuel within any of the NTS EIS sitewide alternatives to be beyond the scope of this EIS.

3.2.6.3 Claims for Past Damages Resulting from Atmospheric Testing. In accordance with the provisions of the Radiation Exposure Compensation Act of 1990, as amended, which is administered by the Department of Justice, members of the public who reside within the geographic boundaries and time period therein defined may be eligible for monetary benefits as compensation for illness or damage related to specific diseases and death.

Historical dose estimates for past activities at the NTS, such as atmospheric weapons testing and belowground weapons testing, are available from a variety of sources (Church et al., 1990; Gesella and Voilleque, 1990). It is not within the scope of this assessment to recalculate the current information available on dose reconstruction at the NTS and the surrounding communities. Because none of the alternatives considered in the NTS EIS involve the resumption of atmospheric weapons testing, the risks for those activities are not assessed here. The risk to human health due to underground weapons testing is assumed to be similar to the past venting event detailed in the Special Nevada Report (SAIC/DRI, 1991). A wealth of information is available from the Off-site Radiation Exposure Review Project that was initially established by the DOE to collect historical exposure estimates and reconstruct the doses received by individuals off the NTS due to fallout.

To better understand the human health and safety issues posed by each of the alternatives, the DOE conducted a human health risk assessment as part of this EIS (see Appendix H). The human health risk assessment incorporates information on waste inventories, radioactive materials associated with nuclear weapons testing and defense program activities, and other hazardous materials that are used at the NTS under each of the alternatives considered. Risks that are examined include both fatal and non-fatal health effects that could result from transportation or other work-related accidents and from exposures to hazardous and radioactively contaminated materials.

3.3 Comparison of Alternatives and Environmental Impacts

The NTS EIS presents the discussion of environmental impacts of four alternatives for five DOE programs and site-support activities at the NTS and six other sites within Nevada. Tables 3-1 through 3-4 show site programs and projects for each alternative. Chapter 4 describes the affected environments of each of these sites by resource area, addressing, where applicable, the following resource areas: land use, airspace, transportation, socioeconomics, geology and soils, water resources, biology, air quality, noise, visual quality, cultural resources, occupational and public health and safety, and Environmental Justice. Chapter 5 describes the potential impacts of each of the alternatives on each of the resource areas. The discussion of impacts is arranged by resource area within each site so that the reader may find a discussion of the impact of a specific program for each alternative at a particular site. The following section presents a brief qualitative summary of the major impacts of each of the five programs. For each of the programs, there are resource areas that are of more interest than others. These major areas are summarized here. For further detail on these areas or for discussions of other resource areas, the reader should consult the relevant sections in Chapters 4 and 5.

Defense Program. Evaluation of the alternatives in this EIS for the Defense Program does not identify significant physical environmental impacts that would change the environmental baseline established by past activities. This would include Alternatives 1 and 3, which address a scenario to conduct one or more underground nuclear tests if directed by the President. Stockpiled holes for potential underground tests are isolated from other NTS activities. The construction of new facilities would have a minor, localized impact to the physical environment of the site but would not lead to off-site impacts. The most significant impacts would be the loss of income and jobs resulting from the elimination of the Defense Program activities under Alternatives 2 and 4.

Based on the more than 40 years of operations and information, many of the consequences of past Defense Program activities and other activities have been documented. Additional Defense Program impacts resulting from the alternatives considered in this EIS are significant, although small, compared to the impacts of previous testing. More than 800 underground nuclear tests have been conducted at the NTS. As discussed in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977), underground testing has resulted in unavoidable adverse impacts to portions

Table 3-1. Comparison of Defense Program Activities for the Alternatives

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Stockpile Stewardship - Maintain Readiness to Test - Conduct Underground Nuclear Weapons Testing (if directed) - Conduct Dynamic Experiments, including Subcritical Experiments, and Hydrodynamic Tests - Conduct Conventional High-Explosive Testing - Destroy Damaged Nuclear Weapons **Nuclear Emergency Response** - Nuclear Emergency Search Team - Federal Radiological Monitoring and Assessment Center - Aerial Measuring System - Accident Response Group - Radiological Assistance Program - Internal Emergency Management Program **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests	**Stockpile Stewardship** - Discontinue All Activities **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests	**Stockpile Stewardship** - Maintain Readiness to Test - Conduct Underground Nuclear Weapons Testing (if directed) - Conduct Dynamic Experiments, including Subcritical Experiments, and Hydrodynamic Tests - Conduct Conventional High-Explosive Testing - Construct Nuclear Weapons Simulators - National Ignition Facility (if selected in Stockpile Stewardship and Management Programmatic EIS) - Destroy Damaged Nuclear Weapons **Stockpile Management** - Store Nuclear Weapons - Disassemble Nuclear Weapons - Assemble Nuclear Weapons - Modify and Maintain Nuclear Weapons - Test Weapons Components for Quality Assurance - Provide Interim Storage of Pits **Nuclear Emergency Response** - Nuclear Emergency Search Team - Federal Radiological Monitoring and Assessment Center - Aerial Measuring System - Accident Response Group - Radiological Assistance Program - Internal Emergency Management Program **Storage and Disposition of Weapons-Usable Fissile Materials** - Store Weapons-Usable Fissile Material - Disposition Weapons-Usable Fissile Material - Construct New or Modify Tunnel Complexes - Increase Robotic Technology Experiment - Construct New or Modify Existing Structures - Heavy Industrial Facility **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests	**Stockpile Stewardship** - Discontinue All Activities **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests

Table 3-2. Comparison of Waste Management Program Activities for the Alternatives

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Area 3 Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste Closure: - Disposal Crater Complex UE3ax/bl - Disposal Crater Complex UE3ah/at **Area 5** Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste - Nevada Generated Mixed Waste - Greater Confinement Waste Storage: - Nevada Generated Mixed Waste - Transuranic Waste - Mixed Transuranic Waste - Hazardous Waste Closure Activities: - Close Designated Low-Level Waste Disposal Units - Close Designated Mixed Waste Disposal Units - Close Designated Greater Confinement Disposal Units **Area 6** Storage Activities: - PCB Waste Disposal Activities: - Hydrocarbon Landfill **Area 11** Treatment Activities: - Explosive Ordnance Disposal Unit	No Activity	**Area 3** Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste Closure: - Disposal Crater Complex UE3ax/bl - Disposal Crater Complex UE3ah/at Construction: - Future Low-Level Waste Disposal Pit - Building 3-302 (expansion) - Area 3 Truck Decon Station **Area 5** Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste - Nevada Generated Mixed Waste - Greater Confinement Waste Storage: - Nevada Generated Mixed Waste - Transuranic Waste - Mixed Transuranic Waste - Hazardous Waste Facility Construction Activities: - Breaching and Sampling Facility - Real-Time Radiography - Transuranic Waste Certification Facility - Transuranic Waste Handling and Loading Facility - Mixed Waste Storage Pad - Mixed Waste Disposal Units - Low-Level Waste Disposal Units - Greater Confinement Disposal Units - Hazardous Waste Storage Pad (expansion) - Water Supply Line - Access Control Building - Maintenance Building - 5-01 Road Reconstruction (may not be necessary) - 5-07 Road Reconfiguration (may not be necessary) - 500-Year Flood Protection - Low-Level Waste Storage Facility - Fire Protection Utilities - Telephone System Closure Activities: - Close Designated Low-Level Waste Disposal Units - Close Designated Mixed Waste Disposal Units - Close Designated Greater Confinement Disposal Units Treatment Facility: - Cotter Concentrate Mixed Waste **Area 6** Storage Activities: - PCB Waste Treatment Activities: - Low-Level Liquid Waste Treatment Facility - Mixed Liquid Waste Treatment Facility Disposal Activities: - Hydrocarbon Landfill **Area 11** Treatment Activities: - Explosive Ordnance Disposal Unit	**Area 3** Disposal: - Nevada Generated Low-Level Waste Closure: - Disposal Crater Complex UE3ax/bl - Disposal Crater Complex UE3ah/at **Area 5** Disposal: - Nevada Generated Low-Level Waste Storage: - Transuranic Waste - Mixed Transuranic Waste - Hazardous Waste Closure Activities: - Close Designated Low-Level Waste Disposal Units - Close Designated Mixed Waste Disposal Units - Close Designated Greater Confinement Disposal Units Facility Construction Activities: - Water Supply Line - Access Control Building - Maintenance Building - 5-07 Road Reconfiguration - 500-Year Flood Protection - Fire Protection Utilities - Telephone System Treatment Facility: - Cotter Concentrate Mixed Waste **Area 6** Storage Activities: - PCB Waste Treatment Activities: - Low-Level Liquid Waste Treatment Facility Disposal Activities: - Hydrocarbon Landfill **Area 11** Treatment Activities: - Explosive Ordnance Disposal Unit

Table 3-3. Comparison of Environmental Restoration Program Activities for the Alternatives

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Underground Test Area Corrective Action Unit - Continue Groundwater Monitoring - Continue Drilling Characterization Wells - Evaluate and Implement Remediation Strategies **Soils Media Corrective Action Unit and Part of NAFR Complex** - Continue Studies to Identify, etc. Alternate Remedial Measures - Remove Contaminated Soils on NTS and Nellis Lands - Dispose of Contaminated Soils in Permitted Facilities - Select Alternate Remedial Action Method and Implement **Industrial Sites Corrective Action Unit** - Characterize and Dispose of Environmental Restoration Sites - Continue Field Program to Identify Sites - Dispose of Waste in Approved Facilities - Continue to Characterize and Remediate the Resource Conservation and Recovery Act Industrial Sites **Decontamination and Decommissioning Facilities** - Continue Remediation Action and Planning **Defense Nuclear Agency Sites** - Continue Operations to Stop Contaminant Migration - Characterize and Remediate Contaminated Muck Piles and Ponds - Select and Implement Alternate Remedial Action or Redesign **Tonopah Test Range** - Continue Characterization and Remediation **Central Nevada Test Area** - Continue Characterization and Remediation **Project Shoal Area** - Continue Characterization and Remediation	No Activity	**Underground Test Area Corrective Action Unit** - Continue Groundwater Monitoring - Continue Drilling Characterization Wells - Evaluate and Implement Remediation Strategies - Intensify Groundwater Monitoring - Accelerate, Evaluate, and Implement Remediation Strategies - Alternate Uses May Require Stricter Cleanup Levels **Soils Media Corrective Action Unit and Part of NAFR Complex** - Continue Studies to Identify, etc. Alternate Remedial Measures - Remove Contaminated Soils on NTS and Nellis Lands - Dispose of Contaminated Soils in Permitted Facilities - Activities Would Accelerate Above Present Levels - After Studies, Select Alternate Remedial Action Method and Implement - Alternate Uses May Require Stricter Cleanup Levels **Industrial Sites Corrective Action Unit** - Characterize and Disposition of Environmental Restoration Sites - Continue Field Program to Identify Sites - Continue to Characterize and Remediate the Resource Conservation and Recovery Act Industrial Sites - Activities Would Accelerate Above Present Levels - Alternate Uses May Require Stricter Cleanup Levels **Decontamination and Decommissioning Facilities** - Accelerate Remedial Actions - Alternative May Require Clean Closure, Not Closure In Place **Defense Nuclear Agency Sites** - Accelerate Operations to Stop Radiation and Hazardous Contaminated Migration - Select and Implement Alternate Remedial Action or Redesign - Alternate Uses May Require Stricter Cleanup Levels - Characterize and Remediate Contaminated Muck Piles and Ponds. **Tonopah Test Range** - Accelerate Characterization and Remediation of Site **Central Nevada Test Area** - Accelerate characterization and remediation **Project Shoal Area** - Continue Characterization and Remediation - Accelerate Characterization and Remediation of Site	**Underground Test Area Corrective Action Unit** - Continue Groundwater Monitoring - Continue Drilling Characterization Wells - Evaluate and Implement Remediation Strategies - Intensify Groundwater Monitoring - Accelerate, Evaluate, and Implement Remediation Strategies - Alternate Uses May Require Stricter Cleanup Levels **Soils Media Corrective Action Unit and Part of NAFR Complex** - Continue Studies to Identify, etc. Alternate Remedial Measures - Remove Contaminated Soils on NTS and Nellis Lands - Dispose of Contaminated Soils in Permitted Facilities - Activities Would Accelerate Above Present Levels - After Studies, Select Alternate Remedial Action Method and Implement - Alternate Uses May Require Stricter Cleanup Levels **Industrial Sites Corrective Action Unit** - Characterize and Disposition Environmental Restoration Sites - Continue Field Program to Identify Sites - Continue to Characterize and Remediate the Resource Conservation and Recovery Act Industrial Sites - Activities Would Accelerate Above Present Levels - Alternate Uses May Require Stricter Cleanup Levels **Decontamination and Decommissioning Facilities** - Accelerate Remedial Actions - Alternative May Require Clean Closure, Not Closure In Place **Defense Nuclear Agency Sites** - Accelerate Operations to Stop Radiation and Hazardous Contaminated Migration - Select and Implement Alternate Remedial Action or Redesign - Alternate Uses May Require Stricter Cleanup Levels - Characterize and Remediate Contaminated Muck Piles and Ponds. **Tonopah Test Range** - Accelerate Characterization and Remediation of Site **Central Nevada Test Area** - Accelerate characterization and remediation **Project Shoal Area** - Continue Characterization and Remediation - Accelerate Characterization and Remediation of Site

Table 3-4. Comparison of Nondefense Research and Development, Work for Others, and Site Support Activities for the Alternatives

Nondefense Research and Development Program			
Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
- Establish Solar Enterprise Zone - Spill Test Facility - Alternate Fuel Demonstration Project (16 vehicles) - Technology Development (normal) - Environmental Research Park	- No Activity	- Establish Solar Enterprise Zone - Construct and Operate Solar Production Facilities - Spill Test Facility - Alternate Fuel Demonstration Project (16 vehicles plus fueling station) - Technology Development (expanded) - Environmental Research Park	- Establish Solar Enterprise Zone - Construct and Operate Solar Production Facilities - Spill Test Facility - Alternate Fuel Demonstration Project (16 vehicles) - Technology Development (expanded) - Environmental Research Park
Work for Others Program			
Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Treaty Verification - Threshold Test Ban Treaty - Peaceful Nuclear Explosion Treaty - Chemical Weapons Convention Treaty - Treaty on Open Skies **Nonproliferation Projects** **Counterproliferation Research and Development** - Dipole Hail - Big Explosives Experimental Facility - Cut and Cover **Conventional Weapons Demilitarization** **Nondefense Research and Development** - Conduct Munitions Research and Development - Training Exercises	- No Activity	**Increased activity levels for:** **Treaty Verification** - Threshold Test Ban Treaty - Peaceful Nuclear Explosion Treaty - Chemical Weapons Convention Treaty - Treaty on Open Skies **Nonproliferation Projects** **Counterproliferation Research and Development** - Dipole Hail - Big Explosives Experimental Facility - Cut and Cover **Conventional Weapons Demilitarization** **Nondefense Research and Development** - Conduct Munitions Research and Development - Training Exercises	**Treaty Verification** - Treaty on Open Skies No Activity - Increased Use of Airspace by DoD
Site Support Activities			
Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
No change in: - Facilities - Services - Utilities - Communications	- Facilities (cold standby) - Services (minimal) - Utilities (minimal) - Communications (minimal) **Tonopah Test Range** - Maintain Site Support for Stockpile Stewardship	**Expand as necessary:** - Facilities - Services - Utilities - Communications	**Modify as Necessary:** - Facilities - Services - Utilities - Communications

of the land, geologic, and groundwater resources, making them unusable for most purposes. Formation of craters, surface subsidence, and the release of radioactivity into the environment have been the most significant impacts to the physical environment as a result of historical testing operations at the NTS. Pockets of radioactive contamination surround each expended underground test location. The quantity of radioactivity remaining in the subsurface media can be estimated, based on the half-life of the fission products. From data on the number and dates of the underground tests at the NTS, a total quantity of radioactivity remaining underground is estimated to be 3.0 x 10^8 curies (Ci). Much of this radioactivity, exclusive of tritium, remains captured in the original cavity, and thus is not available to leach into the groundwater.

The impacts of conducting subcritical experiments underground would be much less than those for nuclear testing since no self-sustaining fission chain reactions occur and much less radioactivity is deposited to the geologic environment. As in the case of nuclear testing, the radioactivity is captured underground.

Radioactively-contaminated surface areas on the NTS resulted primarily from atmospheric testing of nuclear weapons from 1951 to 1962. Additionally, safety tests conducted at the surface from 1954 to 1963 resulted in the radioactive contamination of the soil. More than 200 radiation-contaminated controlled areas have been identified and mapped on the NTS.

The DOE has established a monitoring program on and off the NTS to detect radionuclides in air and in groundwater. To date, no radioactive contamination attributable to DOE activities has been detected in monitoring wells off the NTS. Detection of significant contamination is limited to underground testing areas on the NTS. Potable supply wells on the NTS utilize quality groundwater, meeting Safe Drinking Water Act Standards.

In addition to the historic and ongoing monitoring, the DOE has developed groundwater models, which continue to be refined, for addressing the concerns for potential groundwater transport of radionuclides. Health effects to the public from subsurface radioactivity have been modeled, based on predictions of future tritium concentrations in well water, even though predicted concentrations are well below current regulatory limits. Any public exposure to elevated tritium concentrations resulting from underground nuclear testing would necessarily occur outside the boundaries of DOE/DoD controlled areas. Modeling results to date consistently indicate that any such tritium levels would be below the U.S. Environmental Protection Agency guidelines for drinking water. The most recent model results from the Nevada Environmental Restoration Program (GeoTrans, 1995) predict that_no tritium above natural background levels would appear outside of NTS/NAFR Complex controlled areas. The earlier screening study by Daniels et al., (1993) predicts a tritium peak of 4000 pCi/L. Therefore, calculations of the lifetime dose to a maximally exposed member of the public in the uncontrolled area around the time of peak tritium concentration indicate a lifetime probability of contracting a fatal cancer between 8 x 10^{-13} (about one in one trillion) and 1 x 10^{-5} (about one in 100,000).

Waste Management. The incremental environmental impacts over baseline conditions from waste management activities under Alternatives 1 and 3 would be negligible. Under Alternative 3, some new facilities would create a slight increase beyond the impacts under Alternative 1. Under Alternatives 2 and 4, little change in impact would be seen over present conditions because most of the land clearing, waste transportation, and geologic disturbance have already occurred.

Waste management has been an integral part of the NTS operations since the establishment of the NTS in 1951. The environmental impacts related to the Waste Management Program are minor compared to those of the other programs. The issues related to waste management are waste transportation and protection of the hydrologic, geologic, and biologic resources. A summary of the issues and impacts related to these topics is presented.

Impacts from waste management activities are mostly a result of transportation of waste from other sites to the NTS. The majority of the postulated injuries and fatalities would be a result of normal traffic accidents and not a result of exposure to the transported waste. Accident scenarios that involve release of radioactive waste were factored into the risk evaluation. The DOE is committed to continue working with stakeholders and the American Indian Sovereign Nations into the future as issues arise.

Low-level waste at the Area 3 Radioactive Waste Management Site is disposed of in subsidence craters formed from past underground nuclear tests. Underground nuclear detonations create underground cavities into which the overlying soil and rock above the cavity then collapse. The final result is a crater on the surface. The craters that are and would continue to be used at the Area 3 Radioactive Waste Management Site represent the unavoidable adverse impacts that resulted from past underground nuclear tests. Use of the craters for waste disposal is a beneficial use of lands that have been significantly and unavoidably impacted by past actions. These craters have significantly altered the topography and have significantly impacted the surface drainage. Emplacement of waste in the craters and subsequent engineered closure of the cells would return portions of the surface topography to a natural grade, help to partially restore drainage patterns, and prevent the downward migration of precipitation into the waste. Additionally, recent hydrologic data support the current conceptual hydrogeologic model that no groundwater pathway exists beneath the Area 3 UE3ax/bl disposal craters.

Waste Management Program operations in Area 5 are more diverse and include facilities for hazardous and mixed waste management in addition to low-level waste management facilities. After 30 years of waste disposal operations, groundwater monitoring in wells recently completed near the Area 5 Radioactive Waste Management Site has not detected any contamination. In addition, field studies conducted to support the performance assessment models, which include monitoring of soil moisture and chloride ion concentrations, indicate that water falling on the surface (precipitation) in Frenchman Flat does not reach the groundwater. These studies and the absence of contamination support the conclusion that no groundwater pathway exists beneath the Area 5 Radioactive Waste Management Site. Thus, no impact to groundwater from waste management operations would be expected to occur. Cultural resource surveys will be performed prior to construction or expansion of any facility.

The long-term effects of waste disposal operations have been evaluated as a part of the performance assessment process. Scenarios developed in the performance assessment process are used to evaluate the potential for public exposure to radionuclides from the disposed waste. These scenarios consider transport of radionuclides by surface water and groundwater, by air, and by human intrusion pathways. Preliminary results of the Area 5 Radioactive Waste Management Site Performance Assessment (Shott et al., 1995) indicate that the risk of potential exposure to the public from waste disposal activities through surface water is not significant. Based on results of field studies, the groundwater pathway and air pathways are not considered credible transport mechanisms.

The limiting scenarios identified in the Area 5 performance assessment are the inadvertent intruder scenarios, which are postulated to occur thousands of years in the future when areas previously used for waste disposal would be inadvertently mined or farmed. The significant exposure would result from a person living on the former waste disposal site consuming food and water (assumed to be contaminated) for a lifetime. The results of this very conservative approach to estimating exposure are then used to establish design, operation, closure, and waste acceptance criteria for the waste management facilities. The performance assessment is a continuous process used to improve the design and operation of DOE waste management facilities.

Environmental Restoration Program. Environmental restoration activities would continue at varying levels of intensity under all but Alternative 2. Approximately 10,000 acres of land would be disturbed during the restoration activities under Alternatives 1, 3 and 4. After the corrective action, which would be based on potential future land uses as determined through the

Federal Facility Agreement and Consent Order process, these lands would be available for uses which may range from unrestricted public uses to various levels of restriction. Under Alternative 2, the environmental restoration activities would cease. This would result in a condition of noncompliance with environmental requirements (i.e., the Resource Conservation and Recovery Act) and limit the future use of the land.

Nondefense Research and Development. Historic environmental impacts from this program have been minimal. The most significant impact from Nondefense Research and Development would occur under Alternatives 3 and 4 and would result from the siting and construction of a Solar Enterprise Zone facility. This facility would disturb over 2,000 acres of disturbed and undisturbed habitat and require 6.2×10^6 m^3/yr (5,000 acre feet/yr) of water and would provide a net positive increase in terms of jobs and economic stability.

Work for Others. The Work for Others Program under Alternatives 1 and 3 is similar to historic activities and not expected to have significant impacts. Under Alternative 2, the program is discontinued, and under Alternative 4, the program is minimal.

A comparison of the environmental impacts of the four alternatives is summarized by resource or issue in Table 3-5. The alternatives, as described in Section 3.1, are Alternative 1, Continue Current Operations (No Action Alternative); Alternative 2, Discontinue Operations; Alternative 3, Expanded Use; and, Alternative 4, Alternate Use of Withdrawn Lands.

3.4 American Indian Overview of Environmental Impacts

As part of the consultation with the Consolidated Group of Tribes and Organizations, summary assessments and recommendations were prepared by the American Indian Writers Subgroup. The DOE has taken these CGTO recommendations under consideration. This section provides a summary of each project and a general response by the CGTO that includes at least one recommended action.

This section contains the overall and integrated responses of the Consolidated Group of Tribes and Organizations (CGTO) to five categories of actions as contained in the (1) Defense Program, (2) Waste Management Program, (3) Environmental Restoration Program, (4) Nondefense Research and Development Program, and (5) Work for Others Program. The CGTO recommends that funding be provided so that American Indians can conduct systematic studies of waste management and environmental restoration activities, and develop an American Indian public education program for the NTS.

Defense Program. *The Defense Program involves actions that range from complying with the nuclear weapons test moratorium of 1992, that precludes new underground nuclear testing, to maintaining a state of readiness to resume nuclear tests if so instructed by the President or Congress. The CGTO believes that any future nuclear testing will continue to adversely impact American Indian cultural resources. Studies have shown that nuclear testing has caused rockshelters and petroglyph panels to be destroyed when the edges of rock outcrops break off due to ground vibrations generated by the test (Stoffle, et al., 1994). Studies have also shown that plants have been removed so that roads, power lines, drill pads, and water ponds can be built as part of constructing the underground test chambers. American Indians express the opinion that some plants have been polluted due to releases of radioactivity from underground tests. American Indians also express the opinion that some plants are dying or do not flourish because they are not being prayed for ("talked to") and used in a traditional manner by American Indian people. American Indian people express concern that future underground tests will continue to crack the earth, thereby releasing radioactivity into the large underground water systems who are themselves alive, as well as being a basis for all other life and a part of the earth itself. Many American Indian people indicated that they were emotionally and spiritually troubled by ground-disturbing activities and underground nuclear tests. Even in areas where American Indian studies have occurred, there have not been studies of petroglyphs, power places, or cultural landscapes. Some areas have not been studied at*

Table 3-5. Summary comparison of environmental impacts of the alternatives (Page 1 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Land Use, Site Support Activities, Airspace			
Minimal land-use impacts would occur from continuation of current operations. All land uses would be consistent with current site and zone designations. Because of the location of the sites analyzed, and because similar land uses generally would be located on the borders of the sites, surrounding land uses would not be affected by this alternative.	Surrounding land-use impacts would be the same as those listed under Alternative 1. Closure without environmental restoration would not meet requirements of federal and state laws and signed agreements and memorandums.	Surrounding land-use impacts would be the same as those listed under Alternative 1. There would be minimal land-use impacts on site from increased intensity of operations and land-use conditions. Land uses at the Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area would be similar to Alternative 1. The new Solar Enterprise Zone facility could result in up to 2,402 acres of new land disturbance.	Potential public uses of relinquished NTS lands would be located in designated areas surrounded by buffer zones. Current defense-related designated areas would be redesignated for nondefense activities. Land uses at the Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area would be similar to those listed under Alternative 1. New Solar Enterprise Zone facility activities could occur at the NTS, Eldorado Valley, Dry Lake Valley, or Coyote Spring Valley; these activities would be compatible with existing land uses. Surrounding land-use impacts would be the same as those listed under Alternative 1. Land-use designations and zones would be incompatible with existing designations and zones.
Site support activities would continue at current levels.	Site support activities would decrease and facilities would be closed.	Site support activities and structures would be modified and expanded, as needed.	Site support activities would be reduced and facilities would be closed.
Airspace activities would be maintained at the current level of air traffic, navigational aid services, and airspace structure.	The NTS and Tonopah Test Range would experience reduced flight operations; otherwise, there would be no impacts to airspace.	Impacts to NTS airspace would be the same as those listed under Alternative 1. Minimal impacts would be experienced at the Tonopah Test Range, Central Nevada Test Area, Project Shoal Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.	Airspace impacts would be the same as those listed under Alternative 1.
Land Disturbance[a]			
10,000 acres	0 acres	21,000 acres	15,500 acres

[a]The total amount of land currently disturbed on the NTS is approximately 60,000 acres. Numbers shown represent additional estimated disturbed acreage under each alternative after 10 years (acres to be reclaimed are not included).

Table 3-5. Summary comparison of environmental impacts of the alternatives (Page 2 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Transportation (On-site, Off-site, Transportation of Materials and Waste, Other Transportation)			
Minimal on-site impacts would exist at the NTS, Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area. The NTS would average 3,370 trips per day. This would not change the level of service on affected highways and roads.	A total of 60 one-way vehicle trips per day would occur on the site. This would not change the level of service on affected highways and roads.	A total of 16,310 on-site vehicle trips per day are estimated under this alternative. No roadway would experience any significant traffic congestion. All key NTS roadways would have a capacity exceeding 2,000 vehicles per hour. Minimal impacts would be felt at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.	A total of 12,180 on-site vehicle trips per day are estimated. No roadway would experience any significant traffic congestion. All key NTS roadways have a capacity exceeding 2,000 vehicles per hour. Minimal impacts would be experienced at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.
A total of 1,480 one-way vehicle trips per day would occur off site by 2005. All key roads in the vicinity of the site would continue to operate at level of service C or better. However, while NTS-generated traffic would be relatively minimal, segments of I-15, U.S. Hwy. 95, and U.S. Hwy. 93 within metropolitan Las Vegas could deteriorate to unacceptable levels of service by 2000 because of cumulative traffic growth without state and local governmental transportation improvement projects. Minimal impacts to off-site traffic would be experienced at the Tonopah Test Range, Central Nevada Test Area, and Project Shoal Area.	A decrease over Alternative 1 of 1,480 one-way vehicle trips per day would occur off site by 2005. All key roads in the vicinity of the site would continue to operate at level of service C or better.	An increase over Alternative 1 of 1,030 one-way vehicle trips off site per day would occur by 2005. Most key roads in the vicinity of the site would continue to operate at level of service C or better. While the NTS-generated traffic would be relatively minimal, segments of I-15, U.S. Hwy. 95, and U.S. Hwy. 93 within metropolitan Las Vegas could deteriorate to unacceptable levels of service by 2000 because of cumulative traffic growth without state and local governmental transportation improvement projects.	A decrease from Alternative 1 of 610 one-way vehicle trips off site per day would be experienced by 2005. All key roads in the vicinity of the site would continue to operate at level of service C or better. However, while the NTS-generated traffic would be relatively minimal, segments of I-15, U.S. Hwy. 95, and U.S. Hwy. 93 within metropolitan Las Vegas could deteriorate to unacceptable levels of service by 2000 because of cumulative traffic growth without state and local governmental transportation improvement projects.
Approximately 350,000 m^3 (457,783 yd^3) of low-level waste and 50,000 m^3 (65,398 yd^3) of mixed waste would be generated on and off the site in a 10-year period.	Minimal generation of materials and waste would occur under Alternative 2.	Approximately 100,000 m^3 (130,795 yd^3) low-level waste and 300,500 m^3 (393,039 yd^3) of mixed waste would be generated on and off the site in a 10-year period.	Approximately150,000 m^3 (196,193 yd^3) of low-level waste and 500 m^3 (654 yd^3) of mixed waste would be generated on and off the site in a 10-year period.
Transportation risks along the entire route for low-level radioactive and mixed waste during the 10-year study period from vehicular accidents is expected to be 2 fatalities and 27 injuries. Latent cancer fatalities associated with this level of radioactive waste transport for the 10-year study period would be 0.0025. There would be no impact on direct use of local railroads, air transportation, or other modes of transportation.	There would be no impact on direct use of local railroads, air transportation, or other modes of transportation.	Risks associated with transporting radioactive waste would increase to 8 vehicle-related fatalities, 103 injuries, and 0.075 latent cancer fatality over the 10-year period of study. Minimal impacts would occur on direct use of local railroads, air transportation, or other modes of transportation.	No off-site transportation of radioactive materials and waste would occur. There would be minimal impacts on direct use of local railroads, air transportation, or other modes of transportation.

Table 3-5. Summary comparison of environmental impacts of the alternatives (Page 3 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Socioeconomics (Economic Activity, Population, and Housing)			
Total direct employment would be approximately 6,600 in 2005. Unemployment rate: Clark County, 5.8% Nye County, 5.2%. Total personal income in 2005: Clark County, $32,280,885,000 Nye County, $780,701,000. Population in 2005: Clark County, 1,380,920 Nye County, 38,516. Housing demand in 2005: Clark County, 539,422 Nye County, 14,435.	A decrease from Alternative 1 of 6,490 direct jobs in 2005 would occur under Alternative 2. Unemployment rate increase over Alternative 1 in 2005: Clark County, +1.9% Nye County, +2.5%. Total personal income decrease in 2005 from Alternative 1: Clark County, ($884,676,000) Nye County, ($44,609,000). Population decrease from Alternative 1 in 2005: Clark County, -7,946 Nye County, -583. Housing demand decrease from Alternative 1 in 2005: Clark County, -2,928 Nye County, -218.	An increase over Alternative 1 of approximately 4,550 direct jobs in 2005 would occur under Alternative 3. Unemployment rate decrease from Alternative 1 in 2005: Clark County, -1.1% Nye County, -0.05%. Total personal income increase in 2005 over Alternative 1: Clark County, +$632,638,000 Nye County, +$31,457,000. Population increase over Alternative 1 in 2005: Clark County, +10,020 Nye County, +656. Housing demand increase over Alternative 1 in 2005: Clark County, +3,914 Nye County, +246.	A decrease from Alternative 1 of approximately 2,750 direct jobs in 2005 would occur under Alternative 4. Unemployment rate increase over Alternative 1 in 2005: Clark County, +1.1% Nye County, +1.7%. Total personal income decrease in 2005 from Alternative 1: Clark County, ($374,608,000) Nye County, ($18,833,000). No substantial employment level would be triggered; therefore, population and housing demand would not change when compared to Alternative 1.
Geology and Soils			
Testing impacts would include ground motion hazards and secondary seismic effects, soil contamination, alteration of natural drainage paths, and decreased surface stability. Impacts from other activities would include dust creation, soil contamination, and an increase in erosion potential. There would be minimal impacts at the Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area.	Discontinuing operations would result in no additional impacts to geology and soils. However, the media that have been contaminated or altered by underground nuclear test would as in alternatives remain unavailable for unrestricted use. No surface areas contaminated by past activities would be remediated and any present access restrictions based on contamination would continue.	Impacts would be the same as those listed under Alternative 1. Minimal impacts would be experienced at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.	Impacts would include dust creation, soil contamination, and an increase in erosion potential. Minimal impacts would occur at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.

Table 3-5. Summary comparison of environmental impacts of the alternatives (Page 4 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Hydrology (Surface Hydrology and Groundwater)			
There would be minimal potential impact from the alteration of existing drainage paths caused by testing.	There would be no new impacts to surface hydrology.	There would be minimal potential impacts from alteration of natural drainage paths caused by new construction.	There would be minimal potential impacts from alteration of natural drainage paths caused by new construction.
Total effects from continuing groundwater withdrawals are expected to be minor. Local effects to the Yucca Flat Basin could be substantial if the annual water demand exceeds the basin's perennial yield.	Water demand would be reduced to that required for environmental monitoring and for potable water for the caretaker workforce.	Because of new program activities other potential impacts would be increased slightly over those listed under Alternative 1. However, the Solar Enterprise Zone has been estimated to require up to 6.8 x 10^6 m^3/yr (5,550 ac-ft/yr) of water. Local effects to the affected basin such as those near Dry Lake Valley could be substantial if the annual water demand exceeds the perennial yield of the basin. Increased waste quantities would not result in impacts.	Other potential impacts generally would be the same as those listed under Alternative 1 except at a decreased level. However, the Solar Enterprise Zone has been estimated to require up to 6.8 x 10^6 m^3/yr (5,550 ac-ft/yr) of water. Local effects to the affected basin such as those near Dry Lake Valley could be substantial if the annual water demand, were to exceed the perennial yield of the basin.
There could be localized impacts related to underground tests conducted under or near the water table. Monitoring has revealed few instances of migration of radionuclides beyond the near test environment. No impacts are anticipated from waste management activities. Other potential quality impacts would be minimal. Minimal impacts would occur at the Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area.	Contaminated areas would not be restored, resulting in continued possibility of groundwater contamination.	Minimal impacts would be experienced at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.	Minimal impacts are expected at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.
Biological Resources			
Approximately 7,360 acres of generally undisturbed habitat would be disturbed, primarily in support of the Environmental Restoration Program at the NTS, Tonopah Test Range, and Central Nevada Test Area. This would represent approximately 1 percent of total undisturbed habitat in these areas. There would be minimal impact to desert tortoise population viability and on biodiversity or ecosystem functions.	There would be no effect on undisturbed natural habitat. Discontinuation of man-made water sources would change the distribution of horses, deer, and chukar. However, there would be no sitewide ecosystem impacts.	Approximately 10,420 acres of generally undisturbed habitat would be disturbed, primarily in support of the Environmental Restoration Program at the NTS, Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area. This would represent an increase of 3,060 acres over Alternative 1. A portion of this area (3,015 acres) could be desert tortoise habitat. The Solar Enterprise Zone could minimally impact biodiversity or ecosystem functions at Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley. Coyote Spring Valley lies within critical habitat for the desert tortoise.	Approximately 9,275 acres of generally undisturbed habitat would be disturbed, primarily for the Environmental Restoration Program and the Solar Enterprise Zone at NTS. The NTS, Tonopah Test Range, Central Nevada Test Area, and Project Shoal Area impacts would generally be the same as those listed under Alternative 1. The Solar Enterprise Zone could minimally impact biodiversity or ecosystem functions at all sites and areas. Coyote Spring Valley lies within critical habitat for the desert tortoise.

Table 3-5. Summary comparison of environmental impacts of the alternatives (Page 5 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Air Quality and Radiological Air Quality			
Pollutant emissions from stationary and mobile sources would be generated on site and off site. These emissions would be dispersed over a wide area. No major air emission sources are planned. Pollutant concentrations related to NTS activities would be well below ambient air quality standards. No substantial increases in air pollution are expected by 2005 and Nye County would continue its present attainment designation for all criteria pollutants. No additional violations of air quality standards would be provided in the nonattainment area of Clark County. The region is expected to conform with the applicable State Implementation Plan for all National Ambient Air Quality Standards (NAAQS). Radiological air quality impacts would not reach the maximum CAP-88 air dose assessment modeled dose. Impacts would be minimal.	Pollutant emissions associated with stationary sources would be essentially eliminated following discontinuance of operations, and mobile source emissions would be substantially reduced. Radiological air quality impacts would be the same as those listed under Alternative 1.	Impacts would be the same as those listed under Alternative 1. Pollutant concentrations related to NTS activities, though higher than the Alternative 1, would remain below ambient air quality standards. Selected values for two pollutants of concern are PM_{10} : 600 tons/ year; less than one percent of regional burden. CO_2 : 224 tons/year of which 90 tons/year would be in the Las Vegas Valley; less than 0.2 percent of Clark County emissions.	Impacts would be the same as those listed under Alternative 1. Pollutant concentrations related to NTS activities would be lower than those of Alternative 1. All pollutants would remain below ambient air quality standards.
Noise			
Transportation noise levels on site would be minimal and would not produce any noise impacts off site. Temporary noise impacts from construction-related noise would occur within the immediate vicinity of construction sites. Noise impacts would be negligible because the sites are located within remote areas. No sensitive receptors are close to construction areas. Noise from other activities would decrease with distance and would be barely distinguishable from background noise levels.	A minor amount of noise would result from operations vehicles. Other noise levels would be a result of noises typically found in uninhabited desert areas.	Impacts would be the same as those listed under Alternative 1.	Impacts would be the same as those listed under Alternative 1, except for the Defense Program, which would have the same impacts as Alternative 2.
Visual Resources			
New land disturbance would be located in areas of scenic quality common to the region, but none would be visible from any public viewpoints. Although there would be short-term, local adverse effects because of environmental restoration, there would be long-term beneficial effects because of revegetation.	There would be little change in the overall appearance of the existing landscape.	Most new land disturbance would be located in areas of scenic quality common to the region. However, the areas proposed for the Solar Enterprise Zone facility in Eldorado Valley, Dry Lake Valley, or Coyote Spring Valley have a high visual sensitivity because they cross major highways. Furthermore, Coyote Spring Valley has extensive panoramic views of linear mountain ranges and valleys.	There would be slight changes in the overall appearance of the existing landscape. New ground disturbance would be located in areas of scenic quality common to the region, but none of these areas would be visible from any public viewpoints. The impacts of the Solar Enterprise Zone would be the same as those listed under Alternative 3.

Table 3-5. Summary comparison of environmental impacts of the alternatives (Page 6 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Cultural Resources			
There would be impacts to cultural resources as a result of ground disturbing activities resulting from construction of new facilities, utilities, road upgrades, and decommissioning of existing buildings. Continued visitation and vehicular traffic could indirectly affect recorded archaeological sites and archaeologically sensitive areas. The precise location of these resources is unknown until archaeological survey is conducted. Surveys will be conducted prior to any ground disturbing activities. Modification of existing buildings would include an evaluation of their historic significance, especially in relation to Cold War/nuclear development themes, to minimize impacts. According to the CGTO, under Alternative 1, access to American Indian culturally significant places would continue to be reduced. The potential would exist for unauthorized artifact collection and culturally inappropriate environmental restoration techniques.	Discontinuance of activities would eliminate most impacts to cultural resources. The degree of impact to American Indian cultural sites, as stated by the CGTO, would be less than that associated with Alternative 1.	The amount of acreage disturbed as a result of activities described for Alternative 3 would double as compared to Alternative 1. Approximately 20,930 acres of ground disturbance are anticipated. Construction of new facilities, wells, utilities roads, and burial of contaminated soils may affect cultural resources. Large-scale activities associated with the Solar Enterprise Zone facility could affect cultural resources. Modification of existing buildings would include an evaluation of their historic significance, especially in relation to Cold War/nuclear development themes, to minimize impacts. According to the CGTO, under Alternative 3, access to American Indian culturally significant places would continue to be reduced. Increased visits by students and researchers who collect artifacts, visit sacred areas, and remove plants or animals, and the scraping of land would affect American Indian cultural resources.	Most impacts would be the same as those listed under Alternative 3. Access impacts, according to the CGTO, for American Indians would be less than that experienced under Alternative 1. However, the potential for unauthorized artifact collection would be increased from Alternative 1 because of increased public access.
Land Use Land Zone Areas			
1. Nuclear Test Zone (includes Areas 19 and 20) - 1,120 km² (435 mi²) 2. Nuclear and High Explosive Zone - 180 km² (70 mi²) 3. Research, Test, and Experiment Zone - 45 km² (20 mi²) 4. Radioactive Waste Management Zone - 5 km² (2 mi²) 5. Yucca Mountain Site Characterization Zone (within NTS boundary) - 225 km² (90 mi²) 6. Critical Assembly Zone - 130 km² (50 mi²) 7. Spill Test Impact Zone (within NTS boundary - 15 km² (5 mi²) 8. Reserved Zones on NTS (within NTS boundary) - 1,775 km² (685 mi²)	1. Yucca Mountain Site Characterization Zone (within NTS boundary) 225 km² (87 mi²) 2. Monitored/Restricted Zone (within NTS boundary) - 3,255 km² (1,260 m²)	1. Nuclear Test Zone (includes Areas 19) - 705 km² (275 mi²) 2. Nuclear and High Explosive Zone - 381 km² (147 mi²) 3. Research, Test, and Experiment Zone - 575 km² (222 mi²) 4. Radioactive Waste Management Zone - 5 km² (2 mi²) 5. Yucca Mountain Site Characterization Zone (within NTS boundary) - 225 km² (90 mi²) 6. Solar Enterprise Zone - 34 km² (13 mi²) 7. Spill Test Impact Zone (within NTS boundary - 15 km² (5 mi²) 8. Defense Industrial Zone - 170 km² (65 mi²) 9. Reserved Zones on NTS (within NTS boundary) - 1,375 km² (530 mi²)	1. Non-Defense Research/Development/Testing Zone (includes Areas 19 and 20) - 1,295 km² (500 mi²) 2. Radioactive Waste Management Zone - 5 km² (2 mi²) 3. Yucca Mountain Site Characterization Zone (within NTS boundary) - 225 km² (90 mi²) 4. Solar Enterprise Zone - 35 km² (13 mi²) 5. Spill Test Impact Zone (within NTS boundary) - 15 km² (5 mi²) 6. Reserved Zones (within NTS boundary) - 1,310 km² (505 mi²) 7. Potential Turnback Area (includes Area 22 Solar Enterprise Zone) - 610 km² (235 mi²)

NOTE: CGTO = Consolidated Group of Tribes and Organizations.

Table 3-5. Summary comparison of environmental impacts of the alternatives (Page 7 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Occupational and Public Health and Safety (Routine and Accident Operations)			
The health impacts to workers due to occupational exposure and accidents could result in a probability of 1 in 8 of a single latent cancer fatality and 1 in 21 of a single other detrimental health effect in the worker population. The risk of life-threatening noncarcinogenic effects on workers involved with an accidental release of hazardous chemicals has a hazard index of 0.58.	The health impacts to workers due to occupational exposure and accidents could result in a probability of 1 in 47 of a single latent cancer fatality and 1 in 120 of any other detrimental health effect in the worker population. The risk of life-threatening noncarcinogenic effects on workers involved with an accidental release of hazardous chemicals has a hazard index of 0.48.	The health impacts to workers due to occupational exposure and accidents could result in a probability of 1 in 8 of a single latent cancer fatality and 1 in 20 of any other detrimental health effect in the worker population. The risk of life-threatening noncarcinogenic effects on workers involved with an accidental release of hazardous chemicals has a hazard index of 2.4.	The health impacts to workers due to occupational exposure and accidents could result in a probability of 1 in 13 of a single latent cancer fatality and in 1 in 30 of any other detrimental health effect in the worker population. The risk of life-threatening noncarcinogenic effects of workers involved with an accidental release of hazardous chemicals has a hazard index of 0.58.
Health impacts to the public from accidental release of radionuclides could result in a probability of 1 in 18,000 of a single latent cancer fatality and 1 in 40,000 of any other detrimental health effect in the population within 50 miles. Potential public exposure to accident release of hazardous chemicals could result in a probability of 1 in 4,000 of a single incidence of cancer in the population. No noncarcinogenic detrimental health effects are expected.	Health impacts to the public from accidental release of radionuclides could result in a probability of 1 in 20,000 of single latent cancer fatality and 1 in 50,000 of any other detrimental health effect in the population within 50 miles. Potential public exposure to accidental release of hazardous chemicals could result in probability of 1 in 50,000 of a single incidence of cancer in the population. No noncarcinogenic detrimental health effects are expected.	Health impacts to the public from accidental release of radionuclides could result in a probability of 1 in 18,000 of a single latent cancer fatality and 1 in 40,000 of any other detrimental health effect in the population within 50 miles. Potential public exposure to accidental release of hazardous chemicals could result in a probability of 1 in 4,000 of a single incidence of cancer in the population. No noncarcinogenic detrimental health effects are expected.	Health impacts to the public from accidental release of radionuclides could result in a probability of 1 in 20,000 of a single latent cancer fatality and 1 in 43,000 of a single other detrimental health effect in the population within 50 miles. Potential public exposure to accidental release of hazardous chemicals could result in a probability of 1 in 4,000 of a single incidence of cancer in the population. No noncarcinogenic detrimental health effects are expected.
Potential accidental venting of radionuclides from an underground test could result in a probability of 1 in 180 of a single latent cancer fatality and 1 in 400 of any other detrimental health effect in the population within 50 miles.		Potential accidental venting of radionuclides from an underground test could result in a probability of 1 in 180 of a single latent cancer fatality and 1 in 400 of a single other detrimental health effect in the population within 50 miles.	
The maximum reasonably foreseeable radiological accident has a probability of 1 in 10 million years and involves a non-nuclear explosion in a nuclear weapons storage bunker at Area 27. This accident could result in public impacts of 3 to 55 latent cancer fatalities and 1 to 25 other detrimental health effects.	The maximum reasonably foreseeable radiological accident has a probability of 1 in 10 million years and involves a failure of an artillery-fired test assembly at the Tonopah Test Range. This accident would result in only small fractional increases in the probability of latent cancer fatality or other detrimental health effects in the offsite population.	The maximum reasonably foreseeable radiological and chemical accidents are the same as for Alternative 1.	The maximum reasonably foreseeable radiological accident has a probability of 1 in 2 million years and involves an airplane crash into the Area 5 transuranic waste storage unit. This accident could result in public impacts of 1 to 13 latent cancer fatalities and 0 to 6 other detrimental health effects.
The maximum reasonably foreseeable chemical accident has a probability of 1 in 10 million years and involves an airplane crash into the Spill Test Facility. This accident could result in 0 to 3 latent cancers in the offsite population, but no noncancer health effects would be expected.	The maximum reasonably foreseeable chemical accident has a probability of 1 in 13,000 years and involves a multi-container fire at the Area 5 hazardous waste storage unit. This accident would result in only small fractional increases in the probability of latent cancer in the offsite population, and no noncancer health effects would be expected.		The maximum reasonably foreseeable chemical accident is the same as for Alternative 1.
Environmental Justice			
American Indian impacts would only consider American Indian groups and would, therefore, be disproportionately high according to the CGTO's method of defining impacts.	Impacts would be the same as those listed under Alternative 1.	Impacts would be the same as those listed under Alternative 1.	Impacts would be the same as those listed under Alternative 1.

all. It is not possible to completely assess the potential impacts of future underground tests on these cultural resources.

Another major component of the Defense Program involves expanding stockpile management responsibility, storage and disposal of weapons-useable fissile materials, and counterproliferation research and development. The CGTO believes American Indians lack sufficient information and understanding of these issues to make a complete assessment of their impacts on cultural resources. Some observations can be made at this time. The NTS is a holy area that is central to these American Indian people. In general, the more fearful activities that occur here and the more ground disturbance that occurs, the more cultural risks will be involved if American Indian people use these lands. The more such activities occur on these lands, the longer and more difficult it will be to restore these lands to their natural condition.

***Waste Management Program.** The storage of low-level and mixed waste generated by the DOE will be an ongoing responsibility regardless of which EIS alternative is selected. This program minimally involves the storage of existing waste and waste generated during the environmental restoration of NTS lands. Under Alternative 3, waste could be received from any DOE-approved facility, which would cause current NTS waste disposal locations to be filled and new waste facilities to be sited and operated. American Indian people hold both traditional and scientific views of radioactivity. The former builds on the view that rocks are alive; radioactive rocks are powerful, but they can become "angry rocks" if they are removed without proper ceremony, used in a culturally inappropriate way, disposed of without ceremony, and placed where they don't want to be (Stoffle, et al., 1989; Stoffle, et al., 1990). Another issue is the ethics of agreeing to receive radioactive waste from other Native American lands so those people can live without fear of radioactivity (see Project Chariot, DOE/NV, 1994). In general, after properly removed rocks have been used, they are either returned to their place of origin or to a place of cultural significance. The practice of dealing with "bad medicine" or neutralizing negative forces was a part of the traditional culture. So, the question of "how to dispose of radioactive waste in a culturally appropriate manner" could be resolved if the time and resources were provided for American Indian people to participate in a formal study of this issue. American Indian people have not studied the cultural impacts of siting any of the existing waste facilities. So, American Indian people would like to become a part of a retrospective assessment of these facilities, as well as to participate in the assessment of siting all new waste facilities.*

***Environmental Restoration Program.** The Environmental Restoration Program involves actions that would return disturbed land to its natural condition. Up to 1,800 monitoring wells and access roads are a part of this effort. All alternatives involve some environmental restoration and monitoring; however, Alternative 3 would require more restoration because it would disturb more land. American Indian people believe that the natural condition of the land existed before 1492 when the Europeans arrived. The land was in a natural condition when it was managed and used by American Indian people. For example, American Indian plant management techniques involved spiritual interactions like praying and conducting ceremonies for the plants, as well as physical actions like selective burning, transplanting cuttings and seeds, pruning of plants like Tumar (Stanleyappinnata) and willow, and "whipping" pine nut trees to make them fuller. American Indian water management techniques involved spiritual interactions that satisfied the water and its occupants like Water Babies, who need to know why American Indian people are using the water. Water ceremonies assured both rain and snowfall, for example, by praying for a continued relationship between wet snow and the little black bugs who are responsible for making the snow become wet. Generally, American Indian people managed the land according to religious teachings. From the American Indian perspective, environmental restoration should proceed according to American Indian culture and with the participation of American Indian people.*

***Nondefense Research and Development Program.** There is a variety of planned actions considered within this category. Many of these are related to* *the National Environmental Research Park, which permits universities and other federal agencies to conduct research. Other projects involve testing alternative vehicle fuels, testing techniques for handling chemical spills, and building alternative energy generators like solar collectors. American Indian people view each of these as potentially impacting cultural resources. More cars potentially endanger the desert tortoises. University students studying biology may find and collect arrowheads or remove plants that are significant to American Indian people. Solar collectors involve scraping the land. American Indian people believe they should be involved in assessing the impacts of all these proposed actions.*

Only American Indian people know which places are appropriate for visits by non-Indian people and how to collect plants, animals, and soil samples so they do not disrupt the land and its associated spirituality. Only American Indian people can provide guidance for proper behavior; however, a guidance document has not been collectively produced and approved by the CGTO. On the other hand, with proper guidance by American Indian people, university students and other members of the public may learn about the beauty and cultural significance of these lands and begin to change national perceptions of these lands from one as a wasteland to one as an American Indian holy land.

Work for Others Program. *This program contains two major subcategories of activities: the Conventional Weapons Demilitarization Program and Defense-related Research and Development Program. The first program involves the shipment, storage, disposal, and destruction of conventional weapons. The second program involves military training exercises and weaponry tests.*

The CGTO, in principle, approves of the Conventional Weapons Demilitarization Program, because world peace will reduce the need to use the NTS for nuclear weapon production, storage, assembly, and testing. On the other hand, the CGTO believes that if the NTS becomes the place where most or all weapons are stored, disassembled, and disposed, then the NTS lands will be polluted. The presence of conventional and nuclear weapons defines the NTS as a place of destruction, which promotes an image that is inappropriate for a place for peaceful relations between American Indian ethnic groups.

The CGTO knows from past experience, but not formal study, that military training exercises and weaponry tests can adversely impact cultural resources. Military people move across the land on foot and in vehicles without either the time or the purpose to pay attention to the plants that are being crushed, the animals that are being dislocated, or the archaeology materials underfoot. Cultural resources are damaged when conventional weapons are fired nearby. Often, geographically distinctive power places, like the big white rock near Rattlesnake Ridge, are targeted without regard or knowledge of their cultural significance. Without a formal study, the exact impacts of military training exercises will not be fully understood.

3.5 Summary of American Indian Responses to the NTS Action Alternatives

The response of the CGTO to the four alternatives proposed for NTS and discussed site-by-site in the previous paragraphs can be summarized as follows:

Alternative 1: Continue Current Operations. *Under this alternative, the DOE will continue with its current operations and interagency project activities in each of the programs listed above. There will be little or no change planned for the future mission of NTS. To this effect, the CGTO opposes Alternative 1 because of our strong cultural ties to the land. NTS operations have adversely impacted the land, causing irreparable damage to traditional resources. If NTS operations continue, it is expected that damage will be increased and more land will be wasted. Access to culturally significant spiritual places and use of animals, plants, water, and lands may cease because Indian people's perception of health and spiritual risks will increase if nuclear weapon testing, assembly, storage, disassembly, and disposal continues. Nondefense programs are expected to cause adverse impacts if these produce* *more ground disturbance or if they bring people who trample and destroy traditional resources.*

Alternative 2: Discontinue Operations and Decommission. *Under this alternative, all current and planned programs, activities, and operations would be discontinued. Only activities conducted in support of decommissioning, radiation monitoring, and security functions necessary for human health, safety, and security would be maintained. Environmental restoration would not be done. All defense and nondefense programs would be discontinued. Inactive waste disposal sites would be abandoned. Only a minimum of low-level radioactive and mixed waste disposal capacity would be maintained to support closure of the NTS.*

The CGTO supports Alternative 2 because it would allow the land to heal and perhaps return to its natural condition. The CGTO recommends that an evaluation of areas that can be restored for human use be made and that environmental restoration activities be included in this alternative. Access to culturally significant places should be allowed. The DOE should continue to protect all cultural resource sites.

Alternative 3: Expanded Use. *Under this alternative, expanded use of the NTS and its resources would be made to support national programs for both defense and nondefense. Current defense programs would continue, and a variety of defense-related projects currently under consideration would be pursued. Waste management operations would increase and storage/disposal areas expanded. Waste transportation would be increased as well. Environmental restoration and research and development activities would continue and expand. A solar-energy production facility would be built.*

The CGTO opposes Alternative 3 because of our strong cultural ties to the land. Under expanded use, it is expected that the continuation and expansion of current operations as well as the implementation of additional defense and nondefense project activities and programs would irreparably damage American Indian cultural resources present at the NTS. Expansion of NTS operations would conceivably require use of land that is yet untouched, and would worsen the risk of radioactive contamination. Potentially, Native American access to resources and sacred sites would be even more restricted. Expanded use would be detrimental for the socioeconomic development and health of Indian communities.

Alternative 4: Alternate Use of Withdrawn Lands. *This alternative will evaluate the impacts associated with locating new programs and project activities at the NTS, including nondefense research and development programs, expansion of the liquefied gaseous fuel spill test facility in Area 5, and various types of personnel training for locating, containing, handling, or transporting hazardous material, radioisotopes, fuels, explosives, and other material. Under this alternative, waste management operations, waste-generating operations, and ongoing NTS environmental restoration activities would continue. However, the DOE would not maintain a state of readiness for nuclear testing at the NTS. The NTS would be opened for unprecedented public access to some of the most remote areas, including areas that contain American Indian rock shelters, archaeological sites, and petroglyphs. Education and recreational activities would be pursued. The potential for turning back lands to the public domain would depend upon the ability to achieve established clean up and safety levels.*

The CGTO tentatively supports Alternative 4 with reservations regarding certain components of this alternative. Aside from the concerns already expressed regarding waste-related pollution and ground disturbance, the CGTO expects that opening the NTS to the public will adversely impact traditional resources, particularly petroglyphs, archaeological sites, and rock shelters, because of their appeal as tourist attractions. Heavy traffic will trample plants, hurt animals, limit American Indian access to sacred sites and power places, and interfere with traditional practices.

The CGTO would like to have the right of first refusal in the event that the NTS lands are turned back to public use.

3.6 Identification of the Preferred Alternative

The DOE Preferred Alternative is Alternative 3, Expanded Use, plus the public education activities from Alternative 4. The Expanded Use Alternative represents a continuation of the multipurpose, multi-program use of the site, and further represents a continuation and diversification of the DOE/NV and interagency programs and operations at the NTS. The Expanded Use Alternative includes support for ongoing DOE/NV program categories defined in Alternative 1, Continue Current Operations (No Action), and also provides for increased use of the NTS and its resources and capabilities. This alternative would also make the NTS more available to both public and private institutions for purposes of demonstrating new technologies.

Public education activities from Alternative 4 include establishing educational tour routes on the NTS and promoting the concept of creating a nuclear era museum that highlights the NTS testing activities. Tours would allow the public to see firsthand some of the history and impacts of past nuclear testing. These activities would be an important contribution to public understanding of the nation's nuclear testing and Cold War history.

The Draft NTS EIS pointed out that the use the DOE ultimately selected as the Preferred Alternative might not be a single NTS EIS alternative in its entirety, but rather a hybrid created by selecting specific options from among the various alternatives described. This approach was the starting point in the process of identifying the Preferred Alternative. Initially, the universe of activities included under any of the alternatives, by program, were combined and subjected to a process of elimination. This Preferred Alternative identification process began concurrently with the public hearings on the Draft EIS and continued through the comment response process and review of the Final NTS EIS.

The criteria used for eliminating various activities from the combined alternatives were: inconsistency with strategic planning, failure to fulfill statutory mission responsibilities, public concern and perceptions, incompatibility of uses, and consideration of pending programmatic analyses and decisions. Appendix A, *Descriptions of Projects and Activities*, was used extensively in this process for detailed descriptive information. The result of this process was the identification of Alternative 3, Expanded Use, as the most comprehensive alternative in terms of supporting statutory mission responsibilities and providing for a diversification of use to include nondefense, interagency, public and private uses. The Expanded Use Alternative was generically identified in the original Notice of Intent for the NTS EIS; however, the specific nature of the Expanded Use Alternative was not fully realized, nor was its comprehensiveness appreciated by the DOE, until this systematic process was applied.

The Preferred Alternative identification process also led to better programmatic definition of the alternatives in general. In the case of potential activities resulting from other DOE Programmatic EISs, Alternative 3 now states clearly that the specific action contemplated under this alternative is to reserve land and infrastructure pending a programmatic decision. This realistically identifies the nature of the decisions to be made based on the NTS EIS with respect to activities that are currently under programmatic review. Other clarifications include the description of potential public uses of NTS lands in Alternative 4. This concept, in the Draft NTS EIS, was incorrectly described as limited to potential uses of relinquished NTS lands. However, the lands analyzed for potential return to the public were not the only lands on which public education or recreation activities could occur. In the Preferred Alternative process, public education activities were identified as another form of public use. Although this activity is not included in the Expanded Use Alternative, this aspect of Alternative 4 was chosen for inclusion in the Preferred Alternative.

In the Preferred Alternative identification process, the land use zones and maps in the Draft NTS EIS were also considered. Several rezoning concepts were considered in response to concerns that the land use maps would restrict nondefense research use of the site. Rather than adjust boundaries and create additional land use zones and definitions, the definitions of land use categories were amended slightly to include compatible defense and nondefense use in almost every zone of the NTS. As defined in Alternative 3, Expanded Use, only the Defense Industrial Zone is restricted to defense-related activities.

The process of DOE approval of the Preferred Alternative began with the recommendation of the Nevada Operations Office to DOE Headquarters. The DOE continued to consider the Preferred Alternative process, public comments, and comment responses in the preparation of the Final NTS EIS. In this stage of the Preferred Alternative identification process, the various affected program offices considered public comments received with regard to their statutory mission responsibilities. Only after the program offices had concluded that the comments were adequately addressed in the comment response document did they recommend approval of the preferred alternative and the Final NTS EIS to the Secretary of Energy.

3.7 References

REGULATION, ORDER, LAW

40 CFR Parts 1501-1508	U.S. Environmental Protection Agency (EPA), "National Environmental Policy Act (NEPA) and Agency Planning: Council on Environmental Quality," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
60 FR 40164	U.S. Department of Energy (DOE), "Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada," *Federal Register*, Vol. 60, No. 151, Washington, DC, 1995.
NWPA, 1983	Nuclear Waste Policy Act, "Nuclear Waste Policy Act of 1982," Public Law 97-425, 42 U.S.C. 10101-10226, U.S. Government Printing Office, Washington, DC, 1983.

GENERAL

Church et al., 1990	Church, B.W., D.L. Wheeler, C.M. Campbell, and R.V. Nutley, "Overview of the Department of Energy's Off-Site Radiation Exposure Review Project (ORERP)," *Health Physics*, Vol. 59, No. 5, pp. 503-510, 1990.
Daniels et al., 1993	Daniels, J.I., R. Andricevic, L.R. Anspaugh, and R.L. Jacobson, "Risk-Based Screening Analysis of Ground Water contaminated by Radionuclides Introduced at the Nevada Test Site (NTS)," in the *Pilot Study Risk Assessment for Selected Problems at the Nevada Test Site (NTS)*, Lawrence Livermore National Laboratory, UCRL-LR-113891, 1993.
DOE, 1994	U.S. Department of Energy (DOE), *Nevada Test Site Environmental Restoration Sites Inventory 1994 Annual Status Report (Draft), Vols I, II, III & IV*, Las Vegas, NV, 1994.
DOE/NV, 1994	DOE, *Nevada Environmental Restoration Project, Project Chariot Site Assessment and Remedial Action Final Report*, DOE/NV-368, Las Vegas, NV, 1994.
ERDA, 1977	*Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada*, ERDA-1551, Las Vegas, NV, 1977.
GeoTrans, 1995	GeoTrans, Inc., 1995a. *A Stochastic Advective-Dispersive Transport Code for a Multiple Constituents in Dual Porosity or Fractured Geological Media*, prepared for DOE/NV, Las Vegas, NV, 1995.
Gesella and Voilleque, 1990	Gesella, T.F. and P. S. Voilleque (eds.), "Evaluation of Environmental Radiation Exposures from Nuclear Testing in Nevada: A Symposium," *Health Physics*, Vol. 59, No. 5, pp. 501-502, 1990.
SAIC/DRI, 1991	Science Applications International Corporation/Desert Research Institute, *Special Nevada Report*, U.S. Air Force, Tactical Fighter Weapons Center, Office of Public Affairs, Nellis Air Force Base, Las Vegas, NV, 1991.

Shott et al., 1995	Shott, G.J., C.J. Muller, L.E. Barker, D.E. Cawlfield, F.T. Lindstrom, D.G. Linkenheil, M.J. Sully, D.J. Thorne, and L. McDowell-Boyer, *Performance Assessment for the Area 5 Radioactive Waste Management Site at the Nevada Test Site, Nye County, NV,* Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV, 1995.
Stoffle et al., 1989	Stoffle, R.W., M.J. Evans, and C. Harshbarger, *Native American Interpretation of Cultural Resources in the Area of Yucca Mountain, Nevada,* Interim Report, Institute for Social Research, University of Michigan, Ann Arbor, MI, 1989.
Stoffle et al., 1990	Stoffle, R.W., J.E. Olmstead, and M.J. Evans, *Literature Review and Ethnohistory of Native American Occupancy and Use of the Yucca Mountain Region,* Institute for Social Research, University of Michigan, Ann Arbor, MI, 1990.
Stoffle, et al., 1994	Stoffle, R.W., M.J. Evans, D.B. Halmo, M.E. Dufort, and B.K. Fulfrost, *Native American Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site,* Desert Research Institute Technical Report No. 84, BARA, University of Arizona, Tucson, AZ, 1994.

Chapter 4

AFFECTED ENVIRONMENTS

CHAPTER 4
AFFECTED ENVIRONMENTS

This chapter contains the description of the existing environmental conditions of the Nevada Test Site (NTS), the Tonopah Test Range, portions of the Nellis Air Force Range (NAFR) Complex, the Project Shoal Area, the Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley (Figure 4-1). During Environmental Impact Statement (EIS) preparation, the most up-to-date and accurate information available was used to describe existing environments, facilities, activities, and projects. The information serves as a baseline from which to identify and evaluate environmental changes resulting from the proposed alternatives. The baseline conditions, for the purposes of analysis, are the conditions that currently exist. The regions of influence vary, as dictated by the resources under consideration. For some discussions, such as site-support activities, the regions of influence are limited to the areas circumscribed by each U.S. Department of Energy (DOE) administrative boundary. For other topics, such as transportation, groundwater, and air quality, the regions of influence are much larger and may include all of southern Nevada, as well as portions of Utah, Arizona, and California.

The environmental resources discussed in this chapter include land use, geology and soils, hydrology, biology, air quality, noise, and visual and cultural resources. Where applicable, this chapter also describes existing waste management facilities and other resource elements, including airspace, site-support activities, transportation, socioeconomics, occupational and public health and safety, radiological conditions, and Environmental Justice.

The discussions of the DOE administrative units are organized according to their relative geographic proximity to one another. Because the NTS and the NAFR Complex share a boundary and because the units of interest are within 97 km (60 mi) of each other, they are discussed together in the next section. The Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley are discussed separately in subsequent sections.

4.1 Nevada Test Site and Surrounding Areas

The existing environmental conditions of the NTS and portions of the NAFR Complex are described in this section. The portion of the NAFR Complex that is described is limited to Area 13.

The NTS, a unique national resource managed by the U.S. Department of Energy, Nevada Operations Office (DOE/NV), is located about 105 km (65 mi) northwest of Las Vegas. The 3,496 km^2 (1,350 mi^2) site features desert and mountainous terrain and is larger than Rhode Island, making it one of the largest secured areas in the United States. The NTS is in a remote and arid region, surrounded by federal installations, with strictly controlled access, and public lands that are open to public entry.

The following information pertaining to the NTS is provided by the American Indian Writers Subgroup of the Consolidated Group of Tribes and Organizations (CGTO). Information provided by the American Indians is italicized in this EIS to distinguish it from DOE text.

For many centuries, the NTS has been a central place in the lives of American Indian tribes. The NTS and nearby lands contain traditional gathering, ceremonial, and recreational areas for the American Indian people. From antiquity to contemporary times, this area has been used continuously by many tribes. It contains numerous ceremonial resources and power places that are crucial for the continuation of American Indian culture, religion, and society. Until the mid-1900s, traditional festivals involving religious and secular activities attracted American Indian people to the area from as far as San Bernardino, California. Similarly, groups came to the area from a broad region during the hunting season and used animal

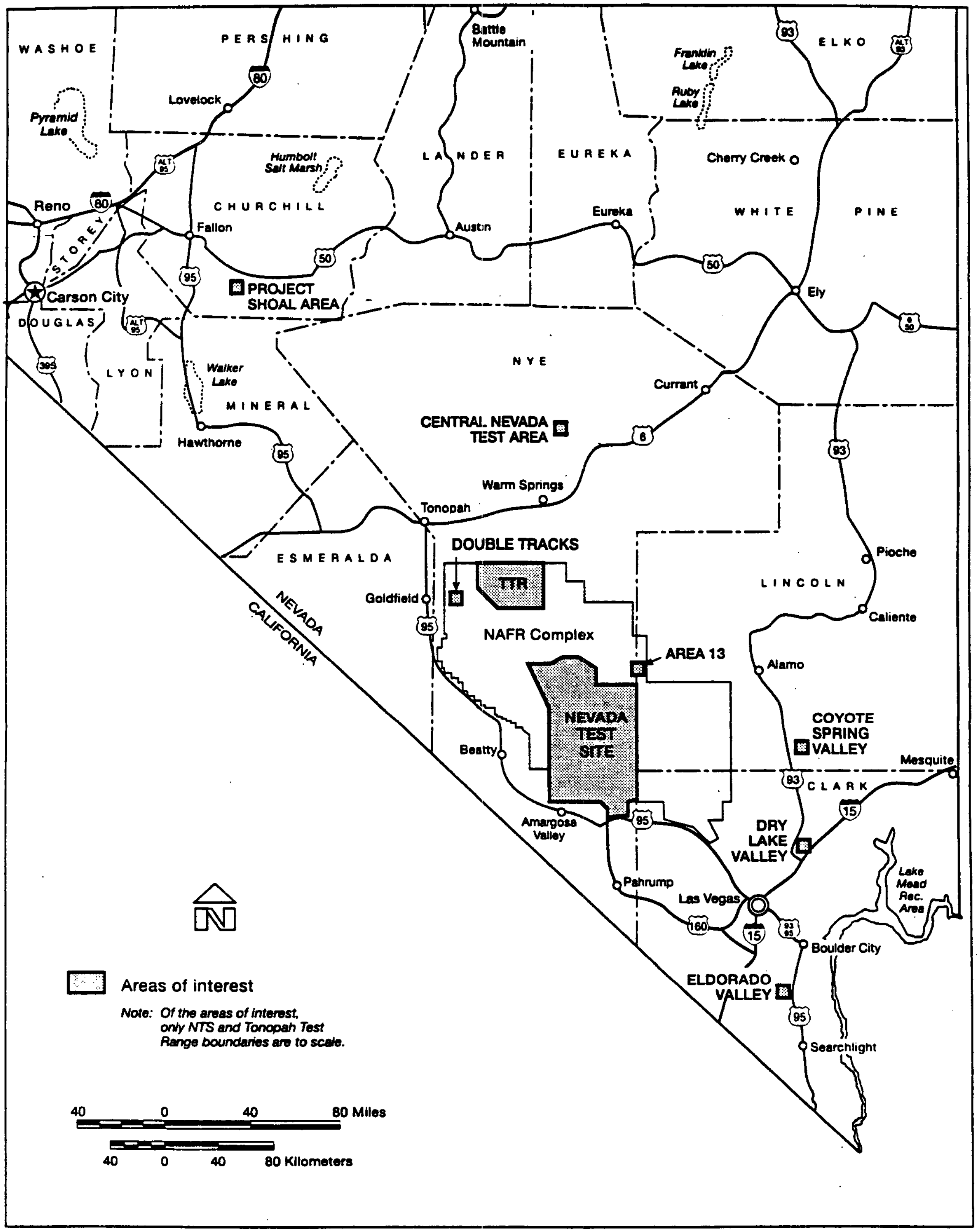


Figure 4-1. NTS and selected areas of interest

and plant resources that were crucial for their survival and cultural practices.

Despite the loss of some traditional lands to pollution and reduced access, the American Indian people have neither lost their ancestral ties to nor have forgotten their cultural resources on the NTS. There is continuity in the American Indian use of and broad cultural ties to the NTS. American Indian people have cared for the NTS resources and will continue to do so.

4.1.1 Land Use

Land resources are important considerations for decisions regarding site use. The land-use analysis determines if there is enough land available for the proposed facilities and required buffers, and identifies conflicts between the proposed project and existing or projected on- and off-site land use. These analyses are necessary to determine whether public lands would be managed in a manner consistent with existing and projected land uses. To make decisions with respect to locating facilities at the NTS, the DOE must consider several issues, particularly the constraints and opportunities related to land resources. These include whether conflicts exist with the administrative framework and whether adequate resources are available and viable.

The known land-use constraints and opportunities at the NTS are outlined in this section and described throughout this chapter. Land-use constraints include those features of the NTS, either natural or manmade, that preclude or limit the future activities that can be conducted in a specific location or area. Opportunities are the best and highest uses of the land that can be accomplished within the constraints. Further definition of land-use opportunities and constraints is planned as part of the *Framework for the Resource Management Plan* (see Volume 2).

Many of the constraints identified throughout Chapter 4 are those resulting from historic land uses, primarily nuclear weapons, rocket and related nuclear testing activities, and to a lesser extent, radioactive waste management activities. Many of these constraints on land use were identified in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977) as unavoidable adverse impacts or irreversible actions with irretrievable commitments of resources. Because of the nature of many historic activities and their consequences, specifically the introduction of radionuclides into environmental media, land use will continue to be constrained in some areas of the NTS during the 10-year period covered by this EIS, and likely well into the future. These constraints, and the specific environmental media that are affected, are summarized at the end of this section.

Natural constraints, such as unstable soils or ecologically sensitive areas, are described in the appropriate sections of Chapter 4 (i.e., Geology and Soils and Biological Resources). Land-use opportunities under baseline (i.e., existing environmental and administrative) conditions are presented throughout the remainder of Chapter 4, beginning in Section 4.1.1.1. The remainder of this section summarizes the constraints to land use resulting from the fulfillment of the DOE's missions at the NTS.

Based upon the more than 40 years of operations and information gathered, many of the consequences of past weapons testing and other activities are well understood and documented. Many of the consequences described in this chapter were previously presented in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977). While not all of the consequences of historic actions at the NTS and adjacent areas have been fully defined, this section presents an overview of their resulting constraints and establishes a baseline of current conditions. The baseline serves as a basis for evaluating the potential impacts of future actions. Because of the complexity of some issues, a full understanding that removes all uncertainty may never be achieved. Nonetheless, the DOE continues, through many of the programs and actions described in this EIS, to address the remaining data deficiencies and uncertainties.

For purposes of discussion, the past activities at the NTS have been grouped into eight categories. In this section, a brief historical overview is provided, and the known consequences and resulting constraints on use of the physical environment are presented.

Eight historic activities, and their consequences, are included in the baseline discussion within this chapter:

Atmospheric Weapons Testing—A total of 100 atmospheric detonations were conducted before the Limited Test Ban Treaty was signed in August 1963. Atmospheric tests include tests conducted at ground level, from towers or balloons, or by airdrops. Of the 100 atmospheric tests, 16 were safety tests. By design, these safety tests produced little or no nuclear yield.

Underground Nuclear Testing—Approximately 800 underground nuclear tests have been conducted at the NTS. The types of tests conducted include deep underground tests used to study weapons effects, designs, safety, and reliability, and shallow borehole tests used to study the peaceful application of nuclear devices for cratering. The 70 underground safety tests conducted on the NTS, by design, produced little or no nuclear yield.

Safety Tests—Between late 1954 and June 1963, 16 tests were conducted aboveground to test the vulnerability of certain weapon designs to possible accidents. At a location in Area 5, 24 experiments, utilizing relatively small quantities of plutonium, were conducted between 1954 and 1956. These experiments, known as the GMX Project, were so-called "equation-of-state" studies where "instantaneous" changes in the physical properties of plutonium materials subjected to detonations from conventional explosives were measured. By design, these experiments produced little or no nuclear yield.

Safety tests are no longer conducted aboveground; all such tests are performed underground in emplacements that are designed so that radioactive materials will not reach aboveground environments (AEC, 1972; AEC, 1973a; ERDA, 1976; ERDA, 1977). Impacts to soils that resulted from these historic activities are described further in Chapter 4, Section 4.1.4.3.

Nuclear Rocket Development Station—Twenty-six experimental tests of reactors, nuclear engines, ramjets, and nuclear furnaces were conducted between 1959 and 1973.

Shallow Land Radioactive Waste Disposal—Some wastes generated during the testing program, and as a result of nuclear projects, were disposed of in shallow cells, pits, and trenches. Because of the site's characteristics, notably the absence of a groundwater pathway, shallow burial continues to be an important waste disposal activity.

Crater Disposal—Contaminated soils and equipment collected during the decontamination of atmospheric testing areas and the consolidation of radioactively contaminated structures, and other bulk wastes, were disposed of in subsidence craters in Yucca Flat.

Greater Confinement Disposal—In 1981, greater confinement disposal of waste was initiated at Area 5 for certain radioactive low-level wastes not suitable for shallow land disposal.

Site-Support—Like any large facility, the NTS has a large infrastructure that provides all site-support services. Food and housing services, paint shops, vehicle maintenance facilities, machine shops, road maintenance, and other on-site facilities all produce more common short-term impacts, such as localized land disturbance, air emissions, and noise. Site-support facilities are associated with NTS land-use opportunities.

Table 4-1 and Figure 4-2 provide information on the key characteristics of the historic activities that have occurred on the NTS and now constrain the future use of certain NTS land areas. Figure 4-2 summarizes the historical activities and identifies the media of concern in the physical environment that could constrain their future use. Table 4-1 lists information on the nature of the source, the type of area involved, the media affected, the principal contaminants, the depth, and the best available estimate of the remaining inventory of radioactivity. It should be noted that in some cases only approximate values are available; these values are presented solely to illustrate the general characteristics of each source group and to highlight the differences between the groups.

More detailed information for each affected resource is included in the specific resource discussions in this chapter. Section 4.1.1.5, Waste Management Program, describes the existing waste management operations at the NTS, including the locations, types of materials managed, and the quantities of radioactive and nonradioactive wastes that have been disposed. Section 4.1.2.3, Transportation of Materials and Wastes, identifies the out-of-state waste generators that ship low-level waste to the NTS for disposal.

In Section 4.1.4.2, the baseline geological conditions are described. The geology baseline documents the physical disturbances to the subsurface environment that have resulted from 35 years of underground nuclear testing.

Section 4.1.4.3, Soils, identifies the historical activities, such as atmospheric nuclear testing, safety tests, and nuclear rocket and reactor experiments that have resulted in contamination of surface soils. The extent and degree of contamination is also explained.

*4.1.1.1 **Public Land Orders and Withdrawals.*** The NTS encompasses 3,496 km^2 (1,350 mi^2) of land area reserved to the jurisdiction of the DOE. Figure 4-3 shows the land area as it has been withdrawn through all forms of appropriation under the public land laws, including mining and mineral-leasing laws through the public land orders and a Memorandum of Understanding. Under Public Land Order 805 (February 12, 1952), approximately 435,000 acres of land were reserved for use by the Atomic Energy Commission as a weapons testing site. Under Public Land Order 1662 (June 20, 1958), 38,400 acres were reserved for the use of the Atomic Energy Commission in connection with the NTS. The lands described under this Public Land Order are not considered in any alternative use by the DOE and are, therefore, not addressed in this EIS. Under Public Land Order 2568 (December 19, 1961), 318,000 acres of land previously reserved for use by the U.S. Air Force were transferred to the jurisdiction of the Atomic Energy Commission for use in connection with the NTS for test facilities, roads, utilities, and safety distances. Under Public Land Order 3759 (August 3, 1965), 21,108 acres of land were reserved for the jurisdiction of the Atomic Energy Commission for use in connection with the NTS. Pahute Mesa, located in the northern portions of Areas 19 and 20, which encompasses 106,240 acres, is managed by the DOE as a part of the NTS in accordance with a 1963 Memorandum of Understanding with the U.S. Air Force. This memorandum was superseded by a Memorandum of Understanding between the U.S. Air Force and DOE/NV in 1982 (DoD, 1982).

In 1983, the U.S. Bureau of Land Management, in accordance with the Federal Land Policy and Management Act of 1976, conducted a review of the existing four land withdrawals that comprise the NTS. The U.S. Bureau of Land Management District Manager concurred with the review's conclusion that the lands were still being used for the purpose for which they were withdrawn. Furthermore, in recognition of a potential end of testing in future years, the U.S. Bureau of Land Management recommended that the land withdrawals again be reviewed in 100 years.

*4.1.1.2 **Land-Use Designations.*** The NTS is located in Nye County in southern Nevada; its southernmost point is located about 105 km (65 mi) northwest of Las Vegas, Nevada. The site varies from 46 to 56 km (28 to 35 mi) in width and 64 to 88 km (40 to 55 mi) in length (north to south).

The DOE is in the process of developing a *Resource Management Plan*. The goal of the *Resource Management Plan* will be to establish a process for managing the facilities and national resources of the NTS to ensure long-term diversity and productivity of natural ecosystems and sustain the use of land and facilities at the NTS. The DOE will use this process to evaluate the selection, design, and location of existing and proposed activities. This process will identify the criteria for evaluating the compatibility of these activities with public values, ongoing missions, existing infrastructure, cultural and natural resources, human health and safety, and other resources and land-use constraints on the NTS.

Table 4-1. Summary of radioactivity on the NTS as of January 1996

Source of Radioactivity	Type of Area	Environmental Media	Major Known Isotopes or Wastes	Depth Range	Amount (curies)
Atmospheric & Tower Tests	Above Ground Nuclear Weapon Proving Area	Surficial Soils & Test Structures	Americium Cesium Cobalt Plutonium Europium Strontium	At Land Surface	Approximately 20
Safety Tests	Above Ground Experimental Areas	Surficial Soils	Americium Cesium Cobalt Plutonium Strontium	Less than 0.9 m (3 ft)	Approximately 35
Nuclear Rocket Development Area	Nuclear Rocket Motor, Reactor, & Furnace Testing Area	Surficial Soils	Cesium Strontium	Less than 3 m (10 ft)	Approximately 1
Shallow Borehole Tests	Underground Nuclear Testing Areas	Soils & Alluvium	Americium Cesium Cobalt Europium Plutonium Strontium	Less than 61 m (200 ft)	Approximately 2,000 at land surface; unknown at depth
Shallow Land Disposal	Waste Disposal Landfills	Soils & Alluvium	Dry Packaged Low-level & Mixed Wastes	Less than 9 m (30 ft)	Approximately 500,000[a]
Crater Disposal	Test induced subsidence crater with sidewalls, cover, & drainage	Soils & Alluvium	Bulk contaminated soils & equipment	Less than 30 m (100 ft)	Approximately 1,250[a] (Approximately 205,000 m^3 [7,250,000 ft^3])[b]
Greater Confinement Disposal	Monitored Underground Waste Disposal Borehole	Soils & Alluvium	Tritium Americium	37 m (120 ft)	Approximately 9.3 million[a] (Approximately 300 m^3 [10,000 ft^3])[b]
Deep Underground Tests	Underground Nuclear Testing Areas	Soils, Alluvium, & Consolidated Rock	Tritium, fission, & activation products	Typically less than 640 m (2,100 ft), but may be deeper	Greater than 300 million

[a] Inventory at time of disposal (not corrected for decay)
[b] Amount of waste that was considered for inventory.

Existing land use on the NTS is divided into two site categories and seven zone categories. The site and zone category definitions are as follows:

Industrial, Research, and Support Site—An industrial site is used for the manufacturing, processing, and/or fabrication of articles, substances, or commodities. A research site is used for projects to verify theories or concepts under controlled conditions. Support sites are used for office space, training, equipment storage, maintenance, security, feeding and housing, fire protection services, and health services.

Waste Management Site—A site used for the disposal, storage, and/or treatment of wastes.

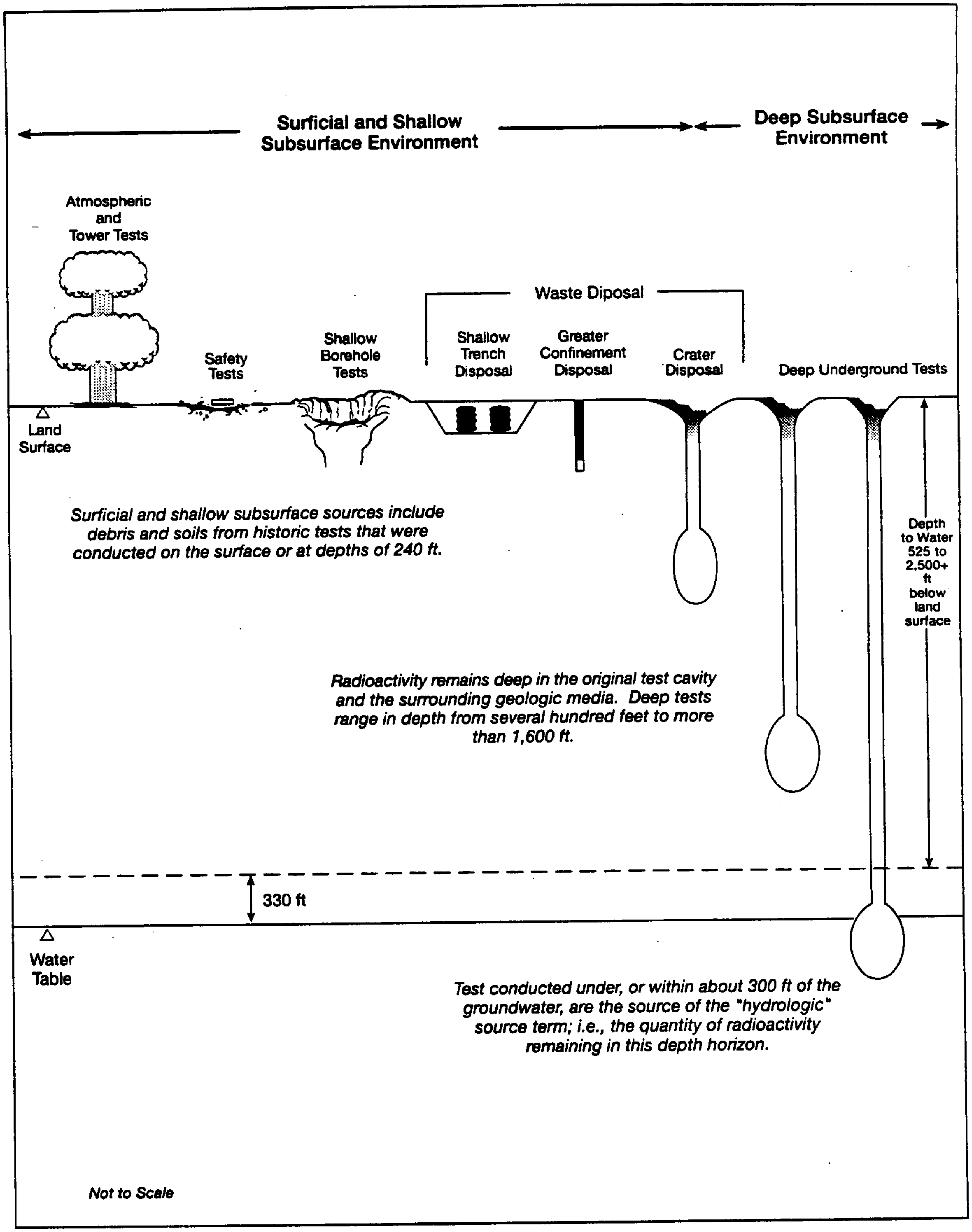


Figure 4-2. Types and depth horizons of radioactivity that remains on the NTS

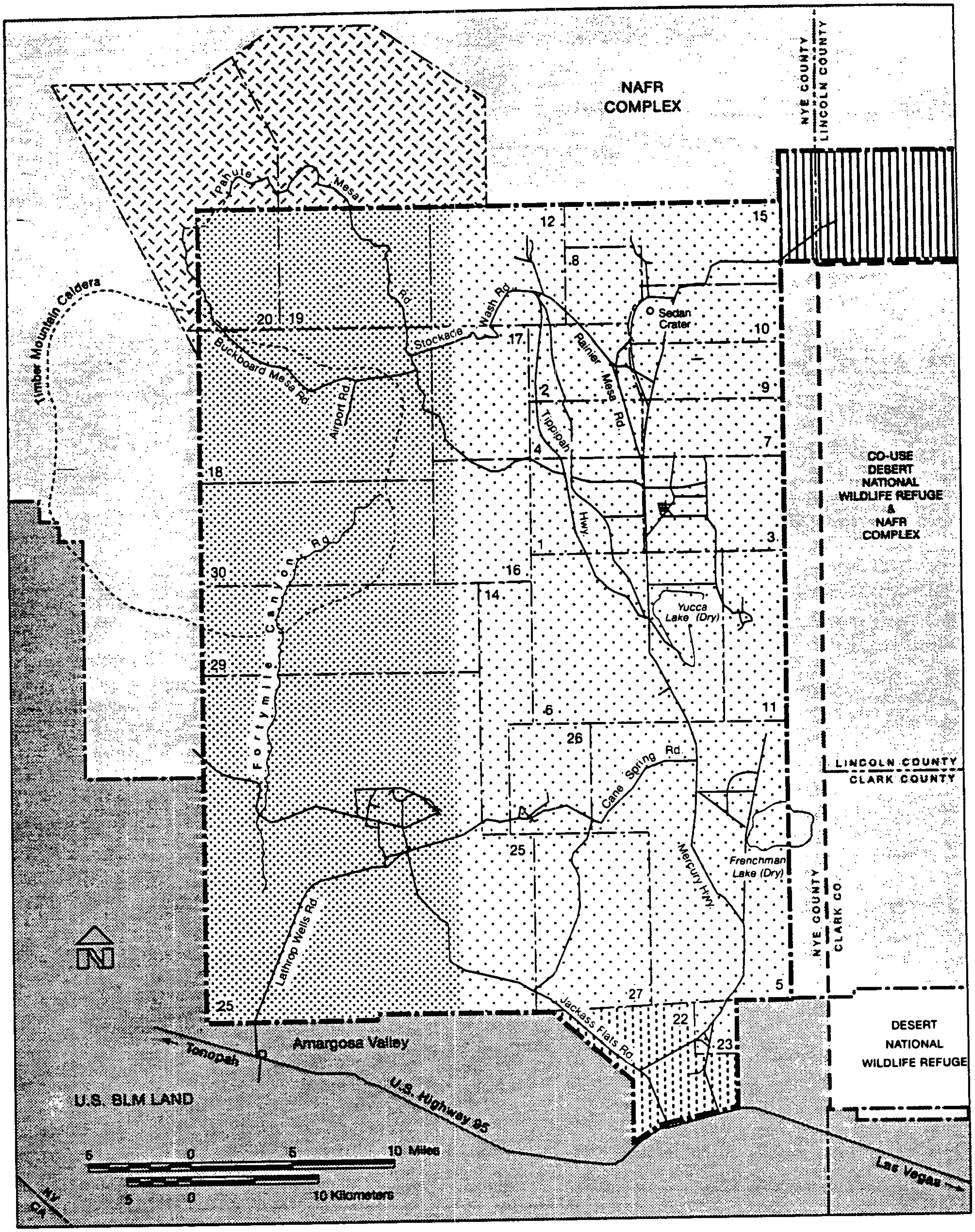


Figure 4-3. NTS land withdrawals and Memorandum of Understanding

LEGEND

Public Land Order 805
435,000 acres
February 12, 1952

Public Land Order 1662
38,400 acres
June 20, 1958

Public Land Order 2568
318,000 acres
December 19, 1961

Public Land Order 3759
21,108 acres
August 3, 1965

Memorandum of Understanding
Air Force and DOE (DOD, 1982)
June 10, 1982
106,240 acres

U.S. Bureau of Land Management (BLM)

NAFR Complex

Co-Use Desert National Wildlife Range and NAFR Complex

Desert National Wildlife Refuge Boundary

County Line

NTS Boundary Line

NTS Area Boundary Line

Figure 4-3 (continued). Legend for NTS land withdrawals and Memorandum of Understanding

Nuclear Test Zone—Land area reserved for underground hydrodynamic tests, dynamic experiments, and underground nuclear weapons and weapons effects tests. The stockpile stewardship emplacement hole inventory is located within this zone (Appendix A, Figure A-1).

Nuclear and High Explosive Test Zone—Land area designated within the Nuclear Test Zone for additional underground and aboveground high-explosive tests or experiments.

Research, Test, and Experiment Zone—Land area designated for small-scale research, development projects, pilot projects, and outdoor tests and experiments for the development, quality assurance, or reliability of materials and equipment under controlled conditions.

Radioactive Waste Management Zone—Land area designated for the shallow land burial of low-level and mixed wastes.

Critical Assembly Zone—Land area used for conducting nuclear explosive operations. Operations generally include assembly, disassembly or modification, staging, repair, retrofit, and surveillance. The potential for weapons storage also exists in this zone.

Spill Test Facility Impact Zone—A downwind geographic area that would confine the impacts of the largest planned tests of materials released at the Spill Test Facility.

Reserved Zone—Controlled-access land area that provides a buffer between nondefense research, development, and testing activities. The Reserved Zone includes areas and facilities that provide widespread flexible support for diverse short-term nondefense research, testing, and experimentation. This land area is also used for short-duration exercises and training, such as Nuclear Emergency Search Team and Federal Radiological Monitoring and Assessment Center training, and U.S. Department of Defense (DoD) land navigation exercises and training.

To simplify the distribution, use, and control of resources, the NTS is also divided into numbered areas. The following pages contain an area-by-area description of land use on the NTS. Refer to Chapter 3, Figure 3-1.

Area 1—As a part of the Nuclear Test Zone, this area occupies 70 km^2 (27 mi^2) near the center of the Yucca Flat weapons test basin. Four atmospheric nuclear tests were conducted here between 1952 and 1955. Three underground nuclear tests have also been detonated in Area 1, one in 1971 and two in 1990.

Buildings and structures associated with aboveground nuclear testing are discussed in Section 4.1.10 and listed in Table 4-37 as NT (Nuclear Testing). Although many of these structures are believed to be eligible, no official evaluation or determination of eligibility has been conducted. Should any of these structures be affected by project activities, an evaluation would be completed, eligibility determined, and consultation with the Nevada State Historic Preservation Office (SHPO) would be conducted prior to initialing the project. The project would be conducted in accordance with SHPO recommendations.

The Lyner Complex is a mined underground complex in Area 1 that is available for dynamic experiments (including subcritical experiments involving special nuclear material) and hydrodynamic tests that cannot be conducted aboveground because they may contain hazardous materials. Initial work on what is now known as the Lyner Complex began in the late 1960s with the mining of the U1a shaft to a depth of 305 meters (m) (1,000 feet [ft]) for a nuclear test. It was not used. Further work took place in the 1980s and early 1990s to develop a complex that could be used to perform intentionally designed low-yield tests or experiments, which included safety tests, and other experiments that would be expected to remain subcritical or produce negligible nuclear energy release. The Ledoux nuclear test with a yield of less than 25 kilotons was conducted in 1990 in a drift within this tunnel complex. The Kismet experiment, involving high explosives, tritium, depleted uranium, and other materials, was a dynamic experiment conducted in the Lyner Complex in March 1995. Both Ledoux and Kismet were contained to prevent radiological releases to the rest of the Lyner Complex and the surface environment.

The Area 1 Industrial Complex, at the intersection of Pahute Mesa Road and Tippipah Highway, is the maintenance and storage area for an over \$20-million inventory of large-hole drilling equipment and miscellaneous supplies. Typical day-to-day operations include replacing worn cutters on a drill bit with new or rebuilt cutters, straightening drill pipe and tubing, and other drilling tool maintenance tasks. A concrete batch plant and storage area for bulk construction material, as well as a shaker plant that produces stemming material and concrete aggregate, lie to the north of the drilling yard.

There is one stockpile stewardship emplacement hole within Area 1 (Appendix A, Figure A-1).

Area 2—This area, within the Nuclear Test Zone, occupies approximately 52 km^2 (20 mi^2) in the northern half of the Yucca Flat basin. The eastern portion of Area 2 was the site of seven atmospheric nuclear tests conducted between 1952 and 1957. The first in a series of underground nuclear tests in Area 2 took place in late 1962 and continued through 1990. A number of the 137 underground tests detonated in Area 2 were simultaneous detonations of multiple devices in the same emplacement hole; other underground tests involved the firing of two or more devices with the devices in separate emplacement holes.

There are eleven stockpile stewardship emplacement holes within Area 2 (Appendix A, Figure A-1).

Most of the structures that comprised a former construction base camp (consisting generally of Butler buildings, Quonset huts, and trailers) have been relocated to Area 6, and the facilities remaining in Area 2 are in the process of being moved to other locations or are being scrapped.

Area 3—This portion of the Nuclear Test Zone occupies 82 km^2 (32 mi^2) near the center of the Yucca Flat weapons test basin and was the site of 17 atmospheric tests conducted between 1952 and 1958. A total of 251 underground nuclear tests were conducted in Area 3 from 1958 through 1992. This is the largest number of tests of any of the NTS underground test areas. A number of these tests consisted of simultaneous device detonations, and nearly all of these simultaneous tests consisted of single devices in separate emplacement holes. Nine of the underground nuclear tests in Area 3 were conducted in unstemmed holes to minimize, but not eliminate, the release of radioactivity to the atmosphere. These unique tests were carried out between mid-1957 and late 1958.

There are four stockpile stewardship emplacement holes within Area 3 (Appendix A, Figure A-1).

Bulk low-level waste is disposed of in selected Area 3 subsidence craters that, collectively, comprise the Area 3 Radioactive Waste Management Site. This activity commenced in the mid-1960s when the DOE began removing scrap tower steel, vehicles, and other large objects that had been subjected to atmospheric testing. From 1979 to 1990, large amounts of contaminated soil and other debris from the NTS were added to the craters. There are seven disposal craters. Two craters are in use, two are full and temporarily capped, and three are in reserve for potential future use.

Area 4—This area, within the Nuclear Test Zone, occupies 41 km^2 (16 mi^2) near the center of the Yucca Flat basin. Area 4 was the site of five atmospheric nuclear tests conducted between 1952 and 1957. From the mid-1970s through 1991, a total of 35 underground nuclear tests were conducted in Area 4, mainly in the northeast corner. Two of these tests involved the simultaneous detonation of multiple devices in the same emplacement hole.

The Big Explosives Experimental Facility in Area 4 is being evaluated for its suitability as an operational complex for testing large charges of conventional high explosives. Comprised of two earth-covered, steel-reinforced concrete structures, one structure may serve as a manned operational control room facility, and the other may serve as an unmanned camera room with viewing ports to a gravel table where large charges of high explosives can be fired.

There are four stockpile stewardship emplacement holes in Area 4 (Appendix A, Figure A-1).

Area 5—This area, within the Reserved Zone, occupies some 246 km^2 (95 mi^2) in the southeastern portion of the site and includes the Area 5 Radioactive Waste Management Site, the Hazardous Waste Storage Unit, and the Spill Test Facility.

From 1951 through early 1962, 14 atmospheric tests were conducted at Frenchman Flat, several of which were weapons effects tests. Among the remains of the structures tested in Frenchman Flat are simulated motel complexes, metal frames that supported a variety of roofing materials, a window test structure, cylindrical liquid storage vessels, reinforced concrete domes and aluminum domes, bridge pedestals, and a bank vault; all of these remains are of considerable historical interest. Five nuclear weapons tests were conducted underground at Frenchman Flat between 1965 and 1968. However, the presence of the carbonate aquifer makes this area less suitable for underground testing than other locations on the NTS.

In the GMX area, 24 experiments, some utilizing relatively small quantities of fissile materials, were conducted between 1954 and 1956. These experiments were so-called "equation-of-state" studies where "instantaneous" changes in the physical properties of plutonium materials subjected to detonations from conventional explosives were measured. These experiments were conducted on or very near one place, and the source can be considered to be at one site.

The Area 5 Radioactive Waste Management Site is located in a 732-acre Radioactive Waste Management Zone used for low-level waste disposal. Mixed waste, including transuranic mixed waste, has been disposed of at the site in the past, and transuranic wastes are currently being stored there pending disposal at the Waste Isolation Pilot Plant near Carlsbad, New Mexico. Disposal of waste at the NTS is discussed in Section 4.1.1.5.

The Hazardous Waste Storage Unit is an accumulation point for nonradioactive materials, such as paints, chemicals, unused or surplus fuels, and other items. Periodically, all hazardous wastes generated at the NTS are sent to permitted commercial facilities for recycling, incineration, or disposal.

The Spill Test Facility is a complex of fuel tanks, spill pads, meteorological and camera towers, equipment and control buildings, and a wind tunnel used for releasing hazardous materials and measuring their behavior in outdoor conditions.

Area 6—This area occupies 212 km^2 (82 mi^2) between Yucca Flat and Frenchman Flat, straddling Frenchman Mountain. Only one atmospheric nuclear test was conducted in Area 6, and that was in 1957. Between 1968 and mid-1990, five underground nuclear tests were conducted at this location, two of which involved the simultaneous detonation of multiple devices in separate emplacement holes.

There are two stockpile stewardship emplacement holes in Area 6 (Appendix A, Figure A-1).

The Control Point complex serves as the command center, air operations center, and timing and firing center for the Yucca Flat weapons test basin, Frenchman Flat, Pahute Mesa, and surrounding areas. Augmenting facilities near the secured compound include a communications building, several radiological sciences and technical services buildings, a fire and first-aid station, and various maintenance and warehouse structures.

The Area 6 Construction Facilities provide craft and logistical support to activities in the forward areas of the NTS. This forward area complex replaces older construction base camps in Areas 2 and 3. Those elements comprising the Yucca Lake facilities include a variety of equipment storage facilities, a heavy- duty maintenance and equipment repair facility, and decontamination facilities. A 3,353 m (11,000 ft) airstrip and nearby weather station also are located on the Yucca Lake bed.

The Device Assembly Facility, when open, will be the primary location of all nuclear explosive operations at the NTS. Nuclear explosive operations include assembly, disassembly or modification, staging, transportation, testing, maintenance, repair, retrofit, and surveillance. The

Device Assembly Facility contains about 9,290 m^2 (100,000 ft^2) of interior floor space within a Critical Assembly Zone composed of approximately 22 acres.

The Hydrocarbon Contaminated Soils Disposal Site is an existing, state of Nevada-approved, Class III landfill. All non-Resource Conservation and Recovery Act-regulated hydrocarbon contaminated soils and materials generated on the NTS are disposed of at this landfill.

Area 7—This area, within the Nuclear Test Zone, occupies 52 km^2 (20 mi^2) in the northeast quadrant of the Yucca Flat weapons test basin. Twenty-six atmospheric tests were conducted in this area. From late 1964 through the fall of 1991, a total of 62 underground nuclear tests were carried out in Area 7, all consisting of a single nuclear device in a drilled emplacement hole.

There are three stockpile stewardship emplacement holes in Area 7 (Appendix A, Figure A-1).

Area 8—This area, within the Nuclear Test Zone, occupies 34 km^2 (13 mi^2) in the northeast quadrant of the Yucca Flat weapons test basin. Area 8 was the site of three atmospheric nuclear tests conducted in 1958. From mid-1966 through late 1988, 10 underground nuclear tests were carried out at this location. Two of the underground tests involved the simultaneous firing of multiple devices put in the same emplacement hole. Underground shelter structures were tested in the late 1950s, and in 1964 these shelters were used by the University of Florida for shelter habitability studies. Lawrence Livermore National Laboratory has conducted experiments in this area.

Area 9—This area, within the Nuclear Test Zone, occupies 52 km^2 (20 mi^2) in the northeast quadrant of the Yucca Flat weapons test basin. Seventeen atmospheric tests were conducted in this area between 1951 and 1958. Area 9 has been used extensively for underground nuclear testing; 100 such tests were carried out from late 1961 to mid-1992. Of the dozen underground tests involving the simultaneous detonation of multiple devices, most involved the use of separate emplacement holes (two or more holes, each with a single device).

There is one stockpile stewardship emplacement hole in Area 9 (Appendix A, Figure A-1).

The Area 9 sanitary landfill is located in a subsidence crater formed as a result of a subsurface nuclear detonation in the early 1960s. This Class II landfill is allowed to receive all types of nonhazardous waste. In October 1995, the landfill underwent partial closure and will reopen as a Class III construction and demolition debris landfill.

Area 10—This area, incorporated in the Nuclear Test Zone, occupies 54 km^2 (21 mi^2) in the northeast quadrant of the Yucca Flat weapons test basin. Area 10 was the selected location for the nation's first nuclear missile system test, an air-to-air rocket, detonated in mid-1957. This was the only nuclear rocket test ever conducted at the NTS. Two of the earliest shallow nuclear cratering experiments conducted at the NTS were detonated in 1951 and 1955 at this location. Resuming with the deeply buried Sedan cratering experiment in mid-1962 and extending through early 1991, a number of underground nuclear tests were conducted in Area 10. Counting both the cratering and contained underground tests, there were 57 nonatmospheric nuclear tests. A number of the underground tests detonated in Area 10 were simultaneous detonations of multiple devices in the same emplacement hole, while others involved the firing of multiple devices, but with each of the nuclear devices located in separate emplacement holes.

Area 10 is the site of Sedan Crater, which was formed by a thermonuclear device detonated in July 1962. It left a large throw-out crater with a diameter of 390 m (1,280 ft) and a depth of 98 m (320 ft). Sedan was the first in a series of 23 Plowshare experiments conducted at the NTS to develop peaceful uses of nuclear explosives. Sedan Crater is listed on the National Register of Historic Places, a file of cultural resources of national, state, regional, or local significance identified by the National Park Service. The Scooter Crater, also located in Area 10, is the result of a 500-ton conventional high-explosive experiment carried out in 1960.

Area 11—This area, which is split among the Nuclear Test and Reserved Zones, occupies 67 km^2 (26 mi^2) along the eastern border of the NTS. Four atmospheric plutonium-dispersal safety tests were conducted in the northern portion of Area 11 in 1954 and 1956 in what is now known as Plutonium Valley. Because of the radioactive residues that remain from the safety experiments, Area 11 continues to be used on an intermittent basis for realistic drills in radiological monitoring and sampling operations. In addition to the aboveground safety tests, five underground nuclear weapons effects tests were carried out in Area 11 between the spring of 1966 and early 1971.

An explosive ordnance disposal site is located in the southern portion of Area 11. This is a Resource Conservation and Recovery Act permitted treatment unit. The site consists of a detonation pit surrounded by an earthen pad, approximately 8 m (25 ft) by 30 m (100 ft), and supplemental equipment, which includes a bunker, electrical shot box, and electrical wire. Typically, up to six detonations of 45 kilograms (kg) (100 pounds [lb]) or less of explosives are conducted annually.

Area 12—This area, within the Nuclear or High Explosive Test Zone, occupies 104 km^2 (40 mi^2) at the northern boundary of the NTS known as Rainier Mesa. No atmospheric tests were conducted at this location. Rainier Mesa was the site of the nation's first fully contained underground nuclear detonation in the fall of 1957. Of the 61 underground nuclear tests carried out in Area 12 between late 1957 and the fall of 1992, only 2 were detonated in drilled holes, whereas all of the others were detonated in mined tunnels.

Today, there are a number of tunnels mined into Rainier Mesa, within which most DoD horizontal line-of-sight exposure experiments were conducted. In particular, N-, P-, and T-Tunnel complexes were extensively developed during the past several decades. N-Tunnel was also the location for a non-proliferation experiment, detonated in September 1993; this experiment involved 1.3×10^6 kg (2.9×10^6 lb) of conventional high explosives. The DoD currently operates a high-explosives research and development tunnel in Area 12. This reusable test bed supports programs involving the detonation of conventional or prototype explosives and munitions.

The Area 12 camp was used to support operations in the northern region of the NTS. The camp includes housing and feeding facilities; other support structures include a major maintenance building, various craft and repair shops, a first-aid facility, and a supply depot. The camp is currently closed.

Area 13—Officially, there is no Area 13 within the NTS boundary; however, there is a land plot on the NAFR Complex, known as NAFR Complex Area 13, which lies off the northeast corner of the NTS. This was the location for a plutonium-dispersal safety experiment conducted in early 1957. The only future DOE activities that would occur in this area would involve environmental restoration.

Area 14—This Reserved Zone area occupies 67 km^2 (26 mi^2) in the south-central portion of the NTS. Relatively isolated from the NTS's major operational and support facilities, no atmospheric or underground nuclear tests have ever been conducted in Area 14.

Area 15—This Reserved Zone area occupies 96 km^2 (37 mi^2) at the northeast corner of the NTS, and no atmospheric tests were conducted at this location. However, between early 1962 to mid-1966, three underground nuclear tests were carried out in Area 15.

Two major complexes are located in Area 15, the Hardhat/Piledriver site and the U.S. Environmental Protection Agency (EPA) Farm Complex, both of which are now closed. The Piledriver experiment in mid-1966 was one of the most complex and expensive DoD underground nuclear tests ever carried out. The purpose of these tests was to investigate the simulated effects of a nuclear surface detonation on a deeply buried, superhard command and control center in a granite rock formation.

From 1978 to 1983, the Spent Fuel Test, Climax was carried out in a separately mined drift at the Hardhat/Piledriver site. The purpose of this study was to learn more about how granite would react to heat and radiation from spent nuclear fuel.

As part of the nation's long-range health and safety program, an experimental 30-acre dairy farm was developed and operated in Area 15 between 1965 and 1981. The purpose of this extensive research program was to study the passage of airborne radionuclides through the soil-forage-cow-milk-food chain.

Area 16—This area, within the Nuclear or High Explosive Test Zone, occupies 73 km^2 (28 mi^2) in the west-central portion of the NTS. No atmospheric tests have ever been conducted at this location. Area 16 was established in 1961 for the DoD's exclusive use in support of a complicated nuclear effects experiment that required a tunnel location in an isolated area away from other active weapons test areas. From mid-1962 through mid-1971, six underground nuclear weapons effects tests (all in the same tunnel complex) were conducted at this location. Currently, the DoD uses this area for high-explosives research and development in support of programs involving the detonation of conventional or prototype explosives and munitions.

Area 17—This area, within the Reserved Zone, occupies 80 km^2 (31 mi^2) in the north-central portion of the NTS. This area has been used primarily as a buffer between other testing activities. No atmospheric tests or experimental activities of programmatic consequence have been conducted in Area 17.

Area 18—This area, within the Reserved Zone, occupies 231 km^2 (89 mi^2) in the northwest quadrant of the NTS. The inactive Pahute airstrip is located in the east-central portion of the area. When in operational status, the airstrip was primarily used for shipment of supplies and equipment for Pahute Mesa test operations.

Area 18 was the site of five nuclear weapons tests: four were conducted in mid-1962 and one underground test was conducted in 1964. Two of these were atmospheric tests, two were cratering experiments, and one was a stemmed underground nuclear test. In 1964, the Lawrence Livermore National Laboratory used the area for a Plowshare-sponsored test using chemical high explosives to investigate the potential use of nuclear explosives for ditch digging in dense hard rock.

Area 19—This area, within the Nuclear Test Zone, occupies 388 km^2 (150 mi^2) in the northwest corner of the NTS. Area 19 was developed for high-yield underground nuclear tests. No atmospheric nuclear tests were conducted in Area 19. From the mid-1960s through 1992, a total of 35 underground nuclear tests were conducted.

There are five stockpile stewardship emplacement holes in Area 19 (Appendix A, Figure A-1).

Area 20—This area, within the Nuclear Test Zone, occupies 259 km^2 (100 mi^2) and is in the extreme northwest corner of the NTS. Area 20, like Area 19, was developed in the mid-1960s as a suitable location for high-yield underground nuclear tests. No atmospheric nuclear tests were conducted in Area 20. Three underground nuclear tests in the megaton and greater yield range were carried out on Pahute Mesa between 1966 and 1976. These tests were the well-publicized Boxcar, Benham, and Handley events. From the mid-1960s through 1992, a total of 46 contained, underground nuclear tests were conducted in Area 20. All of these Pahute Mesa tests have consisted of single nuclear devices being detonated in drilled emplacement holes.

In addition to weapons development tests, one nuclear test detection experiment and three Plowshare tests were conducted on Pahute Mesa. The Plowshare tests in Area 20 included the nuclear cratering experiments Palanquin, Cabriolet, and Schooner. Palanquin, detonated in the spring of 1965, was the first nuclear test on Pahute Mesa.

There are two stockpile stewardship emplacement holes in Area 20 (Appendix A, Figure A-1).

Area 21—There is no Area 21 on the NTS.

Area 22—This area, within the Reserved Zone, occupies 83 km^2 (32 mi^2) in the southeastern corner of the NTS and serves as the main entrance area. Before 1958, this area included Camp Desert Rock, a Sixth Army installation used for housing troops taking part in military exercises at the NTS. After 1958, the camp was essentially removed, with the exception of the Desert Rock Airport. In 1969, the runway was extended to a length of 2,286 m (7,500 ft). The airport currently is open, but provides no services.

Area 23—This area, within the Reserved Zone, occupies 13 km^2 (5 mi^2) in the southeastern portion of the NTS and is the location of the largest operational support complex. Mercury was established in 1951 and serves as the main administrative and industrial support center at the NTS. Permanent structures and services include housing and feeding, laboratory, maintenance, communication and support facilities, computer facilities, warehouses, storage yards, motor pools, and administrative offices. Mercury is located approximately 8 km (5 mi) from U.S. Highway 95.

The Area 23 Class II sanitary landfill, located just west of Mercury, is open to receive all types of nonhazardous solid waste. Wastes are compacted and covered to form layers. The Area 23 landfill receives approximately 830 tons of solid waste annually. The landfill is an open, rectangular pit with steep, nearly vertical sides. The current capacity of the landfill is approximately 4.5×10^5 cubic meters (m^3) (5.9×10^5 cubic yards [yd^3]).

Area 24—There is no Area 24 on the NTS. However, Las Vegas and North Las Vegas are sometimes referred to as Area 24.

Area 25—This is the largest area on the NTS. It occupies some 578 km^2 (223 mi^2) in the southwestern corner of the site and includes an entrance gate to the NTS.

Located roughly in the center of Area 25, Jackass Flats was the site selected for a series of ground tests of reactors, engines, and rocket stages as part of a program to develop nuclear reactors for use in the nation's space program. In the early 1960s, the Atomic Energy Commission and the National Aeronautics and Space Administration negotiated an interagency agreement to establish and manage a test area at the NTS, designated as the Nuclear Rocket Development Station. These facilities, inactive since 1973, remain today in various stages of disrepair. They consist of three widely separated reactor test stands; two maintenance, assembly, and disassembly facility buildings; a Control Point complex; an administrative area complex; and a radioactive materials storage area.

Area 25 is divided into multiple zone categories: Yucca Mountain Site Characterization Zone; Research, Test, and Experiment Zone; and Reserved Zone. The Yucca Mountain Site Characterization Zone within the boundaries of the NTS represents a land assignment area for site characterization activities. The former Nuclear Rocket Development Station administrative area complex in Area 25 has been rededicated as the Yucca Mountain Site Characterization Central Support Site. Limited Yucca Mountain characterization activities are also conducted off site and beyond Area 25. Similarly, the NTS has monitoring activities off site. The Research, Test, and Experiment Zone in Area 25 is used by the U.S. Army's Ballistic Research Laboratory for depleted uranium testing. Two classifications of tests are conducted under this program, open-air tests and X-tunnel tests. These tests include hazard classification and system tests. Research sites within the Reserved Zone include the Treatability Test Facility and Bare Reactor Experiment Nevada (BREN) Tower. The Treatability Test Facility was established in Area 25 for bench-scale testing of physical processes for separating plutonium and uranium from contaminated soils.

Area 25 was used in the early 1980s for MX (Peacekeeper) missile siting studies and canister ejection certification tests.

The 465-m (1,527-ft) BREN Tower has been used intermittently by a number of organizations to conduct sonic-boom research, meteorological studies, and free-fall/gravity-drop tests. More recently, the facility has been used in support of the Brilliant Pebbles program, as well as in studies to develop the technology and measurement techniques for advanced infrared imaging from space satellites. A Brilliant Pebble is a relatively small computer-operated, rocket-powered vehicle that uses sensors and a small laser to detect and track an oncoming ballistic missile, which the Brilliant Pebble vehicle is designed to destroy by kinetic energy.

The Rock Valley Study Area, not shown on the map, is located south of Jackass Flats Road on the southern boundary of Area 25. This location was selected in 1960 for controlled studies relating to the effects of radiation on a desert ecosystem. During the past three decades, these fenced study plots have been used by a number of government-sponsored scientists, as well as students and others conducting environmental research projects and experiments.

Portions of the Area 25 Reserved Zone are used by the military for land navigation and training exercises.

Area 26—This area, within the Reserved Zone, occupies 57 km² (22 mi²) in the south-central area of the NTS. The southern portions of this area were used in the past for nuclear-powered ramjet engine tests known as Project Pluto. The residual test facilities include a control point, test bunker, compressor house and air-storage facilities, and a disassembly building.

Area 27—This area, within the Critical Assembly Zone, occupies 130 km² (50 mi²) in the south-central portion of the NTS. Area 27's principal assembly facilities include five assembly bays, four storage magazines, two combination assembly bay/storage magazines, and three radiography buildings. The Area 27's critical assembly facilities are an alternate to the Device Assembly Facility.

Area 27 was also used in the past for the Super Kukla Reactor Facility.

Area 28—No longer in existence, the Area 28 designation formerly applied to a portion of the NTS that has since been absorbed into Areas 25 and 27.

Area 29—This area, within the Reserved Zone, occupies 161 km² (62 mi²) on the west-central border of the NTS. The site of a communications repeater station for the NTS is located in the Shoshone Mountains.

Area 30—This area, within the Reserved Zone, occupies 150 km² (58 mi²) and, like Area 29, is on the western edge of the NTS. Area 30 also has fairly rugged terrain and includes the northern reaches of Fortymile Canyon. In the past, Area 30 has had limited use in support of the nation's nuclear testing programs, but in the spring of 1968 it was the site of Project Buggy, the first nuclear row-charge experiment in the Plowshare Program.

<u>SURROUNDING LAND USE</u>—Figure 4-4 shows the status and use of lands around the NTS. The NTS is surrounded by other federal lands. The NTS is bordered by the NAFR Complex on the north, east, and west and by U.S. Bureau of Land Management lands on the south and southwest.

Beyond the federal lands that surround the NTS, principal land uses in Nye County in the vicinity of the NTS include mining, grazing, agriculture, and recreation. Currently, Nye County does not have a land-zoning ordinance; however, measures are being reviewed by the Board of Supervisors for approval. Of the total land area within Nye County, only a small number of isolated areas are under private ownership and, therefore, subject to general planning guidelines. Urban and residential land uses occur beyond the immediate vicinity of the NTS, in fertile valley regions such as the Owens and San Joaquin to the west, the Virgin River to the east, Pahrump to the south, the Moapa River to the southeast, and Hike and Alamo to the northeast. The nearest population centers surrounding the NTS are Amargosa Valley, Indian Springs, Beatty, and Pahrump Valley. These are all rural communities, with Amargosa Valley being the closest to the NTS. Las Vegas is the closest major metropolitan area and is located about 105 km (65 mi) southeast of the NTS. Amargosa Valley (formerly Lathrop Wells) lies 3 km (2 mi) south of the NTS border.

Clark County, to the southeast, consists of 20,461 km² (7,900 mi²), of which about 95 percent is owned by the federal government. The primary land uses of these federal lands include open grazing, mining, and recreation. The remaining 5 percent of the land in Clark County is used for state and local government, residential, industrial, and commercial purposes. Numerous

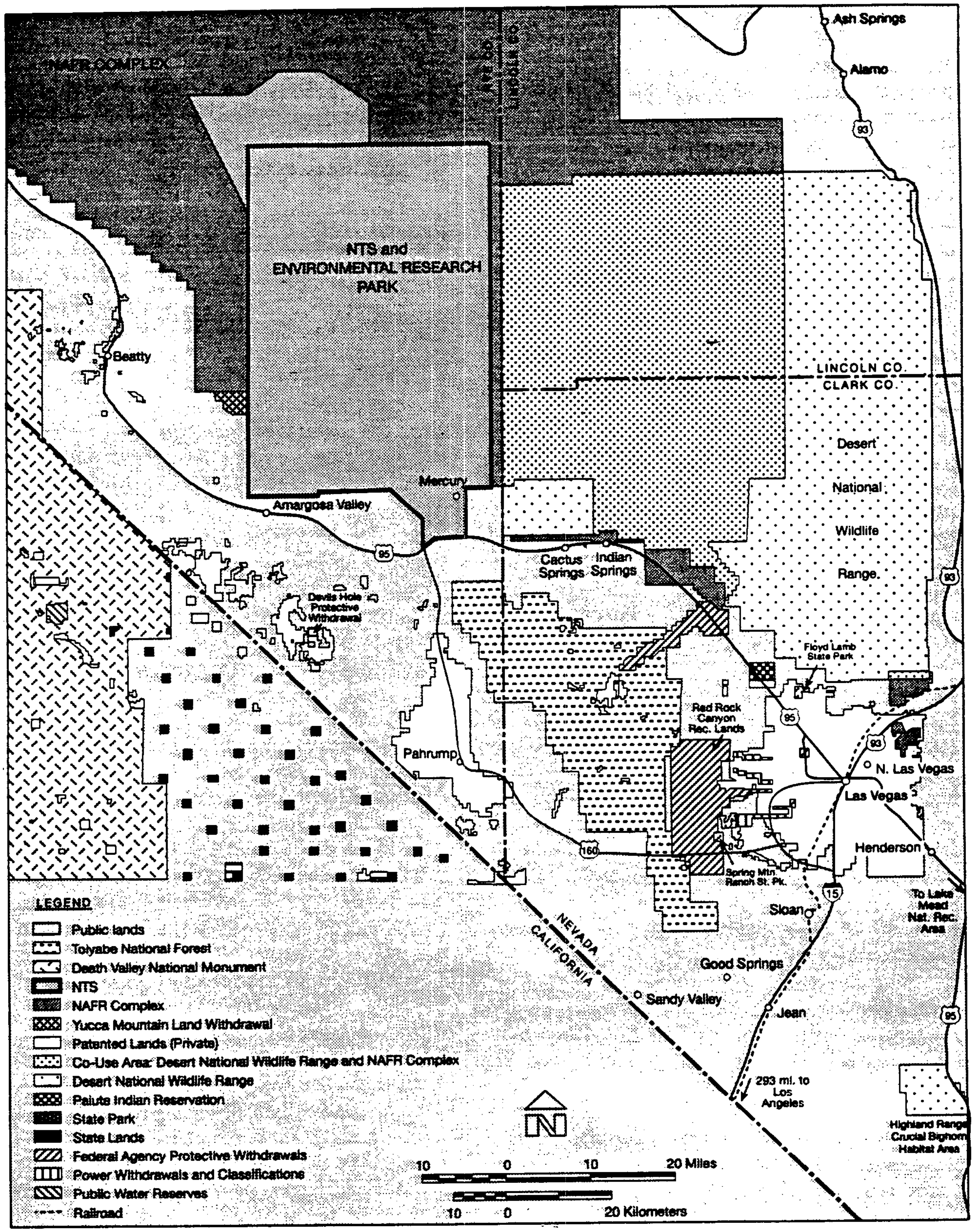


Figure 4-4. NTS and surrounding land use

national, state, and local public recreation areas exist within the region. Outdoor recreational areas include the Lake Mead National Recreation Area, located 121 km (75 mi) east; the Death Valley National Monument, located 19 km (12 mi) to the west-southwest; the Red Rock National Conservation Area, located 64 km (40 mi) to the southwest; and the Desert National Wildlife Range, located 5 km (3 mi) east. Portions of the Desert National Wildlife Range overlap the NAFR Complex and come within 3 km (2 mi) of the boundary of the NTS. State parks include Spring Mountain Ranch State Park, located 80 km (50 mi) southwest, and the Floyd R. Lamb State Park, located 72 km (45 mi) southwest. Other recreational areas include year-round campsites and picnic areas in the Toiyabe National Forest, located 40 km (25 mi) to the southwest. In addition, numerous camping and fishing sites that are used during the spring, summer, and fall months are located in the outlying areas north of the site.

The North Las Vegas Facility occupies approximately 80 acres in the city of North Las Vegas, Nevada. The North Las Vegas Facility is zoned for general industrial use and is bordered on the north, south, and east by general industrial zoning. The western border of the site is adjacent to a street, which acts as a buffer zone, separating the site from fully-developed, single family, residential-zoned property.

The North Las Vegas Facility is divided into three distinct areas. The first area covers 20 acres and houses support for the Lawrence Livermore National Laboratory test program. The second area covers 20 acres and houses support for the Los Alamos National Laboratory test program. The third area covers 38.3 acres and houses a computer center and administrative and engineering support functions.

4.1.1.3 Site-Support Activities. The following sections provide a brief discussion of the current NTS site-support services (infrastructure). Additional details regarding site support are provided in Section A.6 of Appendix A.

FACILITIES—The NTS contains approximately 1,500 buildings that provide approximately 269,419 m^2 (2.9 x 10^6 ft^2) of space. A breakdown of the types of facilities and their cumulative space is given in Table 4-2. Many of these facilities have been either mothballed or abandoned because of the reduction of program activities at the NTS.

SERVICES—Services available at the NTS include law enforcement and security, fire protection, and health care.

Law Enforcement and Security—Law enforcement on the NTS is provided by the Nye County Sheriff's Department through a substation located at Mercury. Security enforcement is the responsibility of Wackenhut Services, Inc. The NTS is a controlled-access area. Wackenhut Services, Inc., a private contractor, provides sitewide protective services following guidelines established by the DOE/NV Safeguards and Security Division.

The DOE currently contracts with the Nye County Sheriff's Department for five officers at the NTS substation to assist in civilian law enforcement. There is no holding facility at the NTS; most people arrested at the NTS are transported to Pahrump. If the individual cannot pay bail, he is sent to Tonopah, Nevada (Willen, 1995).

Security facilities at the main gate include a badging and security office. Other facilities include firing ranges, an ammunition dump, a security training facility, and an obstacle course. Mobile ground patrols provide security throughout the site. Helicopters and light aircraft are used to check perimeter barricades and other remote locations in the forward area. Teams of armed guards are available to respond to emergency situations and to escort the movement of nuclear explosives and special nuclear materials within the NTS. Response teams are equipped with all-terrain, high-speed armored vehicles (Raytheon Services Nevada, 1994b).

Fire Protection—The fire protection capacity of the NTS is structured to accommodate current mission requirements, with a self-contained fire-fighting department responsible for suppression and prevention. Other services include rescue, hazardous material response, training of fire personnel, fire prevention inspection, installation of all fire

Table 4-2. Building space on the NTS

Functional Unit	Square Meters	Square Feet
Administrative	72,081	775,874
Temporary Housing	22,499	242,178
Storage	68,886	741,483
Services	62,667	674,539
Research and Development	38,215	411,338
Reactor and Accelerator	305	3,286
Other Known Assets	101	1,088
Other Storage	3,713	39,971
Industrial/Production Process	3,290	35,418
Service Structures	205	2,208
Communication and Related Systems	797	8,575
Distribution Systems	36	390

extinguishers at the NTS, and fire prevention awareness programs (Raytheon Services Nevada, 1994).

A fire department staffed with support-contractor personnel provides 24-hour fire-fighting services for the NTS. In addition, fire protection and crash rescue services are provided for two airstrips, upon request. Within site boundaries, the fire department provides support during the transportation, transfer, and storage of toxic and flammable gases. The fire department maintains one fire station in Mercury. Support equipment used by the fire department include one engine company, one tanker truck, and one UNMOG used for wildlands support (Raytheon Services Nevada, 1994).

Health Care—An eight-bed dispensary in Mercury serves as a clinic for the NTS. Facilities include rooms for emergency care, examination and treatment, X-ray, and associated darkroom equipment, as well as offices and storage. The facility can respond rapidly to normal and emergency situations, including in-patient treatment, emergency surgery, and radiation accidents. First-aid stations are located near field activities so that personnel can be treated quickly. Ambulances are available for emergencies that occur on the site, in nearby communities, or on highways (Raytheon Services Nevada, 1994).

UTILITIES—The utilities at the NTS include water systems, wastewater systems, and electrical systems.

Water Systems—The NTS is presently served by a water system consisting of 11 operating wells for potable water, one well for non-potable water (Table 4-3), 27 usable storage tanks, 13 usable construction water sumps, and 6 water transmission systems (with 5 permitted water distribution systems). The wells are not being used to their full capacity and are capable of producing much more water if needed. Additional inactive wells are available (Table 4-4) or wells may be drilled and developed if increased water production is required. Wells, sumps, and storage tanks are used, as required, to support construction or operational activities. Five water storage tanks are currently under construction at the NTS. Domestic, construction, and fire protection water are supplied by this system through over 161 km (100 mi) of supply line. Potable water is trucked to support facilities that are not connected to the potable water

Table 4-3. Active water supply wells on the NTS

Well*	Water Service Areas	Area Served	Type	Status	Sumps & Reservoirs Storage Capacity L	Sumps & Reservoirs Storage Capacity gal	Flow Rate L/min	Flow Rate gal/min
U-20a	A	19, 20	Nonpotable	Active	154,400,000	40,780,000	1,060	280
8	B	2, 12	Potable	Active	2,100,000	553,000	2,045	540
UE-16d	B	1	Potable	Active	None	None	735	194
C	C	6, 3	Potable	Active	4,880,000	1,290,000	1,100	290
C-1	C	6, 3	Potable	Active	See Well C	See Well C	1,100	290
4 and 4a	C	6	Potable	Active	See Well C	See Well C	2,651	700
5b	C	5, 22, 23	Potable	Active	2,700,000	710,000	871	230
5c	C	5, 22, 23	Potable	Active	190,000	50,000	871	230
J-12	D	25	Potable	Active	13,510,000	3,555,000	2,878	760
J-13	D	25	Potable	Active	190,000	50,000	2,574	680
Army Well 1	C	22, 23	Potable	Active	None	None	371	98

* The locations of these wells are shown on Figure 4-5.

Table 4-4. Inactive water supply wells on the NTS

Well[a]	Water Service Areas	Area Served	Type	Status	Sumps & Reservoirs Storage Capacity L	Sumps & Reservoirs Storage Capacity gal	Flow Rate L/min	Flow Rate gal/min
UE-19c	A	19, 20	Nonpotable	Inactive	13,984,000	2,900,000	1,363	360
UE-15d	B	15	Nonpotable	Inactive	56,781	15,000	1,022	270
2	B	2, 4, 7, 9, 10	Potable (chlorinator)	Inactive (pump failed)	3,293,308	870,000	643	170
UE-1r	B	1	Nonpotable	Inactive	None	None	1,022	270
UE-5c	C	5	Nonpotable	Active for environmental sampling only	None	None	1,325	350
5a	C	5	Potable	Abandoned	None	None	341	90
F	C	27	Nonpotable	Inactive	None	None	901	238
3	C	3	Nonpotable	Inactive	None	None	None	None
J-11	D	25	Potable	Abandoned	See Well J-12[b]	See Well J-12[b]	None	None

[a] The locations of these wells are shown on Figure 4-5.

[b] Table 4-3.

system. The NTS used approximately 1.7 billion liters (L) (457 million gallons [gal]) of water in 1994. Mercury was the primary user of this water, using 40 percent of the total water pumped. The forward areas of the NTS used approximately 7.0 x 10^8 L (1.9 x 10^8 gal).

For evaluation purposes, the NTS water system has been divided into four water service areas (A, B, C, and D) according to the location of the water system and support facilities (Figure 4-5). Water service area A includes NTS Areas 19 and 20; service area B covers Areas 2, 4, 7, 8, 9, 10, 12, 15, 17, and 18; service area C supplies Areas 1, 3, 5, 6, 11, 22, 23, 26, and 27; and service area D supplies water to the remaining areas of the NTS.

Non-potable water distribution in water service area A is through an aboveground 152 millimeter (mm) (6-inch [in.]) pipe line that runs along the Pahute Mesa Road between Well UE-19c, the Area 20 camp, and Well U-20a. Water in this system must maintain a constant flow to prevent freezing in the extreme temperatures.

Water service area B has two potable water distribution systems to serve water needs in this area. The Area 17 support facilities are supplied by the system from Well UE-16d. The other transmission system in this area feeds from Well 8 to the Area 12 camp through 152-mm (6-in.) pipe line and 102-mm (4-in.) pipe line and then into the Area 2 facilities through 152-mm (6-in.) pipe line connecting to Well 2.

The two distribution systems in water service area C feed several wells and use 203-mm (8-in.), 102-m (4-in.), and 152-mm (6-in.) underground pipelines. The Area 6 distribution system is supplied by Wells 4, C, C1, and 4a, and provides potable water service to the Device Assembly Facility, the Yucca Lake facilities, the Control Point, and the Well 3 yard. This system contains segments of old asbestos pipe. Area 5, Mercury, and Desert Rock facilities are supplied by a system connecting Wells 5b, 5c, and Army Well 1.

Wells J-12 and J-13 supply potable water to the single transmission system in water service area D. This system (in NTS Area 25) supplies several reservoirs and the former Nuclear Rocket Development Station facilities through 152 mm (6-in.), 203-mm (8-in.), and 304-mm (12-in.) pipe lines.

Wastewater Systems—Wastewater on the NTS is disposed of either by a combination septic tank and leach field system or by a lagoon system. At areas not serviced by a permanent wastewater system, portable sanitary units are provided. The size and type of wastewater systems used are determined by anticipated discharge and cost effectiveness.

Electrical System—Electric power is delivered to the NTS at the Mercury switching center in Area 22 by a primary 138-kilovolt (kV) supply line from the Nevada Power Company system near Las Vegas. A second Nevada Power Company-owned 138-kV line connects the Mercury switching center to the Jackass Flats substation in Area 25. Valley Electric Cooperative, serving the Pahrump, Nevada area also has a transmission connection to the Jackass Flats substation. The dual transmission and station connections provide the NTS with the ability to receive service from either transmission source depending on contractual arrangements. A DOE-owned 138-kV loop extends this primary power supply into the NTS forward areas where smaller, lower-voltage distribution lines feed power to individual facilities. During the last several years, the NTS has been provided power under contracts with Nevada Power Company and the Western Area Power Administration. Additionally, the DOE has periodically operated oil-fired diesel generators at Area 25 for peak and back-up power supply purposes (Raytheon Services Nevada, 1994).

Electric power on the NTS is carried over 426 km (265 mi) of transmission and subtransmission lines (Raytheon Services Nevada, 1994). The power subtransmission uses an extensive 34.5-kV system and two small 69-kV systems. These systems provide distribution voltages of 4.16 kV and 12.47 kV at various substations. Distribution voltages are transformed to both 480/277-volt and 208/120-volt three-phase systems for most NTS loads, with a few single-phase 120-volt services.

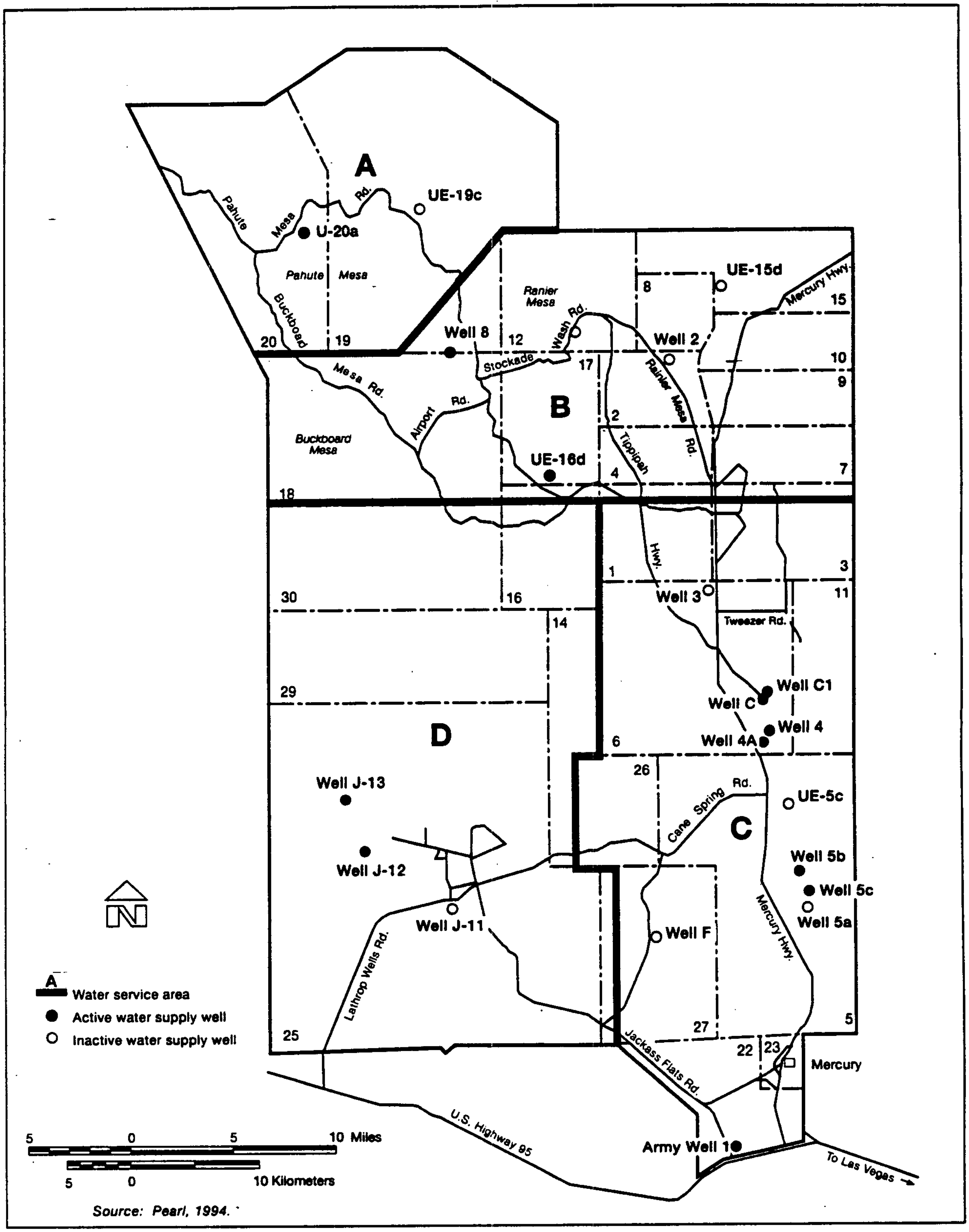


Figure 4-5. Existing water service areas and supply wells on the NTS

Power transmission/subtransmission lines and substations located on the NTS are shown on Figure 4-6.

COMMUNICATIONS—Communication systems cover not only the entire area of the NTS, but also reach far beyond its boundaries. The NTS telecommunications system employs digital telephone switching, fiber-optic transmission, microwave, two-way radio, voice privacy, data transmission systems, general- and special-purpose data communications, and teleconferencing services (secure as necessary).

Communications support also includes automated data processing equipment, automated office support systems, and information systems. Computer systems encompass general purpose, stand alone, data management, word processing, engineering, computer-aided drafting, and computer-aided manufacturing.

4.1.1.4 Airspace. Airspace must be managed and used in a manner that best serves the competing needs of commercial, general, and military aviation interests. The Federal Aviation Administration is responsible for the overall management of airspace and has established different airspace designations that are designed to protect aircraft during flights to or from an airport, transiting between airports, or operating within "special use" areas identified for defense-related purposes. Rules of flight and air traffic control procedures have been established to govern how aircraft must operate within each type of designated airspace. All aircraft operate under either instrument flight rules or visual flight rules.

The type and dimension of individual airspace areas established within a given region and their spatial and procedural relationship to one another are contingent upon the different aviation activities conducted in that region. When any significant change in airspace use is planned for a region, the Federal Aviation Administration will reassess the airspace configuration to determine if such changes will adversely affect (1) air traffic control systems and/or facilities, (2) movement of other air traffic in the area, or (3) airspace already designated and used for other purposes (i.e., military operating areas or restricted areas). Approximately 16,000 sorties were flown on the Tonopah Test Range by the DOE in Fiscal Year 1994. These sorties included employee transportation and activities associated with Defense and Work for Others Programs.

Airspace associated with the NTS and vicinity is shown on Figure 4-7. The NTS airspace is part of the NAFR Complex, which includes 4 restricted areas, the desert military operating areas/air traffic control assigned airspace, 2 low-altitude tactical navigation areas, 29 military training routes, and 3 air refueling routes. Greater detail of the airspace configuration is shown on Figure 4-8. Restricted area R-4808 is the airspace over the NTS. Airspace control over portions of the restricted areas and all desert military operating areas has been delegated to the Nellis Air Traffic Control Facility by the Federal Aviation Administration Air Route Traffic Control centers serving the surrounding airspace. The Nellis Air Traffic Control Facility controls the entry and exit of military aircraft in this airspace, while the Range Control Center monitors mission activities within this airspace. Because activities in restricted areas can be hazardous, nonparticipating aircraft are restricted from this airspace except when released by the controlling agency for joint use. The Nellis Air Traffic Control Facility may release and authorize use of R-4806 and R-4807 for nonparticipating aircraft when these areas are not required for defense-related activities. Restricted areas R-4808 and R-4809 are managed by the DOE and are never authorized for use by civilian aircraft.

The desert military operating areas comprise the eastern half and northern portion of the airspace associated with the NAFR Complex. The training conducted within the desert military operating areas consists of high-speed operations, including abrupt aircraft maneuvers and supersonic flight at or above 1,524 m (5,000 ft) above ground level. Within the military operating areas, military aircraft are exempted from the provisions of Federal Aviation Regulation 91.71, which normally restrict abrupt aircraft maneuvers or aerobatics within federal airways and control zones. The desert military operating areas are active during daylight hours Monday through Saturday and at other times by authorization.

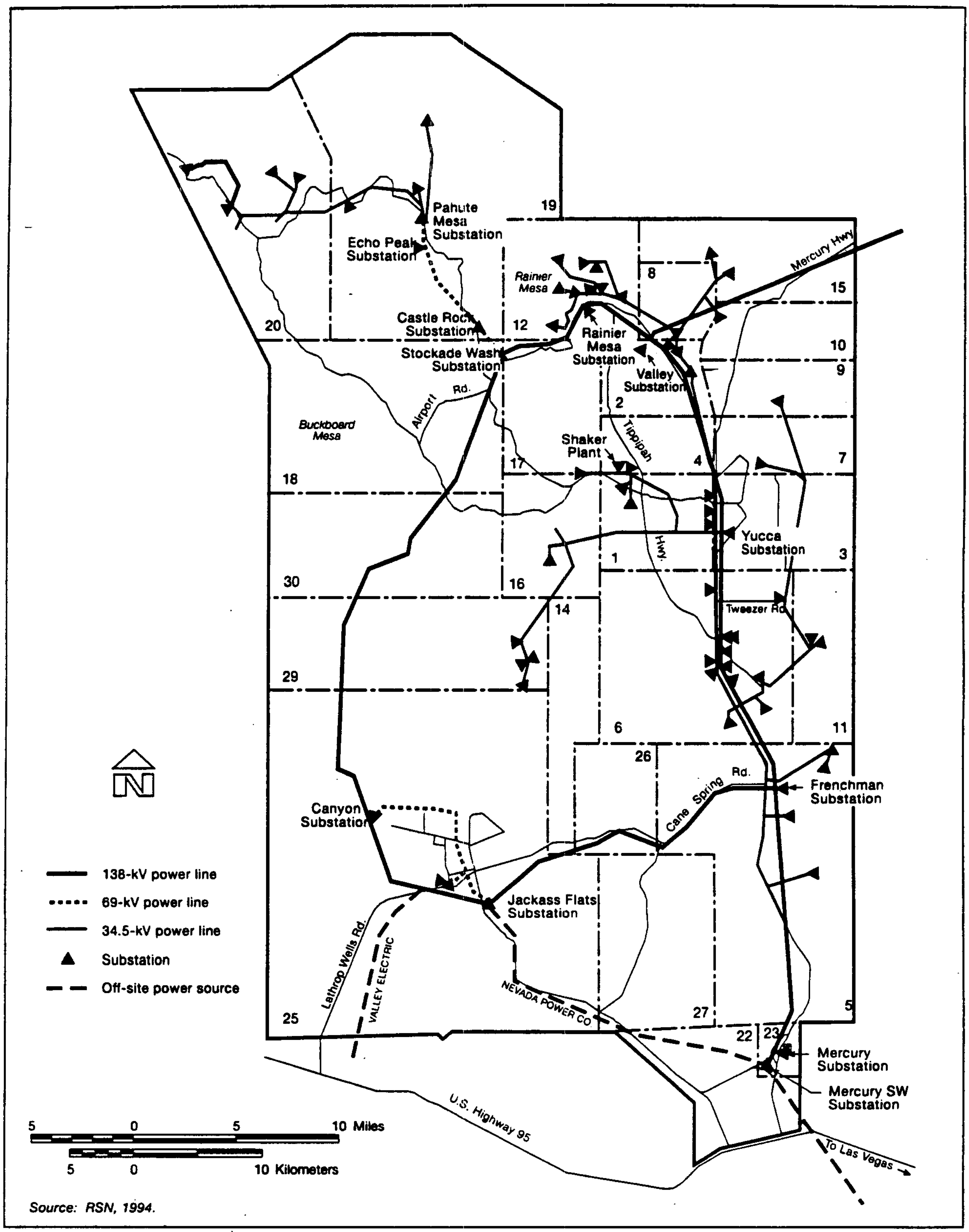


Figure 4-6. NTS sitewide power distribution.

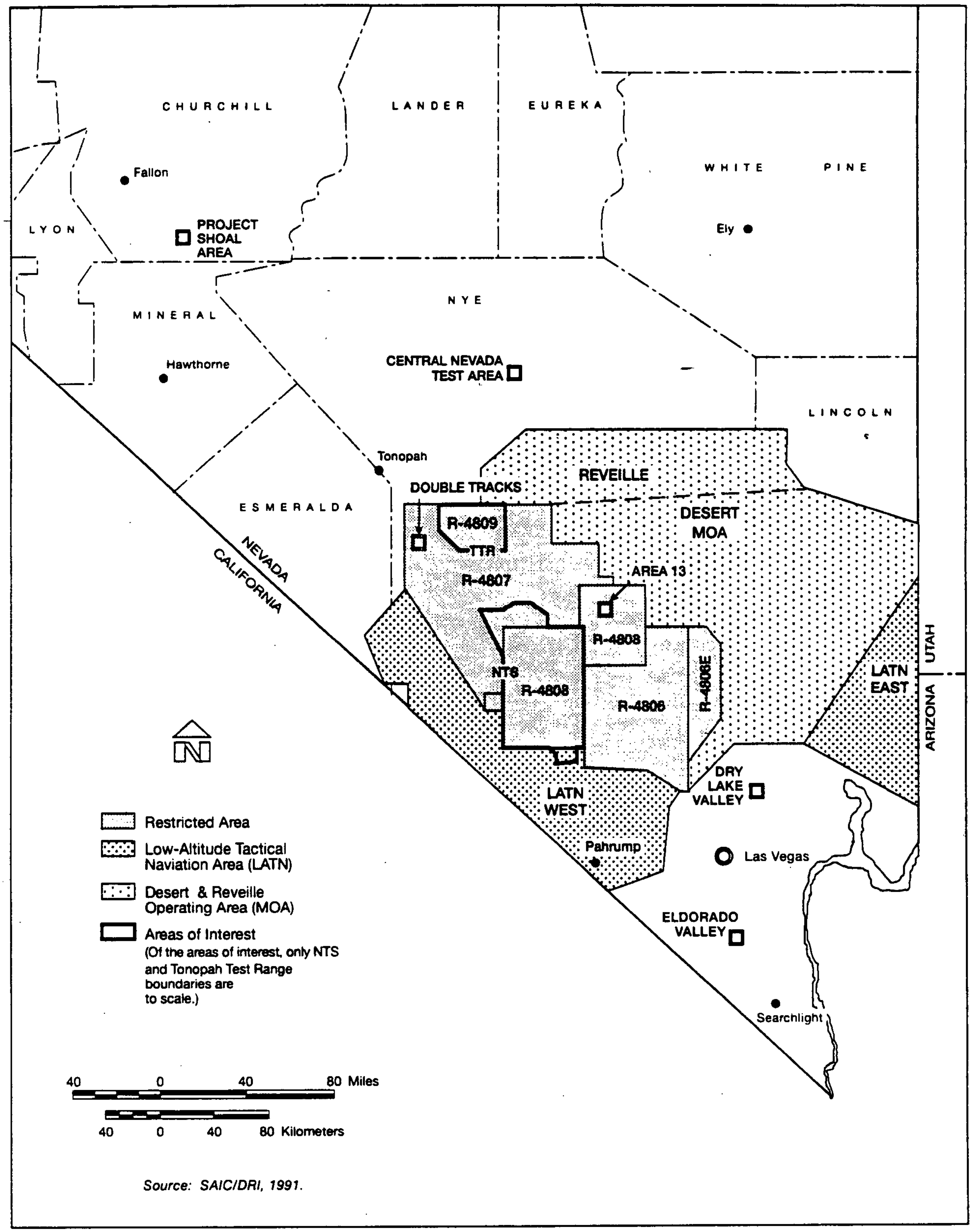
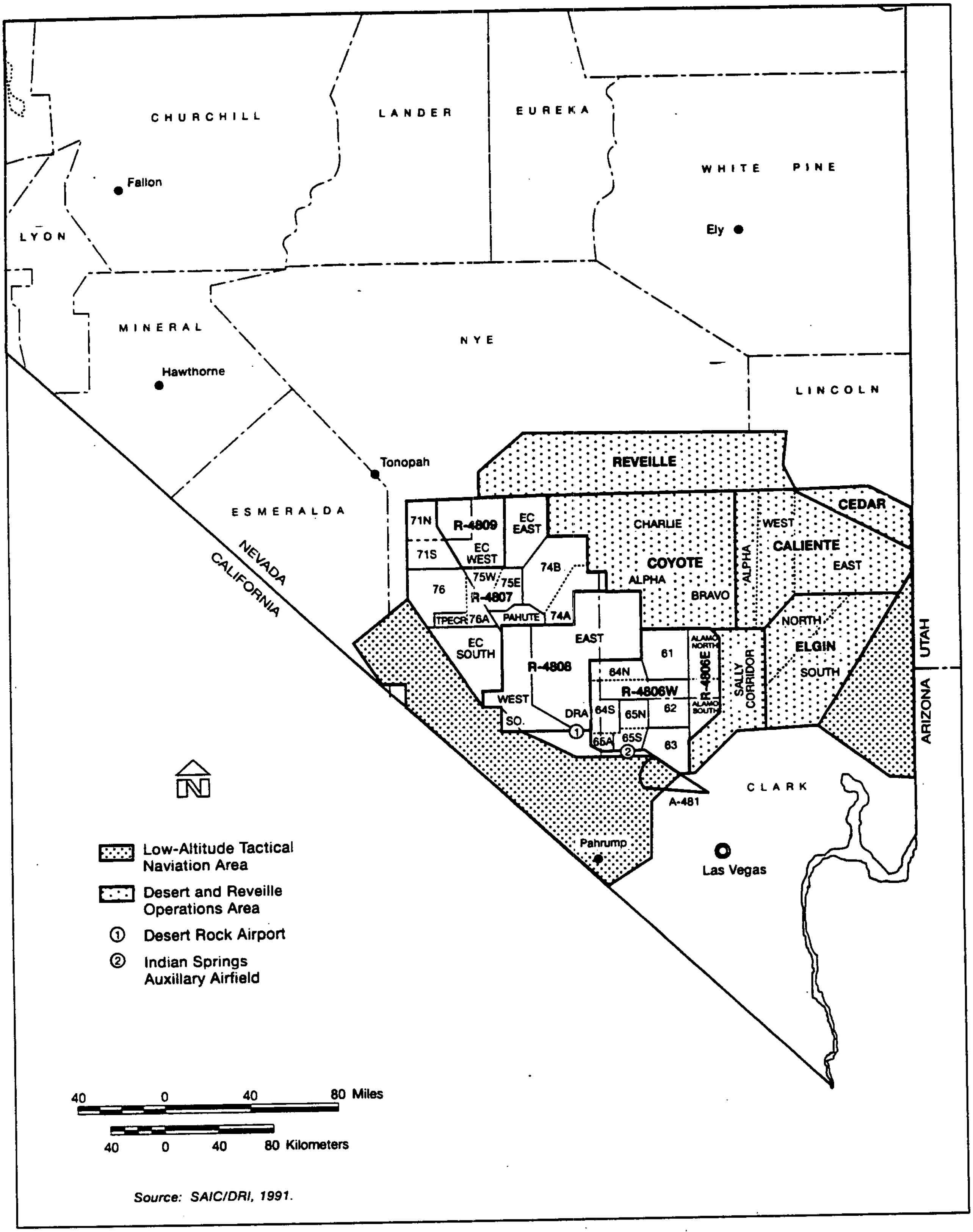


Figure 4-7. NTS and vicinity airspace



Source: SAIC/DRI, 1991.

Figure 4-8. Detailed configuration of the NTS and vicinity airspace

Even though military aircraft are scheduled for flight activity within the military operating areas, civilian aircraft flying under visual flight rules can fly through the area. In addition, both military and civilian aircraft operating under instrument flight rules may be cleared through the military operating areas by Nellis Air Traffic Control Facility if in-flight separation can be provided.

The low-altitude tactical navigation areas are unrestricted airspace used intermittently by the military. These areas allow A-10 aircraft to practice random tactical navigation and formations between 30 m (100 ft) and 457 m (1,500 ft) above ground level at airspeeds at or below 250 knots (288 mi/hr).

These areas are normally used when no airspace is available for this type of training within the NAFR Complex.

The military training routes and air refueling routes are located within or at the boundaries of airspace associated with the NAFR Complex. Several of these military training routes overlap or are reversals of each other. Generally, military training routes are established below 3,048 m (10,000 ft) mean sea level for operations at speeds in excess of 250 knots (288 mi/hr). However, some military training route segments may be at higher altitudes because of terrain or climb and descent requirements. There are instrument-flight-rule military training routes and visual-flight-rule military training routes. The normal width of an instrument-flight-rule military training route from the centerline is 8 km (5 mi) and 8 to 16 km (5 to 10 mi) for visual-flight-rule military training routes, although some segments of these routes may be as narrow as 3 km (2 mi) and as wide as 32 km (20 mi). Figure 4-9 shows the complexity of military training routes.

There are several other types of designated airspace around the NAFR Complex/Las Vegas area. The following are brief descriptions of these types:

- Indian Springs Air Force Auxiliary Airfield Class D airspace encompasses a 8 km (5-statute mile) radius around the airfield from the surface to 914 m (3,000 ft) aboveground level within which aircraft are provided air traffic control service by the Indian Springs tower. The tower can advise civilian aircraft of military operations occurring at Indian Springs

- Desert Rock Airport is a controlled, but unmanned, airfield operated by the DOE, located southwest of Mercury along U.S. Highway 95 (Figure 4-8). Only periodic flights involving general-aviation single-engine to multi-engine jet aircraft occur at this airport

- Las Vegas Class B airspace encompasses Nellis Air Force Base and McCarran International Airport. All aircraft operating within the Class B airspace must be in contact with an air traffic control facility. In the northern portion of the Class B airspace, air traffic control is provided by the Nellis Approach Control. The southern portion is controlled by the Las Vegas Approach Control

- Alert Area 481 is a designated airspace extending from Nellis Air Force Base westward to advise civilian aviation of high-density military operation transiting between the base and the NAFR Complex. The alert area begins at 2,134 m (7,000 ft) mean sea level and extends to a ceiling of 5,791 m (19,000 ft) mean sea level.

The Nevada Airport System Plan (NDOT, 1995) indicates that in 1994 there were 824,570 civilian aircraft operations in Nevada. In 1994, there were 2,031 general aviation aircraft based at airports in Nevada, the locations of which are indicated in Figure 4-10.

Because of airspace restrictions associated with the NTS/NAFR Complex, commercial and general aviation aircraft must normally use routes of flight that remain clear of this range complex. With respect to commercial aviation (certificated air carrier operations), flight is generally conducted along an en route "highway" system defined by ground- or space-based radio navigational aids. In the NTS/NAFR Complex area, the federal airways (low altitude) (Figure 4-11) and jet route (high altitude) systems circumvent airspace used for defense-related purposes in a direct manner, or vertical separation is provided between military

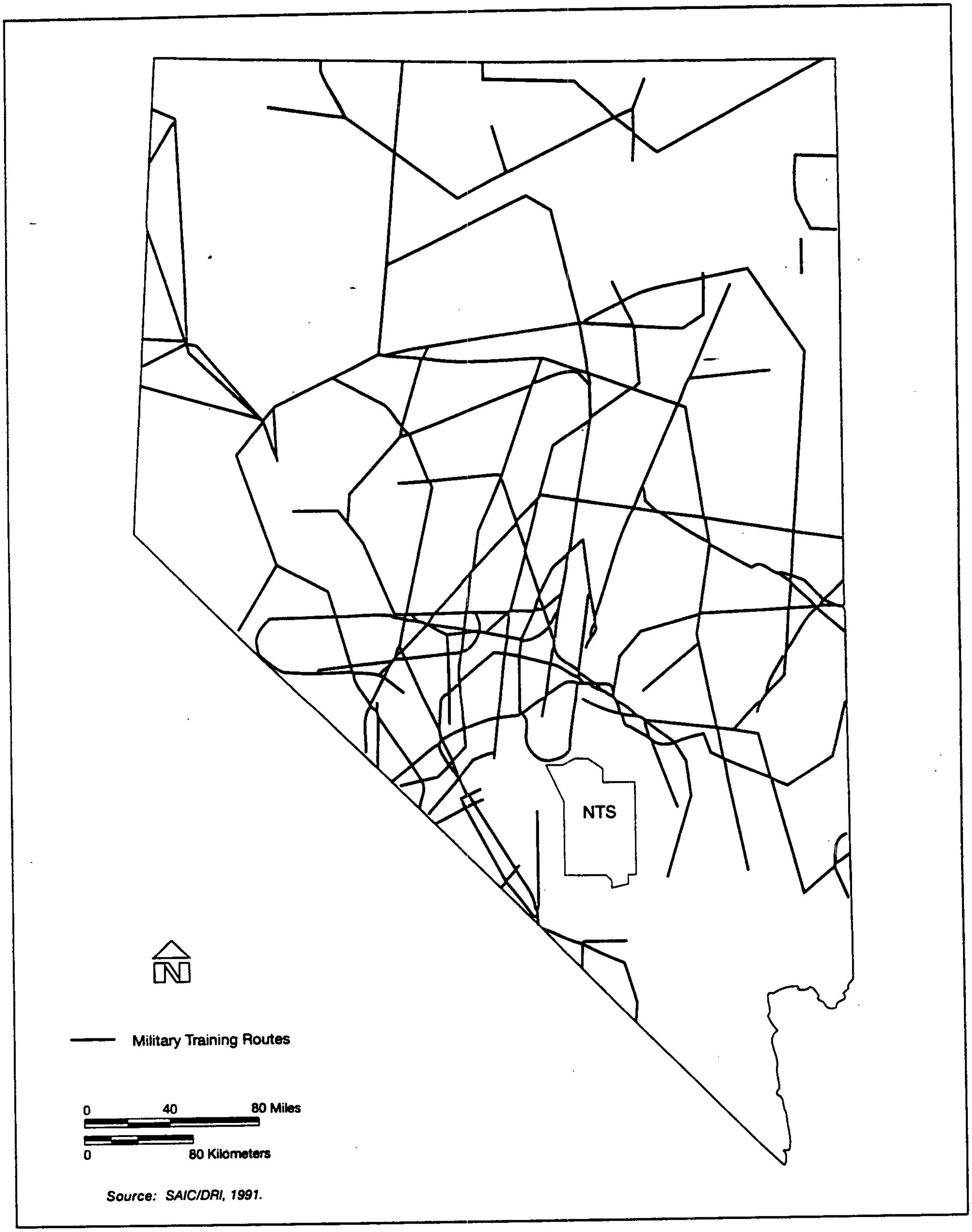


Figure 4-9. Military training routes in Nevada.

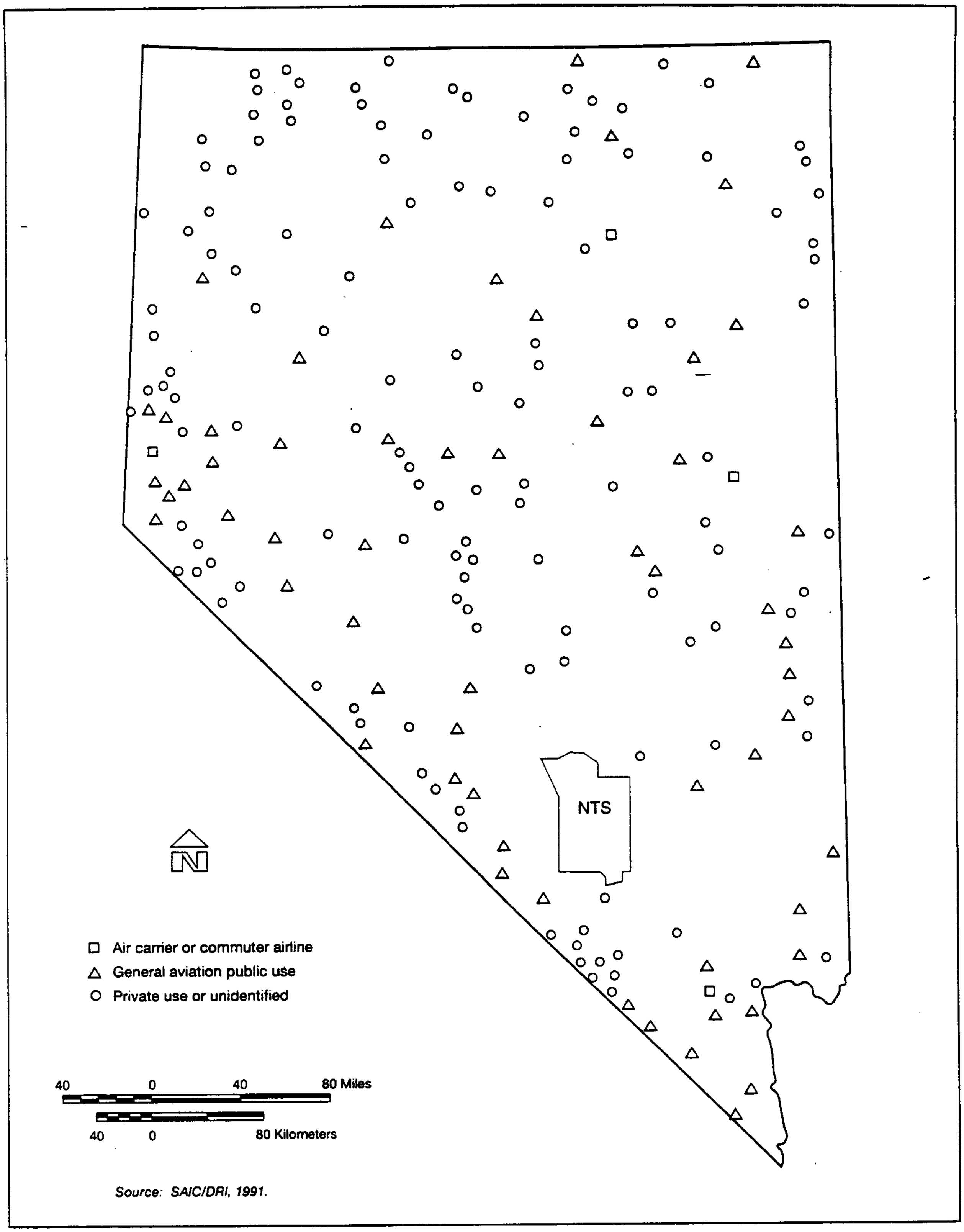


Figure 4-10. Commercial, general, and private aviation airports and airfields in Nevada

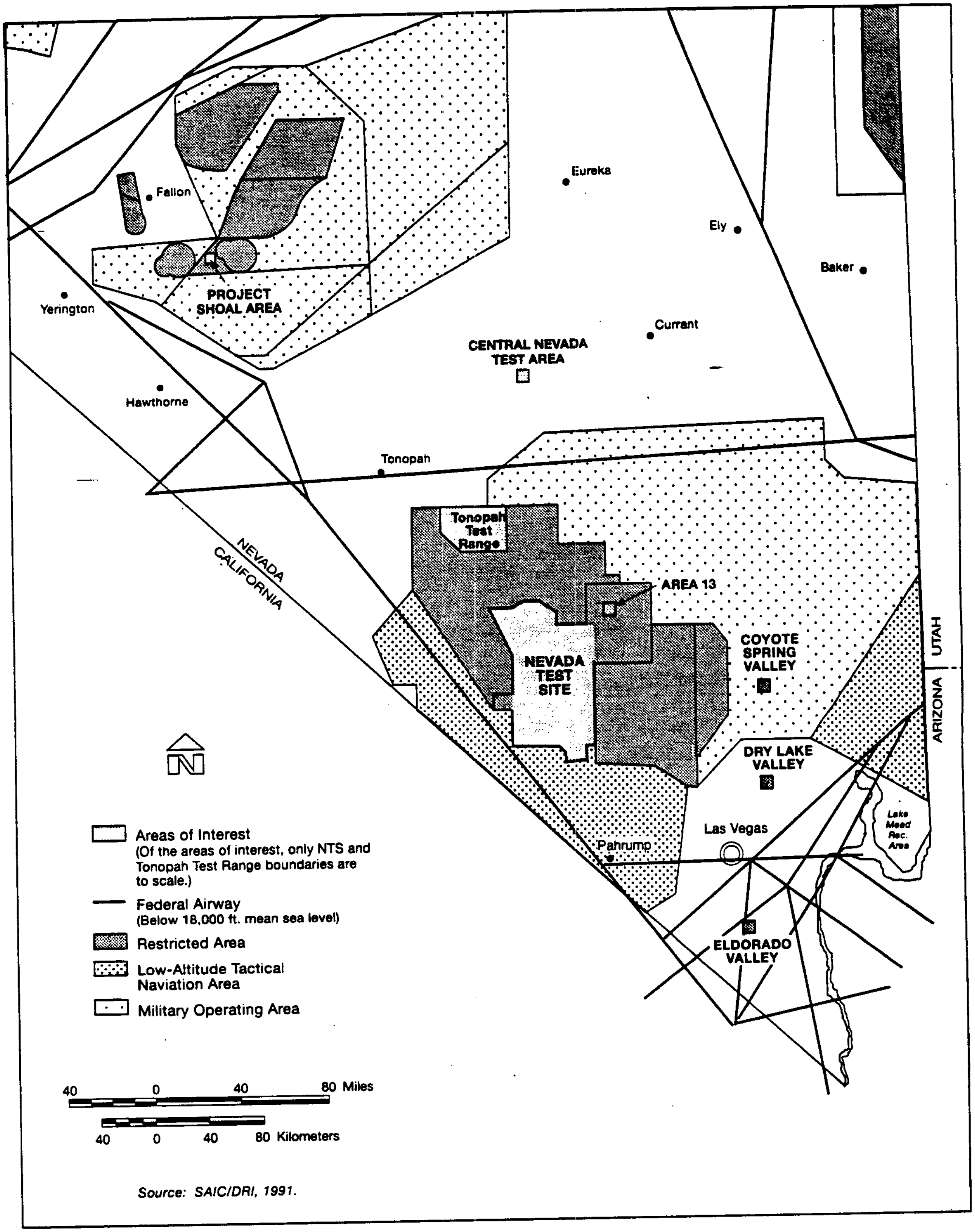


Figure 4-11. Federal low-altitude airways in southern Nevada

aircraft and the en route commercial traffic on these systems (Figure 4-12).

General aviation includes business or corporate air transportation and private, recreational, or training activities. General aviation aircraft operate within the framework of the en route airway system, as well as within the uncontrolled airspace outside the structured airway and terminal airspace. Recreational flying occurs on weekends when airspace is not normally used for defense-related training. However, occasional diversions around defense-related airspace that increase flying distance and fuel consumption may occur.

4.1.1.5 Waste Management Program. Waste Management Program activities include disposal, storage, treatment, closure operations and the activities of the Waste Minimization/Pollution Prevention Program. Each waste and operation type is discussed in this section; the waste Minimization/Pollution Prevention Program is discussed in Appendix C, Section C.6, and is summarized at the end of this section.

Wastes, such as nonhazardous, nonradioactive sanitary, and industrial wastes from the NTS programs are disposed of in several industrial landfills, sewage treatment systems, and septic tank systems located at the NTS. Five types of wastes are managed at the NTS: low-level waste, mixed wastes (transuranic and low-level), hazardous wastes, Toxic Substances Control Act wastes, and nonhazardous solid wastes.

The following sections summarize existing waste management operations by type: disposal, storage, treatment, and closure. Within the discussion of each type of operation, the different waste types managed and the locations of the facilities are identified. All of these wastes are managed in three types of management facilities: treatment facilities, storage facilities, and disposal facilities (Figure 4-13).

DISPOSAL OPERATIONS—In 1961, the Area 5 Radioactive Waste Management Site was established for the disposal of low-level waste from both on-site and off-site DOE generators. The developed area or unit within the Area 5 Radioactive Waste Management Site consists of 17 landfill cells (pits and trenches) and 13 greater confinement disposal boreholes. The operational mixed waste and low-level waste disposal cells within the Area 5 Radioactive Waste Management Site include the following:

- Pits for the disposal of on-site generated mixed waste and low-level waste
- Trenches for the disposal of low-level waste.

Approximately 500,000 Curies (Ci) of low-level waste have been disposed of in Area 5 pits and trenches. High-specific-activity wastes have been disposed of in greater confinement disposal units. Approximately 9.3×10^6 Ci of high-specific-activity waste, primarily tritium, have been disposed of in greater confinement disposal units in Area 5.

Historically (since the mid-1960s), the Area 3 Radioactive Waste Management Site was used primarily for the disposal of contaminated waste generated from the NTS Atmospheric Testing Debris Disposal Program, which involved the cleanup of atmospheric testing sites. Total volume of waste disposed of in Area 3 as of September 1994 was 3.0×10^5 m^3 (1.1×10^3 ft^3) and consists of tower assemblies, metal cable, miscellaneous metal scrap, and soil from the blading (scraping) of the first few inches of the site to remove the surficial radioactive contamination.

Approximately half of the radioactive waste disposed of in the Areas 3 and 5 Radioactive Waste Management Sites is atmospheric testing debris generated during the cleanup of the NTS aboveground nuclear detonation areas. The remainder of the waste was received from other DOE and defense-related facilities conducting environmental restoration activities, research and development projects, and nuclear weapons production. This waste was generally in the form of soil, construction rubble, compactible trash, glass, plastics, filters, and process residues. Today, Area 3 is used for the disposal of bulk and packaged low-level waste from on-site and off-site DOE generators.

Current waste management disposal cells at the Area 3 Radioactive Waste Management Site are

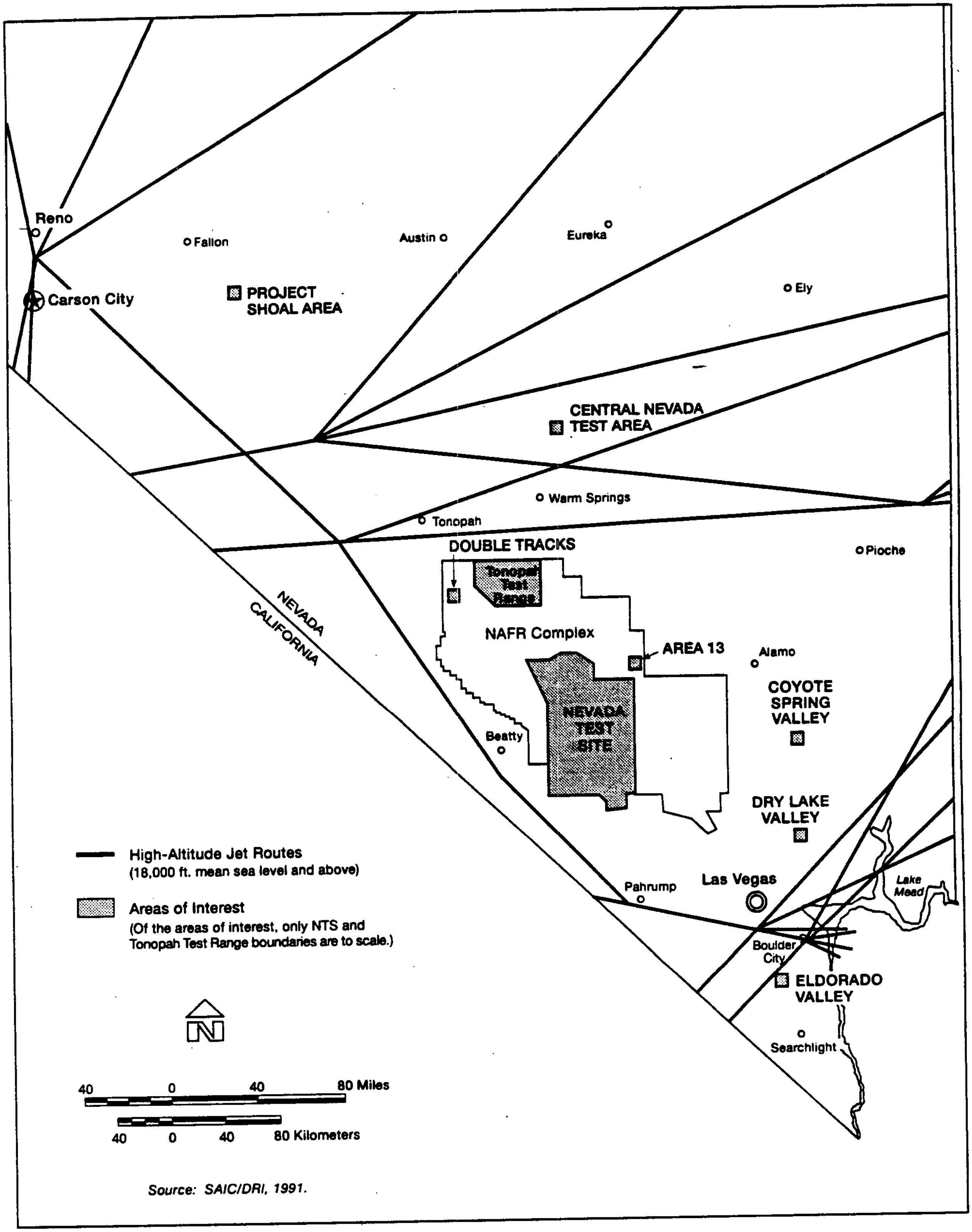


Figure 4-12. High-altitude jet routes in southern Nevada

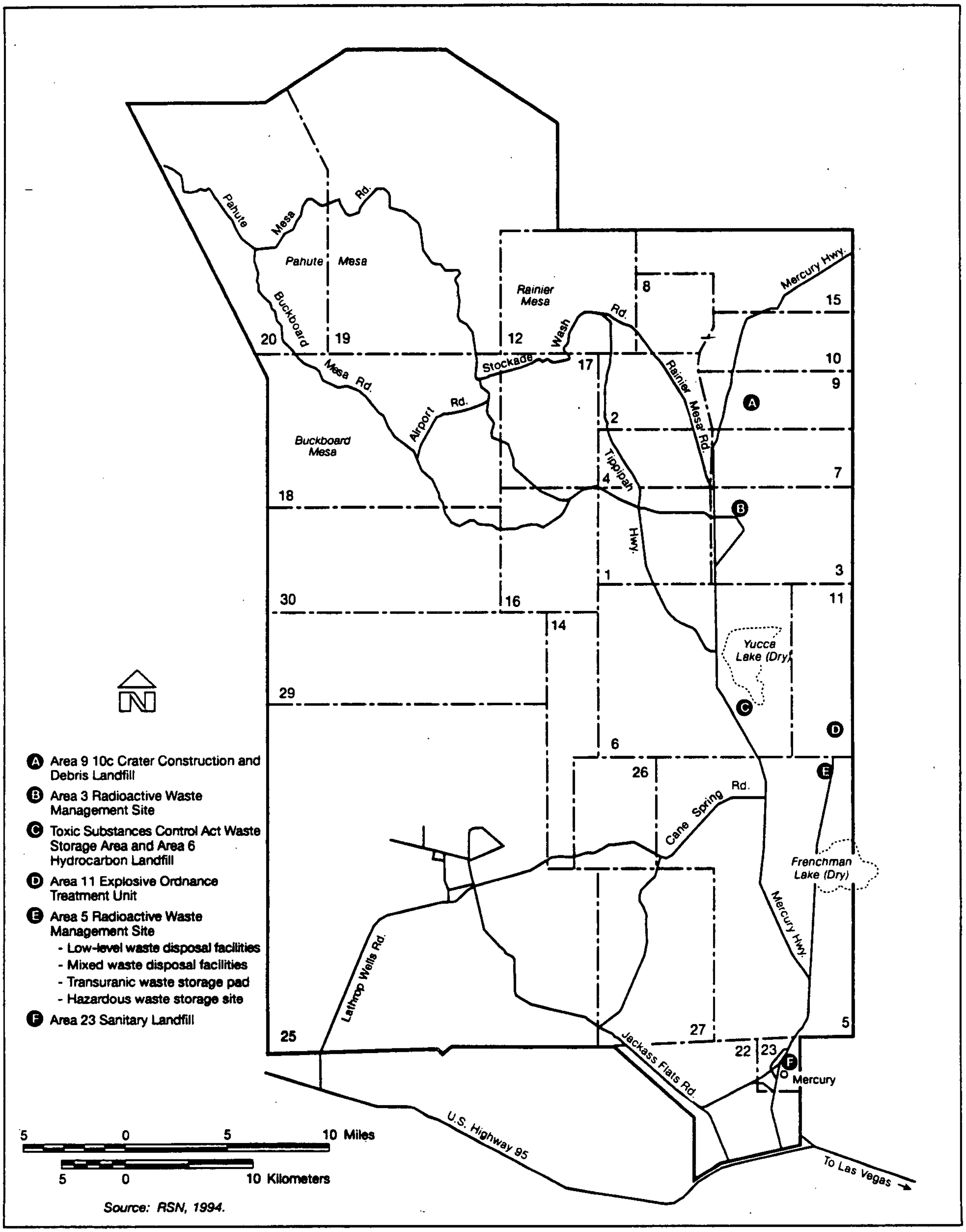


Figure 4-13. Existing treatment, storage, and disposal facilities on the NTS

comprised of four subsidence craters (U-3ax, U-3bl, U-3ah, and U-3at), with areas between craters excavated to make two oval-shaped landfill cells. Conventional landfill methods are used to dispose of waste in each cell; each layer of waste is covered with 1 m (3 ft) of fill before additional waste materials are disposed. The U-3ax/bl disposal cell contains mixed waste and low-level waste. It is inactive, temporarily covered, and awaiting closure. The U-3ah/at cell is currently being used for low-level waste disposal; mixed waste is not accepted. To date, approximately 1,250 Ci have been disposed of in the Area 3 subsidence craters. Three additional subsidence craters are reserved for low-level waste cells: U-3bh, U-3bg, and U-3az.

Several factors were considered in selecting subsidence craters for the disposal of waste. The degree of bulking, sometimes called compaction, that occurs during the collapse of the rubble chimney is an important consideration. Subsidence crater and cavity volumes were compared to establish the changes in the bulk density of the collapsed material. This was done to ensure that the resulting bulk density of the chimney rubble is equal to or greater than the density of the original, undisturbed geologic media. Such siting practices have ensured that additional compaction of the rubble below the waste management unit does not occur (Hawkins and Kunkle, 1996a).

The 13 greater confinement disposal boreholes contain mixed waste; low-level waste; waste similar to greater-than-Class C low-level waste; high-specific-activity low-level waste; and transuranic and transuranic mixed wastes. Limited quantities of transuranic waste were also disposed of in Trench 4C and in greater confinement units located in Area 5.

Since the 1980s, hazardous waste generated on the NTS has been shipped off site to commercial facilities. Receipt of transuranic waste for disposal at the NTS ceased in 1988; receipt of mixed waste for disposal from off-site generators ceased in 1990.

Low-level Waste—The NTS currently operates the Areas 3 and 5 Radioactive Waste Management Sites for the disposal of low-level waste from both the NTS and off-site defense generators. The Area 5 Radioactive Waste Management Site uses pits and trenches for shallow land burial of standard-packaged low-level waste. Included in the category of low-level waste is classified waste. Classified waste is low-level waste that is 'classified' because of the physical shape or specific composition of the material contained in the waste. Classification creates a need for the use of separate disposal units which are controlled with additional security measures. Area 3 uses subsidence craters generated during underground nuclear weapons testing for disposal of bulk low-level waste.

All waste coming to the NTS for disposal is subject to rigid waste acceptance criteria that mandate waste form, packaging, and certification. All generators are required to prepare a quality assurance program that ensures the NTS waste acceptance criteria are met; this program is audited by the DOE/NV for compliance. Only after all discrepancies are resolved does the generator receive permission to ship waste to the NTS. Once approved, generators are audited annually to ensure the continued adequacy of the program (DOE, 1992).

Mixed Waste—Pit 3, at the Area 5 Radioactive Waste Management Site, has Resource Conservation and Recovery Act interim status to accept mixed waste. Only NTS generators are currently allowed by the state of Nevada to dispose of waste in Pit 3, provided the mixed waste meets the requirements in the Resource Conservation and Recovery Act land disposal restrictions. No mixed waste has been certified or disposed of in Pit 3 in recent years, even though the capability exists.

The state of Nevada must approve the submitted Resource Conservation and Recovery Act Part B permit application for Mixed Waste Disposal Units prior to construction of the new units, which are intended for use as disposal units for off-site mixed waste primarily. The state of Nevada will defer review and comment on the application submitted until the completion of negotiations between all states and the DOE under the Federal Facility Compliance Act. Pit 3 at the Area 5 Radioactive Waste Management Site contains an inventory of 8,024 m^3 (283,372 ft^3) of mixed waste. Pit 3 currently has interim status under Resource Conservation and Recovery Act for disposal of mixed waste generated by the DOE/NV. The disposal cell U-3ax/bl at the Area 3 Radioactive Waste Management Site also contains mixed waste. However, unlike Pit 3 in Area 5, this cell is completely filled and is awaiting closure. There are other disposal cells that contain constituents that would be considered hazardous according to current standards. The disposal cells at the Area 3 and Area 5 Radioactive Waste Management Sites will be closed with a Resource Conservation and Recovery Act-compliant closure cap, if required.

Nonhazardous Solid Waste—Currently, three nonhazardous solid waste landfills are being used for the disposal of solid waste at the NTS. The landfills are located in Areas 6, 9, and 23. The Area 6 landfill is a Class III landfill that accepts hydrocarbon-burdened soil and debris. The Area 9 and Area 23 landfills are currently considered Class II landfills because they each accept less than 20 tons per day of solid waste for disposal.

The Area 9 landfill is located in Crater U-10c. This landfill is an open, circular pit with steep, almost vertical sides which was formed from an underground nuclear test. The current capacity of the landfill is approximately 9.9×10^5 m^3 (3.5×10^7 million ft^3). Prior to the development in 1976 of Resource Conservation Recovery Act regulations governing the disposal of hazardous wastes, solid and liquid wastes were disposed of in the landfill. Since 1976, the Area 9 landfill has received construction and demolition waste, including paper, cardboard, vehicle parts, glass, concrete, gypsum board, nonsalvageable scrap metal and wood, and other materials. As a Class II landfill, the Area 9 landfill was allowed to receive all types of nonhazardous solid waste, excluding radioactive waste, free liquids, and asbestos. The Area 9 landfill receives an estimated 6,800 tons of solid wastes annually.

The Area 23 landfill is an open, rectangular pit with steep, nearly vertical sides. The current capacity of this landfill is approximately 4.5×10^5 m^3 (1.6×10^7 ft^3). The Area 23 landfill receives all types of nonhazardous solid waste. Nonpathogenic hospital waste, dead animals, and asbestos-containing materials are buried in separate cells that are identified by concrete markers. The Area 23 landfill receives approximately 830 tons of solid waste annually.

Although both landfills are currently classified as Class II landfills, changes in State regulatory requirements will cause the Area 9 landfill to undergo partial closure and reopen as a Class III construction and demolition landfill. The Area 23 landfill will remain in operation as a Class II landfill, but will be modified to comply with new State regulations. The modifications to both landfills and the associated potential impacts to the environment are presented in *Environmental Assessment for Solid Waste Disposal* (DOE, 1995a).

WASTE STORAGE OPERATIONS—Waste storage operations are discussed under separate subheadings for transuranic and transuranic mixed waste, mixed waste, low-level waste, hazardous waste, and polychlorinated biphenyl (PCB) waste.

Transuranic and Transuranic Mixed Waste—Currently, transuranic and transuranic mixed waste is stored on the Area 5 transuranic waste storage pad in accordance with a Settlement Agreement with the state of Nevada, signed June 23, 1992. Provisions of this agreement include permission to store transuranic mixed waste on the pad until the Waste Isolation Pilot Plant in New Mexico, or another DOE site, is available as a possible treatment, storage, or disposal destination. The agreement does not allow a volume increase for additional transuranic mixed waste to be received from outside of the state of Nevada. The agreement does not pertain to transuranic waste without hazardous components. A facility is planned to allow the DOE to characterize and certify that the existing transuranic waste meets the Waste Isolation Pilot Plant waste acceptance criteria and to prepare it for shipment to the Waste Isolation Pilot Plant. Facilities for staging and loading the transuranic waste into special containers will be in place. Some DOE/NV Environmental Restoration Program projects might generate a limited amount of transuranic waste; such waste will be stored on the pad and certified before it is transported to the Waste Isolation Pilot Plant.

Mixed Waste—Mixed waste is currently accepted for storage at the Area 5 transuranic waste storage pad under a Mutual Consent Agreement between the state of Nevada and the DOE that allows storage of incidental mixed waste discovered or generated during NTS cleanup activities. In accordance with this agreement, the DOE submitted a Resource Conservation and Recovery Act Part B permit application to the State in January 1995 for the construction of a Mixed Waste Storage Unit. Final disposition of this mixed waste is subject to the agreements reached between the DOE and the State under the Federal Facility Compliance Act. These agreements will cover the location and development of new facilities, the use of mobile units, and the transportation of mixed waste to specified facilities.

Low-level Waste—The NTS has a formal storage facility for NTS-generated low-level waste. This facility is located in Area 6 in the vicinity of the Decontamination Shop. The NTS-generated low-level waste is stored at this facility while characterization and certification activities are being completed prior to disposal at the Areas 3 or 5 Radioactive Waste Management Sites.

Hazardous Waste—The Resource Conservation and Recovery Act Part B permit for the Hazardous Waste Storage Unit does not allow for storage longer than one year. Therefore, the inventory of hazardous waste is stored for less than one year prior to shipment to an off-site permitted treatment or disposal facility.

PCB Waste—PCB waste disposal is regulated as hazardous by the state of Nevada. All other PCB activities are regulated under the Toxic Substances Control Act. This waste is accumulated and stored for up to nine months in the Area 6 Toxic Substances Control Act waste accumulation unit. This unit accepts only PCB and PCB-contaminated waste generated at the NTS. Accumulated PCB waste is shipped off site to a commercial Toxic Substance Control Act-permitted treatment, storage, and disposal facility.

WASTE TREATMENT OPERATIONS—Waste treatment operations are discussed under separate subheadings for low-level, mixed waste, and hazardous waste.

Low-level Waste—Currently, no radioactive waste treatment operations occur at the NTS.

Mixed Waste—Currently, no mixed waste treatment operations occur at the NTS.

Hazardous Waste—Currently, only the Explosive Ordnance Disposal Unit treats hazardous waste at the NTS. Operating under a Resource Conservation and Recovery Act Part B permit, the Explosive Ordnance Disposal Unit is capable of treatment by detonation of waste explosives, including damaged or expired conventional explosives. No other types of hazardous waste are treated at the unit.

CLOSURE OPERATIONS—The DOE/NV is developing a site-specific design for closure for the Area 5 Radioactive Waste Management Site that will take into consideration the climate, geology, surface water and regional hydrology, and waste forms. This project, part of the Integrated Closure Program, will investigate the optimum design for successful closure integrity in the arid NTS environment. Closure of the Area 5 Radioactive Waste Management Site will not occur until after the end of the active life of this area, beyond the year 2005. A number of alternatives are being considered, from one large closure cap for the entire Area 5 Radioactive Waste Management Site to caps for individual waste units. Closure performance standards include minimum maintenance requirements, provisions for protection of human health and the environment, provisions for minimizing or eliminating contaminant release, and complying with applicable regulations and DOE orders. The Area 3 low-level waste disposal cell, U-3ax/bl, will be closed under Resource Conservation and Recovery Act requirements because of the presence of hazardous waste components disposed of before the Resource Conservation and Recovery Act was implemented.

WASTE MINIMIZATION/POLLUTION PREVENTION PROGRAM—The DOE is committed to preventing pollution and reducing waste generation at the NTS. This is accomplished through establishing partnerships with private industry, and complying with federal, state, and local regulations. The elements of the DOE/NV Waste Minimization/Pollution Prevention Program addresses reporting requirements, compliance costs, reduction costs, employee concerns, environmental liability, training, and the reduction, recycle, and reuse of commodities. Appendix C.6 provides a description of the DOE/NV Waste Minimization/ Pollution Prevention Program.

4.1.2 Transportation

The following sections address baseline transportation activities with respect to on-site traffic, off-site traffic, transportation of materials and wastes, and other transportation. Figure 4-14 illustrates the NTS transportation system.

4.1.2.1 On-Site Traffic. The main access to the NTS is the Mercury Highway, which originates at U.S. Highway 95, 105 km (65 mi) northwest of Las Vegas, Nevada, and accesses the main gate in Mercury. Eight kilometers (5 mi) to the west of Mercury is another entrance, which is a turnoff to Jackass Flats Road; however, this entrance is presently barricaded. The NTS has a restricted access into Area 25 from U.S. Highway 95 at Lathrop Wells Road, approximately 32 km (20 mi) west of Mercury. A fourth entrance, seldom used, is located in the northeast corner of the NTS and can be reached from State Route 375. Other existing roadways, although unpaved, could provide entrance or exit routes in case of an emergency. Access to the NTS is restricted, and guard stations are located at all entrances, as well as throughout the site.

The 1,127-km (700-mi) road network consists of 644 km (400 mi) of paved primary roads and 482 km (300 mi) of unpaved secondary roads. Most paved roadways are two-way and two-lane with 89 km per hour (kph) (55 mi per hour [mph]) speed limits unless posted otherwise. The speed limit in developed areas is 32 kph (20 mph). The maximum speed limit on dirt roads is 56 kph (35 mph). In addition, the NTS contains numerous event-related unpaved roads that are not maintained after a test has been conducted. Traffic flow and control throughout the NTS is maintained by conventional stop and yield signs at major intersections. Traffic regulations are enforced by the Nye County Sheriff's Department.

<u>SOUTHERN ROAD NETWORK</u>—The primary paved roads in the southern part of the NTS include Mercury Highway, Jackass Flats Road, Cane Spring Road, and Lathrop Wells Road (Figure 4-14).

Mercury Highway is the primary route from the interchange at U.S. Highway 95. Most of this road is 8 m (26 ft) wide; however, the shoulders vary from 1 to 2 m (4 to 6 ft) wide. Traffic consists of light- and heavy-duty trucks and cars, security vehicles, and emergency vehicles. The Mercury bypass is a well-constructed road and runs from just north of Gate 100, the main entrance to the NTS. This 8-m (26-ft)-wide road was built to enable rerouting of all traffic with a forward area destination.

Jackass Flats Road from Mercury to the Area 25 support area is a hot-mix asphalt road, which is in fair condition. Currently, some repair work is needed to meet current standards. The road system in Area 25 is made up of 7-m (22-ft)-wide roadways with 5-centimeter (cm) (2-in.) hot-mix asphalt surfaces. This roadway provides the principal access to the Area 25 support region. The Lathrop Wells Road provides access to Area 25 and the southwestern NTS from U.S. Highway 95. This plant-mix, oil-and-chip road with no shoulders extends to Guard Station 500 (east of the Area 25 support region) where it becomes Cane Spring Road. Cane Spring Road extends east to Mercury Highway, where it terminates. Cane Spring Road is also an oil-and-chip road, except for an asphalt-overlaid section 3 km (2 mi) west of Mercury Highway.

Vehicles delivering waste shipments to Area 5 use Road 5-01, which was not constructed to withstand the current or proposed Radioactive Waste Management Site traffic load. Road 5-01 branches off Mercury Highway approximately 8 km (5 mi) north of Mercury. It is the main access into Frenchman Flat where the Spill Test Facility, the Hazardous Waste Storage Unit, and the Radioactive Waste Management Site are located. Road 5-01 was constructed in 1965 to access the Defense Nuclear Agency weapons compound located northeast of the Area 5 Radioactive Waste Management Site. The road was built over the existing terrain without runoff drainage

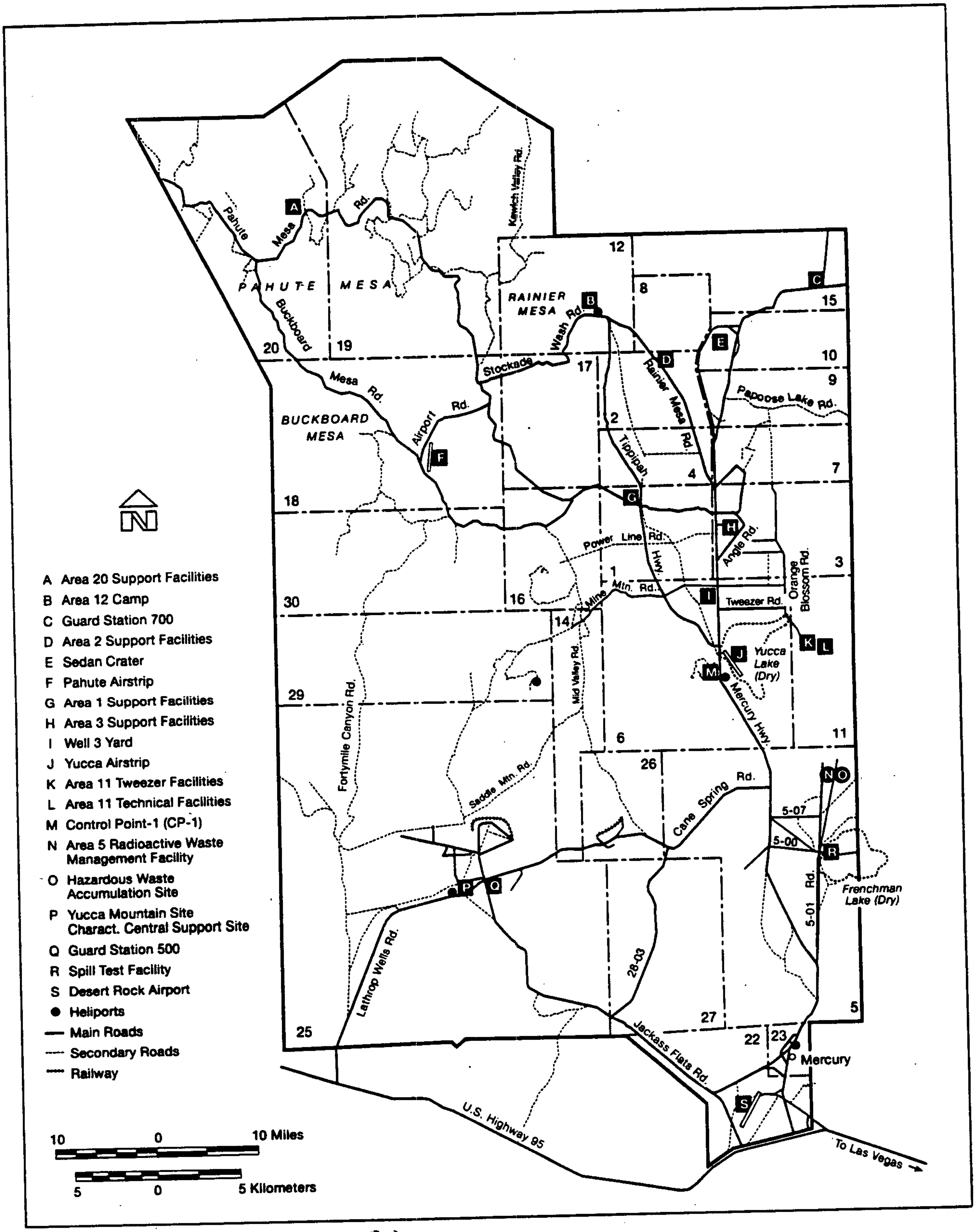


Figure 4-14. NTS transportation system

considerations and without formal design engineering. It is less than 6 m (20 ft) wide and has been used for five years beyond its expected 25-year service life. Road 5-07 provides a secondary access to this area, which is 8 km (5 mi) south of Control Point-1.

A new road will be constructed to provide access for waste shipments to the Area 5 Radioactive Waste Management Site. A new route from the Mercury Highway to the Radioactive Waste Management Site will be provided. The 5.0-km (3.1-mi) new roadway will be constructed by extending Cane Spring Road east from Mercury Highway to intersect with Road 5-01, 0.3 km (0.2 mi) south of the existing Radioactive Waste Management Site. In addition, improvements will be made to the Road 5-01 from this intersection into the Radioactive Waste Management Site.

Although Road 28-03 is a low-traffic road, it is adequately maintained because Area 27 is a high-security area. Tweezer, Angle, and Orange Blossom Roads are narrow, secondary, oil-and-chip roads with no shoulders. These roads require periodic maintenance. Orange Blossom Road has been abandoned, and signs have been posted warning drivers to use at their own risk.

Paved, local traffic streets in Mercury are approximately 6 m (18 ft) wide, which is sufficient for the current traffic loads. However, streets do not have curbs or gutters, and surface drainage is carried in ditches parallel with streets. Traffic flow through the numerous intersections in Mercury is controlled by the use of stop signs and yield signs. There is no real pathway system; pedestrians walk along the side of the roads or through open areas.

The remainder of the roadway network is composed of graded gravel roads and jeep trails. Gravel roads to event sites are maintained as requirements dictate. Gravel roads that remain in good condition include Mine Mountain and Mid-Valley/Saddle Mountain Roads.

NORTHERN ROAD NETWORK—The primary paved roads in the northern part of the NTS are Mercury Highway, Pahute Mesa Road, Buckboard Mesa Road, and Tippipah Highway. Other roads providing access to the northern areas are Rainier Mesa Road, Stockade Wash Road, and Circle Road. Pahute Mesa Road from Yucca Flat weapons test basin to the Area 20 camp is a typical hot-mix paved road. At the higher elevations, the road is winding and crosses rugged terrain, which is extremely hazardous under winter conditions. Chains or snow tires are essential when these conditions prevail. From the Area 20 camp to the intersection of Buckboard Mesa Road, Pahute Mesa Road consists of graded gravel.

Tippipah Highway extends from the Area 12 camp on Rainier Mesa Road south to Mercury Highway in Area 6. It is an adequately drained, all-weather highway that bypasses areas where testing has damaged Mercury Highway. This 8-m (26-ft)-wide road has 2.5-m (8-ft) compacted shoulders and was constructed with 7.5-cm (3-in.) hot-mix asphalt over a 30.5-cm (12-in.) base.

Rainier Mesa Road, which provides access to the Area 12 camp from Mercury Highway, was one of the first gravel roads on the NTS. Currently, this narrow oil-and-chip road with no shoulders requires minimum maintenance.

In the Yucca Flat weapons test basin, the segment of Mercury Highway from the intersection with Rainier Mesa Road north to Sedan Crater is not passable for normal traffic because of damage from numerous local underground nuclear weapons events. Although there are many detours and bypasses from Sedan Crater to Guard Station 700, the 6-m (20-ft)-wide road is in good condition.

Stockade Wash Road from Area 12 camp to Pahute Mesa Road is a hot-mix asphalt road in good condition; however, the mountain pass section through Eleana Ridge is weathered and requires maintenance.

Buckboard Mesa Road from Road 18-03 north to Pahute Mesa Road is a relatively new 18-km (11-mi)-long paved road that provides convenient access to the mesa testing areas.

Orange Road, which was constructed during the early development of the NTS, was abandoned in favor of the Tippipah Highway. Because this road has not been maintained for a number of years, most of the paving has deteriorated.

NTS VEHICLES AND TRANSPORTATION SERVICES—The Maintenance and Operations contractor for the NTS maintains and repairs the fleet of 2,342 government-owned vehicles at the NTS. Vehicles include sedans, station wagons, ambulances, and light- and heavy-duty trucks. The vehicle fleet reached a peak of 3,370 vehicles in 1988. The total mileage of the fleet in 1994 was 2.5×10^7 km (1.6×10^7 mi). The peak mileage for the fleet was 4.9×10^7 km (3.1×10^7 mi) in 1985. Regular and compact pickup trucks, compact sedans, and 3/4-ton four-wheel drive trucks accumulated most of the mileage (Stowell, 1995).

Commuter buses provide daily passenger service to the NTS from Las Vegas and Pahrump by way of U.S. Highway 95. The number of buses entering the NTS varies daily, depending on the on-site activities in progress. Currently, there are 54 buses serving Las Vegas, and 5 buses serving Pahrump. The commuter bus service provides dedicated routes to the forward areas, and paved parking areas for the buses are located at the support facilities within Areas 6, 23 (Mercury), and 25. Limited bus parking is also available at other support facilities on the NTS. Parking for government and private commuter vehicles is available at most buildings on the NTS (Thomas, 1995).

4.1.2.2 Off-Site Traffic. Background traffic on key roads in the vicinity of the NTS has experienced rapid growth in the last ten years. This growth varied widely by location. An average annual growth ranging from 6 to 12 percent was experienced on Interstate 15, a 4- to 7-percent increase on Interstate 80, a 2- to 5-percent increase on U.S. Highway 95, a 4- to 7-percent increase on U.S. Highway 93, and less than 2 percent elsewhere on rural highways. While background traffic has increased in Nevada, traffic volumes at the Mercury interchange have decreased by approximately 2 percent per year during the last ten years because of reductions in the NTS workforce.

The region of influence for the transportation analysis includes principal road, air, and rail networks leading to the NTS, with emphasis on the immediate area surrounding the site. In the region of influence, continuous traffic counts available from automatic traffic recorders show seasonal peaks in traffic demand (i.e., highest volumes occur in August and September). Recreational routes, such as Interstate 15 to Las Vegas and Interstate 80 to Reno, Nevada, also experience weekend peaks. Daily morning and late afternoon peaks are apparent on all routes; however, the late afternoon peak is generally more intense than the morning peak.

Traffic volumes on a roadway vary; that is, during any particular hour, traffic volume may be greater in one direction than in the other. In the region of influence, for example, data show as much as a 2:1 imbalance on rural routes, but almost a 1:1 split on urban routes.

The potential for congestion and other problems of a roadway segment is generally expressed in terms of level of service. The level of service scale ranges from A to F, with each level defined by a range of volume-to-capacity ratios. Level of service A, B, and C are considered good operating conditions where minor or tolerable delays are experienced by motorists. Level of service D represents below average conditions. Level of service E corresponds to the maximum capacity of the roadway. Level of service F represents a jammed situation. The level of service designations and their associated volume-to-capacity ratios are presented in Table 4-5. These levels are based primarily on the *Highway Capacity Manual Special Report 209* (Transportation Research Board, 1994) and are adapted for local conditions.

The region surrounding the NTS is served by a network of interstate, U.S. and state highways and city streets. Figure 4-15 shows the general local road network now in place in the immediate vicinity of the NTS. For the purpose of this analysis, key roads are identified as those roads providing access to the site and most frequented by personnel, visitors, construction workers, vehicles carrying materials for construction, and radioactive waste delivery trucks. Key roads in the immediate vicinity of the site include Interstate 15; U.S. Highways 6, 93, and 95; and Nevada State Route 375. In addition, Interstate 80 and U.S. Highways 40 and 50 provide regional access to the site from the

Table 4-5. Road transportation levels of service

		Criteria (Volume-to-Capacity)		
LOS[a]	Description	Freeway[b]	Multilane Highway[c]	2-Lane Highway[d]
A	Free flow with users unaffected by presence of other users of roadway.	0-0.35	0-0.33	0-0.12
B	Stable flow, but presence of users in traffic stream becomes noticeable.	0.36-0.54	0.34-0.50	0.13-0.24
C	Stable flow, but operation of single users becomes affected by interactions with others in traffic stream.	0.55-0.77	0.51-0.65	0.25-0.39
D	High density but stable flow; speed and freedom of movement are severely restricted; poor level of comfort and convenience.	0.78-0.93	0.66-0.80	0.40-0.62
E	Unstable flow; operating conditions at capacity with reduced speeds, maneuvering difficulty, and extremely poor levels of comfort and convenience.	0.94-1.00	0.81-1.00	0.63-1.00
F	Forced or breakdown flow, with traffic demand exceeding capacity; unstable stop-and-go traffic.	>1.00	>1.00	>1.00

[a] Level of service
[b] Level of service for basic freeway sections, 113 kph (70 mph)
[c] Level of service for multilane highway, 97 kph (60 mph) design speed
[d] Level terrain, 20-percent no passing zones, design speed 97 kph (60 mph) or greater; also applicable to three-lane highways.

Source: Transportation Research Board, 1994.

northeast and south, respectively. The following paragraphs describe these major roadways.

Interstate 15 is the major regional access to the site. It runs north-south, connects San Diego, California, to Salt Lake City, Utah, and extends north to the Canadian border. Interstate 15 is generally a four-lane divided highway constructed to full freeway standards with full control of access. Within the Las Vegas metropolitan area, Interstate 15 becomes a six-lane freeway. Interstate 80 and U.S. Highway 50 are both major east-west freeways. They are generally four-lane highways with full control of access. U.S. Highway 40 is also an east-west freeway that does not intersect Nevada.

U.S. Highway 95 is a major north-south roadway extending south to the Mexican border and north to the Canadian border. U.S. Highway 95 is by far the most frequented direct access to the NTS and is used by over 95 percent of the employees working on site. It is the closest and most direct route to the site for hauling materials and waste, whether hauled directly by trucks or by rail. It is a four-lane roadway between Las Vegas and the Mercury interchange and within Las Vegas, and a two-lane rural highway beyond the Mercury interchange to the north. U.S. Highway 93 is a major north-south roadway across Nevada. It extends from Las Vegas to the Canadian border, intersecting Interstate 80 near the town of Wells, Nevada. It is an all-weather, two-lane paved roadway. U.S. Highway 6 is an east-west roadway, located to the north of the NTS and the Tonopah Test Range, and links U.S. Highways 93 and 95. It is also an all-weather, two-lane paved roadway.

Nevada State Route 375 provides vehicular access to the NTS via a connecting road. It runs northwest along the northeastern boundaries of the site. This stretch of two-lane highway links U.S. Highways 6 and 93.

On March 23, 1993, there were 1,375 vehicles of all categories entering or leaving the NTS via Gate 100; this number was found to be representative of the annual average daily traffic. The morning peak hour of the site (as a generator) occurs generally between 5:30 a.m. and 7:30 a.m. Traffic counts were performed during the morning peak hour in March 1995. There were 232 vehicles entering the site via Gate 100 between 6:25 a.m.

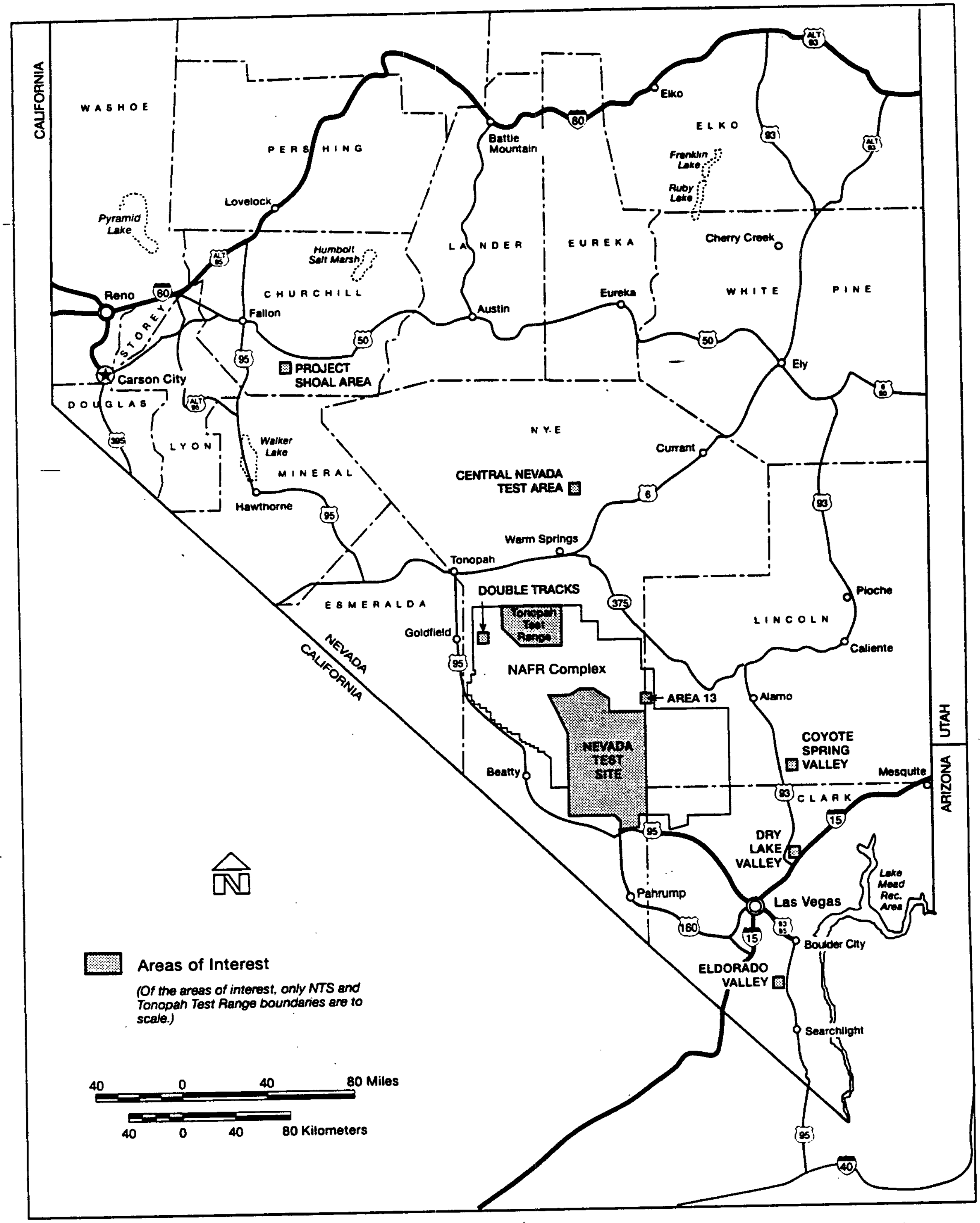


Figure 4-15. General local road network in southern Nevada

and 7:25 a.m. During the same time, there were only ten vehicles exiting the site. The 232 vehicles carried approximately 2,000 passengers (including drivers). The 232 total vehicles included 23 buses (10 percent), 152 one-person cars (66 percent), 47 two-person car pools (20 percent), 8 three-or-more-person car pools (3 percent), and only 2 trucks (less than 1 percent). Of all vehicles entering the site, 98 percent come from the east (Las Vegas area) and the remaining 2 percent from the west (Nye County) (Tetra Tech, Inc., 1995).

Volumes, peak-hour volumes, capacities, and the corresponding level of service on key regional and local roadways in the region of influence are shown in Table 4-6. Some segments of Interstates 15 and 80 and U.S. Highway 95 within the urban areas of Las Vegas and Reno, Nevada, already operate at level of service F because of heavy traffic volumes (recreational, local, and commuter traffic). U.S. Highway 93 at Hoover Dam operates at level of service F because of steep grades and sharp curves. Some segments of Interstate 15 and U.S. Highway 93 in Las Vegas operate at level of service D. All other key roads operate at level of service C or better due mainly to low traffic volumes.

The 1993 annual average daily traffic on key roads varied considerably in both space and time. Traffic volumes on Interstate 15 are highest within Las Vegas. As seen in Table 4-6, in 1993 there were 26,420 annual average daily traffic on Interstate 15 at the California/Nevada state line; 155,795 just north of the Sahara Avenue interchange (the maximum volume recorded on Interstate 15 within Nevada); 84,445 north of Washington Street; 33,770 north of Cheyenne Avenue; and only 11,530 at the Nevada/Utah state line. At the California/Nevada state line, August is the peak month of the year, representing 120 percent of the average month of the year, and Sunday is the peak day of the week, representing 140 percent of the average day of the week. Within Las Vegas, August remains the peak month, representing only 105 percent of the average month, and weekday volumes dominate rather than weekends.

The 1993 annual average daily traffic along Interstate 80 also varied considerably from a low of 5,000 in rural areas to a maximum of approximately 96,000 in urban areas. The highest volume is recorded in Reno, Nevada, at the U.S. Highway 395 junction, and the lowest recorded is at the Nevada/Utah state line. At the California/Nevada state line, August is the peak month, representing approximately 130 percent of the average month, and Saturdays and Sundays are the peak days of the week, representing 120 percent of the average day of the week. Within Reno and vicinity, August remains the peak month, representing only 109 percent of the average month, and weekday volumes dominate. In rural areas, August traffic is by far the highest, being 145 percent of the average month and having little daily variations (all days of the week handle the same amount of traffic).

The 1993 annual average daily traffic on U.S. Highway 95 shows a wide variation in traffic volumes between urban and rural sections. Within the urbanized area of Las Vegas, volumes varied between a low of 20,000 and a high of 145,580 recorded between Interstate 15 and Martin Luther King Boulevard. There were 116,675 vehicles at south Jones Boulevard. Elsewhere, the 1993 annual average daily traffic was well below 10,000.

At the Mercury interchange, the main access to the NTS, annual average daily traffic was 3,635 and 2,175, respectively, south and north of the interchange. West of the Mercury interchange and beyond, daily volumes decrease further to reach 1,720 north of Beatty, Nevada. There are little monthly variations in traffic volumes on this highway, although August remains the peak month with very little weekly variations.

In 1993, U.S. Highway 93 carried 1,160 annual average daily traffic just north of Nellis Air Force Base, and 1,210 farther north near Crystal Springs. In 1993, State Route 375 and U.S. Highway 6 in the vicinity of the site carried, in general, less than 500 annual average daily traffic.

4.1.2.3 Transportation of Materials and Waste. This section presents the types of materials and waste that are currently transported to and on the NTS. Refer to Chapter 2, Section 2.4.2 for definitions of the various waste types.

Table 4-6. Traffic volumes and level of service on key roads (Page 1of 2)

Roadway Segment	Two-Way[a] Capacity VPH[b]	1993 AADT[c]	1993 DDHV[d] One Direction	1993 Baseline LOS[e]
Regional				
I-15 at California/Nevada state line	6,800	26,420	2,403	D
I-15 north of Sahara Avenue interchange	10,200	155,795	6,050	F
I-15 north of the downtown expressway interchange	10,200	91,985	3,572	D
I-15 just north of the D Street and Washington Street interchange	10,200	84,445	3,280	C
I-15 north of the Cheyenne Avenue interchange	6,800	33,770	1,311	B
I-15 south of the Lamb Blvd. interchange	6,800	12,905	501	A
I-15 north of West Mesquite interchange (Nevada/Utah state line)	6,800	11,530	448	A
I-80 east of Apex interchange (California/Nevada state line)	6,800	22,825	1,568	B
I-80 west of the U.S. Hwy. 395 interchange (Reno)	6,800	95,955	4,423	F
I-80 west of the West Vista Blvd. interchange (east Reno)	6,800	26,445	1,219	B
I-80 east of Winnemucca interchange	6,800	6,495	408	A
I-80 east of U.S. 93 Hwy. interchange east of Wells	6,800	4,405	259	A
I-80 east of the West Wendover interchange (Nevada/Utah state line)	6,800	4,495	264	A
Local				
U.S. Hwy. 95 south of Jones Blvd. interchange	10,200	116,675	5,907	F
U.S. Hwy. 95 north of Sunset Road interchange (east Las Vegas)	6,800	41,770	2,092	C
Rancho Road, (SR[f] 599) east of the northern U.S. Hwy. 95/Rancho Road interchange	6,800	12,700	636	A
U.S. Hwy. 95 south of SR 157 north of Las Vegas	6,800	7,880	733	A
U.S. Hwy. 95 just east of Mercury interchange	6,800	3,635	338	A
U.S. Hwy. 95 interchange at Mercury				
Southbound off ramp	1,500	140	13	C
Southbound on ramp	1,500	560	52	C
Northbound off ramp	1,500	565	53	C
Northbound on ramp	1,500	145	13	C
Local				
SR 433, between U.S. Hwy. 95 and Mercury	2,000	1,375	128	B
U.S. Hwy. 95 3.8 miles north of Mercury interchange	2,000	2,715	253	C
U.S. Hwy. 95 from Amargosa Valley to Beatty	2,000	615	57	A
Hwy. 95 north of Beatty	[illegible]	1,720	160	B

Table 4-6. Traffic volumes and level of service on key roads (Page 2of 2)

Roadway Segment	Two-Way[a] Capacity VPH[b]	1993 AADT[c]	1993 DDHV[d] One Direction	1993 Baseline LOS[e]
U.S. Hwy. 93 south of the Nevada/Arizona state line (Hoover Dam)	1,500	747	695	F
U.S. Hwy. 93 east of Westbound off ramp of Railroad Pass interchange	6,800	24,605	2,289	D
U.S. Hwy. 93 north of I-15/U.S. Hwy. 93 interchange	2,000	1,160	108	A
U.S. Hwy. 93 south of SR 375 Junction near Crystal Springs	2,000	1,210	113	B
U.S.Hwy. 93 west of SR 375 Junction near Crystal Springs	2,000	440	41	A
SR 375 west of U.S. 93 Junction at Crystal Springs	1,500	195	29	A
SR 375 east of Warm Springs	1,500	85	13	A
U.S. Hwy. 6 east of Warm Springs at SR 375 Junction	1,700	145	15	A
U.S. Hwy. 6 west of Warm Springs at SR 375 Junction	1,700	210	20	A
U.S. Hwy. 6 east of Tonopah west of SR 376 Junction	1,700	1,095	105	B

[a] Based on 1985 Highway Capacity Manual
[b] Vehicles per hour
[c] Annual average daily traffic
[d] This is the directional design hourly volume per the 1985 Highway Capacity Manual. It considers the 30th peak hour of the year and the peaking and directional characteristics on various segments as supplied by the Nevada Department of Transportation, Annual Traffic Report 1993a. For two-lane highways, directional factors are applied, in general, a 70/30 split
[e] Level of service
[f] SR=State Route.

Source: NDOT, 1993a.

TRANSURANIC WASTE—The NTS expects no additional transuranic or transuranic mixed wastes to be transported to the NTS from off-site generators. It is expected that approximately 204,663 kg (451,201 lb), having a total volume of 612 m^3 (800 yd^3), of transuranic waste currently stored at the NTS would eventually be transported to the Waste Isolation Pilot Plant for disposal (DOE/NV, 1994a).

MIXED WASTE—On-site transportation of mixed waste to the Area 5 Radioactive Waste Management Site is anticipated because it will likely be generated during environmental restoration and decontamination projects at the NTS. Off-site transportation of mixed waste from the NTS is not anticipated.

LOW-LEVEL WASTE—Low-level waste may be generated during normal NTS operations. It is packaged and transported to one of two low-level waste disposal facilities in operation at the NTS: the Area 5 Radioactive Waste Management Site or the Area 3 Radioactive Waste Management Site (DOE/NV, 1992a). Low-level waste from other DOE facilities is transported to both sites for disposal. In addition, the DOE/NV accepts classified low-level waste from DoD facilities if DOE Headquarters has designated the activity to ship waste to the NTS. The total low-level waste transported to the Area 5 Radioactive Waste Management Site during 1961 to 1991 was 3.96×10^5 m^3 (1.4×10^7 ft^3). During Fiscal Year 1993, approximately 1.9×10^4 m^3 (6.71×10^5 ft^3) of low-level waste was transported from on-site and off-site generators to the NTS (DOE/NV, 1994a). As of August 10, 1995, the following generators are approved to ship low-level waste to the NTS for disposal:

- Aberdeen Proving Grounds, Aberdeen, Maryland (temporary suspension)
- Allied-Signal, Kansas City Plant, Kansas City, Missouri
- Ann Arbor Inertial Confinement Fusion Facility, Ann Arbor, Michigan
- Fernald Environmental Management Project, Cincinnati, Ohio
- General Atomics, San Diego, California
- Inhalation Toxicology Research Institute, Albuquerque, New Mexico
- Lawrence Livermore National Laboratory, Livermore, California, including Site 300
- Mound Plant, Miamisburg, Ohio
- Pantex Plant, Amarillo, Texas
- Bechtel Nevada Corporation (formerly Reynolds Electrical and Engineering Co., Inc.), NTS, Nevada (on site)
- Rocky Flats Plant, Golden, Colorado
- Reactive Metals Inc., Extrusion Plant, Ashtabula, Ohio
- Rockwell-Rocketdyne, Canoga Park, California
- Sandia National Laboratories, Livermore, California
- Sandia National Laboratories, Albuquerque, New Mexico.

The following generators are awaiting approval pending DOE Headquarters's concurrence:

- Oak Ridge National Laboratory, Oak Ridge, Tennessee (Melton Valley Waste Stream)
- Pinellas Plant, Largo, Florida.

The following generators are in the process of applying for approval to dispose of waste at the NTS:

- Babcock & Wilcox, Lynchburg, Virginia
- Defense Nuclear Agency, Johnston Atoll
- Defense Nuclear Agency, NTS, Nevada

- General Atomics, San Diego, California (new production reactor waste)
- Grand Junction Project Office, Grand Junction, Colorado
- IT Corporation, Las Vegas, Nevada (Project Chariot)
- U.S. Army Armament, Munitions and Chemical Command, Rock Island, Illinois.

These three sets of waste generators—approved, pending, and in process—represent the majority of waste generators who have historically shipped waste to the NTS.

Off-site shipments of low-level waste are made by commercial motor carriers. Transportation of low-level waste is performed in compliance with the packaging, loading, and driver training requirements of the U.S. Department of Transportation, the Nuclear Regulatory Commission, and the Nuclear Regulatory Commission Agreement State Regulation, and is subject to additional oversight by the DOE.

HAZARDOUS WASTE—Hazardous waste cannot be disposed of at the NTS landfill; therefore, it is transported to the Hazardous Waste Storage Unit where it is prepared for off-site shipment. Waste in this category includes, but is not limited to wastes that are ignitable, corrosive, toxic, or reactive. For example, hazardous waste may be generated on the NTS during drilling and tunneling operations and their support activities.

Waste from the use of explosive ordnance detonated by the Defense Nuclear Agency, the DOE Maintenance and Operations contractor, the Wackenhut Firing Range used by the NTS security force, and resident national laboratories is transported to the Area 11 Explosive Ordnance Disposal Facility for treatment. This facility is a Resource Conservation and Recovery Act miscellaneous unit (40 CFR Part 270.23) for conventional explosives.

HAZARDOUS MATERIALS—Live explosives, fuels, corrosives, compressed gas, and limited quantities of nuclear materials such as depleted special nuclear material uranium and radiological calibration source standards are transported onto and within the NTS for use in research, development, well-logging, and testing.

NONHAZARDOUS WASTE—Used petroleum products, uncontaminated tunnel muck, drilling fluids, cement and grout wastes, construction debris, refuse, sludge from wastewater lagoons, septic tank and chemical toilet sludge, and animal carcasses are transported for disposal at either a sanitary landfill, construction landfill, or sewage lagoon.

Sanitary solid waste generated on the NTS is transported via trucks to permitted landfills for disposal. The landfills are at various locations on the site. No off-site shipments of sanitary wastes are made to or from the NTS.

4.1.2.4 ***Other Transportation.*** Other modes of transportation are discussed in the following section. The transportation system includes buses, rail, and air. Greyhound Lines, Inc., provides intercity passenger service to and from Las Vegas. Citizens Area Transit provides bus service to most parts of Las Vegas.

OTHER ON-SITE TRANSPORTATION—No navigable waterways within the region of influence are capable of accommodating waterborne transportation of material shipments to the NTS. Air facilities consist of three airstrips and nine helicopter pads, which serve authorized aircraft. Two on-site rail systems, in Areas 25 and 26, were previously used to transport heavy, oversized, and hazardous payloads between facilities.

Railroads—There are no on-site mainline railroads. A 15-km (9-mi) standard-gauge railroad within Area 25 was abandoned in place. The former Nuclear Rocket Development Station facilities employed a remotely operated train engine to move flatbed cars carrying extremely heavy, large, and highly radioactive materials. A shorter, similar line once connected Project Pluto sites in Area 26. This line is abandoned, and much of the track and equipment have been removed.

Air Transportation—The southern area of the NTS is served by the Desert Rock Airport and Yucca Lake airstrip. Desert Rock Airport (a paved runway, 2 km [6,560 ft] long and 30 m [100 ft] wide) is the primary aircraft support facility at the NTS. It is located 5 km (3 mi) southwest of Mercury, Nevada, in Area 22. Existing features at Desert Rock Airport include an administration/control building, a fireman-standby trailer, an aircraft unloading pad, aircraft parking tie-down spurs, two lighted windsocks, and radio-activated runway lights. The airport also has a landing-arrester cable for use in the recovery of damaged aircraft that require emergency landing facilities. Desert Rock Airport is no longer manned, and no services are available because of funding and program cutbacks. However, Desert Rock Airport is still operational, and the use of this airstrip is controlled by the DOE.

Yucca Lake airstrip is a secondary NTS support facility for authorized aircraft. Features at this facility include an unpaved runway, an abandoned terminal building, and an aircraft refueling station. The runway is subject to flooding following local storms.

The only airstrip in the north is the Buckboard Mesa/Pahute airstrip in Area 18. Classified as a secondary support facility for authorized aircraft at the NTS, the Buckboard Mesa/Pahute airstrip has had minimal use in the last few years. Its primary purpose was to serve as a landing strip for aircraft carrying supplies and personnel to the Pahute Mesa sites. Occasional helicopters and approximately ten fixed-wing aircraft per year landed at the strip when the mesa was in use. Because the runway has no lights, use of the airstrip was restricted to prearranged times during daylight hours. The runway is relatively short. Its surface was unable to withstand the impact from high-speed takeoffs and landings of jet aircraft, so the largest aircraft that can be accommodated was the propeller-driven C-130. The Buckboard Mesa/Pahute airstrip is unusable and no longer serviceable.

Helipads equipped with windsocks, fire extinguishers, and painted markings are located in the following places:

- Area 5 — Radioactive Waste Management Site (Inactive)
- Area 6 — East of Mercury Highway across from the Control Point
- Area 6 — East side of Yucca Lake (Airborne Response Team)
- Area 12 — Area 12 Camp
- Area 18 — Buckboard Mesa/Pahute airstrip
- Area 18 — Pahute Mesa Control Point
- Area 22 — Desert Rock Airport
- Area 23 — Bechtel Nevada Corporation Medical Facility
- Area 25 — West of the Administration Building
- Area 29 — Shoshone Peak.

OTHER OFF-SITE TRANSPORTATION—In this section, other off-site transportation, such as rail and air transport, is described.

Railroads—The closest rail line to the site is the Union Pacific line, which passes through Las Vegas, approximately 80 km (50 mi) east of Mercury. This line connects Los Angeles with Salt Lake City. There is no direct railway link to the site. A 15-km (9-mi) standard-gauge railroad serves Area 25 of the NTS, but does not connect with the Union Pacific. Spurs serve Nellis Air Force Base and a gypsum plant.

Nevada has two other rail lines relevant to this analysis. These lines are part of the transcontinental routes of the Union Pacific and Southern Pacific Railroads. These lines run parallel to each other, close to Interstate 80 in northern Nevada. Over a distance of 290 km (180 mi), the Union Pacific and Southern Pacific lines are operated as a paired track.

The Union Pacific line passing through Las Vegas is designated as a Class A main line, which means heavy freight movement (exceeding 20 million tons per year) and high-quality physical condition for the tracks. Through Nevada, this line crosses rugged desert country and, with the exception of the Las Vegas Valley, almost no other population clusters. The line is primarily single track with frequent sidings. Between Salt Lake City, Utah, and Barstow, California, this line has on average one siding for every 8 km (5 mi). However, as the line enters the Las Vegas area, it becomes a double track for approximately 16 km (10 mi). Las Vegas is the site of a yard and crew change point. The Union Pacific has constructed a new yard for the Las Vegas area, located to the north of downtown.

The daily average number of trains through Las Vegas is 10 to 15. Each train has 60 to 70 cars and a load of 3,000 to 6,000 tons. Because of the importance of the route, Union Pacific adheres to a high maintenance standard: heavy welded rails, long-life concrete ties, frequent sidings, a centralized traffic control system, several types of detectors, and radio communications. With these attributes, it is estimated that the line capacity could accommodate 25 to 54 trains per day, 2 to 4 times the current demand. It is not known how much site-related rail freight is being processed through this line.

The Union Pacific maintains gross weight restrictions for cars on the Los Angeles and Salt Lake lines, including the branches. These restrictions are 119,295 kg (263,000 lb) for four-axle cars; 178,715 kg (394,000 lb) for six-axle cars; and 238,589 kg (526,000 lb) for eight-axle cars. Four-axle cars of 147,417 kg (325,000 lb) gross weight can be handled. Six-axle locomotives are allowed over all portions of the line. The excellent track conditions allow maximum freight train speeds of 112 kph (70 mph) east of Las Vegas and 96 kph (60 mph) west where grades and curves restrict speed.

The Union Pacific is one of the nation's strongest railroads. The routes through Nevada are important transcontinental extensions of Union Pacific routes. Both main lines appear to figure prominently in the railroad's future plans. Future freight growth is projected for the Los Angeles and Salt Lake lines as a result of demands for low-sulfur coal in the Pacific Rim countries. Already, Union Pacific handles 80 percent of the lumber used in Las Vegas, and it is constantly expanding its automobile delivery business.

The Union Pacific's northern rail route parallels the Overland Route across much of northern Nevada. Union Pacific operates 10 to 15 trains per day on this line. Maximum train speeds are 113 kph (70 mph) for freight trains. This line is operated by centralized traffic control, with the dispatcher currently located in Sacramento, California.

The Southern Pacific's northern rail route (the Overland Route) operates 10 to 20 freight trains daily. It is suitable for 113 kph (70 mph) freight train speed. Southern Pacific's major Nevada freight yard is located in Sparks.

Rail passenger services in the region of influence are provided by Amtrak (the Desert Wind), which provides daily trains through Las Vegas; the Amtrak station is located downtown at the Union Plaza Hotel and Casino.

Air Transportation—Commercial air service to and from the region of influence is available through McCarran International Airport, located in Las Vegas, which provides jet air passenger and cargo service from both national and local carriers (Figure 4-16). In addition, three small airports are located in the region of influence: Sky Harbor Airport off Lake Mead Drive; and Boulder City Airport and North Las Vegas Air Terminal. Air transport service is also possible through two U.S. Air Force bases in the area: Nellis Air Force Base in North Las Vegas and the Indian Springs Auxiliary Airfield.

McCarran International Airport is located in Las Vegas, 120 km (75 mi) southeast of the NTS. It is the primary commercial airport in the region. This airport has three runways:1,524 m, 2,979 m, and 3,851 m (5,001 ft, 9,776 ft, and 12,636 ft) long. The North Las Vegas Air Terminal is located northwest of the city, 88 km (55 mi) southeast of the NTS. It has two 1,524 m (5,000 ft) runways.

Accident History—Interstates 15 and 80, and U.S. Highways 40 and 95 are potential routes for the transport of radioactive waste. Accidents on

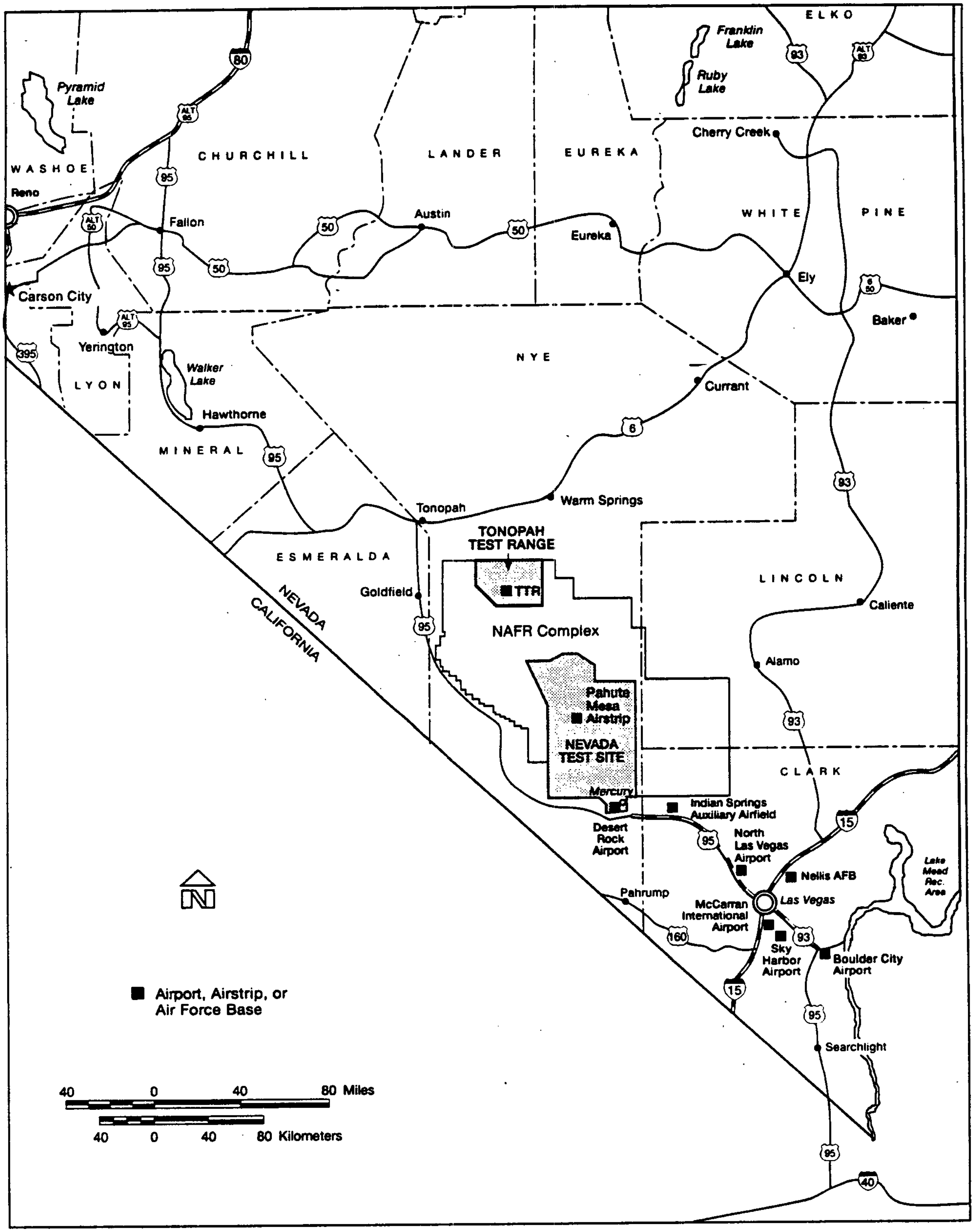


Figure 4-16. Airports in southern Nevada

state highways are generally reported and compiled by location and severity. Three classes of accidents are generally considered: fatality, injury, and property damage. Accident rates on highway segments are generally reported as number of accidents per million vehicle miles. Accident rates used in calculating the transportation risks are listed in Appendix I.

Freeways have the lowest accident rate. Multi-lane conventional highways show higher accident rates. Two-lane highways have the highest accident rates.

Expressed in number of accidents, heavily traveled segments would have the highest number of accidents.

Railroad accident information is available through the Federal Railway Administration. Railroad transport is not used for shipping waste to or from the NTS; therefore, railroad accidents were not analyzed for this study.

4.1.3 Socioeconomics

These sections present recent socioeconomic trends in the region surrounding the NTS, the Project Shoal Area, and the Central Nevada Test Area. Site effects are also discussed. Site-related effects are defined as program-related economic activity (employment, earnings, and personal income), population, housing, public finance, public services (public education, police and fire protection, and health care), and Environmental Justice.

REGION OF INFLUENCE—The region of influence is defined as the area in which the principal direct and secondary socioeconomic effects of site actions are likely to occur and are expected to be of the most consequence for local jurisdictions. The socioeconomic information presented in this EIS discusses current conditions in a region of influence comprised of Nye and Clark counties, Nevada. This region of influence includes most of the residential distribution of the employees of the DOE, its contractor personnel, and supporting government agencies. The region of influence also encompasses the probable location of future off-site contractor operations and indirect economic activities.

The regions of influence addressed in this section vary as appropriate from one socioeconomic issue to another. The public finance region of influence includes the cities of Las Vegas and North Las Vegas, the towns of Tonopah and Pahrump, Clark and Nye counties, and the Clark County and Nye County school districts. The finances of the unincorporated towns of Beatty and Amargosa Valley are administered by Nye County. The pertinent regions of influence for different public services also differ. For example, with public education, the region of influence is the Clark County and Nye County school districts.

American Indian Region of Influence—Within this region of influence~~,~~ there also are several Indian reservation, tribal enterprises, tribally controlled schools, tribal police departments, and tribal emergency response units. The following reservations are located within the designated region of influence: Duckwater Shoshone Tribe, Las Vegas Paiute Tribe, Moapa Paiute Tribe, and the Yomba Shoshone Tribe. In addition, there are tribes which are located geographically outside of the region of influence, but are potentially impacted by NTS activities. One of these tribes, the Timbisha Shoshone Tribe, based in Death Valley, California, is located closer to the NTS than many towns in northern Nye County. As a consequence of this proximity, people from the Timbisha Shoshone Tribe, are a part of the social and economic region of influence of the NTS. For example, students from the Timbisha Shoshone Tribe attend public school in Beatty, Nevada whereas many Shoshone students from Tacopa, California attend school in Pahrump, Nevada. Timbisha tribal members both work and shop in Clark and Nye counties.

The Pahrump Paiute Tribe, located in Pahrump Valley, is composed of Indian people who have been historically recognized by federal and state agencies as qualified to receive services as Indian people, and who as a group are currently seeking federal acknowledgment.

ECONOMIC ACTIVITY—A survey of the NTS worker residential distributions in 1994 revealed that 90 percent of the workforce live in Clark County and 7 percent live in Nye County. The remaining 3 percent reside in other counties or states. Within Clark County, most employees of the DOE/NV reside in the Las Vegas area (DOE, 1994b).

Analysis of economic activity impacts in the region of influence of Clark and Nye counties is accomplished separately for each county. The differences in size, economies, and contributions would produce a misleading analysis if both were analyzed as one aggregate area. For example, in 1994, the NTS accounted for 1 percent of total Clark County employment, as contrasted with 6 percent of total Nye County employment.

Between 1970 and 1980, total employment in Clark County increased from 1.13×10^5 to 2.64×10^5, or an average of 13.3 percent annually (Table 4-7). Total employment in Nevada in 1970 was approximately 256,000. By 1980, total employment increased to 488,000, an annual average increase of 9.1 percent. In contrast, total employment in the United States increased from 9.11×10^7 in 1970 to 1.14×10^8 in 1980, an annual average increase of 2.5 percent.

Clark County—Clark County, which is comprised of 20,531 km^2 (7,927 mi^2), is located in southern Nevada and is composed of large expanses of unincorporated land and five incorporated cities. These cities are Las Vegas, North Las Vegas, Henderson, Boulder City, and Mesquite. Despite the recent national recession, Clark County has continued to prosper because of expansion in the hotel and gaming industry, relocation of retirees to southern Nevada, expansion of the local government infrastructure, and additional investments. However, all indicators point to slower economic activity in the late 1990s (Schwer, 1995).

By 1990, total employment by place of work in Clark County had increased to 447,625, representing an average annual increase of 6.9 percent from the 1980 figure of 264,849. Between 1980 and 1990, average annual employment growth in Nevada was 5.3 percent, and in the United States, 2.2 percent.

The largest employment sectors in Clark County in 1990 were service industries (45.8 percent), of which the hotel, gaming, and recreation sector accounted for 61 percent. Retail trade, government, and construction accounted for 15.6 percent, 11.4 percent, and 8.6 percent, respectively (Figure 4-17). The remaining 18.6 percent was divided among the following sectors: finance, insurance, and real estate (7.3 percent); transportation and utilities (4.6 percent); wholesale trade (3.0 percent); manufacturing (2.6 percent); agricultural services (0.9 percent); agriculture (0.1 percent); and mining (0.1 percent). Employers of the largest workforces in the region are listed in Table 4-8.

In 1990, average annual earnings in Clark County were $24,382, while per capita income was $18,267 (Table 4-7). Total earnings by place of work reported in 1990 for Clark County were $10,914 million (Figure 4-17). Industrial sectors reporting the largest shares of earnings in Clark County in 1990 included services (47.5 percent), government (13.1 percent), manufacturing (10.6 percent), and retail trade (10.2 percent) (U.S. Bureau of Census, 1991).

According to the state of Nevada Employment Security Department, Clark County had 395,200 members of the total labor force who were employed, while 19,500 of the total labor force, or 4.7 percent, were unemployed (Table 4-9). The unemployment rate for Clark County was slightly lower than for the state (4.9 percent) and the nation (5.5 percent).

According to *Economic Outlook*, employment in Clark County will grow at a 3.9-percent rate during 1995 and at 3.5 percent for 1996 (Schwer, 1995). Although total employment continues to show very strong trends of growth, the unemployment rate has increased from an average of 5.0 percent in 1990 to an average of 7.1 percent in 1993 because of the in-migration rate exceeding the rate of employment opportunities. This is lower than the 1993 fourth quarter rate of 7.3 percent for Nevada and higher than the national unemployment rate of 6.4 percent (State of Nevada, 1993a).

Nye County—Nye County, located northwest of Clark County, is comprised of approximately 46,786 km^2 (18,064 mi^2). The federal government

Table 4-7. Summary of economic indicators (by place of work), Clark and Nye Counties, Nevada, and the United States

	1970	1980	1990	Average Annual Change 1970-1980	Average Annual Change 1980-1990	Average Annual Change 1970-1990
Clark County, Nevada						
Population	273,288	463,087	797,142	6.9%	7.2%	9.6%
Total Jobs	113,839	264,849	447,625	13.3%	6.9%	14.7%
Civilian Labor Force	116,200	237,700	414,700	10.5%	7.4%	12.8%
Unemployment Rate	5.9%	6.9%	4.7%			
Earnings Per Job	$26,178	$23,958	$24,382	-0.8%	0.2%	-0.3%
Per Capita Income	$15,629	$17,504	$18,267	1.2%	0.4%	0.8%
Nye County, Nevada						
Population	5,599	9,048	17,781	6.2%	9.7%	10.9%
Total Jobs	7,149	7,860	12,889	1.0%	6.4%	4.0%
Civilian Labor Force	2,230	2,580	9,100	1.6%	25.3%	15.4%
Unemployment Rate	1.8%	5.0%	3.5%			
Earnings Per Job	$29,389	$34,041	$31,415	1.6%	-0.8%	0.3%
Per Capita Income	$15,825	$17,991	$16,268	1.4%	-1.0%	0.1%
State of Nevada						
Population (1,000s)	493	801	1,202	6.2%	5.0%	7.2%
Total Jobs (1,000s)	256	488	748	9.1%	5.3%	9.6%
Civilian Labor Force (1,000s)	218	430	626	9.7%	4.6%	9.3%
Unemployment Rate	5.9%	6.2%	4.9%			
Earnings Per Job	$25,351	$23,660	$24,037	-0.7%	0.2%	-0.3%
Per Capita Income	$15,616	$18,051	$19,812	1.6%	1.0%	1.3%
United States						
Population (1,000s)	203,799	227,255	249,466	1.2%	1.0%	1.1%
Total Jobs (1,000s)	91,093	113,726	138,573	2.5%	2.2%	2.6%
Civilian Labor Force (1,000s)	82,771	106,940	124,787	2.9%	1.7%	2.5%
Unemployment Rate	4.9%	7.1%	5.5%			
Earnings Per Job	$23,220	$23,218	$24,278	0.0%	0.5%	0.2%
Per Capita Income	$13,017	$15,652	$18,635	2.0%	1.9%	2.2%

NOTE: Dollars are in constant 1990 dollars.

Sources: State of Nevada, 1990; U.S. Bureau of Census, 1991.

Table 4-8. Workforce in Clark and Nye Counties

Employer	Number of Employees[a]	Percentage of Total
Clark County School District	15,000	3.36
Nellis Air Force Base	9,100	2.04
Nevada Test Site	7,700[b]	1.73
Clark County	4,650	1.04
University of Nevada, Las Vegas	4,600	1.03
University Medical Center (hospital)	2,650	0.59
Humana Hospital-Sunrise	2,400	0.54
Las Vegas Metropolitan Police	2,250	0.50
Smith's Food and Drug	2,225	0.50
City of Las Vegas	1,925	0.43
Las Vegas Post Office	1,875	0.42
Nevada Power Company	1,750	0.39
K-Mart Corporation	1,000	0.22
Other Employment (including hotels and casinos)	389,035	87.20
Total	**446,160**	**100.00**

[a] Numbers are approximate

[b] This number reflects the cumulative total of NTS-related employees (Las Vegas area or at the NTS) who reside in the Las Vegas metropolitan area regardless of their place of employment. This number does not reflect the anticipated layoff of approximately 2,000 for Fiscal Year 1995.

Source: State of Nevada, 1993b.

Table 4-9. 1990 civilian labor force, employment and unemployment, Clark and Nye Counties, Nevada, and the United States

	Civilian Labor Force	Employed	Unemployed	Unemployment Rate
Clark County	414,700	395,200	19,500	4.7%
Nye County	9,100	8,780	320	3.5%
State of Nevada (1,000s)	626	595	31	4.9%
United States (1,000s)	124,787	117,914	6,874	5.5%

Source: State of Nevada, 1990; U.S. Bureau of Census, 1991.

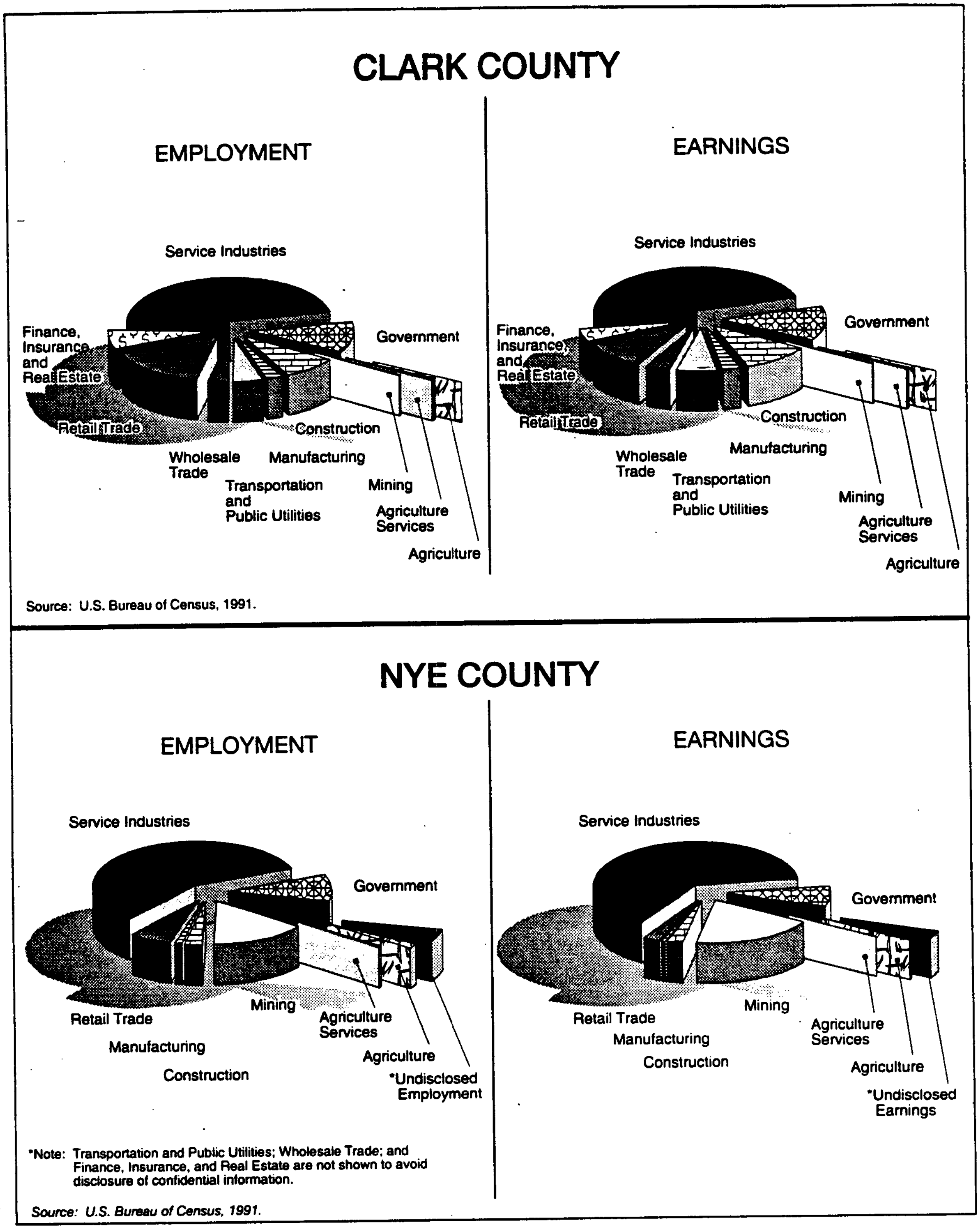


Figure 4-17. Clark County and Nye County 1990 employment and earnings by place of work

controls 93 percent of the land area. Mining, federal installations, tourist and recreation attractions, and grazing allotments all occur largely on public land in Nye County (Nye County Board of Commissioners, 1993).

Nye County is comprised of communities widely separated by distance, each with a distinct and independent economic base. The NTS and Tonopah Test Range have been operating in Nye County for several decades. Federal facilities have provided employment for Nye County residents and a modest amount of procurement for local business. The economy in each community is dependent on different private companies and, in some cases, different industries. Because the communities are widely separated by distance, economic links to each other are limited. Metropolitan economies generally absorb a significant portion of business and residential purchases. Rural economies, such as Nye County, however, often leak large portions of both business and residential purchases to larger communities, resulting in economic loss and a set of economic development needs different from those in more urban areas (Nye County Board of Commissioners, 1994).

Nye County's strategy to increase economic development opportunities from federal facilities is to engage the appropriate divisions of the DOE in a formal set of interactions. Nye County has identified the need for a qualified workforce and business base to fulfill federal requirements. To this end, Nye County has developed programs to inform local businesses of federal procurement opportunities and continuing formal and informal interaction with appropriate federal agencies (NEEDA, 1993a). One example of this proactive approach is Nye County's status as a cooperating agency in the NTS EIS.

Total employment in Nye County between 1970 and 1980 increased from 7,149 to 7,860, or an average of 1.0 percent annually (Table 4-7). Total employment in Nevada in 1970 was approximately 256,000. By 1980, employment increased to 488,000, an annual average increase of 9.1 percent. In contrast, total employment in the United States increased from 9.11×10^7 in 1970 to 1.14×10^8 in 1980, an annual average increase of 2.5 percent. In the 1970s and 1980s, nuclear weapons testing at the NTS dominated the Nye County economy when described in terms of employment by place of work. While most of the NTS workforce commutes to the Las Vegas area and most food and other services are provided at federally subsidized facilities on the NTS, some county private businesses do provide the NTS with support services.

In 1990, total employment in Nye County expanded to 12,889, an annual increase of 6.4 percent from the 1980 figure of 7,860. This increase in employment was largely composed of employees who lived outside Nye County, as can be seen in Table 4-7 (less than 10 percent live in Nye County). The table lists employees by place of work rather than by place of residence. This accounts for the low number of civilian labor force (9,100) when compared to the total number of jobs (12,889). Between 1980 and 1990, average annual employment growth in Nevada was 5.3 percent, and in the United States, 2.2 percent. While total employment in Nye County was increasing during this period, employment at the NTS and Tonopah Test Range was decreasing. In addition to the loss of an estimated 140 NTS jobs held by Nye County residents, the relocation of the U.S. Air Force 37th Tactical Fighter Wing from the Tonopah Test Range resulted in the loss of an estimated 511 jobs held by Nye County residents (SAIC/DRI, 1991).

In 1990, the largest employment sectors in Nye County were service industries (58.2 percent), mining (15.2 percent), government (9.4 percent), retail trade (6.8 percent), construction (2.6 percent), agriculture (1.7 percent), manufacturing (1.1 percent), and agricultural services (0.4 percent) (Figure 4-17). The large percentage of service jobs can be explained by the large number of jobs at the NTS, which are classified as service. The remaining 4.7 percent was divided among the following sectors: wholesale trade; finance, insurance, and real estate; and transportation and utilities. The specific breakdowns are not shown to avoid disclosure of confidential information.

In 1990, average annual earnings per job in Nye County were $31,415 (inflated by the large number of NTS workers), while per capita income was $16,268 (Table 4-7). Jobs at the NTS and Tonopah Test Range are relatively high paying. For example, the average worker received $47,319 in compensation in 1994. Consequently, Nye County earnings decreased approximately 9 percent over a 3-year period from 1989 to 1992, a result in large part due to the decline in the NTS employment and the relocation of the U.S. Air Force 37th Tactical Fighter Wing from the Tonopah Test Range. Total earnings reported in 1990 for Nye County were $404.9 million. Industrial sectors reporting the largest shares of earnings in Nye County in 1990 included services (64.0 percent), mining (19.2 percent), and government (7.5 percent) (Figure 4-17). According to the state of Nevada Employment Security Department, 8,780 members of the total labor force were employed (Table 4-9), while 320 or 3.5 percent of the total labor force was unemployed. The unemployment rate for Nye County was lower than the State (4.9 percent) and the nation (5.5 percent) (State of Nevada, 1990).

The federal fiscal year is the period between October 1 and September 30. Total employment at the NTS in Fiscal Year 1994 was 7,016 and is expected to be approximately 6,580 in Fiscal Year 1995, a decrease of almost 19 percent. This will be the lowest employment level at the NTS for Fiscal Years 1987 through 1995. In Fiscal Year 1987, employment reached a historical high of 9,908. The subsequent reduction of employment between Fiscal Years 1988 and 1994 can be attributed mainly to budgetary constraints and the nuclear testing moratorium (Table 4-10).

Total expenditures at the NTS have been decreasing over the last five years, from $856.2 million in Fiscal Year 1990 to $769.5 million in Fiscal Year 1994. This decrease can also be attributed to budgetary constraints and the nuclear testing moratorium (Table 4-10).

POPULATION—This section presents the 1990 population for Clark and Nye counties. In addition, two cities, Las Vegas and North Las Vegas in Clark County, and four towns, Tonopah, Pahrump, Beatty, and Amargosa Valley in Nye County, are discussed. Summaries of population can be found in Tables 4-7 and 4-11.

Clark County—According to *Economic Outlook*, in 1990 the population for Clark County was 797,142, an increase of 334,055, or an average annual increase of 7.2 percent from the 1980 level of 463,087 (Schwer, 1995). The overall increase is equivalent to an annual average growth for the county of approximately 9.6 percent over the 1970 to 1990 period. By comparison, the average annual growth for Nevada was approximately 5 percent and nearly 1 percent for the United States between 1980 and 1990.

The population of the city of Las Vegas totaled 268,330 in 1990, an increase of 63 percent from the 1980 level of 164,674 (State of Nevada, 1995b). The average annual growth of 5.7 percent for the 1970 to 1990 period was below the county level. In 1970, the city of Las Vegas accounted for 46.0 percent of the Clark County population (State of Nevada, 1994); by 1990, the City accounted for 33.7 percent of the total population.

The population of the city of North Las Vegas was 50,030 in 1990, an increase of 1.5 percent from the 1980 level. The average annual growth of 1.9 percent for the 1970 to 1990 period was below the county level. In 1970, the city of North Las Vegas accounted for 13.3 percent of the Clark County population; in 1990, the city accounted for 6.3 percent of the total population in Clark County.

Nye County—In 1990, the population for Nye County was 17,781, an increase of 8,733, or an average annual increase of 9.7 percent from the 1980 level (Nye County Board of Commissioners, 1993). The overall increase is equivalent to an annual average growth for the county of about 10.9 percent over the 1970 to 1990 period. By comparison, for the period 1980 through 1990, the average annual population growth for Nevada was about 5 percent and nearly 1 percent for the United States.

As the Nye County seat, Tonopah's economic base includes government employment and a growing travel and tourist economy. However, recent layoffs at area mines and the transfer of the U.S. Air Force 37th Tactical Fighter Wing from the Tonopah Test Range have resulted in population losses in Tonopah (Nye County Board of Commissioners,

Table 4-10. DOE/NV funding and employment, 1990 to 1994

Fiscal Year	Funding (millions)	Employment
1990	$856.2	9,152
1991	$909.1	8,897
1992	$912.3	8,794
1993	$865.8	7,704
1994	$769.5	7,016

Table 4-11. Population in the region of influence, 1990 through 1995

	1990	1991	1992	1993	1994	1995
Clark County	797,142	834,907	870,692	919,388	985,827	1,032,161
Las Vegas	268,330	289,690	303,440	323,300	346,350	362,628
North Las Vegas	50,030	51,060	55,400	60,880	69,700	77,820
Nye County	17,781	19,197	20,613	22,236	23,988	25,976
Tonopah	3,810	3,586	3,375	3,514	3,659	3,810
Pahrump	7,440	8,777	10,355	11,761	13,357	15,170
Beatty	1,652	1,775	1,907	1,915	1,922	1,930
Amargosa	838	916	947	1,010	1,070	1,100

NOTE: 1990 data are U.S. Bureau of the Census counts; all other data are projections.

Sources: Nye County Board of Commissioners, 1993; Schwer, 1995.

1994). The 1990 population in the town of Tonopah was 3,810. Since 1980, the population growth for the town of Tonopah has increased by about 39 percent. In 1990, the town accounted for 21.4 percent of the population in Nye County; this percentage has decreased since 1970 when the town accounted for 30.6 percent of the Nye County population (U.S. Bureau of the Census, 1991).

Pahrump is the largest and most rapidly growing community in Nye County. It nearly tripled in size in the decade between 1980 and 1990 and has continued to grow. It can be anticipated that the community's reputation as a retirement center and bedroom community for Las Vegas will continue to attract new residents (Nye County Board of Commissioners, 1994). The 1990 population for the town of Pahrump was 7,440.

Since 1980, growth in Pahrump has driven growth in Nye County. The average annual growth of 2.5 percent for the 1970 to 1990 period was below the state and national averages. In 1990, the city accounted for 41.8 percent of the population in Nye County; this percentage has increased since 1970 when the city accounted for 17.2 percent of the Nye County population (U.S. Bureau of the Census, 1991).

The population in Beatty increased dramatically between 1985 and 1990 because of the development of the Bond Gold Bullfrog Mine and Mill. The 1990 population was 1,652 and has increased only slightly since. Beatty's economy and population are based predominately on mining, employment at federal facilities, and travel and tourism. Beatty may face potential population losses resulting from the depletion of current mineral reserves (U.S. Bureau of the Census, 1991; Nye County Board of Commissioners, 1994).

The population of the town of Amargosa Valley has ranged from 838 in 1990 to 1,100 in 1995, an increase of 31.3 percent in 5 five years. In 1995, Amargosa Valley accounted for 4.2 percent of the total population in Nye County.

HOUSING—The housing stock and number of building permits are discussed in the following section for Clark County; the cities of Las Vegas and North Las Vegas; Nye County; and the towns of Tonopah, Pahrump, and Beatty in Nye County. Table 4-12 presents housing characteristics in the region of influence.

Clark County—In 1990, the housing stock in Clark County consisted of 317,188 units, an increase of 127,328 units or 67.1 percent over the 1980 total of 189,860. Between 1980 and 1990, Clark County housing unit vacancies increased from 15,969 units or 8.4 percent of the housing stock in 1980 to 30,163 vacant units or 9.5 percent of the housing stock in 1990. The housing market continues to flourish as the demand for new housing consistently exceeds the supply. The increase in demand is attributable to the influx of retirees and other in-migrant population (U.S. Bureau of the Census, 1991; ULI, 1994).

The number of building permits issued annually in Clark County rose sharply in the mid-to-late-1980s, with a peak of 26,432 permits issued in 1988. In the early 1990s, the number of permits dropped, with 13,027 issued in 1992. Building permits issued in a given year may not represent the actual number of units built; however, they are indicative of the level of new residential development in the city (Schwer, 1995).

In 1990, the housing stock in the city of Las Vegas consisted of 109,670 units, an increase of 42,629 units or 63.6 percent over the 1980 total of 67,041. Between 1980 and 1990, the city of Las Vegas housing units vacancies increased from 4,897 units or 7.3 percent of the housing stock in 1980 to 9,935 vacant units or 9.1 percent of the housing stock in 1990.

The outlook for the Las Vegas residential market remains very positive for single-family homes. Job growth, driven by the hotel and gaming industry, should remain strong for the next several years. The addition of over 10,000 new hotel rooms in 1995 will create approximately 15,000 jobs in that sector. Applying the multiplier effect, another 30,000 additional secondary jobs could be created in other areas of the economy. This strong job growth will fuel demand for housing in all market segments. Overall, a strong market is projected though 1995. Projections beyond 1995 will be determined by new economic development activity, such as another large-scale resort and gaming project or the relocation of other major employers to Las Vegas (ULI, 1994).

The city of North Las Vegas' 1990 housing stock consisted of 15,837 units, an increase of 1,738 units or 12.3 percent over the 1980 total of 14,099. Between 1980 and 1990, North Las Vegas housing unit vacancies increased from 1,037 units or 7.4 percent of the housing stock in 1980 to 1,312 vacant units or 8.3 percent of the housing stock in 1990.

Nye County—The availability of affordable housing for senior citizens and low- and middle-income residents and the ability of entry-level buyers to obtain financing for housing are of concern in Nye County (Nye County Board of Commissioners, 1994). In 1990, the housing stock in Nye County consisted of 8,073 units, an increase of 3,871 units or 92.1 percent over the 1980 total of 4,202 (Nye County Board of Commissioners, 1993). Between 1980 and 1990, Nye County housing unit vacancies decreased from 768 units or 18.3 percent of the housing stock in 1980 to 1,409 vacant units or 17.5 percent of the housing stock in 1990. The vacancy rate does not reflect substandard units or houses held for occasional and recreational use.

Table 4-12. 1990 housing characteristics in the region of influence

	Housing Stock	Housing Demand	Vacancy Rate
Clark County	317,188	287,025	9.51%
Las Vegas	109,670	99,735	9.06%
North Las Vegas	15,837	14,525	8.28%
Nye County	8,073	6,664	17.45%
-Tonopah	1,767	1,460	17.37%
Pahrump	3,514	3,029	13.80%
Beatty	912	762	16.45%

NOTE: Housing stock is the total number of units; demand is the total number of occupied units.

Source: U.S. Bureau of the Census, 1991.

The 1990 housing stock in the town of Tonopah consisted of 1,767 units. Some 1,460 were occupied and 307 were vacant (17.4 percent). The largest number of houses were built between 1980 and 1984. A major decline in new housing construction has been experienced since 1984 (NEEDA, 1993b).

In 1990, the housing stock in the town of Pahrump consisted of 3,514 units. The vacancy rate was 13.8 percent, and 3,029 were occupied (NEEDA, 1993b). Fifty-eight percent of the houses have been built since 1979, and 92 percent of all housing units have been built since 1969.

In 1990, the housing stock in the unincorporated area of Beatty consisted of 912 units. Of these, 762 were occupied, resulting in a vacancy rate of 16.5 percent. The largest portion of the houses were built between 1970 and 1979. A gradual decline in new housing has been experienced in the past 20 years. Ninety-four new structures were under construction in 1990 (NEEDA, 1993b).

PUBLIC FINANCE—The financial characteristics of potentially affected local jurisdictions are presented in this section. The local jurisdictions include Clark County, the cities of Las Vegas and North Las Vegas, Clark County School District, Nye County, the towns of Tonopah and Pahrump, and the Nye County School District. The finances of Beatty, Amargosa Valley, and Manhattan are administered by Nye County.

Government funds discussed in this section are those through which most government functions of the jurisdiction are financed. Government fund types include the general, special revenues, debt service, and capital project funds. The general fund accounts for financial transactions related to revenues and expenditures of services are not accounted for in other funds. Special revenues funds are those funds accounted for in the proceeds of specific revenue sources that are legally restricted for specified purposes. Debt service funds account for the accumulation of resources for, and the payment of, interest and principal on general long-term debt. Capital project funds are used to account for financial resources for the acquisition or construction of major capital facilities. The fiscal year for all Nevada jurisdictions is the 12-month period from July 1 to June 30.

For many jurisdictions discussed, ad valorem taxes are a major source of revenue. These are taxes that are levied on the assessed valuation of real property. Assessed valuation is a valuation set upon real estate as a basis for levying taxes. Thirty-five percent of the taxable value placed upon real property is used as the basis for levying property taxes in most Nevada jurisdictions.

Table 4-13 summarizes the fiscal position of Clark County and Nye County jurisdictions in Fiscal Year 1994. Columns are presented only to facilitate financial analysis. Such data are not comparable to a consolidation. The fund balances are the

Table 4-13. Financial summary for Fiscal Year 1994, general, special revenues, debt service, and capital project funds, Clark County and Nye County jurisdictions

	Revenues	Expenditures	Revenues Less Expenditures	Debt Service	Current Expense	Fund Balance as Percentage of Current Expense
Clark County	$696,950,016	$767,611,252	($70,661,236)	$65,178,759[a]	$457,379,897[b]	157.95%
Las Vegas	$245,511,322	$249,562,587	($4,051,265)	$10,319,245[c]	$176,253,405[b]	59.67%
North Las Vegas	$51,914,044	$53,747,125	($1,833,081)	$2,528,555[d]	$41,768,530[b]	30.97%
Clark County School District	$716,013,860	$775,193,716	($59,179,856)	$56,980,872[e]	$636,708,860[b]	12.90%
Nye County	$25,450,955	$25,493,176	($42,221)	$19,955[a]	$21,389,278[b]	76.75%
Tonopah	$762,898	$669,800	$93,098	$66,788[c]	$603,012[b]	66.65%
Pahrump	$1,043,164	$944,879	$98,285	$90,014[c]	$711,674[b]	80.35%
Nye County School District	$24,079,470	$25,176,765	($1,097,295)	$4,020,145[f]	$18,840,821[g]	26.86%

[a] Principal and interest
[b] Total expenditures less capital projects and debt service
[c] Principal and interest and fiscal charges
[d] Principal retirement and interest
[e] Principal on loans and bond retirement and interest on bonds
[f] Principal retirement and interest and bond issuance costs
[g] Total expenditures less facilities acquisition and construction and debt service.

Sources: Clark County, 1994a; Clark County School District, 1994b; City of Las Vegas, 1994; City of North Las Vegas, 1994; Nye County, 1994; Nye County School District, 1994; Pahrump, 1994; Tonopah, 1994.

resources remaining from the prior year that are available to be budgeted in the current year. The fund balance as percentage of current expense is a quick look at how much reserve would be used if current (due within a year) expenses had to be paid without considering revenues. The lower the percentage, the less available to pay off current expenses. The following sections focus on Fiscal Year 1994.

Clark County—Clark County, incorporated in 1909, is governed by a Board of County Commissioners and a county manager. This seven-member board is elected by each district to serve staggered four-year terms. Within the county are 5 incorporated cities, including Las Vegas, which is the county seat, and 13 unincorporated towns (Clark County, 1994a). County services provided include the county recorder, assessor, treasurer, social services, airport, hospital, and criminal justice. In addition, the county provides a full range of local services, such as fire, police, road maintenance and construction, animal control, building inspection, and water and sewage systems to county residents living in unincorporated areas.

Total revenues for Fiscal Year 1994 were $696,950,016. The two most significant revenue sources for Clark County in Fiscal Year 1994 were intergovernmental revenues, and ad valorem taxes and special assessments. Intergovernmental revenues were approximately 48 percent of total revenues in Fiscal Year 1994 and have usually been the primary revenue source for Clark County in the past. Sales and use taxes have been a major component of intergovernmental revenues because of growth in the economy. In Fiscal Year 1992, the state of Nevada implemented a "Fair Share" sales tax distribution formula that based distribution on the point of origin rather than need. Since 1981, Clark County had been receiving fewer sales taxes than collected; therefore, this legislation had a positive fiscal impact for the county (Clark County, 1994a).

Ad valorem taxes and special assessments are the second most significant revenue source for Clark County, comprising approximately 23 percent of total revenues in Fiscal Year 1994. Ad valorem taxes were based on an assessed valuation of \$17,107,674,808 and a tax rate of \$0.7131 per \$100 of assessed valuation (Clark County, 1994b).

Expenditures totaled \$767,611,252 for Fiscal Year 1994. The two most significant expenditure categories for Clark County in Fiscal Year 1994 were capital projects and public safety. As 32 percent of total expenditures, capital projects include major transportation improvements throughout the county, a new government center, and buildings for family court services. Public safety expenditures were approximately 27 percent of total expenditures in Fiscal Year 1994. Included in this category are expenditures for the county sheriff, fire department, and coroner.

Revenues less expenditures were a negative \$70,661,236 in Fiscal Year 1994. Debt service (principal and interest) was \$65,178,759. Current expenses, which are total expenditures less capital projects and debt service, were \$457,379,897. The ending fund balance was 158 percent of current expense. The ending fund balance is the excess of assets over liabilities and reserves (Clark County, 1994a).

City of Las Vegas—The city of Las Vegas was incorporated in 1911 and has a council manager form of government. The city provides for fire and police protection (through the Las Vegas Metropolitan Police Department), municipal court, sanitation, construction and maintenance of roads, recreation, and general government services for residents within its approximately 233km^2 (90mi^2) incorporated area. Las Vegas is the county seat of Clark County and has the largest population of any incorporated city in the county.

The two most significant revenue sources in Fiscal Year 1994 for the city of Las Vegas were intergovernmental revenues and taxes. Intergovernmental revenues comprised approximately 56 percent of total revenues. Intergovernmental revenues involve federal grants, cigarette taxes, liquor taxes, sales taxes, motor vehicle privilege taxes, the city share of county gaming licenses, and real property transfer taxes. In Fiscal Year 1994, taxes were approximately 16 percent of total revenues. Tax revenues have two components: real property tax and personal property tax. Both are calculated on the assessed valuation of the property. Total assessed value was \$4,230,821 in 1994. The property tax rate for 1994 was \$0.7247 per \$1,000 of assessed value.

In Fiscal Year 1994, the two largest expenditure categories for the city of Las Vegas were public safety and capital outlay. Public safety expenditures, consisting of police, fire, corrections, traffic engineering, and building and safety services, were approximately 37 percent of total expenditures in this year. Capital outlay, the second largest expenditure category, was 25 percent of total expenditures.

Revenues less expenditures were a negative \$4,051,265 in Fiscal Year 1994. Debt service was \$10,319,245. Current expense was \$176,253,405, and the fund balance as a percentage of current expense was 60 percent (City of Las Vegas, 1993 and 1994).

City of North Las Vegas—The city of North Las Vegas was incorporated in 1946 and has a council manager form of government. The city provides a full range of services within its 166-km^2 (64-mi^2) incorporated area, including general government, police, municipal court, public safety, highway and streets, health and sanitation, culture and recreation, community support, and utilities.

In Fiscal Year 1994, the two most significant revenue sources for the city of North Las Vegas were intergovernmental and taxes. Intergovernmental revenue provided approximately 55 percent of total revenues in Fiscal Year 1994. The intergovernmental revenue consisted of grants, shared revenues, and payments in lieu of taxes. Taxes comprised approximately 15 percent of total revenues and included ad valorem, county option motor vehicles fuel, and room taxes. In 1994, the ad valorem tax rate in North Las Vegas was

$3.119 per $100 of assessed valuation. The total assessed valuation in this year was $661,947,000.

The two largest expenditures for the city of North Las Vegas in Fiscal Year 1994 were public safety and capital projects. Public safety expenditures (police, fire, and protective services) comprised approximately 49 percent of total expenditures in Fiscal Year 1994. Capital project expenditures were the second most important expenditure category at 18 percent of all expenditures.

Revenues less expenditures were a negative $1,833,081 in Fiscal Year 1994. Debt service was $2,528,555. Current expense was $41,768,530, and the fund balance as a percentage of current expense was 31 percent (City of North Las Vegas, 1994).

Clark County School District—Clark County School District boundaries are the same as those of Clark County. The continued rapid growth of Clark County has resulted in a shortage of schools and school buildings. In the 1988 and 1994 elections, bonds for school building programs were approved by voters. It is estimated that between 25 and 38 new schools will be built in the immediate future. In addition, the district is involved in asbestos removal and fire safety retrofitting to meet Nevada fire code requirements. The construction and retrofitting bonds are to be paid with ad valorem taxes.

The key revenue sources for the Clark County School District are local and state sources. Local sources are monies generated from sales taxes, ad valorem taxes, and motor vehicle privilege taxes. These revenues were approximately 64 percent of total revenues in Fiscal Year 1994. The Clark County School District portion of the Clark County ad valorem tax rate in Fiscal Year 1992 was $1.1935 per $100 of assessed valuation; this rate has not changed since Fiscal Year 1988. State sources are revenues generated by the state of Nevada and received by the district based on a formula. The formula includes a standard amount per student, plus special educational funding. These revenues were 33 percent of total revenues in Fiscal Year 1994.

The two major expenditures for the district were regular programs and undistributed expenditures. The regular programs category includes expenditures such as instruction, support, and transportation for all regular elementary and secondary students. Regular programs comprised 42 percent of all expenditures. Undistributed expenditures are charges not readily assignable to a program, such as student and instructional staff support; general and administrative costs; and costs of operating, maintaining, and constructing physical facilities of the district. These undistributed expenditures were 28 percent of total expenditures in Fiscal Year 1994.

In Fiscal Year 1994, revenues less expenditures were a negative $59,179,856. Debt service was $56,980,872. Current expense was $636,708,860. The ending fund balance was $82,112,931, which was 13 percent of the current expense (Clark County School District, 1994a and b).

Nye County—Nye County is governed by a five-member Board of County Commissioners. Within the county are six unincorporated towns, including Tonopah, the county seat. The governing body of Nye County has direct oversight responsibility for the unincorporated towns of Amargosa Valley, Beatty, and Manhattan. County services provided include the county recorder, assessor, treasurer, social services, and criminal justice. In addition, the county provides a limited range of local services, such as police, road maintenance and construction, and animal control. Excluded from the Nye County financial statements are the Nye County School District and the towns of Tonopah and Pahrump. These are discussed in the following sections.

The two most significant revenue sources for Nye County in Fiscal Year 1994 were intergovernmental revenues and ad valorem taxes. Intergovernmental revenues were approximately 55 percent of total revenues. Major components of this revenue were supplemental city/county relief taxes and motor vehicle fuel taxes. Ad valorem taxes are the second most significant revenue source for Nye County, comprising approximately 27 percent of total revenues in Fiscal Year 1994. The 1994 assessed valuation was $636,488,641, and the tax rate was $2.6466 per $100 of assessed valuation.

The two key expenditure categories for Nye County in Fiscal Year 1994 were general government and public safety. General government expenditures were approximately 29 percent of total expenditures in Fiscal Year 1994. Included in this category are expenditures for county administration, finance, and building services. Public safety, the second most significant expenditure at 24 percent of total expenditures, includes the sheriff, search and rescue, and fire departments.

In Fiscal Year 1994, revenues less expenditures were a negative $42,221. Debt service was $19,955. Current expense was $21,389,278. The ending fund balance was $16,416,983, which was 77 percent of the current expense (Nye County, 1994).

Tonopah—Tonopah is the county seat of Nye County and the second largest community in the county. The unincorporated town of Tonopah has a town board form of government. The unincorporated town mechanism is often chosen over incorporation for financial considerations. An unincorporated town may provide certain services and may be allowed certain revenues to fund these services. Unincorporated towns may provide a wide range of services, but are not required to do so. They may use Nye County services and benefit from the cost efficiencies of the larger service system (Nye County Board of Commissioners, 1994). The town provides a range of services within its area, including general government, public safety, highways and streets, and culture and recreation.

In Fiscal Year 1994, the two most significant revenue sources for Tonopah were taxes and intergovernmental revenues. Taxes comprised approximately 53 percent of total revenues and included property taxes and room taxes. In 1994, the property tax rate in Tonopah was $3.2403 per $100 of assessed valuation for an assessed valuation of $31,898,884 (Nye County, 1994). Intergovernmental revenue provided approximately 34 percent of total revenues in Fiscal Year 1994. This revenue included county liquor licenses, county gaming licenses, motor vehicle privilege taxes, relief taxes, and gas taxes.

The two largest expenditures for Tonopah in Fiscal Year 1994 were public safety and culture and recreation. Public safety expenditures (fire services) comprised approximately 35 percent of total expenditures in Fiscal Year 1994. Culture and recreation expenditures were the second most important expenditure category at 26 percent of all expenditures. Culture and recreation includes expenses for parks, libraries, swimming pool, fairs, and ball fields.

Revenues less expenditures were $93,098 in Fiscal Year 1994. Debt service was $66,788. Current expense was $603,012, and the fund balance as a percentage of current expense was 67 percent (Tonopah, 1994).

Pahrump—The unincorporated town of Pahrump has a town board form of government. The largest community in Nye County, the town provides for general government, public safety, public works, health, and culture and recreation services for residents within its area.

The two most significant revenue sources in Fiscal Year 1994 for Pahrump were taxes and intergovernmental revenues. In Fiscal Year 1994, taxes were approximately 49 percent of total revenues. Tax revenues have two components: property tax and room tax. The property tax rate for 1993 was $2.8830 per $1,000 for an assessed value of $225,896,898 (Nye County, 1994). The town levies room taxes. Amounts collected for the Fiscal Year 1994 were $72,288 or 14 percent of all taxes. Intergovernmental revenues comprised approximately 37 percent of total revenues. Intergovernmental revenues involve a motor vehicle privilege tax, relief tax, county and state grants, and gas tax.

In Fiscal Year 1994, the two largest expenditure categories for Pahrump were general government and culture and recreation. General government expenditures, consisting of administration, building and grounds, town board, community center, and advisory planning, were approximately 41 percent of total expenditures in this year. Culture and recreation, the second largest expenditure category, was 16 percent of total expenditures. It included television, recreation, parks, and arena and fair activities.

Revenues less expenditures were $98,285 in Fiscal Year 1994. Debt service was $90,014. Current expense was $711,674, and the fund balance as a percentage of current expense was 80 percent (Pahrump, 1994).

Amargosa Valley—The town of Amargosa Valley is located on U.S. Highway 95, approximately 145 km (90 mi) northwest of Las Vegas. Its northern edge is adjacent to the NTS. The town encompasses some 1,243 km^2 (480 mi^2) and is about half the size of the state of Rhode Island. Its economy is based primarily on farming, the NTS, and several small- and medium-sized mines. Amargosa Valley has no professional government management or administrative staff. It is governed and funded by the Nye County Board of Commissioners. The County Commissioners set the annual budget for the town and enact ordinances and policies on the recommendation of the five-member Amargosa Valley Citizens' Advisory Council. The town provides a range of services, including a community center, library, parks and recreation, fire protection and ambulance, and a senior center.

Amargosa Valley financial and budgetary programs are administered by Nye County and are reflected in the Nye County finance section. Construction of the Amargosa Valley Community Center, library, and sheriff's substation/fire station was financed by general obligation bonds. The original amount of the bond issue was $735,000, which was reflected in increased capital outlay in Fiscal Years 1987 to 1988. The 1987 delinquency rate for ad valorem taxes was approximately 17 percent, and it is expected that Nye County will have to provide additional support to the town in the coming fiscal years (Blankenship, 1995).

Nye County School District—Nye County School District boundaries are contiguous with those of Nye County. The school district is governed by a seven-member Board of School Trustees, who are elected to serve four-year terms.

The key revenue sources for the district are state and local sources. Local sources are monies generated mostly from ad valorem taxes, school support taxes, and franchise taxes. These revenues were approximately 53 percent of total revenues in Fiscal Year 1994.

State sources are revenues generated by the state of Nevada and received by the district based on a formula. The formula includes a standard amount per student, plus special educational funding. These revenues were 44 percent of total revenues in Fiscal Year 1994.

The two major expenditures for the district were regular programs and operations and maintenance. The regular programs category includes expenditures such as instruction, support, and transportation for all regular elementary and secondary students. Regular programs comprise 39 percent of all expenditures. Operations and maintenance costs are the second most significant expenditure for the district, comprising 11 percent of total expenditures in Fiscal Year 1994. This expense includes salaries, benefits, purchased services, supplies, and property.

In Fiscal Year 1994, revenues less expenditures for the Nye County School District were a negative $1,097,295. Debt service was $4,020,145. Current expense was $18,840,821, and the fund balance as a percentage of current expense was 27 percent (Nye County School District, 1993 and 1994).

PUBLIC SERVICES—The key public services examined in this analysis are public education, police and fire protection, and health care. Providers of these services in the region of influence are public school districts, police and fire departments, and hospitals and clinics. Existing conditions for each major public service focus on those providers that are geographically close to the sites and/or maintain the closest relations to the sites. The level of general public service is determined by student-to-teacher ratios at primary and secondary public schools and by the ratio of employees (sworn officers, professional fire-fighters, and health care personnel) to serviced population.

The Superfund Amendments and Reauthorization Act of 1986 requires state and local jurisdiction, within the United States, to plan for and have the capability to respond to incidents involving all hazardous materials including waste that reside in or pass through their jurisdiction. This process is implemented through the Local Emergency Planning Committee and the State Emergency Response Commission. As part of this program local communities and counties are required to implement an Emergency Response Plan. These plans define chain-of-command, notification procedures, and evacuation procedures for each community.

For the past 15 years, the DOE has provided training to responders in Nevada through the First-On-Scene Program. The environment safety and health training will continue to be made available to state regulators, educators, the public, and agencies (firefighters, law enforcement, and emergency, medical personnel) within Nevada. Training courses for environmental safety and health, transportation, radioactive materials management, environmental restoration, and classes that meet or exceed federally mandated training requirements for personnel involved with the generation or disposal of radioactive or hazardous waste can be provided by the DOE/NV. Courses conducted associated with transportation activities include: first-on-scene responder for law enforcement, firefighters, and emergency medical personnel.

PUBLIC EDUCATION—The University of Nevada, Las Vegas, was officially established in 1957. More than 120 graduate and undergraduate programs are offered to a student body of 19,500. The university has on-campus research facilities, including the Desert Biology Research Center, Center for Business and Economic Research, Nuclear Waste Transportation Research Center, and Parent/Family Wellness Center. The Desert Research Institute, a separate division of the University and Community College System of Nevada, was founded in 1959 as an international center for environmental research. The University of Nevada Medical School trains medical students and resident physicians at the University Medical Center, where the school is located (Las Vegas Review-Journal, 1994). The Harry Reid Center is an environmental studies organization located on campus and operated by the university.

Under Nevada law, a single public school district serves each county and is responsible for educating students from kindergarten through grade twelve. The following discussion highlights the Clark County and Nye County school districts in terms of numbers of students and teachers and the student-to-teacher ratio.

American Indian Education—Under federal and Tribal Law, American Indian children can be educated in tribally controlled and federally certified schools located on Indian reservations. Federal funds are available through the Indian Education Act for the education of Indian children. Compensation from the federal government is provided to any school district who has entered into a cooperative agreement with Federally Recognized Tribes whether it be public, private, or an Indian controlled school.

Clark County School District—Approximately 62 percent of Nevada's total public school enrollment is in Clark County. The Clark County School District, with a 1993 to 1994 enrollment of 145,327 students, is the largest district in the state and the eleventh largest school district in the nation. A total of 7,928 full-time equivalent licensed teachers were employed by the school district. These figures result in a student-to-teacher ratio of 18.33:1 for the district. The district has 184 schools, including 127 elementary schools, 27 middle schools, 24 senior high schools, and 6 special schools (State of Nevada, 1995a).

With the continued rapid growth of Clark County, a 10-year, $600,000,000 school building program was approved by voters in 1988. In Fiscal Year 1990, 2 new schools opened as a result of the bond election, followed by 13 more in Fiscal Year 1991. As Fiscal Year 1992 began, 18 new schools opened. Eight schools were opened for use during Fiscal Year 1993, 13 opened in Fiscal Year 1994, and 3 new schools will open in Fiscal Year 1995, completing the 1988 bond program. Depending on the amount of additional monies passed by voters, it is estimated that between 25 and 38 new schools will be built in the immediate future (Clark County School District, 1994a).

Nye County School District—Of the 17 school districts in Nevada, the Nye County School District ranks as the eighth largest. There are 15 schools in the district: 9 elementary, 1 junior high, 1 junior high/high school, and 4 high schools (State of Nevada, 1995a). Some 239 full-time equivalent licensed teachers were employed by the school district in the 1993 to 1994 school year, and the district had a 1993 to 1994 enrollment of 3,918 students. Using these numbers, the student-to-teacher ratio for the Nye County School District was 16.39:1 (State of Nevada, 1995a).

American Indian Tribally Operated Schools in Nye County—In Nye County there is one tribally controlled elementary school. It is operated by the Duckwater Shoshone Tribe. In 1995 the school had 32 students enrolled from preschool to 8th grade, who were taught by three full-time certified teachers; these included two certified elementary teachers, two teaching assistants, one preschool teacher, and one teacher under the Chapter 1 Program. Using these numbers the student-to-teacher ratio was 10.66:1 (Duckwater Shoshone Tribe, 1996).

A tribally operated headstart program is located on the Moapa Paiute Indian reservation. The program is open to all eligible preschool students, both Indian students and non-Indian students from nearby communities. This program is funded through the Inter-tribal Council of Nevada, who operate headstart sites elsewhere in the state of Nevada. Indian students also attend non-Indian public schools.

POLICE PROTECTION—Police protection in the region of influence is provided by the Las Vegas Metropolitan Police Department, the North Las Vegas Police Department, and the Nye County Sheriff's Office with stations at Tonopah, Pahrump, Beatty, Mercury, and Amargosa Valley. Each provides law enforcement services in conjunction with other law enforcement agencies, including the Nevada Highway Patrol.

No universal standards can be employed to determine proper patrol size considering the duties the patrol force is expected to perform, such as responding to calls for service, conducting preventive patrol, and performing miscellaneous administrative tasks. The amount of time that should be devoted to each of these three broad areas is largely a policy decision that is made locally, based on experience. Once an acceptable patrol staffing level has been determined, it is necessary to devise a plan that will provide for the most efficient use of officers' time and the most productive geographic distribution (ICMA, 1982). The following discussion describes sworn officer or deputy levels of service per 1,000 population, the number of vehicles, and the number and capacity of holding facilities.

Las Vegas Metropolitan Police Department—To reduce the duplication of services, effective July 1, 1973, the Clark County Sheriff's Department and the Las Vegas Police Department were deactivated, and the Las Vegas Metropolitan Police Department was activated to take their place. The new department is headed by the elected sheriff of the county. In addition to patrolling the city of Las Vegas, the department provides service for rural areas of the county (Keller, 1995).

The department maintains 1,274 sworn personnel for a level of service of 2.26 per 1,000 people. Training personnel include 13 sworn officers and 10 civilian employees. In addition, there are 18 sworn and 5 civilian crime prevention specialists, which include community relations, crime prevention, and Drug Abuse Resistance Education officers. Some 821 vehicles, including 4-wheel vehicles, motorcycles, and search and rescue vehicles, are used by the department. The holding facility capacity for the Clark County Detention Center is 1,650 and the Las Vegas Detention Center, operated by the city of Las Vegas, is 600 (U.S. Bureau of the Census, 1994; Reed, 1995).

North Las Vegas Police Department—The North Las Vegas Police Department has one station that has 132 commissioned police officers. There are about 1.8 officers per 1,000 North Las Vegas residents. The city also has one detention center that presently (July 1995) houses 100 prisoners; the detention center is approximately 50 percent filled. This low occupancy rate is due to the planning of this facility to accommodate the projected prisoners for the year 2000.

Nye County Sheriff's Office—The Nye County Sheriff's Office, whose main office is located in Tonopah, serves the entire county and supports substations located in Pahrump, Mercury, Amargosa Valley, Beatty, Smoky Valley, and Gabbs. There are 104 sworn officers and deputy personnel, 2 Drug Abuse Resistance Education/crime prevention officers, and 1 assistant sheriff in charge of training in Nye County. Approximately 25 to 30 training instructors are on the force. The sheriff's office has a fleet of 78 vehicles, including 4 search and rescue vehicles.

Fourteen sworn officers and deputy personnel work in the main office in Tonopah, operating at a level of service of 3.67 per 1,000 people. The station also has 13 jailers. Staff also includes one Drug Abuse Resistance Education/crime prevention officer. The substation has 23 vehicles, 4 of which are search and rescue. Currently, there is one holding facility with a holding capacity of 18. This will change to 48 when the new jail is opened (Willen, 1995).

Pahrump Sheriff's Substation—The Pahrump substation maintains an administrative staff of one undersheriff, one area commander, and one Drug Abuse Resistance Education officer. The investigations section has two detectives. The substation employs ten deputies and three sergeants for patrol duties. The detention facility staff includes eight sworn detention deputies and a sergeant. In addition, the Pahrump substation employs two animal control officers. With a total of 28 sworn officers, the level of service is 1.85 per 1,000 people. Of the 26 vehicles used by the substation, 2 are motorcycles and 2 are trucks. The detention center at Pahrump has a total holding capacity of 37 (Redmond, 1995; Richards, 1995).

Beatty Sheriff's Substation—The Beatty substation has five sworn officers and operates at a level of service of 2.59 sworn deputies per 1,000 people. The substation uses seven vehicles. It has one holding facility with four cells and a capacity of eight people for up to 72 hours. However, detainees are often transported to Pahrump because its holding facility capacity is larger. A new building is being added to the Tonopah substation. When this facility is completed, detainees will be transported there (Sullivan, W., 1995).

Amargosa Valley Substation—Law enforcement services in Amargosa Valley are provided by the Amargosa Valley substation of the Nye County Sheriff's Department. The substation provides services to a 1,683-km^2 (650-mi^2) area, but patrols are sporadic because of the low number of sheriff's deputies. The level of service is 2.01 sheriff's deputies per 1,000 people. In addition, the great distances the sheriff's deputies must cover affect response times and wear out patrol cars at a rapid rate. Staff includes two deputies, one part-time mechanic, and three dispatchers. The substation transports prisoners to the holding facility in Beatty, and most bookings are performed at the Beatty substations (Sullivan, W., 1995).

FIRE PROTECTION—Fire protection for the region of influence is provided by the Clark County Fire Department, Las Vegas Fire Department, North Las Vegas Fire Department, and several volunteer fire departments in Nye County (including Tonopah, Pahrump, Beatty, and Amargosa Valley).

In evaluating the adequacy of fire protection levels in any given area, major consideration must be given to a fire department's ability to handle efficiently any reasonably anticipated workload. This requires an evaluation of the possibility of several simultaneous working fires, weather factors that might contribute to the spread of fire, the delay in response or the possibility of slow operation at the scene, and other demographic or geographic conditions that might affect the frequency of fire occurrence and the response time of initial firefighting units (NFPA, 1986). The following is a description of the current number of fire stations, levels of service per 1,000 people, number of firefighters, and types of equipment.

Clark County Fire Department—The Clark County Fire Department is divided in two sections: urban and rural. The urban fire stations are located in areas that are not cities and do not have their own fire departments. The rural fire stations are manned by volunteer firefighters and are discussed in the volunteer fire subsections of this section.

The urban area Clark County Fire Department operates out of 15 stations. With 422 uniformed personnel (1 chief, 2 deputy chiefs, 4 assistant chiefs, 8 battalion chiefs, 77 captains, 100 engineers, and 230 firefighters), the department provides a level of service of 1.04 firefighters per 1,000 people. The 1995 urban population outside incorporated cities in Clark County was assumed to be 39 percent of the entire Clark County population. This reflects the 1990 ratio to the county of the populations of Sunrise Manor, Spring Valley, Whitney (formerly East Las Vegas), Winchester/ Paradise, and Enterprise (U.S. Bureau of the Census, 1994; Vinson, 1995).

The Clark County station units include 15 engines, 8 rescue vehicles, 6 ladder trucks, 2 hose wagons, 1 mobile air unit, 3 battalion chief vehicles, 1 water tender, 1 heavy-rescue vehicle, and 1 hazardous materials vehicle. In reserve are three rescue vehicles and three engines. Reserve vehicles permit the repair of first-line equipment without reducing fire ground forces and provide additional firefighting units during major emergencies. Planned acquisition of station units include a heavy-rescue chase vehicle and a hazardous-materials chase vehicle (King, 1995).

Las Vegas Fire Department—The Las Vegas Fire Department currently has 10 fire stations, but 3 more are anticipated to be built by the year 2000. The department has 303 firefighters, including 1 fire chief, 3 deputy chiefs, 1 assistant fire chief, 6 battalion chiefs, 54 captains, 52 firefighter/paramedics, 58 engineers, and 128 firefighters. This staffing leads to a level of service of 0.84 firefighters per 1,000 people. In addition, the department has 9 training staff and 20 fire prevention staff. The department's equipment consists of 1 air resource vehicle (compressor for air tanks), 11 engines/ pumpers, 4 ladder trucks, 1 hazardous materials vehicle, 6 paramedic trucks, 3 reserve engines, 2 reserve ladder trucks, 3 reserve rescue trucks, and 1 communications unit (Lawson, 1995).

City of North Las Vegas Fire Department—The city of North Las Vegas Fire Department maintains three stations; one additional station was recently built. The total number of firefighters is 84, which results in a level of service of 1.15 for every 1,000 people. In addition, the department has 16 paramedics, 2 training personnel, and 4 fire prevention personnel. Equipment consists of four engine/pumpers, one ladder truck, two reserve engines, two rescue vehicles, and seven automobiles (Marchand, 1995).

Volunteer Fire Departments—There is no Nye County fire department. Because the county population is scattered and small, each area's volunteer fire department responds to fire-related calls. Volunteer fire departments are private, nonprofit corporations. The following discussion outlines the volunteer fire departments in Tonopah, Pahrump, Beatty, and Amargosa Valley.

Tonopah Volunteer Fire Department—The Tonopah Volunteer Fire Department operates out of one station with 27 firefighters, including 1 chief, 1 assistant chief (both of whom receive salaries), and 25 volunteer firefighters. This staffing results in a level of service of 7.09 per 1,000 people. Equipment includes 2 pumpers/engines, 1 mini-pumper, and one 100-ft aerial ladder truck. In reserve are one pumper and one 1942 vintage pumper, which is used as a hose tender (Jamison, 1995).

Pahrump Valley Volunteer Fire Department—The Pahrump Valley Volunteer Fire Department maintains a staff of 30 volunteer firefighters, resulting in a level of service of 1.98 firefighters per 1,000 people. The department employs a paid administrative assistant. Ten of the firefighters are emergency medical technicians. The department has three stations, and equipment consists of one pumper, two attack trucks, one utility truck, three engines, three water tenders, and one heavy-rescue truck (Duga, 1995).

Beatty Volunteer Fire Department and Ambulance Service—The Beatty Volunteer Fire Department has one fire station with no current plans for additional stations. The number of firefighters includes 28 (27 volunteers and 1 paid) for a level of service of 14.51 firefighters per 1,000 people. In addition, the department has five training personnel and five fire-prevention personnel. Equipment includes two pumpers and one crew cab, which is used mainly for automobile rescue (Sullivan, B., 1995).

Amargosa Valley Volunteer Fire Department—The Amargosa Valley Volunteer Fire Department has a force of about 123 volunteers, leading to a level of service of 23.12 per 1,000 people. Only the fire chief is a paid employee. The department charges for fire services to persons not living in Amargosa Valley. The service area encompasses 1,463 km^2 (565 mi^2). The fire department maintains two fire facilities. Station One is located in the town, and Station Two is located near the California border. Station One has a quick-attack truck, a pumper truck, a tanker truck, and a van that is used to transport extrication equipment. Station Two has two pumper trucks. The department has formal mutual-aid agreements with the State Bureau of Fish and Game and the U.S. Bureau of Land Management and responds to calls at Shoshone, California. The department has no equipment, such as hazardous material suits, for hazardous material response. If a hazardous material accident were to occur, the department would wait for assistance from outside sources (Blankenship, 1995).

HEALTH CARE—In Clark County, 1,418 medical doctors and approximately 5,000 registered nurses are registered to practice, resulting in a health care level of service of 1.37 medical doctors and 4.84 registered nurses per 1,000 people. The corresponding level of service for Nye County is 0.34 medical doctors and 1.53 registered nurses per 1,000 people, both of which are inadequate service levels (Table 4-14).

Health care in the region of influence includes 8 full-service hospitals, 2 medical clinics, and 3 special service hospitals located in Clark and Nye counties, with a combined bed capacity of 2,531 beds, or 2.75 beds per 1,000 people (Table 4-15). These facilities provide a wide array of medical services, including physical examinations; treatment of occupational and non-occupational illnesses; emergency, intensive, and cardiac care; coronary care; internal medicine; X-ray and laboratory; infertility; obstetrics and gynecology; neonatal intensive care; inpatient and outpatient surgery; pharmaceuticals; optometry; dental; respiratory therapy; and skilled nursing and long-term care. Services provided by the three special service hospitals include psychiatric, chemical dependency, and mental health treatment. In addition, the Clark County Health District provides public health clinics and visiting nurse services and coordinates the emergency medical services system. There are 3 public health centers, 20 immunization and child health satellite clinics, and a hospice program providing 24-hour care to terminally ill patients (Las Vegas Review-Journal, 1994).

The Tonopah Hospital District has been operating at a loss and will be taken over by the Nye County Board of Commissioners. Pahrump will open an urgent care facility. Health care clinics in Beatty and Amargosa Valley are operated by the Central Nevada Rural Health Consortium. Health care service is generally not readily available to Nye County residents.

The Central Nevada Rural Health Consortium is a quasi-governmental agency that was organized by Nye, Lincoln, Washoe, and Eureka counties to provide health care services to communities in rural Nevada that are not large enough to support private sector health care. The consortium is under contract with Nye County to provide physician's assistant supervision, support services, and equipment to rural areas. One of the clinics it supports is the Amargosa Valley Medical Clinic, which emphasizes family practice but also provides minor emergency service, X-ray service, minor laboratory work, and pharmacy services. Physician's assistants, who are staffed from Beatty, refer serious cases to hospitals and special care facilities in Las Vegas (Blankenship, 1995).

4.1.4 Geology and Soils

All DOE administrative units discussed in this EIS, including the NTS, NAFR Complex, and Tonopah Test Range, lie within the northern Basin and Range Physiographic Province. Because these units have similar settings, they are described together as a

Table 4-14. Health care personnel in the region of influence (1995)

Job Classification	Clark County	Nye County	Level of Service* Clark County	Level of Service* Nye County
Medical Doctors	1,418	9	1.37	0.34
Registered Nurses	5,000	40	4.84	1.53

* Per 1,000 people.

Source: Lyons and Towler, 1995.

Table 4-15. Primary medical facilities serving the region of influence (1995)

Facilities	Location	Number of Licensed Beds
Clark County		
Charter Behavioral Hospital	Las Vegas	84
Desert Springs Hospital	Las Vegas	225
Horizon Hospital	Las Vegas	28
Columbia Sunrise Hospital	Las Vegas	688
Lake Mead Hospital	North Las Vegas	195
Las Vegas Federal Medical Center	Las Vegas	129
Monte Vista Hospital	Las Vegas	80
University Medical Center	Las Vegas	560
Valley Hospital	Las Vegas	416
Women's Hospital	Las Vegas	82
Nye County		
Dr. Russell Joy Medical Clinic	Tonopah	N/A*
NTS Medical Center	NTS	N/A
Nye County Regional Medical Center	Tonopah	44

* Not applicable.

Sources: DOE/NV, 1993; Las Vegas Review-Journal, 1994.

single region. However, the greatest emphasis is placed on the NTS. Discussions of specific administrative units are also included in separate subsections when information at a local scale increases understanding and assists in the evaluation of impacts.

Detailed investigations of the geology of the NTS have been in progress since 1951, shortly after the test site was established. The geologic studies were expanded in the 1950s and early 1960s as underground testing became the established mode for testing nuclear explosives. Since then, many regional and site studies have been conducted that have included detailed geologic mapping, sitewide geophysical surveys, exploratory drilling and testing, and detailed geotechnical studies. As a result of these many investigations, comprehensive databases are available on virtually every aspect of the geologic conditions on the NTS and surrounding areas. As noted in the *Final Environmental Impact Statement Nevada Test Site, Nye County, Nevada*

(ERDA, 1977), the NTS is probably the geologically best known large area within the United States.

4.1.4.1 Physiography. The NTS and surrounding areas are in the southern part of the Great Basin, the northern-most subprovince of the Basin and Range Physiographic Province (Figure 4-18). The basin-and range-province is generally characterized by more or less regularly spaced, generally north-south trending mountain ranges separated by alluvial basins that were formed by faulting. The Great Basin subprovince is an internally draining basin; i.e., precipitation that falls over the basin has no outlet to the Pacific Ocean.

The topography of the eastern and southern NTS and the entire Tonopah Test Range are typical of the Great Basin, with numerous north-south trending mountain ranges and intervening alluvial basins. In the northwestern portion of the NTS, the physiography is dominated by the volcanic highlands of the Pahute and Rainier Mesas.

The relief of the NTS is considerable, ranging from less than 1,000 m (3,280 ft) above sea level in Frenchman Flat and Jackass Flats to about 2,339 m (7,675 ft) on Rainier Mesa and about 2,199 m (7,216 ft) on Pahute Mesa. Figure 4-19 shows the general topographic expression of the region. In general, the slopes of the upland surfaces are steep and dissected, and the slopes in the lowland areas are more gentle and less eroded.

There are three primary valleys on the NTS: Yucca Flat, Frenchman Flat, and Jackass Flats. Both Yucca and Frenchman Flat are topographically closed, with playas in the lowest portions of each basin. Jackass Flats is topographically open with drainage via the Fortymile Wash off the NTS.

The topography of the NTS has been altered by historic DOE actions, particularly underground nuclear testing. The principal effect of testing has been the creation of numerous craters in Yucca Flat basin and a lesser number of craters on Pahute and Rainier Mesas. Shallow detonations were also performed during Project Plowshare to determine the potential uses of nuclear devices for large-scale excavation. Lesser alterations of the natural topography of the NTS and adjacent areas have occurred as a result of road building, sand and gravel mining, underground mining prior to the creation of the NTS, and the construction of waste disposal areas, flood controls, and drainage improvements.

4.1.4.2 Geology. The geology of the NTS consists of a thick section (more than 10,597 m [34,768 ft]) of Paleozoic and older sedimentary rocks, locally intrusive Cretaceous granitic rocks, a variable assemblage of Miocene volcanic rocks, and locally thick deposits of postvolcanic sands and gravels that fill the present day valleys (Frizzell and Shulters, 1990). Figure 4-20 is a generalized geologic map of the NTS. More detailed stratigraphic information is available from recently updated maps of the NTS (Frizzell and Shulters, 1990) and Pahute Mesa (Minor et al., 1993). Figure 4-21 shows a generalized stratigraphic column for the area in the vicinity of the NTS.

The tectonic history of the region is very complex, and major structural events have left their imprint on the stratigraphy of the area. This region of the western United States was a stable continental margin until Late Devonian time, when uplift west and north of the NTS resulted in the erosion and deposition of thick Mississippian sandstones in a foreland basin (Poole and Sandberg, 1991). Compressional deformation during the Sevier orogeny produced regional thrusts, folds, and wrench faults that fundamentally rearranged the positions of the Paleozoic and older sedimentary rocks (Armstrong, 1968). The Sevier orogenic zone may have been extended with normal faulting prior to late Mesozoic time and the intrusion of granitic rocks (Hodges and Walker, 1992; Cole et al., 1993).

Following erosion throughout most of the Early Tertiary Period, the area in and around the NTS began to pull apart along low-angle normal faults and strike-slip faults associated with the formative stages of the modern basin-and-range structural province (Guth, 1981; Hamilton, 1988; Wernicke et al., 1988; Cole et al., 1989). Eruptions of the southwest Nevada volcanic field occurred in the Middle Tertiary Period (Warren et al., 1989; Sawyer et al., 1990). Successive eruptions produced no less than seven large and partially overlapping calderas,

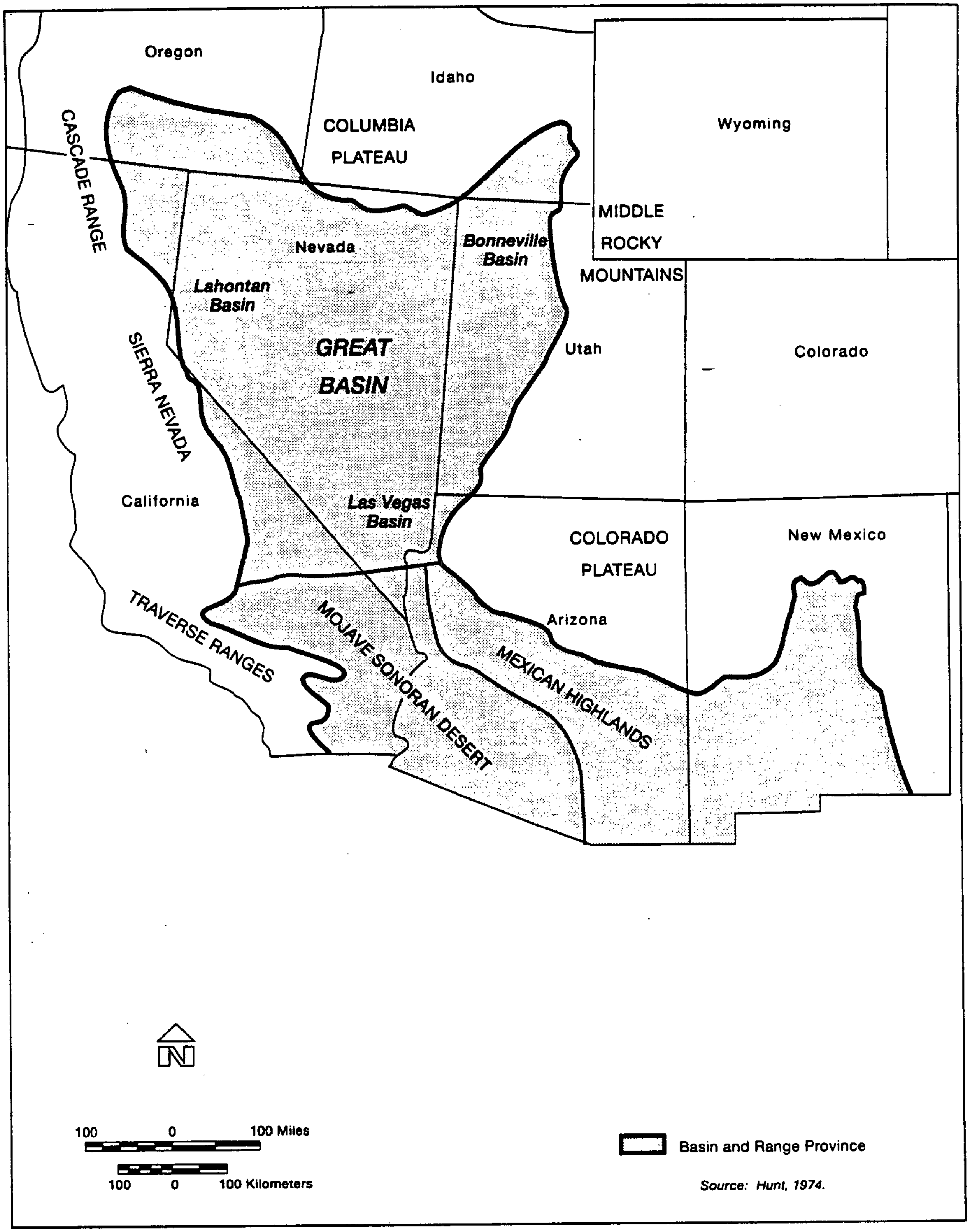


Figure 4-18. Basin and Range Physiographic Province

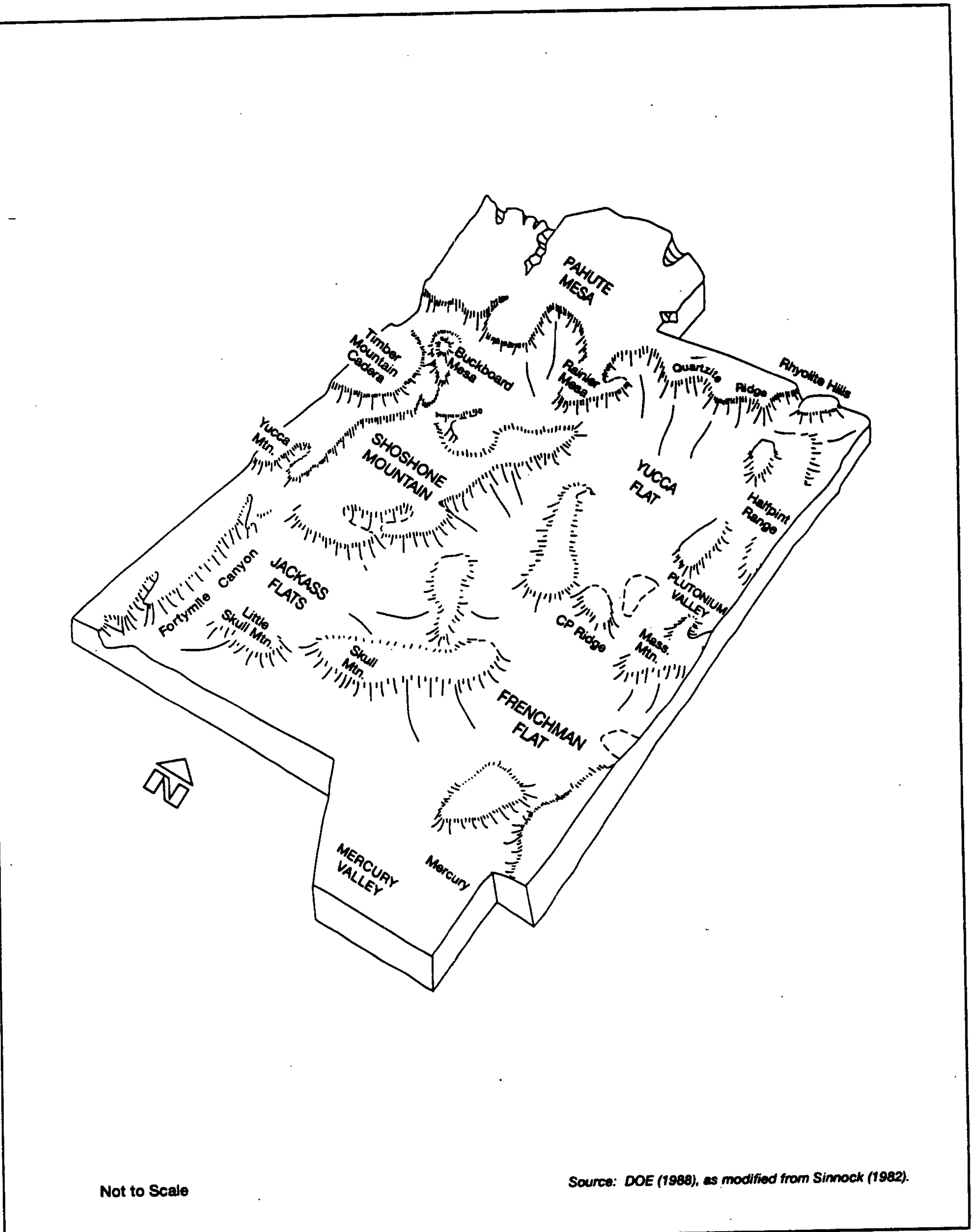
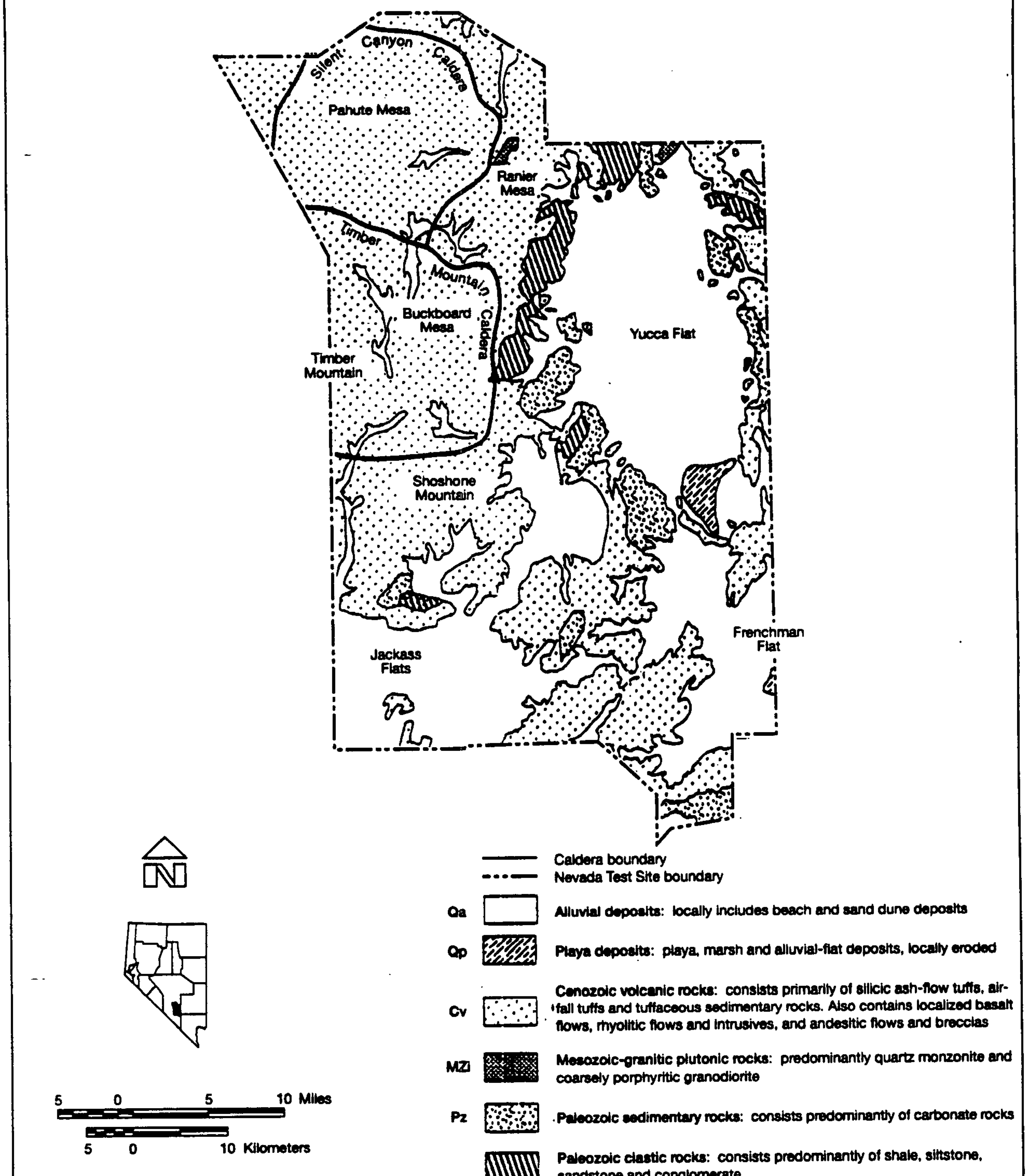
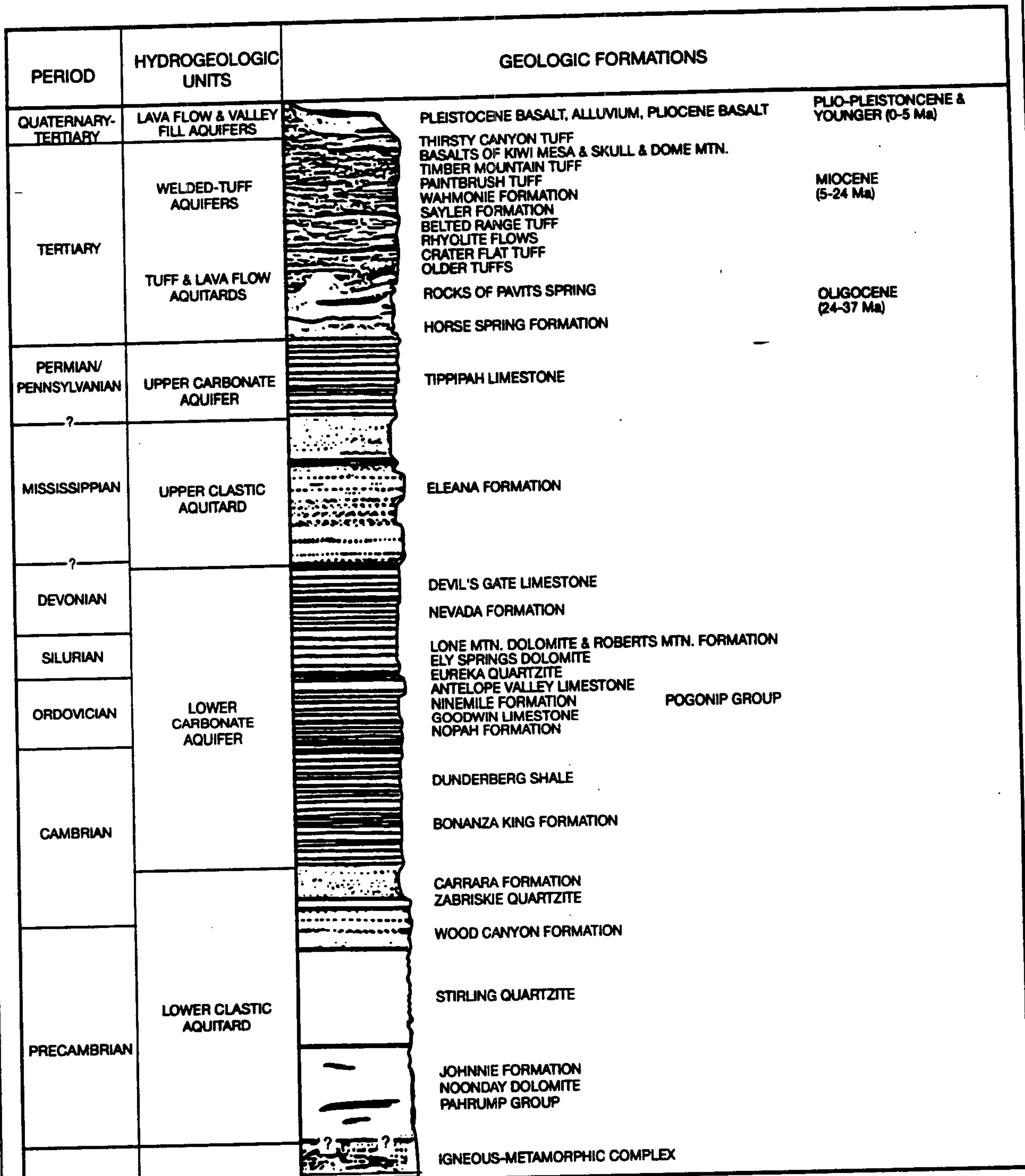


Figure 4-19. Topography of the NTS



Source: Frizzell and Shulters, 1990.

Figure 4-20. Generalized geologic map of the NTS



Source: DOE, 1988.

No vertical scale inferred

Figure 4-21. Generalized stratigraphic column which were filled with lava flows and blanketed by vast deposits of tuff.

Cenozoic crustal extension formed normal faults, continued during and after volcanic activity, and caused further tilting and lateral translation of major upper crystal blocks. Modern alluvial basins have progressively filled with as much as 1,200 m (3,936 ft) of coarse gravels and sands and localized deposits of playa silt and clay. Tectonic extension, wrench movement, and seismic activity continue to the present day.

YUCCA FLAT AND FRENCHMAN FLAT—Yucca Flat and Frenchman Flat, where nuclear testing occurred, are intermontane basins typical of basin-and-range structure. The alluvium- and tuff-filled valleys are rimmed mainly by Precambrian and Paleozoic sedimentary rocks and Cenozoic volcanic rocks.

In the lowland areas of these basins, the consolidated rock units are overlain with alluvium. On the alluvial fans, the alluvium comprises interbedded gravel, sand, and silt with varying degrees of cementation. These coarse-grained deposits grade to the predominantly clay deposits under the playa areas. Limited areas of wind-blown sands and silts are also present in portions of the lowland areas.

Mesozoic intrusive rocks are located at the north-northeast edge of the Yucca Flat weapons test basin. Precambrian and Paleozoic rocks are regionally extensive and occur under the basins as basement rocks.

The lowermost 2,999 m (9,840 ft) of the pre-Tertiary section consists of Late Precambrian to Middle Cambrian quartzites and siltstones. These clastics are overlain by 4,599 m (15,088 ft) of Cambrian through Devonian dolomite, interbedded limestone, and thin, but persistent, shale and quartzite layers. Pennsylvanian limestone depositionally overlies the Eleana formation along the western edge of the basins. The second assemblage consists of heterogeneous carbonate rocks that lie structurally above the Eleana formation as a result of thrust faulting of low-angle normal faulting (Cole et al. 1989). A few drill holes at the NTS have penetrated these "isolated" carbonate rocks overlying the Eleana formation. Thrust faults have repeated sections of the Paleozoic and Precambrian rocks, and low-angle gravity faulting has created isolated blocks of the Paleozoic rocks out of stratigraphic order. Today, most prominent structures are related to basin-and-range extensional faulting that is younger than the volcanic rocks. In the Yucca Flat weapons test basin, fault strikes are mostly north-south; in Frenchman Flat, structure strikes are mostly west-southwest.

Outflow sheets of tuffs from the volcanic centers west of the basins occurred during the Tertiary Period and were emplaced on the irregular paleotopographic surface of the basins. The youngest sediments of the valleys are sand and gravel, derived from the volcanic and sedimentary rocks in the surrounding highlands. Tests at both locations have been detonated primarily in alluvium or in the volcanic rocks. A few larger tests were detonated in the underlying carbonate rocks beneath the northern Yucca Flat weapons test basin during the early years of the testing program, and three small tests were detonated in granite just north of the Yucca Flat weapons test basin at the Climax stock (OTA, 1989). Testing near or below the water table was common in both the Yucca Flat weapons test basin and Frenchman Flat test area.

PAHUTE MESA AND RAINIER MESA—The southwestern Nevada volcanic field, of which Pahute Mesa is part, includes a broad volcanic plateau underlain by tuffs and lavas from the Timber Mountain-Oasis Valley caldera complex and the Silent Canyon and Black Mountain calderas north of Timber Mountain (Byers et al., 1989). This Miocene, rhyolitic, eruptive center produced an overlapping complex of fault-controlled calderas in the general area of Timber Mountain and Pahute Mesa and laterally extensive tabular outflow sheets of welded tuff on Rainier Mesa. The Timber Mountain caldera is listed as a National Natural Landmark by the U.S. Park Service. Recent work indicates that as many as six calderas may be present in the Pahute Mesa area and that the calderas may be ellipsoids bounded by faults related to basin-and-range structure rather than circular collapse structures (Ferguson et al., 1994).

Stratigraphic units represent caldera-forming, caldera-filling, and caldera-burying emplacements, depending on their location relative to their originating and successive eruptions (Ferguson et al, 1994).

All underground tests within Pahute Mesa, as well as Rainier Mesa, have been detonated within volcanic rocks.

OTHER TESTING AREAS—The DOE has also conducted limited nuclear tests in areas beyond the four major testing areas already discussed. The limited testing areas include Buckboard Mesa, Dome Mountain, Shoshone Mountain, and the Climax stock.

The area of testing in Buckboard Mesa is located in the east-central portion of Timber Mountain, and the Dome Mountain testing area is located along the southern flanks of this caldera. These two sites exhibit the general geologic conditions of the caldera complex, that is, a thick sequence of volcanic rocks, including welded and ash-flow tuffs; volcanic-derived sediments, including sandstone and conglomerate; and basalts. The radial fracturing and faulting typical of a caldera are present at both of these sites.

Shoshone Mountain is located beyond the Timber Mountain caldera, but the volcanic rocks derived from this volcanic center predominate at this site, as well. The predominant rocks include the Ammonia Tanks and Tonopah Spring tuffs and ash-flow tuffs. There are also exposures of clastic sediments and carbonate rocks of Paleozoic age, including the Tippipah Limestone and the Eleana formation, on the northwest flanks of the Shoshone Mountain testing area. At this site, the northeast to southwest striking normal faults typical of many portions of the Basin and Range Province are predominant.

The Climax stock, located along the northern flank of Yucca Flat, was used for testing and experimentation. The stock is a granitic (quartz monzonites and granodiorite) intrusion of the Late Cretaceous age. The Climax stock occurs at the intersection of two geologic structures, the Tippinip fault and the Halfpint anticline, and intrudes Paleozoic sediments.

Many of the valleys have playas that may hold shallow water after seasonal storms. Playa sediments are bedded sand, silt, or clay and may include salts. Other sediments in the region carried and deposited by wind are typically sand and silt. These aeolian sediments generally are from nearby playas or dry river beds, but can be from afar. These deposits are often retransported by streams. However, surfaces of relatively stable deposits in the valleys generally have a thin veneer of wind-deposited silt.

SUBSURFACE RADIOLOGIC SOURCES—As discussed in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977), underground nuclear testing has resulted in unavoidable adverse impacts to land resources that render the resources unusable for most purposes. Underground nuclear tests were begun in June 1957, and through 1992 there were approximately 800 underground tests conducted at the NTS with yields ranging from zero to 1,000 kilotons (kt). Underground testing, for the purposes of discussion, can be divided into three broad categories: shallow borehole tests, deep vertical tests, and tunnel tests. In this section, the current condition of the subsurface geologic resources, as they have been affected by historic activities, is presented.

Shallow borehole tests were conducted between 1960 and 1968. Some of these tests were safety-related, others were conducted as part of Project Plowshare to determine whether nuclear detonations could be used as a method for excavation. The shallow tests resulted in the development of some large ejection craters, most notably the Sedan Crater in the northern end of the Yucca Flat testing area. Sedan, a 104-kt nuclear device detonated 194 m (635 ft) underground, displaced about 1.2 x 10^7 tons of earth and created a crater 390 m (1,280 ft) in diameter and 98 m (320 ft) deep. McArthur (1991) estimates that the remaining inventory of surficial radioactivity at the Sedan Crater is 344 Ci. The total estimate for all releases from shallow borehole tests to the surficial soil horizon at the NTS is 2,000 Ci.

Deep vertical underground nuclear tests have been completed in Frenchman Flat, Yucca Flat, Pahute

Mesa, Rainier Mesa, Shoshone Mountain, Buckboard Mesa, and Dome Mountain. The tunnel complex at Rainier Mesa has been extensively used for special experiments and tests that require access to materials and monitoring equipment left near the point of detonation. Figure 4-22 shows the locations of the underground tests. The historic tests have left their mark on the NTS both in terms of physical disruption and a large subsurface inventory of remaining radioactive isotopes.

The major impacts of an underground nuclear test on the physical environment are ground motion, disruption of the geologic media, surface subsidence, and contamination of the subsurface geologic media and surficial soils. Ground motion is a temporary phenomenon that, with the exception of rockfalls and minor land displacements, has not resulted in permanent effects on the NTS. The cratering, the disruption of underground geologic media, and the release of radioactivity into the environment have been the most significant impacts to the physical environment as a result of historic testing operations at the NTS. The physical impacts of vertical underground tests can perhaps be best described through a discussion of the events that occur after a nuclear detonation.

Figure 4-23 shows the sequence of events after an underground detonation. Within tens of milliseconds following detonation, the nuclear device and surrounding rock are vaporized, creating a "bubble" of high pressure steam and gas. An underground spherical cavity is formed by the pressure of this gas bubble and the explosive momentum that is imparted to the host rock. As the cavity continues to expand, the pressure decreases and, usually within a few tenths of a second after detonation, equalizes with the pressure from the overlying rock. At this point, the cavity has reached its greatest dimensions. Concurrent with this pressure decrease, the shock wave from the detonation travels outward, crushing and fracturing the rock in the near-test environment.

As the hot gases cool, the molten rock begins to collect and solidify on the cavity sidewalls and in a puddle at the bottom of the cavity. When the gas pressure declines to the point where it can no longer support the overlying rock and soil, the cavity may collapse, forming a chimney upward from the cavity. The collapse occurs as the overlying rock breaks into rubble and falls into the cavity void. This process continues until either the cavity completely fills with rubble, the chimney reaches a level where the strength of the rock can support the overburden, or, as usually happens, the chimney reaches land surface. When the chimney reaches the surface, the ground sinks, forming a saucer-like subsidence crater. The crater usually forms within a few hours after the detonation.

Historic deep vertical underground testing has resulted in the formation of hundreds of craters at the NTS, leaving Yucca Flat with a "pockmarked" appearance that is even visible on satellite images of the area. The craters generally range in diameter from 61 to 610 m (200 to 2,000 ft) and range in depth from a few meters to 60 m (a few feet to 200 ft) depending on the depth of emplacement and the explosive energy yield. The development of craters has been the principal consequence of nuclear testing on the terrain of the NTS and was one of the unavoidable adverse impacts identified in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977) (see Plate 7, entitled Aerial View of the Many Craters Within Yucca Flat, of the *Framework for the Resource Management Plan* [Volume 2]).

In addition to the cavity, chimney, and subsidence crater, pressure ridges and small displacement faults may occur at the surface. The surface fracturing and faulting are the result of the sudden uplift of the earth at the time of detonation and the collapse during the formation of the chimney and crater. Another permanent consequence of testing has been vertical displacement along existing faults, particularly along Yucca Fault and Carpetbagger Fault in Yucca Flat. Vertical displacement of as much as 2 m (8 ft) has occurred along portions of the Carpetbagger Fault. Cratering has occurred on Pahute Mesa but, because of the greater competency of the rocks in that area and the depths of most tests, cratering in this test area has been infrequent. Fracturing has occurred on the top of Rainier Mesa as a result of the loss of strength in the rocks in that area.

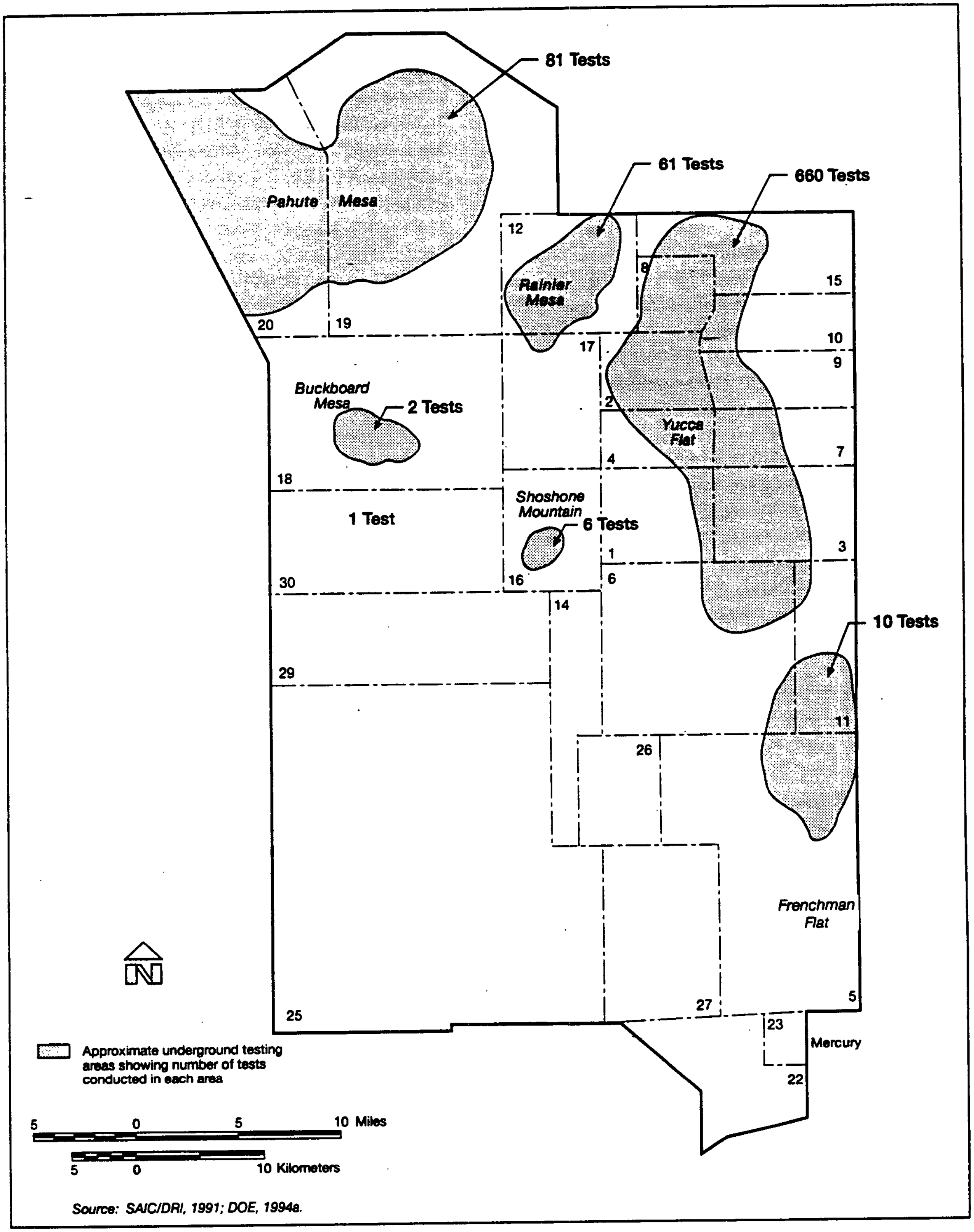


Figure 4-22. Location of underground testing areas and number of tests on the NTS

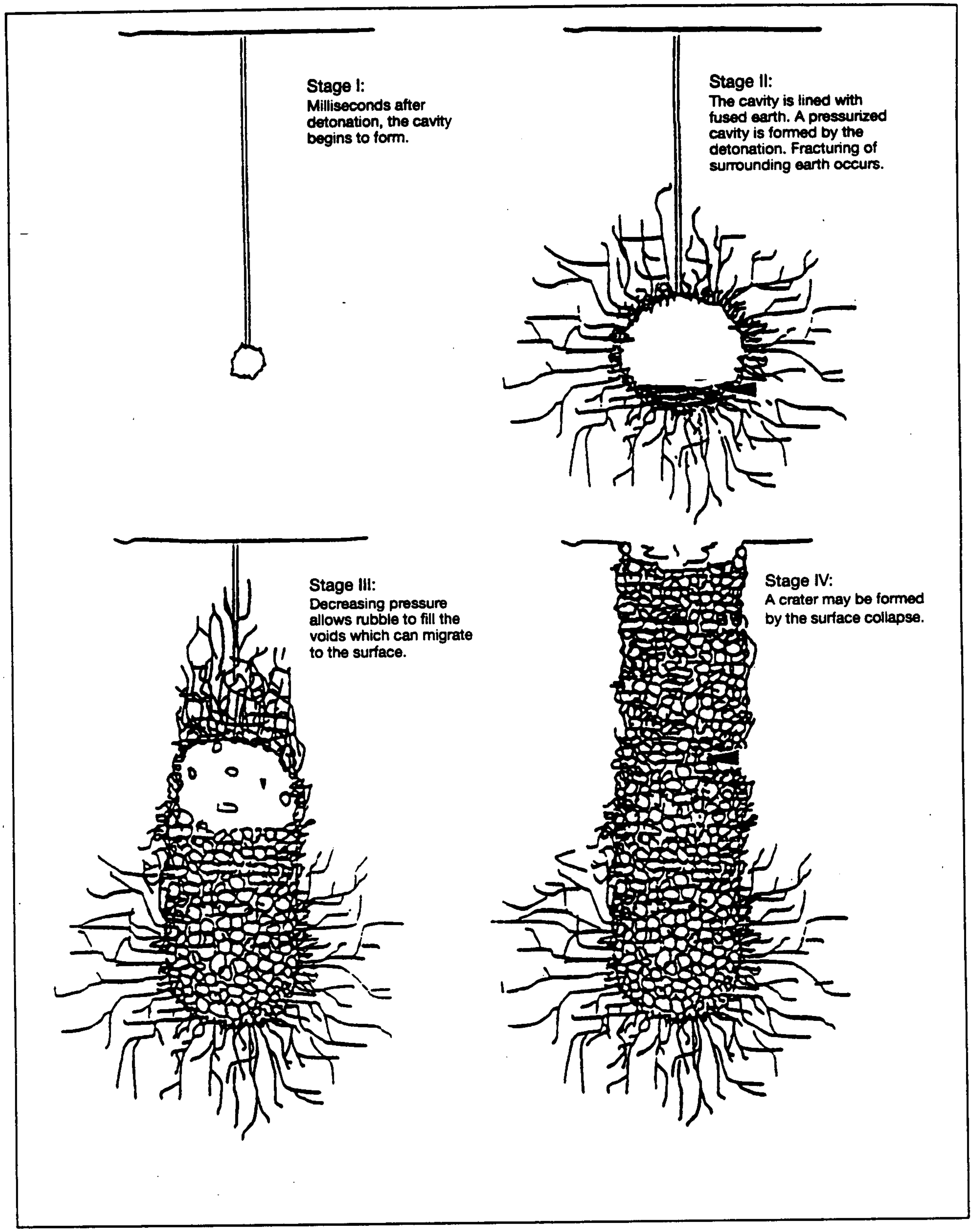


Figure 4-23. Formation of an underground nuclear explosive test cavity, rubble chimney, and surface subsidence crater

Although nuclear tests may have long-term physical consequences on the physical environment, effects of the tests are not synergistic. The sum of the effects of multiple tests does not produce unexpected consequences. Site selection factors that are essential to ensuring both containment and the integrity of test data have also ensured that failures within the test areas have not and would not occur. Appendix A describes the siting factors in greater detail.

The fracturing of the rock in the near-test environment may have resulted in some alteration of the natural permeability of the rocks underlying portions of the NTS. The shock wave and compressive forces from the tests can, on one hand, increase the permeability by creating more fractures near the test while, on the other hand, decrease the permeability by opening and closing fractures at greater distances from the test. According to the Office of Technology Assessment (OTA, 1989), post-test measurements of rock samples taken from tunnel complexes generally show that the properties of the host rock are unchanged at a greater distance than 3 cavity radii from the point of detonation. At this distance and beyond, no fracturing occurs from the detonation, but the preexisting fractures are opened as the shock wave propagates through the host rock and are closed after the shock wave is past. In some instances, the closing of the fractures may have reduced the fracture aperture and may have resulted in some permanent reduction in the gross permeability of the rock mass.

Another consequence of past underground testing has been the formation of pockets of radioactive contamination surrounding each underground test. The total amount of radioactivity released into the underground environment during a test is called the radionuclide source term. The source term includes numerous isotopes that are both short- and long-lived. For the example used for atmospheric testing of a 1-kt nuclear weapon, an initial release of 41 billion curies decays to about 10 million curies in just 12 hours. According to information presented in Borg et al. (1976), the quantity of radioactivity remaining from a 1-kt underground detonation 180 days after detonation is about 45,000 Ci (including 18,570 Ci of tritium).

It should be noted that there is considerable uncertainty concerning these estimates. For example, Borg et al. (1976) indicate that the actual tritium activity after 180 days (expressed in this EIS on a per-kiloton-basis) could range from 5,570 to 55,770 Ci.

The radionuclide inventories that have been referred to are an order of magnitude estimate to illustrate the dominance of short-lived radionuclides soon after a nuclear detonation and the effect of radioactive decay in reducing that inventory. More precise estimates of the radionuclide inventory for geologic media are discussed in the following text. Estimates of the remaining inventory that may be available for transport via groundwater and soil contamination are presented in the sections of the NTS EIS that concern hydrology and soils.

Declassification of the summed inventory (by radionuclide) that remains in, or within 98 m (321 ft) of, the water table has allowed an updated, unclassified estimate of the total radionuclide inventory remaining in the subsurface as a result of underground testing at the NTS. The estimate was based upon two key references: Borg et al. (1976) and a Los Alamos National Laboratory memorandum from T. Benjamin to M. Pankrantz (Benjamin, 1995). This memorandum, which in turn, was based upon Goishi et al. (1995), listed the remaining radionuclide inventory in, or within, 100 m (328 ft) of the water table (as of January 1994) for Los Alamos National Laboratory-only fission products as well as Los Alamos National Laboratory <u>and</u> Lawrence Livermore National Laboratory unfissioned fissile materials, neutron-activated radionuclides, and tritium.

Because the fission products table provided by Los Alamos National Laboratory addressed just the Los Alamos National Laboratory events, it was necessary to first project the radionuclide inventory for all tests. This adjustment was based upon the percentage of Los Alamos National Laboratory tests relative to all tests, and it resulted in the summaries presented in Section 4.1.5.2.

This estimate represents the source term exclusively for events that were detonated within 100 m (328 ft) of the water table; therefore, a further adjustment was needed to estimate the remaining inventory from tests conducted above this level. To estimate this value, the number of announced tests and the distribution of tests in proximity to the water table (as published by Bryant and Fabryka-Martin [1991]) was used. Their work indicates that 38 percent of the tests were conducted under or within 75 m (246 ft) of the water table; thus, the total hydrologic source term for the NTS, as defined previously, represents 38 percent of the total inventory. It is noted that the number of announced tests published by these authors has since been updated, but it was assumed that the relative proportion of shallow and deep events does not vary much from the information presented in their report. Based upon these relative percentages, the total inventory from all tests was estimated to be 3.0×10^8 Ci.

There is some uncertainty regarding this estimate including: the uncertainties in the estimation techniques used by Goioshi et al. (1995), in the actual proportions of Los Alamos National Laboratory tests and water table tests, and in the assumption that the inventories per test are similar for tests in or near the water table as compared to those above the water table. Nonetheless, the estimate serves as a useful reference until declassification efforts allow the release of a more refined estimate. Insofar as the intent of this estimate is to provide a basis for comparison with the remaining inventories which can be measured (e.g., surficial soils, waste disposal units, greater confinement disposal), the estimate is considered appropriate.

GEOLOGIC HAZARDS—Many natural hazards could impact facilities at the NTS, the NAFR Complex, and the Tonopah Test Range (Guzowski and Newman, 1993). Most of these hazards can be discounted on the basis of being physically unreasonable. Six natural hazards occur at a scale that could impact large areas. These include seismicity, volcanism, and four geotechnical hazards: soil instability, slope instability, ground instability, and flooding. Each of these is discussed below, except flooding, which is discussed in Section 4.1.5.1, Surface Hydrology.

SEISMICITY—Ground-motion studies have played a large role in the weapons testing program. Sandia National Laboratories has developed a program for recording surface and subsurface motions resulting from underground nuclear explosions (Vortman, 1979; Vortman and Long, 1982a and b). There are several factors that influence the level and duration of ground motion from underground explosions, including (1) yield of the device; (2) ground-coupling at the source of the explosion, which is a function of depth of the device, local geology, and stratigraphy; (3) geological complexity along the transmission path; and (4) the topography and geology at the location receiving ground motion. There is always some variation or unknown associated with estimating these factors, but because of the long history of conducting weapon tests, the effects are reasonably predictable.

Seismic activity in the region has recently been characterized (Vortman, 1991). This analysis was based on 11,988 seismic events that occurred within 193 km (120 mi) of the NTS since 1868. Of these events, 8,161 were natural, and 3,827 were human-induced. The actual number of seismic events may be larger because emplacement of instruments capable of detecting low-magnitude events is relatively recent. Naturally occurring seismic events are associated with extensional tectonic activity characteristic of the province (Sinnock, 1982; Vortman, 1991).

Three major fault zones in the region may be currently active: Mine Mountain, Cane Spring, and Rock Valley (Figure 4-24). Small earthquakes recently occurred at or near the Cane Spring Fault zone and the Rock Valley Fault zone, although no surface displacement was associated with either of these earthquakes (Carr, 1974). A fault near Little Skull Mountain in the southwest part of the NTS was the site of a 5.6 magnitude earthquake in 1992. This is the largest earthquake recorded within the boundaries of the NTS and may have resulted from the magnitude 7.5 earthquake near Landers, California, which occurred less than 24 hours earlier. Although there was no surface rupture, the Little Skull Mountain earthquake was the first to cause significant damage to facilities on the NTS (Anderson et al., 1993). These facilities, however, were built prior to the more stringent building codes presently followed on the NTS. The earthquake caused an estimated $40,000 in damage to the Field Operations Center, a two-story concrete-block structure located in Area 25 and used by the DOE for studies at Yucca Mountain (Anderson et al., 1993).

Additionally, the Yucca Fault in Yucca Flat weapons test basin (Figure 4-24) has been active in the recent geologic past (Sinnock, 1982; Rogers et al., 1987). This fault displaces surface alluvium by as much as 18 m (60 ft). Displacement of this young surface alluvium indicates that movement on Yucca Fault has occurred within the last few thousand to tens of thousands of years; subsurface displacement along this fault is 213 m (700 ft). The Carpetbagger Fault lies west of the Yucca Fault within Yucca Flat weapons test basin (Figure 4-24). In the subsurface, this fault shows about 610 m (2,000 ft) of displacement in the past 7.5×10^6 years (Sinnock, 1982).

Human-induced historic seismic events recorded since 1868 include those resulting from (1) filling Lake Mead, (2) high-explosive tests, (3) underground nuclear-explosive tests, (4) postnuclear explosion cavity collapses, or (5) after shocks from nuclear explosions (Vortman, 1991). Seismic waves from nuclear explosions are believed to relieve tectonic stress, as manifested by earthquakes deeper than 3 km (1.2 mi) (Rogers et al., 1987), aftershocks, and reactivation of nearby faults in the areas of nuclear-device testing (Rogers et al., 1991). Studies of nuclear-explosive tests show that these events can generate vertical and horizontal displacements on nearby existing faults. As much as 102 cm (40 in.) of vertical displacement and 15 cm (6 in.) of horizontal displacement have been observed (Rogers et al., 1991). Parts of both the Yucca Fault and the Carpetbagger Fault have been reactivated from nearby testing of nuclear devices (Frizzell and Shulters, 1990).

The NTS and the eastern parts of the NAFR Complex and Tonopah Test Range are within Seismic Zone 2B, as defined in the Uniform Building Code (ICBO, 1991) (Figure 4-25). The western parts of the NAFR Complex and the Tonopah Test Range are within Seismic Zone 3. Zone 2B is defined as an area with moderate damage potential, and Zone 3 is an area with major damage potential. Current design practices require facilities to be built to Seismic Zone 4 standards.

The *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977) reported that only architectural damage has been sustained in the local communities for tests greater than 100 kt. Since the Threshold Test Ban Treaty, only a few reports of damage to local communities occur each year, and these are of a very minor nature. Beyond about 48 km (30 mi), structures would have to be higher than several stories tall before they would be affected. The closest location where structures of that height are located is Las Vegas. A smaller number of similar complaints have been recorded from people in Las Vegas high-rise structures.

Seismic activity may also have some impacts on groundwater flow. Water level fluctuations have been observed in southern Nevada that may be attributed to major earthquakes in southern California. These fluctuations are typically short-lived, with water levels rapidly returning to their pre-quake levels. Seismic activity can also fracture the rock aquifers, thereby increasing the transmissive properties of the aquifers and the rate at which groundwater flows through them.

VOLCANISM—Several late Cenozoic, silicic caldera complexes occur in an eastward-trending belt between 37 degrees and 38 degrees north latitude (Stewart, 1980). A part of this belt, which includes the mesas of the NTS and part of the northwestern NAFR Complex and the Tonopah Test Range, has been termed the southwestern Nevada volcanic field (Byers et al., 1989) (Figure 4-26). The Stonewall Caldera is the youngest (7.5×10^6 years) major silicic center in the area. Silicic volcanism is characterized by large-volume explosive eruptions.

A transition from predominantly silicic volcanism to predominantly basaltic volcanism, characterized by low-volume mild eruptions, was initiated approximately 1.0×10^8 years ago (Christiansen and Lipman, 1972). Since 7.5×10^6 years ago, only scattered, short-duration volcanic activity occurred

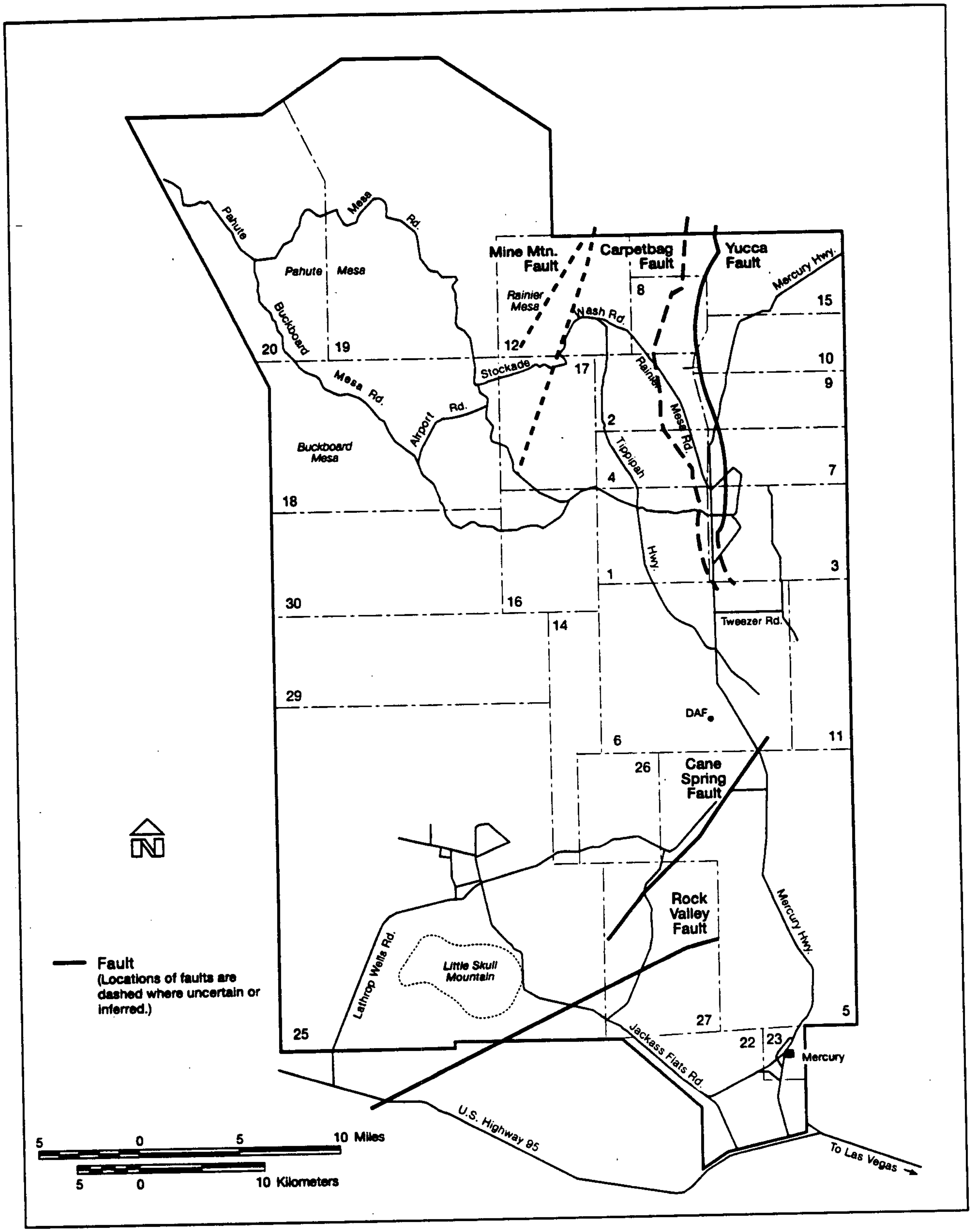


Figure 4-24. NTS fault map

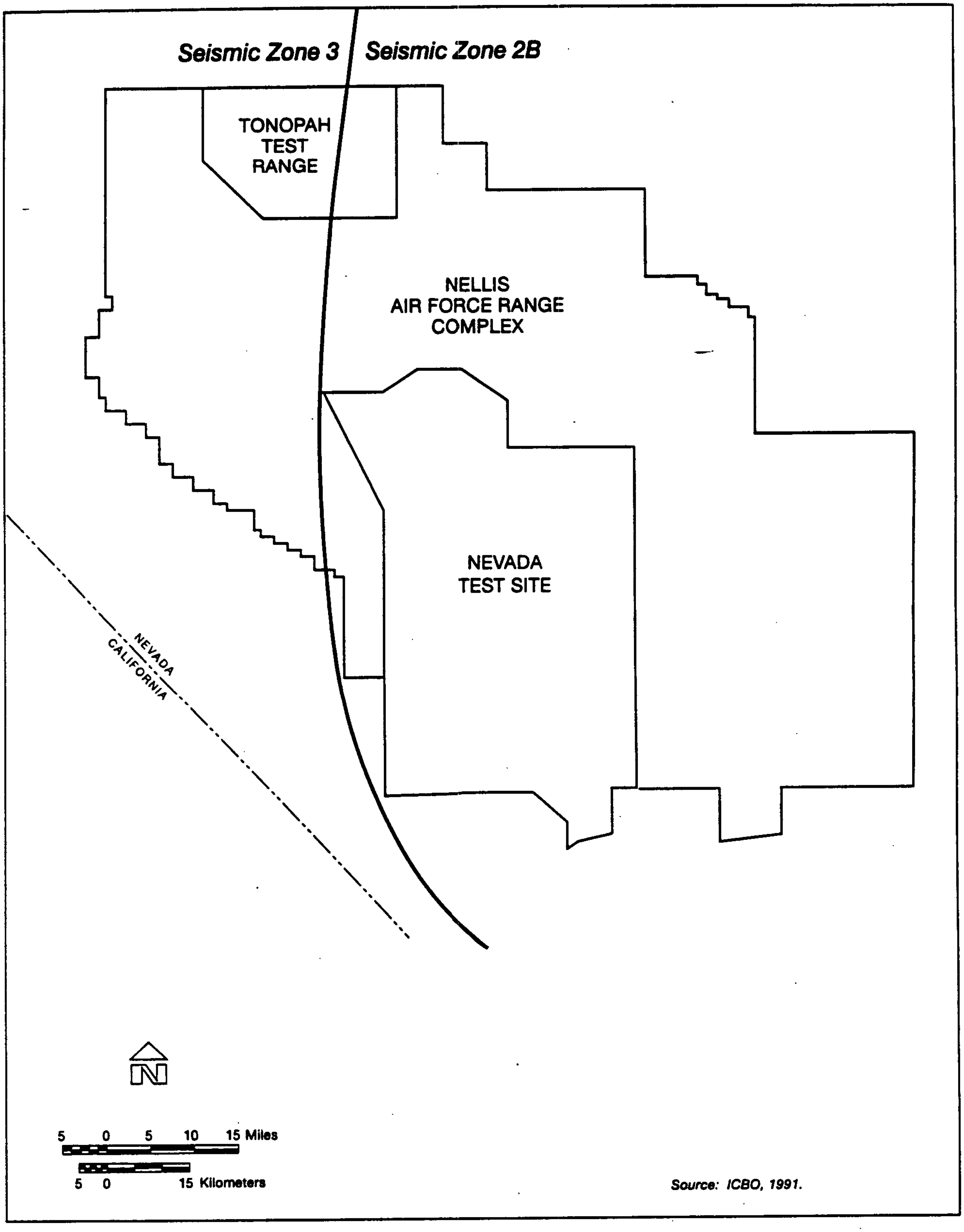
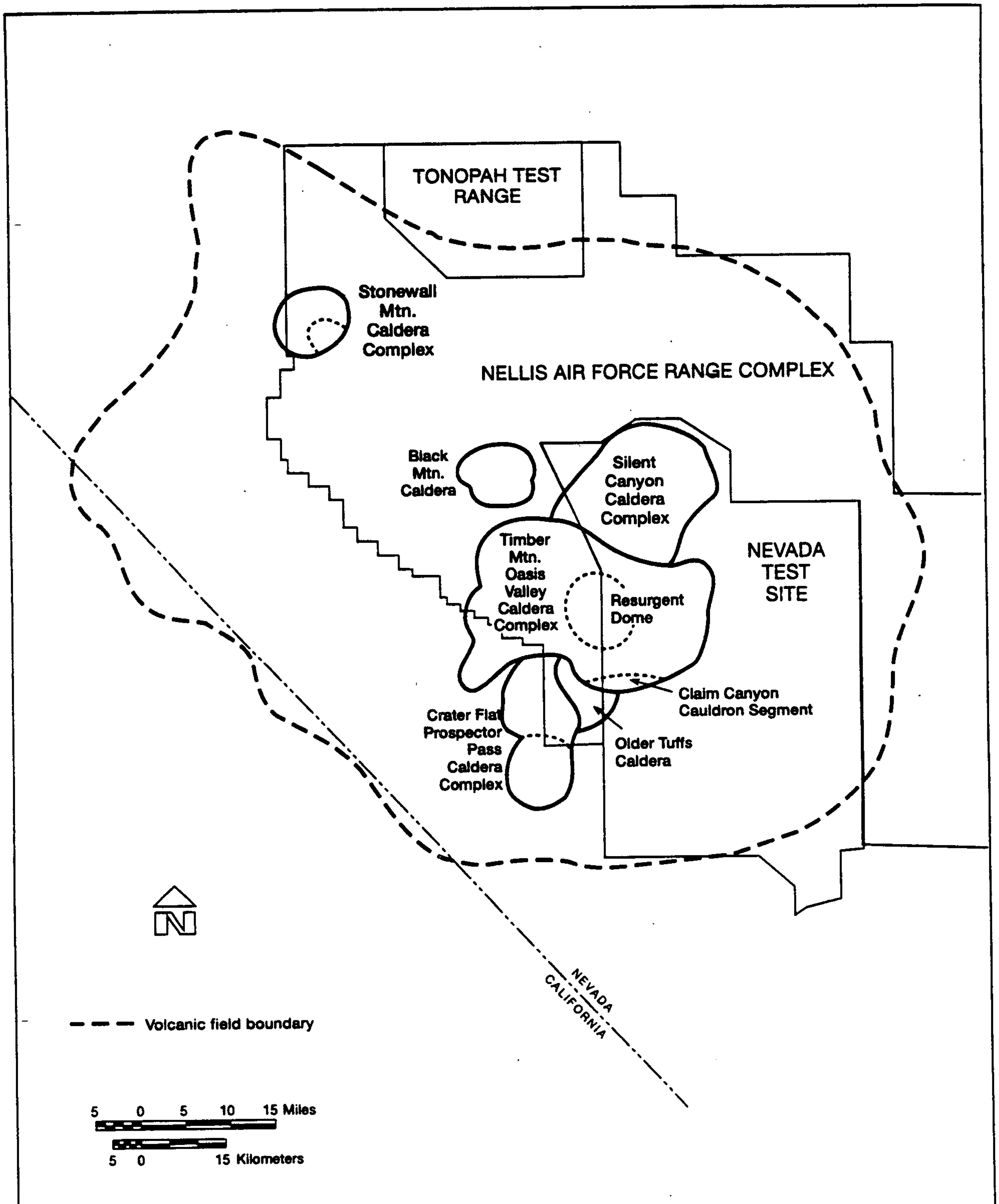


Figure 4-25. Seismic zones in the NTS area



Source: Modified from Byers et al, 1976.

Figure 4-26. Southwestern Nevada volcanic field in Nevada. The volcanic rocks are primarily basaltic cinder cones and lava flows (Stewart, 1980; Sawyer et al., 1990). The nearest examples of Quaternary volcanic cones and lava flows are located in Crater Flat, west of the NTS (Crowe, 1993).

Based on analysis of previous basaltic volcanism in the NTS region, there is no evidence of either an increase in the volcanic rate or the development of a large-volume volcanic field (Crowe et al., 1986).

GEOTECHNICAL HAZARDS—Geotechnical hazards are those that present an inherent direct risk to structures. Such hazards relevant to the region fall under the headings of slope stability, soil stability, and ground stability. Although this section primarily discusses hazards to engineering, areas that are particularly stable for certain activities are also noted.

Slope Stability—Within the region, no natural factors have been reported as affecting engineering aspects of slope stability. External factors that have or could affect slope stability in the region include load and fracturing and ground motion associated with nuclear explosions. Although not reported as problematic, caution is warranted for certain activities (e.g., construction and drilling) on or near slopes in or near areas of previous nuclear testing. On the NTS, particular caution is warranted on or near slopes that have been tunneled for nuclear testing. Site-specific evaluation of slope stability is necessary for specific activities.

Soil Stability—Soils in arid environments are typically rich in montmorillonite. The structure of montmorillonite is conducive to swelling or contraction as water is added or removed. Although not reported as problematic in the region, site-specific evaluation for expandable clay would be necessary for specific activities because soils in the region have not been mapped extensively.

Ground Stability—Certain soil-forming processes enhance ground stability: development of a pavement and accumulation of calcium carbonate, which are often coincident. Ground with these attributes, notwithstanding absence of factors that would result in instability, may be preferred for certain activities (e.g., waste management and foundations). In general, ground that has not been reworked by surface flow of water is more likely to have these attributes. Site-specific evaluation for pavement development, calcium carbonate accumulation, and the absence of detrimental soil conditions would be necessary for certain activities.

Ground will tend to be less stable if it:

- is composed of readily weathered and/or fractured rocks
- contains void space
- lacks vegetation
- is subjected to:

  - surface flow of water
  - freezing and thawing
  - wind
  - ground motion
  - heaving pumping of groundwater.

Although not reported as problematic, site-specific evaluation or regional evaluation for these factors would be necessary for certain activities.

Certain areas where nuclear devices have been tested may be less stable than other areas (Figure 4-22). On the NTS, not all rubble chimneys resulting from tests have reached the surface; these areas are considered to be unstable (Figure 4-23). Such areas are not appropriate for other types of use because of their instability; these areas are fenced and controlled. Areas in the region where testing of nuclear devices may be resumed certainly have to take into account ground motion associated with that testing. Evaluations of the suitability of areas for testing indicate that areas that have been used in the past are those most suited for testing (Houser, 1968).

GEOLOGIC RESOURCES—Geologic resources in the region are discussed under the headings of economic minerals, aggregate, hydrocarbons, and geothermal resources. The impact that past activities have had on geological resources is also discussed.

ECONOMIC MINERALS—Economic minerals are discussed under the headings of precious metals, base metals, ferroalloy metals, and industrial minerals. Important mineral commodities in the NTS region include gold, silver, copper, lead, zinc, tungsten, and uranium (Myhrer, 1990). Mining districts are shown in Figure 4-27. Should the region be opened for public access, areas of previous mining could become important for the collection of mineral specimens.

Precious Metals—Significant gold and silver deposits may be present east of Goldfield in the northwestern NAFR Complex. Silver may be present in the Oak Spring District at the north end of Yucca Flat and west of Area 13; a significant amount of silver has been taken from the Groom mine in this area (BLM, 1979). A potentially economic mineral deposit may remain in the Wahmonie District.

The NTS has been closed to commercial mineral development since the 1940s (SAIC/DRI, 1991). Reactivation of many other gold districts in the region, in response to current gold prices and modern extraction technologies, suggests that the potential for precious metal deposits in the NTS region should be considered moderate to high (SAIC/DRI, 1991).

Base Metals—Copper, lead, zinc, and mercury are known to be present within the region. Economic quantities of copper, lead, and zinc have been recovered from the Groom mine (Humphrey, 1945; Quade and Tingley, 1983; SAIC/DRI, 1991).

Ferroalloy Metals—On the basis of commercial tungsten mining operations in the Oak Spring District during the late 1950s and early 1960s, the NTS region is considered to have moderate potential for the occurrence of tungsten skarn deposits or polymetallic replacement deposits (SAIC/DRI, 1991). Molybdenum is also associated with these deposits (BLM, 1979). Iron (magnetite) is present in the region; however, the resource potential is considered to be low (SAIC/DRI, 1991).

Industrial Minerals—Uranium resources may be present in the northwestern part of the NAFR Complex (BLM, 1979). Zeolitized rocks underlie most of the volcanic rocks and the alluvial basins in the NTS region. The widespread occurrence of zeolite deposits in the region suggests a low to moderate potential for development. Barite is known to occur in the region in veins associated with quartz and mercury, antimony, and lead mineralization. Barite veins at the NTS are small and impure and do not represent a potential barite resource. Fluorite is also present in the region. Little is known about the occurrence of fluorite, and its resource potential is assumed to be low to moderate (SAIC/DRI, 1991).

AGGREGATE—Most of the alluvial valleys in the region have aggregate resources at least along the flanks of adjacent mountains. The quantity and quality of these resources are likely sufficient to meet future demand. These resources do not have any unique value over aggregate occurring in other areas throughout southern Nevada.

HYDROCARBON RESOURCES—Grow et al. (1994) indicated that on the basis of rock type and thermal maturity, the northeastern and southern parts of the NTS and NAFR Complex have the potential for oil and gas, and the southern part of the NTS and the southeastern part of the NAFR Complex have the potential for gas. Thermal maturity acceptable for oil, however, is just within the range of acceptability. Values for both total organic carbon and hydrogen index is regionally continuous; potential source rocks are low. Further, late Tertiary extensional faulting in the region has likely disrupted any seals that are required for hydrocarbon accumulation. Based on these findings, the potential for hydrocarbon resources in the region is considered to be low. Previous investigators have also concluded low potential for hydrocarbon resources in the region based on various parameters (Harris et al., 1980) and on reported shows of surface and subsurface hydrocarbons (Garside et al., 1988). Figure 4-28 shows the relative potential for oil and gas resources in the region. No occurrences of oil and gas, coal, tar sand, or oil shale in the region have been reported.

GEOTHERMAL RESOURCES—Hot springs are common in the province (Fiero, 1986). However, if water temperatures near Yucca Mountain are

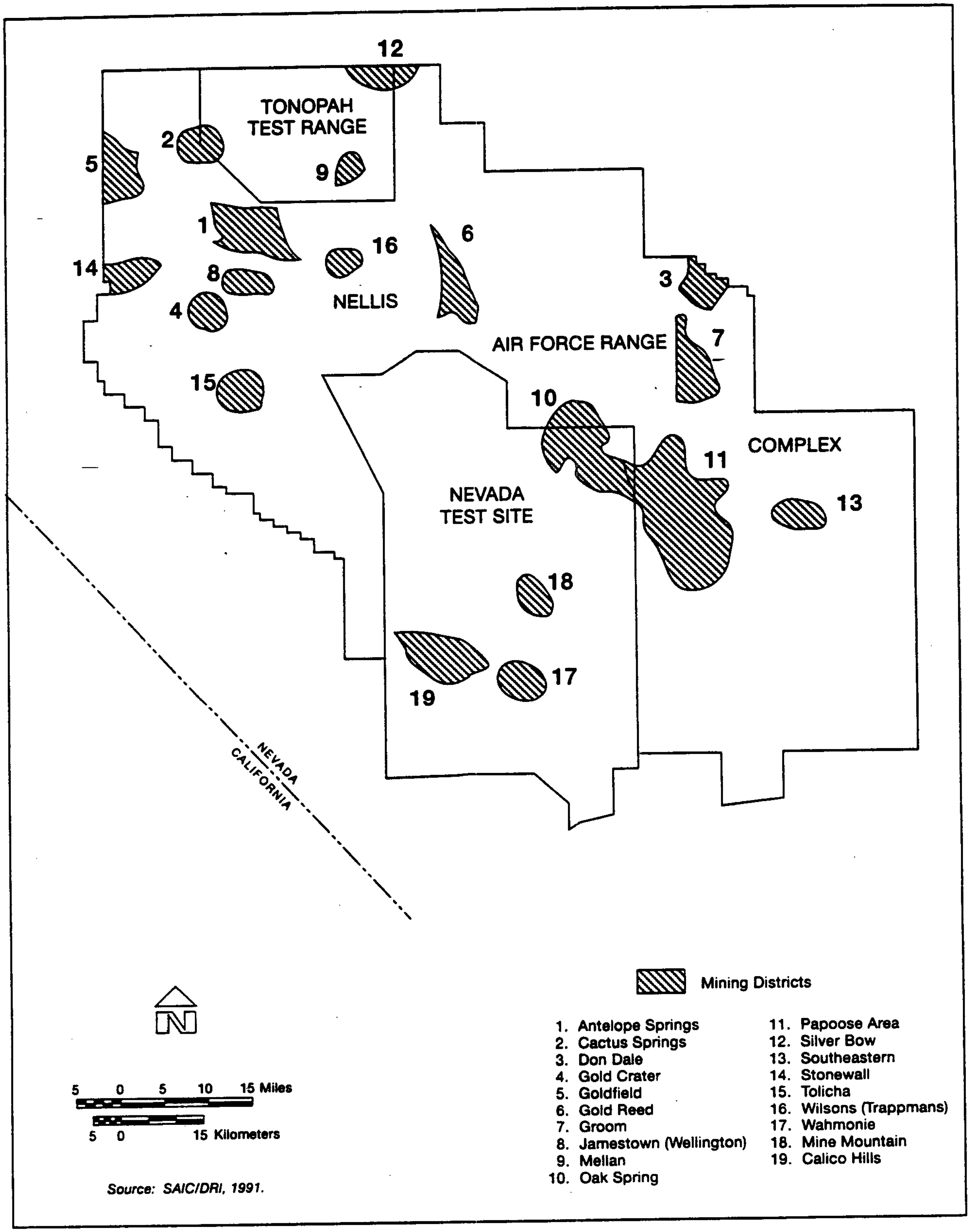


Figure 4-27. Mining districts located in the NTS, Tonopah Test Range, and NAFR Complex

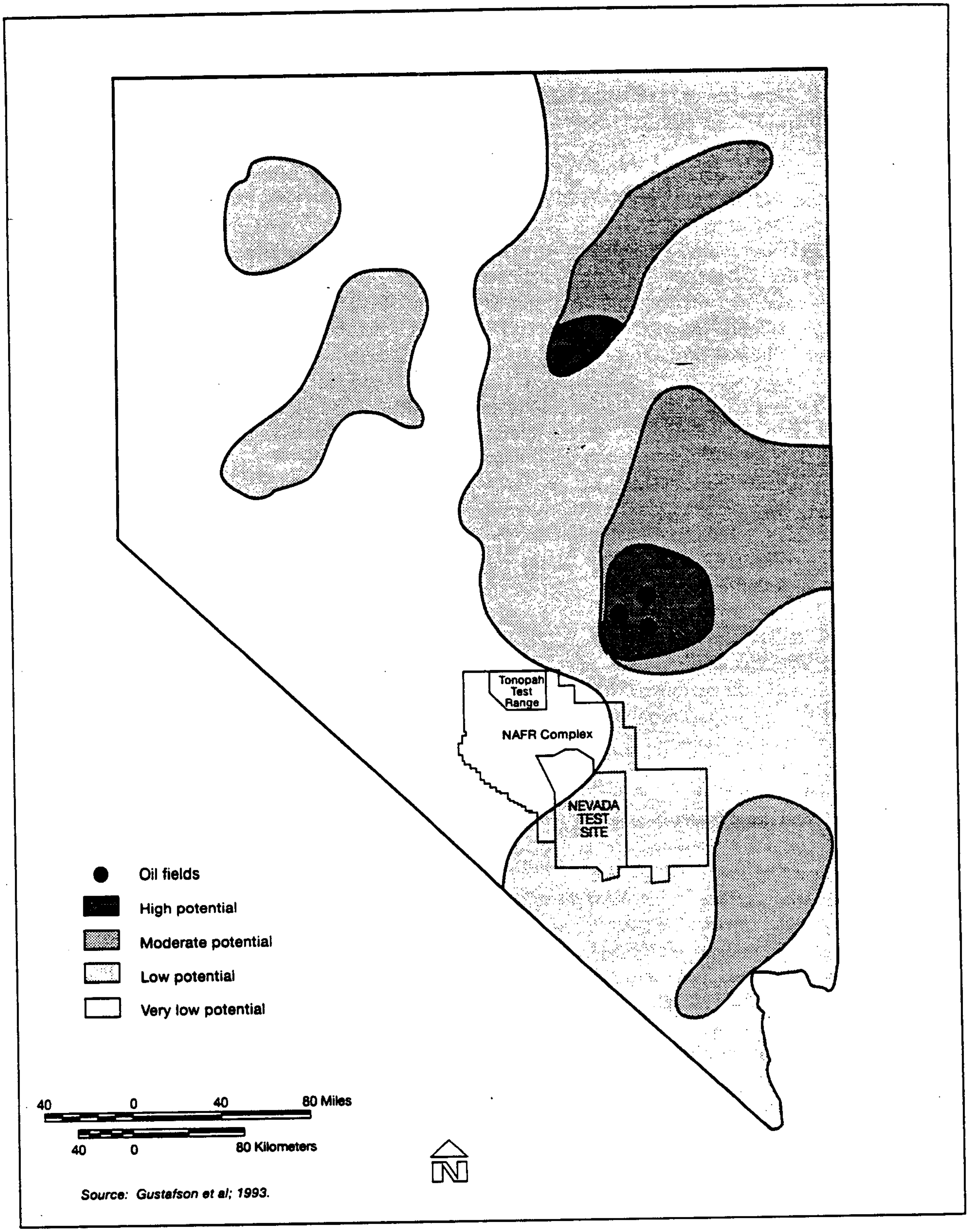


Figure 4-28. Nevada petroleum potential

representative (50 to 60 °C [120 to 140 °F]), water temperatures in the region may be insufficient for commercial power development. Current technology requires reservoir temperatures of at least 180 °C (356 °F) for commercial power generation (DOE, 1988).

A preliminary assessment of the geothermal potential of the NTS by the Harry Reid Center for Environmental Studies and Professional Analysis Incorporated (1994) found that there was very good potential for the development of a moderate temperature geothermal resource. This resource potential was judged to be suitable for the development of a binary geothermal power plant.

The North Las Vegas Facility, which is located in North Las Vegas in Clark County, is located within Seismic Zone 2. The soils on the North Las Vegas Facility range from stiff to very stiff silty and sandy clay and clay with interbedded medium-dense clayey and silty sand. The soils at the North Las Vegas Facility are considered acceptable for standard construction techniques.

4.1.4.3 ***Soils.*** Soil survey work has been limited on the NTS and surrounding areas to relatively small areas of local interest. Areas of local interest include specific facilities such as some large structures and waste disposal sites. In these cases, soil investigations are primarily limited to the characterization of specific geotechnical parameters. In some instances, the results of these investigations are published in form documents, e.g. Ho et al (1986) discusses the suitability of natural soils for foundations for surface facilities at Yucca Mountain. Often, information from these investigations has not been published and appears in various permit applications and DOE files. A great deal of research has been conducted, however, into the movement of contaminants through the soils of the NTS and the definition of areas where soils have been contaminated.

In general, the soils of the NTS are similar to those of surrounding areas and include aridisols and entisols. The degree of soils development reflects their age, and the soils types and textures reflect their origin. Entisols generally form on steep mountain slopes where erosion is active. The aridisols are older and form on more stable fans and terraces.

Soil loss through wind and water erosion is a common occurrence throughout the NTS and surrounding areas. Portions of some watersheds probably exhibit higher erosion rates, but the erosion conditions and susceptibility of soils on the NTS have not been defined.

There are limited areas of soils that can be irrigated on the NTS according to the Nevada map prepared by the Division of Water Resources (State of Nevada, 1973), and they occur only in the lower elevations of the Yucca Flat weapons test basin, Frenchman Flat, and Jackass Flats. Elsewhere on the NTS, the soils are generally very limited in both thickness and areal extent.

In the Yucca Flat weapons test basin, the soils include those soils that can be irrigated with moderate limitations and with moderately low available water-holding capacity and stony, cobbly soils. In Frenchman Flat, the soil classes present have severe limitations with low available water-holding capacities and soil subject to flooding. The soils that can be irrigated in Jackass Flats have very severe limitations, coarse textures, and very low available water-holding capacities.

According to Romney et al. (1973), the soils of the southern NTS reflect the mixed alluvial sediments upon which they form. Soils are generally young in profile development and show only weak evidence of leaching. In general, soils texture is gradational from coarse-grained soils near the mountain fronts to fine-grained soils in the playa areas of the Yucca Flat weapons test basin and Frenchman Flat. Most soils are underlain by a hardpan of caliche. Soil salinity generally increases dramatically in the direction of the playa areas, with the highest level of soluble salts having accumulated in the deeper soil profile horizons in Frenchman Flat.

The soils on portions of the NTS have been contaminated during the conduct of various testing and ancillary operations. The largest areas of surficial contamination are in the Yucca Flat weapons test basin, Frenchman Flat, Plutonium Valley, and in scattered locations in the western and northwestern parts of the facility. A discussion of radiological contamination in the soil can be found in the following section. A comprehensive investigation is underway to determine the risks associated with this soil contamination. Actions will be taken as part of the Environmental Restoration Program to reduce these risks, as appropriate.

RADIOLOGICAL SOURCES IN SOIL—The historical impacts on soils as a result of past Defense Program actions have been considerable and, in some instances, these impacts are considered significant. Lesser impacts include excavation of soils for roads and structures, alteration in nature drainages and erosion regimes, and the contamination of soils. This section describes the baseline soils conditions at the NTS, the NAFR Complex, and the Tonopah Test Range, as documented previously in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977).

Atmospheric Testing—Aboveground nuclear weapons tests were initiated on January 27, 1951, with the detonation of a 1-kt air-dropped weapon over Frenchman Flat, and a total of 100 tests were conducted prior to the signing of the Limited Test Ban Treaty in August 1963. Atmospheric testing included weapons that were dropped by planes, those detonated from towers constructed to heights of 30 to 213 m (100 to 700 ft), tests conducted on land surface, and tests where the weapon was lofted using helium-filled balloons 137 to 457 m (450 to 1,500 ft) above the ground.

Depending on the proximity of the explosion to the ground surface and the size of the yield, surface disturbances from atmospheric testing vary widely. The greatest surficial disturbances typically occurred when an air-dropped weapon penetrated the ground surface to a shallow depth (about 15 m [50 ft]) before detonation. According to information presented by Glasstone (1962), such a test with a yield of 100 kt would result in a crater about 36 m (120 ft) deep and about 219 m (720 ft) in diameter.

Radioactivity from atmospheric tests was dispersed by three primary mechanisms: throwout, base surge, and fallout. Throwout occurs at detonation when the fireball propels large volumes of rock and soil upward. Base surge refers to the settling and outward movement of the throwout. Fallout is the portion of material that does not settle, but rises and merges with the radioactive weapons residues. These materials subsequently descend to earth over the next few hours or more as fallout. The extent and distribution of contamination from an atmospheric test was quite variable depending on the height of detonation, the yield and type of device, the nature of the ground surface, the mass of inert material surrounding the device, and weather conditions at the time of, and following, the test (DOE, 1988). Glasstone (1962) documented the chronology of a shallow penetration -air-dropped test. Typical isotopes formed during the historic atmospheric testing included strontium, cesium, barium, tritium, and iodine. Of these, strontium-90 and cesium-137 are of the most concern because of their longer half-lives of 28 and 29 years, respectively.

The vast majority of radioactivity released during atmospheric testing decayed very quickly after each test was conducted. For example, for a 1-kt atmospheric test, the initial release after 1 minute is about 4.1×10^{10} Ci. This activity is reduced to 1.0×10^{7} Ci just 12 hours after the detonation. If the activity remaining after 12 hours is used as the basis for estimates, then about 6.0×10^{10} Ci were released during atmospheric testing between 1951 and 1963 at the NTS (OTA, 1989).

Many of the fission products released during the detonations were dispersed into the atmosphere, and much of the residual radioactivity has decayed in the more than 30 years since the last atmospheric test. Nonetheless, some of the longer-lived radionuclides remain in the soil and physical structures. The primary radioactive isotopes that remain on the NTS from historic atmospheric testing include americium, plutonium, cobalt, cesium, strontium, and europium. According to the Desert Research Institute (1988), the remaining radioactivity in NTS soils within 1,829 to 3,048 m (6,000 to 10,000 ft) of the Able test (a 1-kt airdrop) totaled almost 15 Ci. Based on the most recent estimates for Frenchman Lake (McArthur, 1991), about 20 Ci of radioactivity remain in this area. Most, if not all, of this remaining activity can be attributed to historic atmospheric testing. Residual contamination from atmospheric testing may also be present in Yucca Flat in Areas 1, 2, 3, 4, 7, 8, 9, and 10 of the NTS and in Buckboard Mesa in Area 18. However, because of the number of underground tests that were conducted in these areas, it is not possible to discriminate what residuals are remaining from atmospheric tests. Contamination remaining from the atmospheric tests in these areas is included within the inventory for shallow borehole tests, discussed in Section 4.1.4.2, Geology.

Safety Tests—Portions of the NTS, the NAFR Complex, and the Tonopah Test Range were used between 1954 and 1963 for chemical explosion tests of plutonium-bearing materials. Because of the similarities in the types of tests conducted and the consequences of those tests, the NAFR Complex and the Tonopah Test Range are included within this discussion and are not repeated in the discussion of the affected environment for those facilities.

The safety tests, or subcritical events, were conducted to evaluate the safety of nuclear weapons in accident scenarios. Two series, the GMX Project and Project 56, were conducted on the NTS in Areas 5 and 11, respectively. The GMX Project Site was used for 24 specific equation of state studies or experiments fissile materials. Project 56 was comprised of four discrete surface safety tests. Project 57 consisted of a single test and was conducted on the NAFR Complex in Area 13; the Double Tracks Test was conducted in the northernmost part of the NAFR Complex. An environmental assessment analyzing the potential environmental effects of four remediation alternatives was completed for the Double Tracks Site in April, 1996 (DOE, 1996). During preliminary characterization at the site, several pieces of highly radioactively contaminated metal were located, retrieved, and placed in a drum at the site. Between 998 and 1, 588 g (2.2 and 3.5 lbs) of plutonium were spread during the test. The recent work has shown that contamination of 200 pCi/g or higher, affects approximately 2.5 acres. Three safety tests conducted as part of the Clean Slate experiments were performed on the Tonopah Test Range. Figure 4-29 shows the locations of events conducted on the NTS and the NAFR Complex and Figure 4-30 shows the approximate areas of plutonium contamination exceeding 10 pCi/g.

The safety tests used mixtures of plutonium and uranium that were subjected to detonations of conventional explosives. Concurrent with and after these detonations, extensive studies were conducted to understand the dispersal and transport of these isotopes in the environment, including uptake by plants and animals. These studies were documented in a benchmark series of papers by the Nevada Applied Ecology Group, a panel of scientists chartered by the DOE to investigate the effects of testing at the NTS.

The immediate effects of the tests included the dispersal of plutonium and uranium over significant areas. To determine the area impacted by these tests, inventories were conducted by the Nevada Applied Ecology Group. These inventories were later augmented by extensive field-sampling efforts conducted under the Radionuclide Inventory and Distribution Program. These studies resulted in the definition of affected areas. Figures 4-30 through 4-37 show the limits of the affected areas and the distribution of radioactivity within those areas.

The total areas that were contaminated and the remaining inventory of radionuclides are summarized by McArthur and Mead (1989) and (McArthur, 1991) for areas on the NTS and in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977) for the off-site locations. The GMX Project ion Area 5 resulted in the contamination of about 240 acres, with estimates of the total remaining inventory ranging from 1.7 to 2.5 Ci.

The Project 56 tests resulted in the contamination of about 2,200 acres, with estimates of the remaining inventory ranging from 34 to 39 Ci. On the NAFR Complex, the two disturbed areas total slightly under 1,000 acres, with an estimated remaining inventory of about 50 Ci. On the Tonopah Test Range, almost 670 acres were contaminated, with an estimated remaining inventory of about 65 Ci. The ranges in values given are all approximations and reflect the limitations in field sampling of large areas, detection equipment, and laboratory analyses.

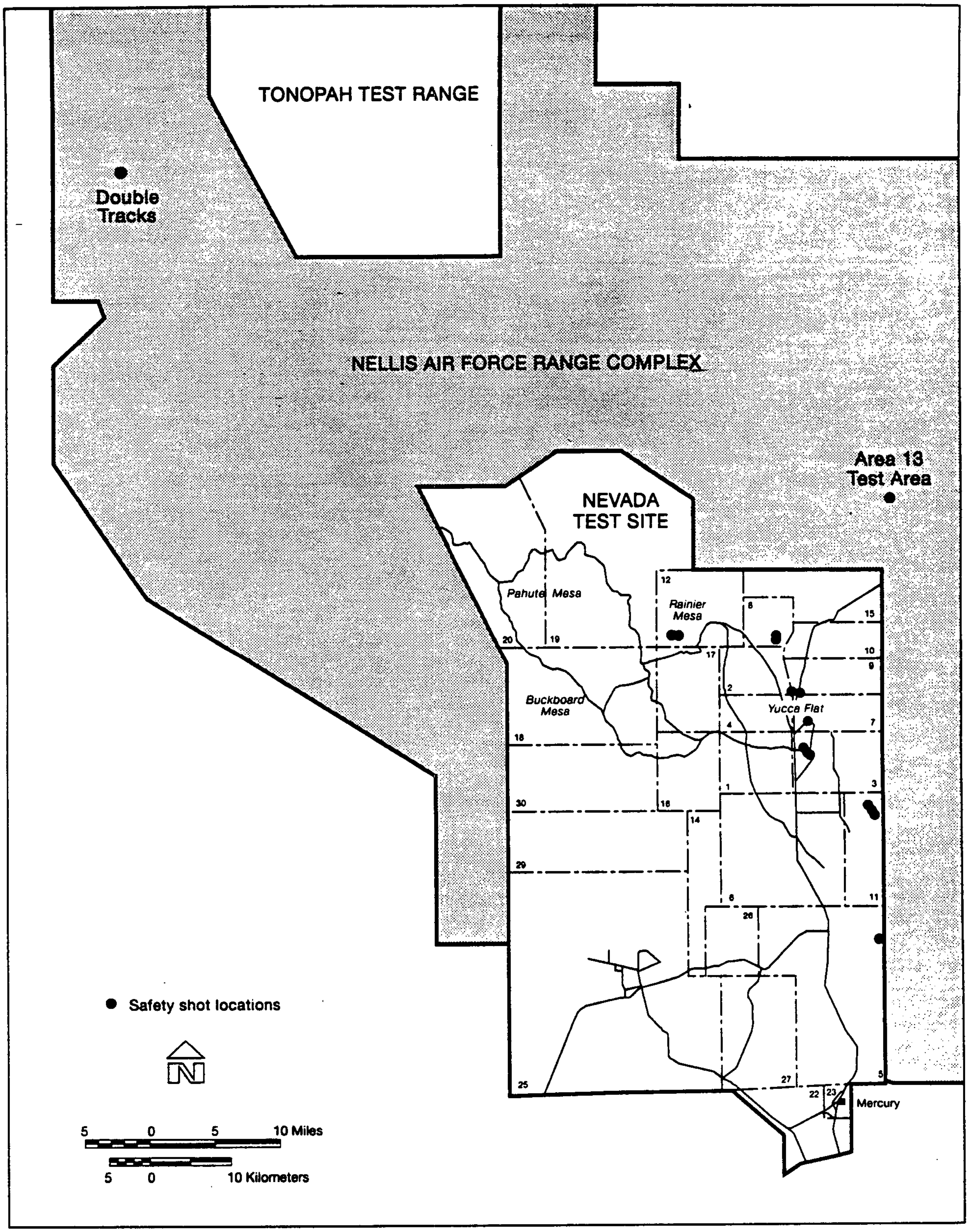


Figure 4-29. Locations of safety tests on the NTS and NAFR Complex

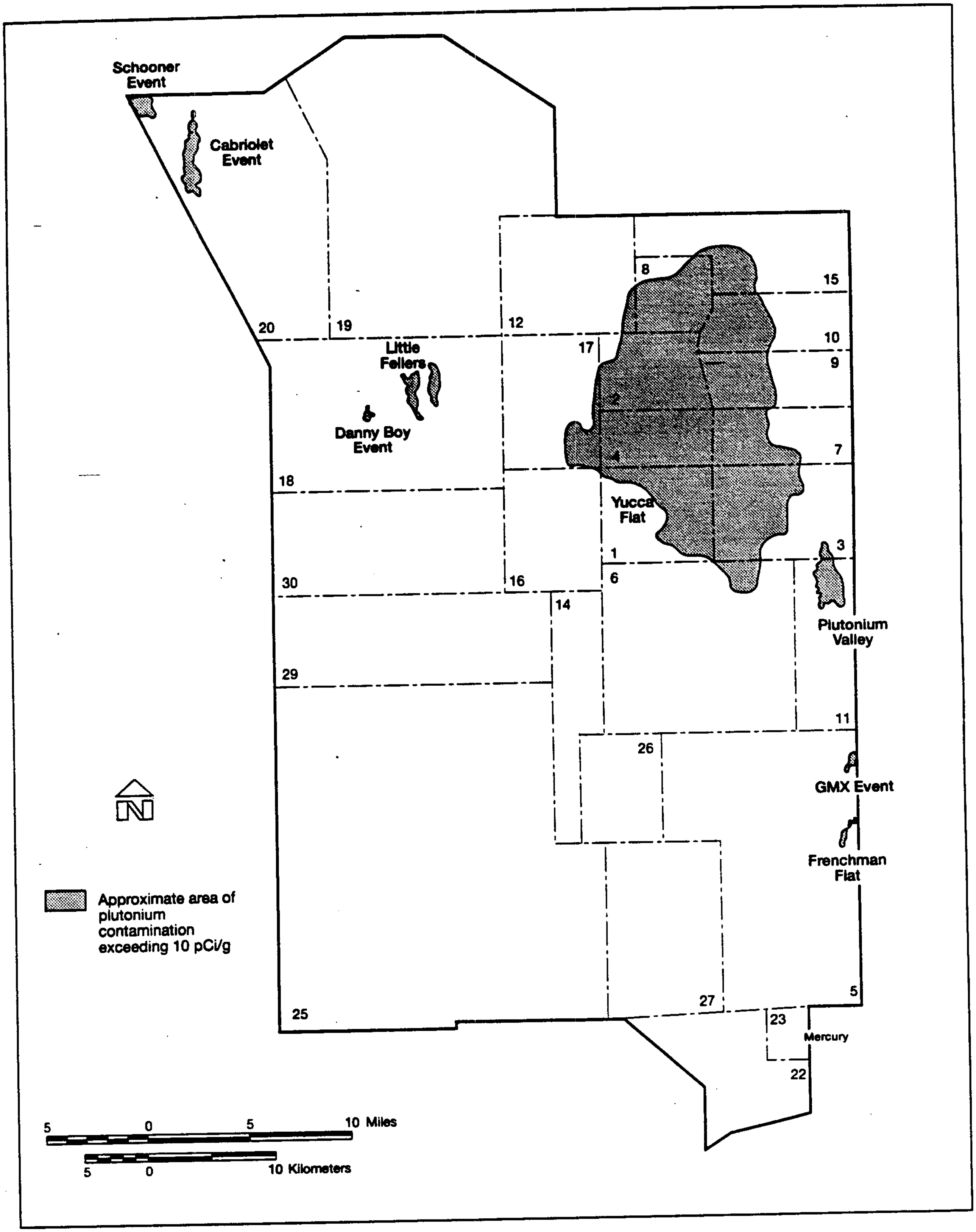
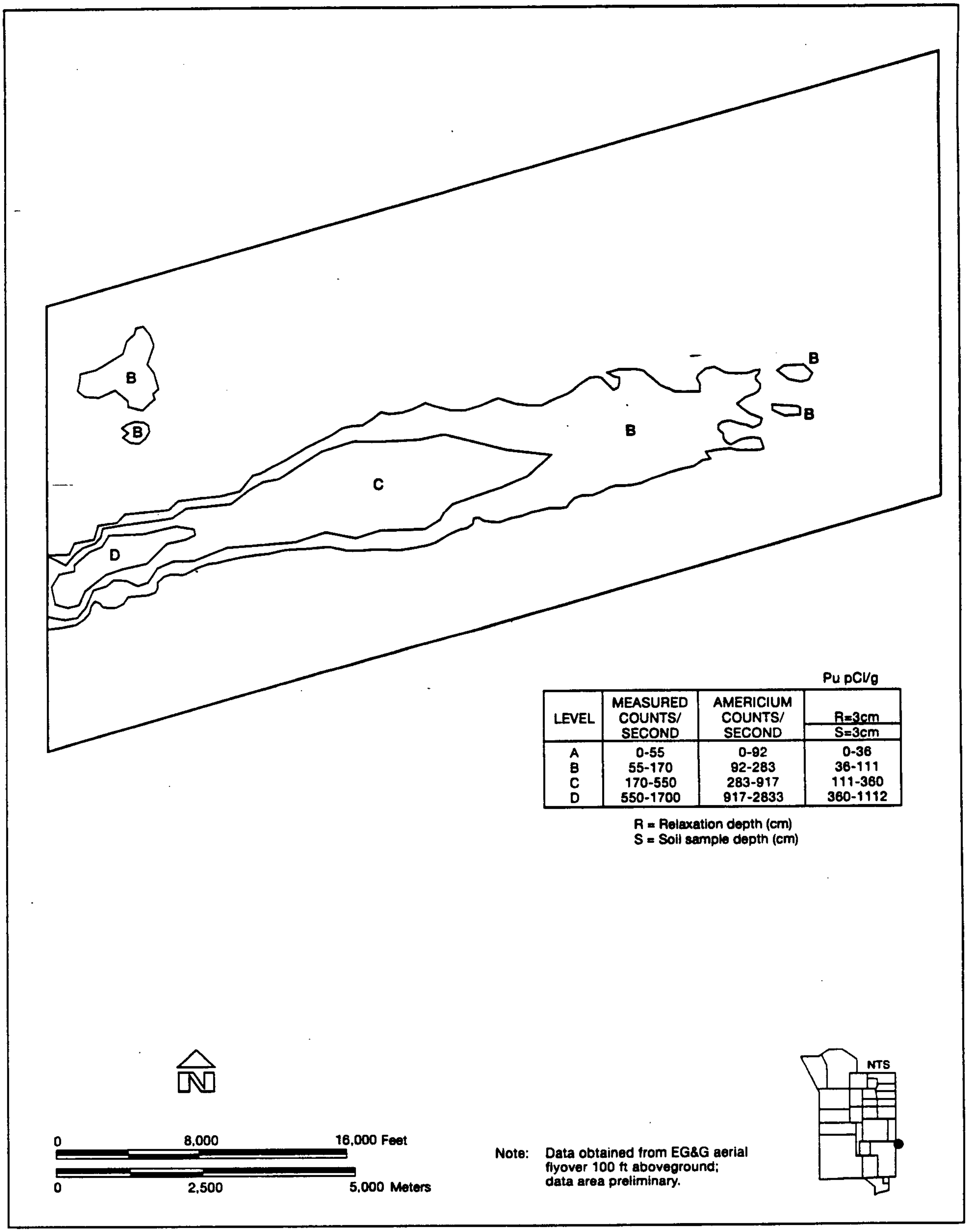


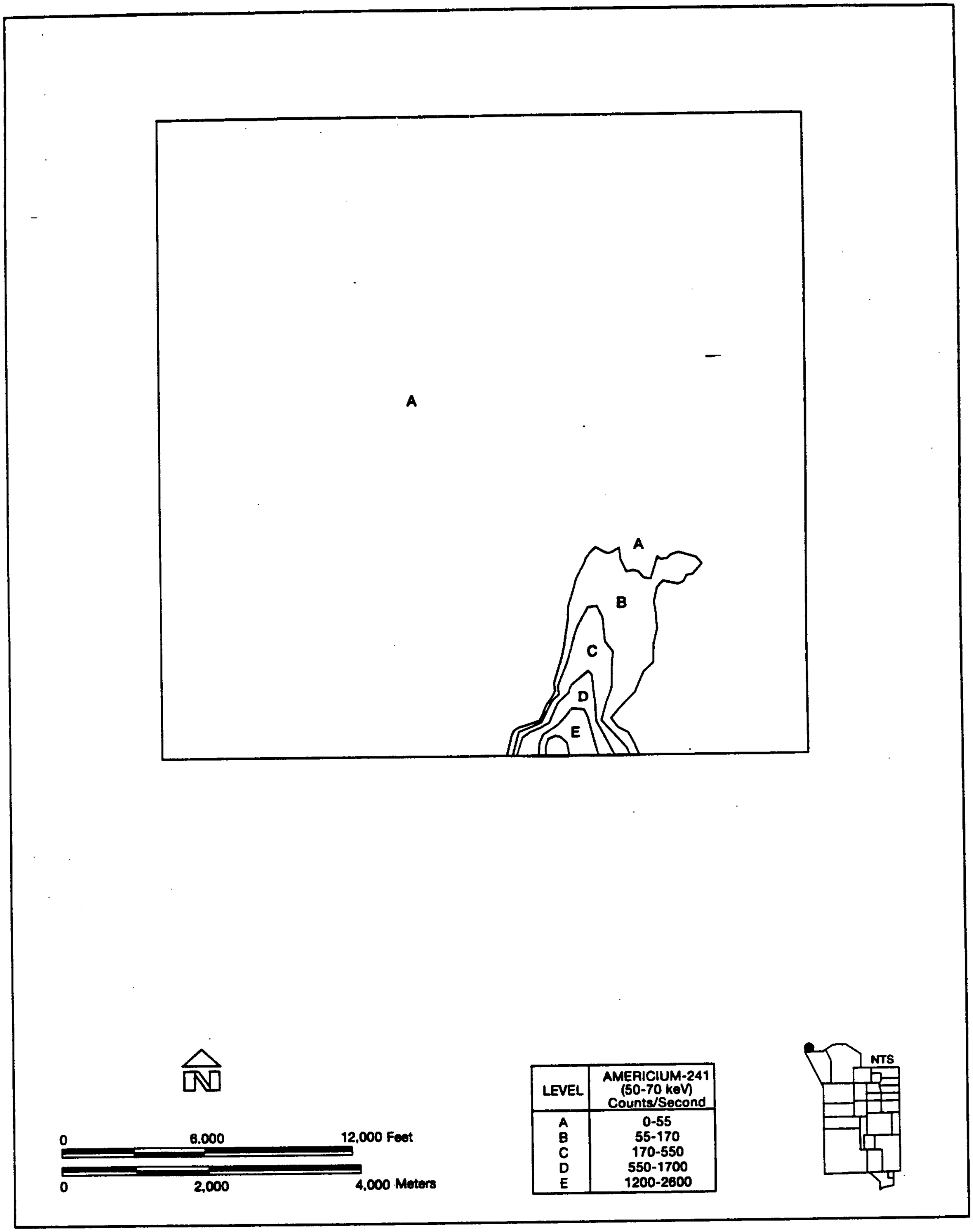
Figure 4-30. Approximate area of plutonium contamination exceeding 10 pCi/g on the NTS



LEVEL	MEASURED COUNTS/ SECOND	AMERICIUM COUNTS/ SECOND	Pu pCi/g R=3cm S=3cm
A	0-55	0-92	0-36
B	55-170	92-283	36-111
C	170-550	283-917	111-360
D	550-1700	917-2833	360-1112

R = Relaxation depth (cm)
S = Soil sample depth (cm)

Figure 4-31. Approximate area of plutonium contamination plume east of Smallboy site



LEVEL	AMERICIUM-241 (50-70 keV) Counts/Second
A	0-55
B	55-170
C	170-550
D	550-1700
E	1200-2600

Figure 4-32. Approximate area of plutonium contamination plume north of Schooner site

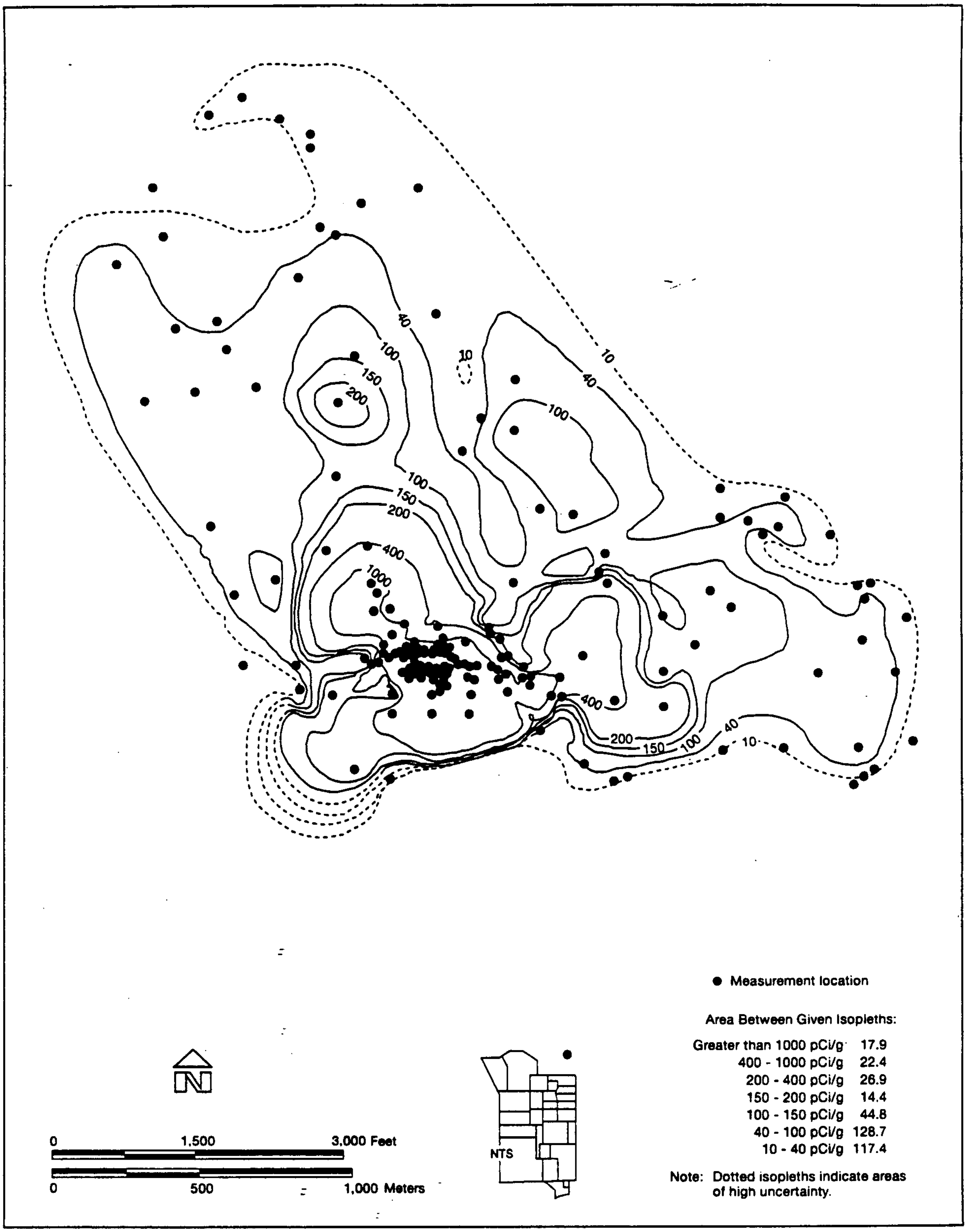


Figure 4-33. Approximate area of plutonium contamination, Area 13

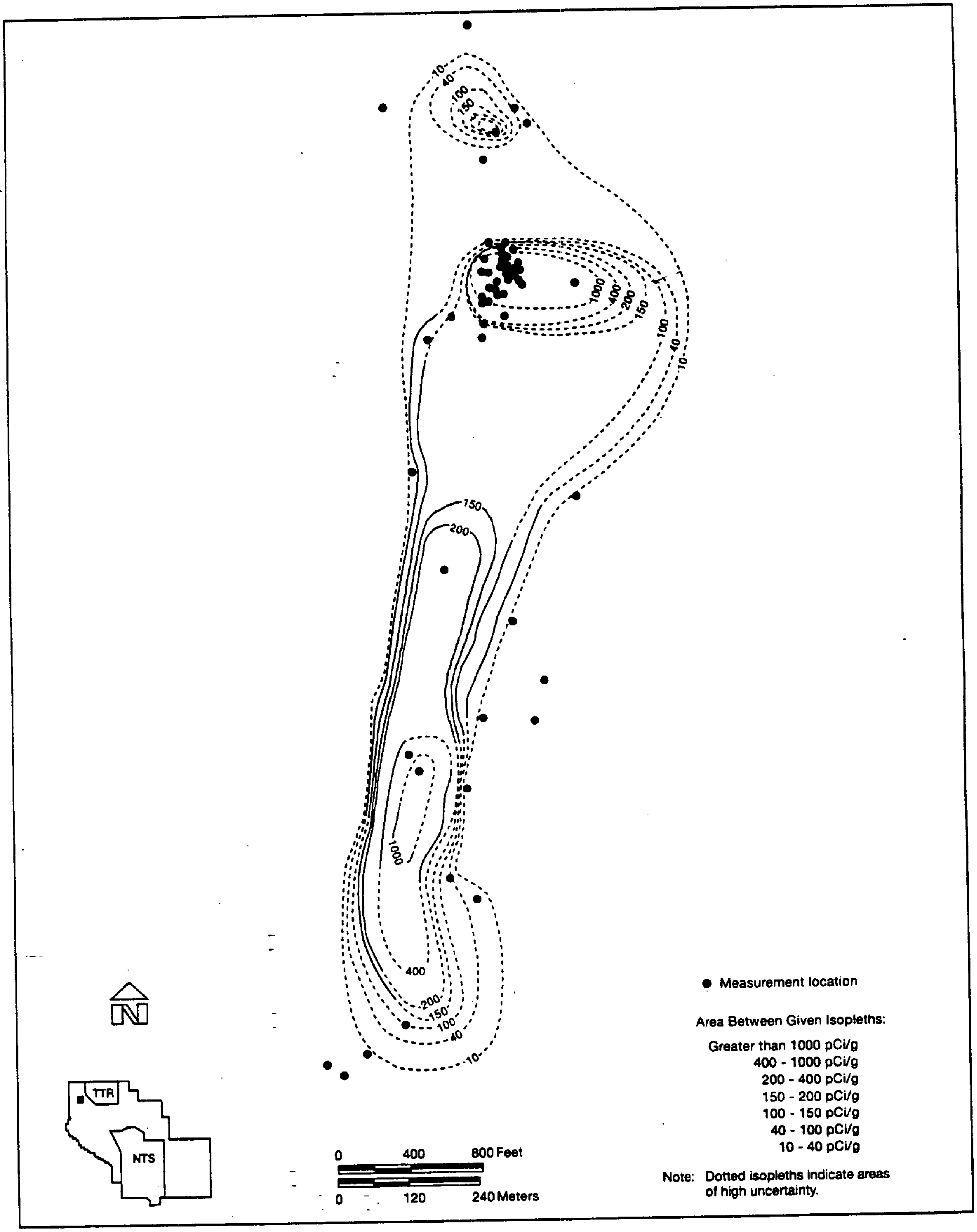
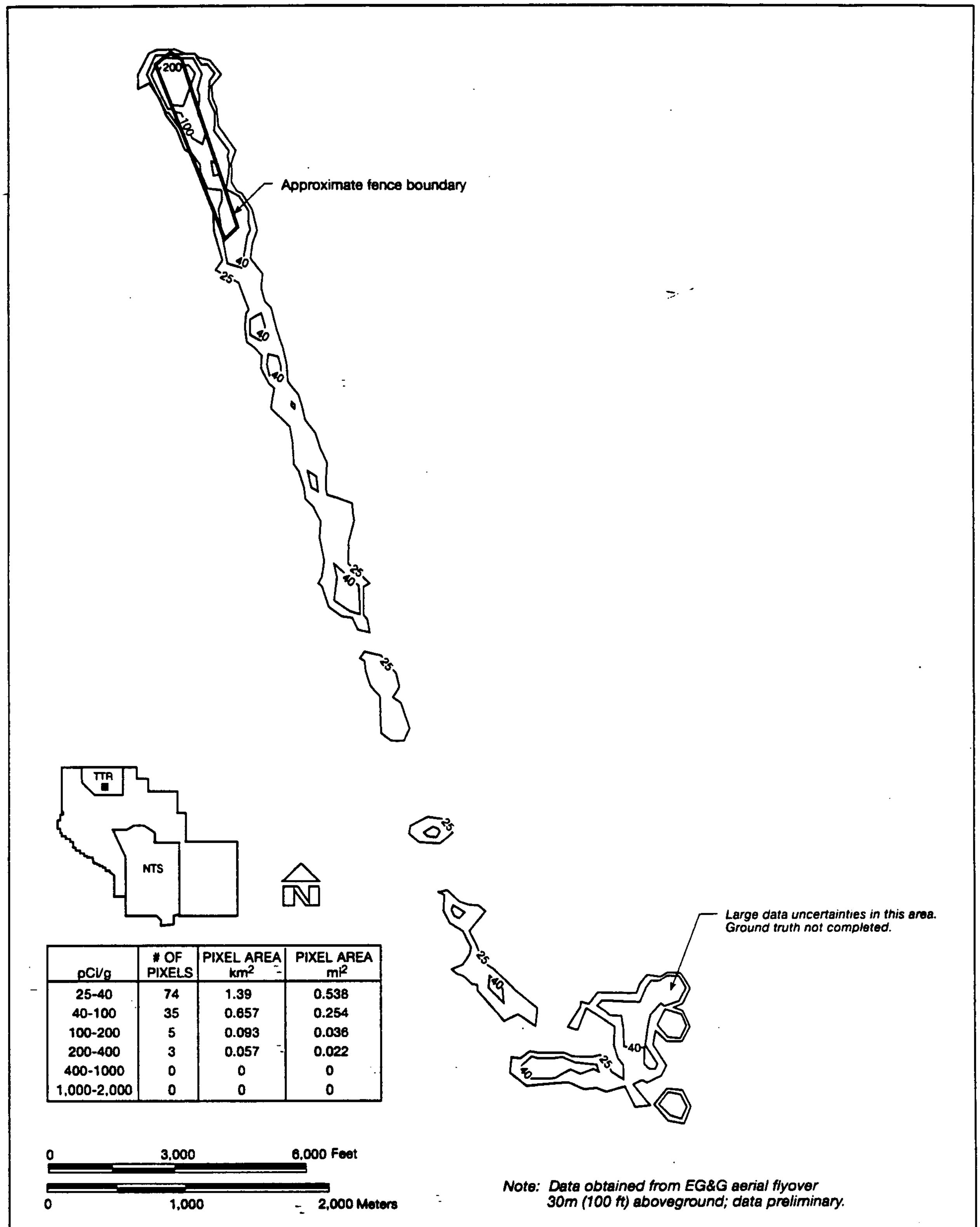
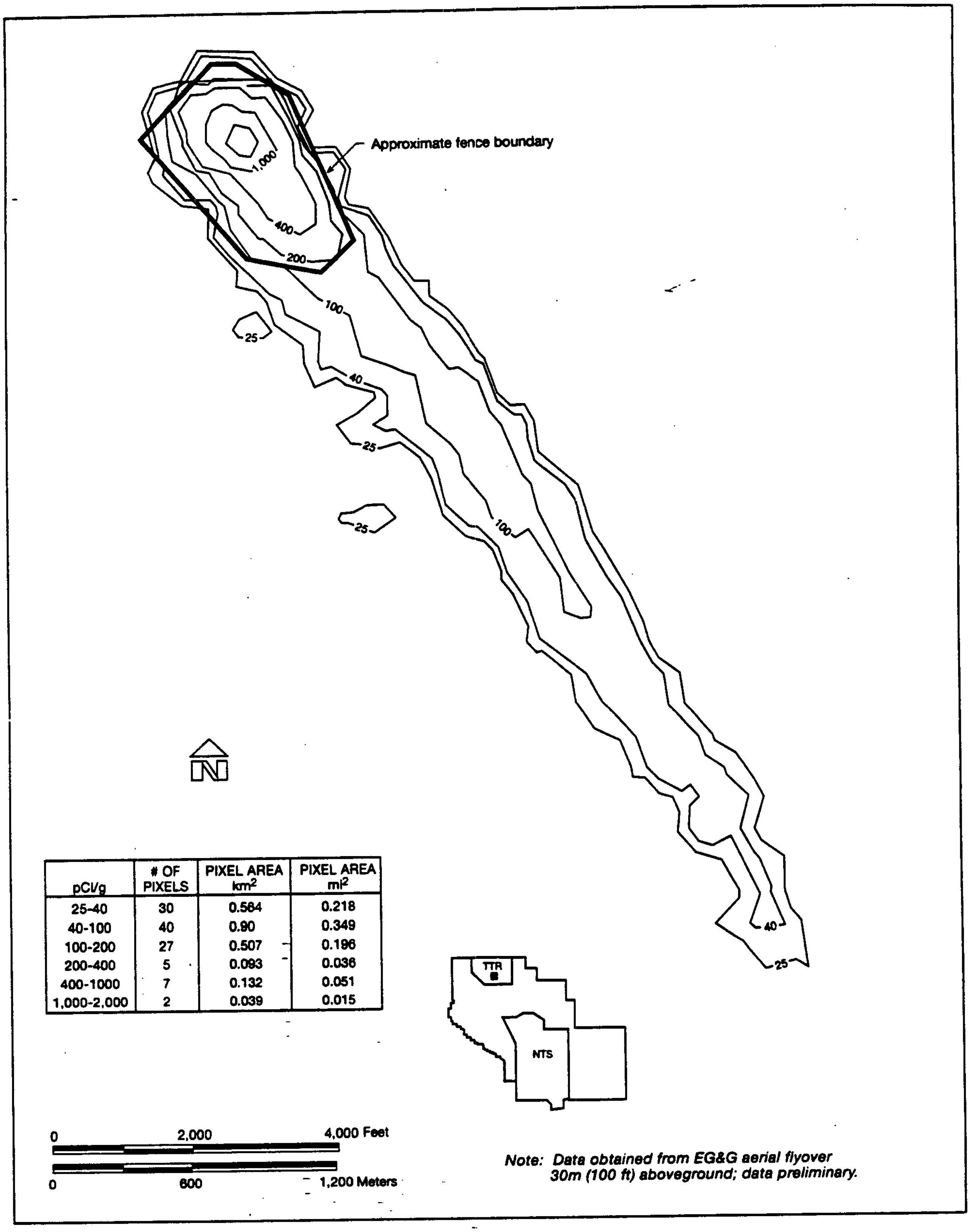


Figure 4-34. Approximate area of plutonium contamination, Double Tracks Test



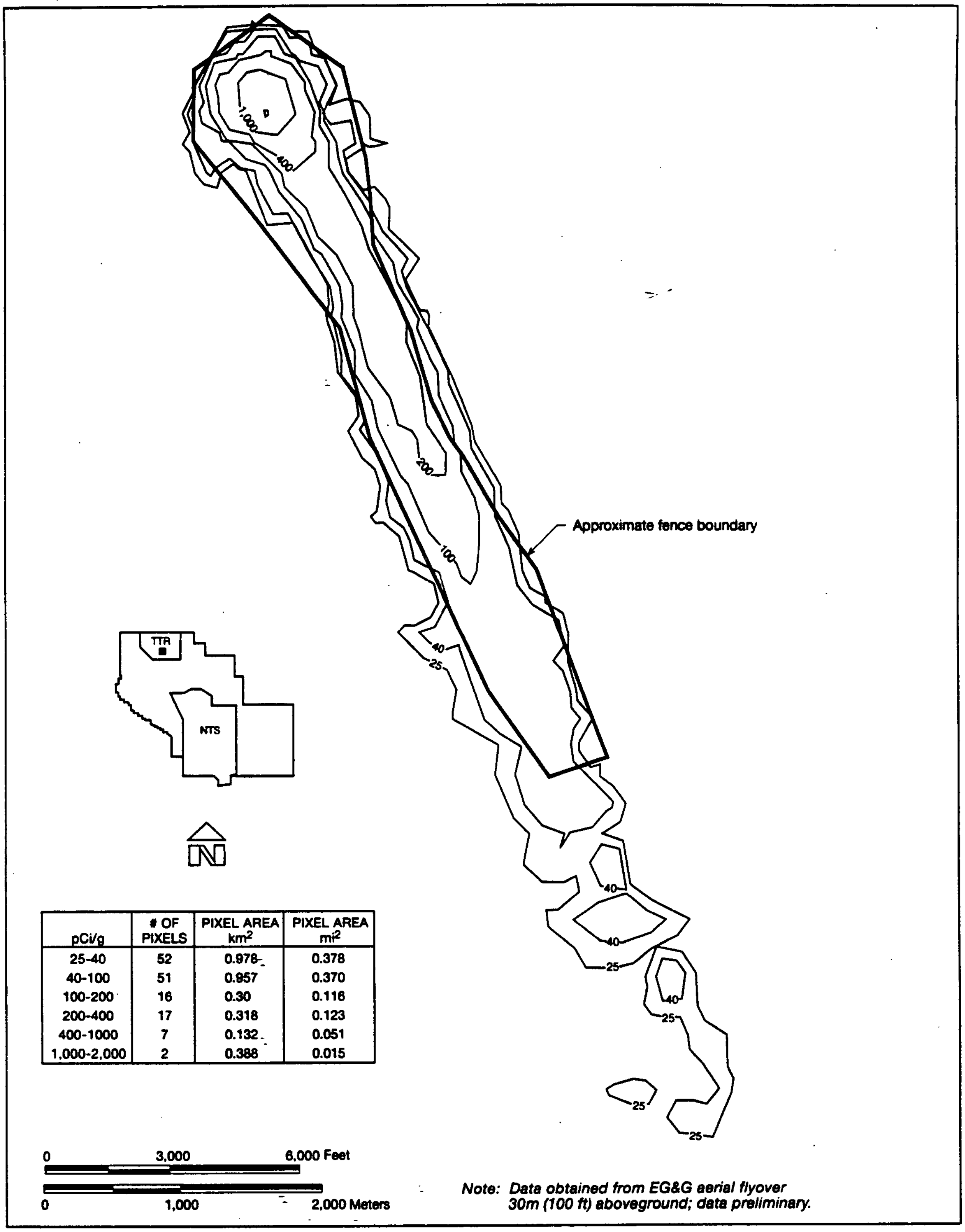
pCi/g	# OF PIXELS	PIXEL AREA km^2	PIXEL AREA mi^2
25-40	74	1.39	0.538
40-100	35	0.657	0.254
100-200	5	0.093	0.036
200-400	3	0.057	0.022
400-1000	0	0	0
1,000-2,000	0	0	0

Figure 4-35. Approximate area of plutonium contamination at the Tonopah Test Range, Clean Slate 1 site



pCi/g	# OF PIXELS	PIXEL AREA km^2	PIXEL AREA mi^2
25-40	30	0.584	0.218
40-100	40	0.90	0.349
100-200	27	0.507	0.196
200-400	5	0.093	0.036
400-1000	7	0.132	0.051
1,000-2,000	2	0.039	0.015

Figure 4-36. Approximate area of plutonium contamination at the Tonopah Test Range, Clean Slate 2 site



pCi/g	# OF PIXELS	PIXEL AREA km²	PIXEL AREA mi²
25-40	52	0.978	0.378
40-100	51	0.957	0.370
100-200	16	0.30	0.116
200-400	17	0.318	0.123
400-1000	7	0.132	0.051
1,000-2,000	2	0.388	0.015

Figure 4-37. Approximate area of plutonium contamination at the Tonopah Test Range, Clean Slate 3 site

At both on- and off-site locations, the primary isotopes are plutonium, uranium, and americium, with lesser amounts of cesium, strontium, and europium. These long-lived radionuclides remain today in the surficial soils in the vicinity of the test areas and are available to be transported by wind and uptake by plants and animals. Extensive research into the mobility of the isotopes has found that wind can transport the contaminants and concentrate them in mounds around desert shrubs, and water can cause plutonium to migrate deeper into the soils with time. The isotopes are now relatively immobile unless the soils are disturbed.

The uptake of plutonium by plants can vary widely, with large intakes as a result of plutonium dust settling on the leaves of a plant, while the quantity of uptake is almost negligible for movement from the soil via the plant's root system. In total, the inventory of plutonium in plants is small compared to the inventory in soils. In a comprehensive study of a contaminated area in Area 13 of the NAFR Complex, 44 Ci of plutonium were estimated to be in the soils while only 0.000264 Ci were estimated to have entered the foliage. Research has indicated that this trend may be as accurate for americium, however, which is much more easily taken into the root systems of plants. Similarly, the radioactivity levels in animals has been found to vary widely depending on the species, their habitats, and time spent in the contaminated area.

One of the actions being evaluated in this EIS is the characterization and remediation of the contaminated soils on the NTS, the NAFR Complex, and the Tonopah Test Range. Over the past two decades, the DOE has conducted many different types of surveys and research projects concerning these soils. A long-term data baseline has been established, the areas of contamination have been delineated, air monitoring and radiological surveying continue for key indicator parameters (plutonium, noble gases, and tritiated water vapor), and an extensive research and development project has evaluated alternative methods for cleaning up the soils. The final disposition of the remaining isotope inventory in these soils will be determined as part of the Soils Corrective Active Unit of the Environmental Restoration Program.

Nuclear Rocket and Related Tests—A number of activities were conducted at the Nuclear Rocket Development Station in Areas 25 and 28. From 1959 through 1973, the area was used for a series of open-air nuclear reactor, nuclear engine, and nuclear furnace tests and for the High Energy Neutron Reactions Experiment. Equipment and facilities remain from some of these activities, and there are some limited areas of contaminated soils. The total estimated inventory of isotopes remaining in the soils in this area of the NTS has been estimated to be about 1 Ci (McArthur, 1991). The primary soil contaminants in this area are isotopes of strontium, cesium, cobalt, and europium. The disposition of this contamination will be addressed as part of the Soils Corrective Action Unit under the Environmental Restoration Program.

4.1.5 Hydrology

Discussion of hydrology is divided into surface hydrology and groundwater. Surface hydrology is discussed in terms of hydrographic basins, whereas groundwater is discussed in terms of hydrogeologic basins. A hydrographic basin is the area drained by a stream system and bounded by topographic divides (Bates and Jackson, 1987). A hydrogeologic basin is groundwater flow from source areas located either in the bounding mountain ranges or upgradient basins toward discharge areas where groundwater is lost to evapotranspiration, discharge to the surface water regime, or flows underground into downgradient basins. The two types of basins are not necessarily coincident, but the distribution of surface water certainly has an effect on the distribution of groundwater.

The hydrologic conditions of the NTS have been extensively studied, and a very large database is available concerning the surface water and groundwater regimes. In fact, the hydrology of the NTS has probably received more scientific scrutiny than any other area in Nevada. However, the database for areas beyond the test site boundaries is not as extensive because of the lack of activities and wells over much of the region. The off-site database has been expanded in recent years through a number of regional studies conducted by the U.S. Geological Survey, the Desert Research

Institute, and other research organizations. Further, these organizations are continuing to expand the scope of their studies on the NTS as well, thereby addressing uncertainties both on and off the site.

No surface water features are located at the North Las Vegas Facility. The North Las Vegas Facility is located in the Las Vegas Valley, which is in a desert region between sharp, rugged mountain ranges. The lowest point of the alluvial fan is the Las Vegas Wash, which drains an area of 2,280 km^2 (880 mi^2) toward Lake Mead. Storm water from the North Las Vegas Facility is discharged into local flood control system.

4.1.5.1 Surface Hydrology. The Great Basin, a hydrographic basin in which no surface water leaves except by evaporation and which includes much of Nevada, is part of the Basin and Range Physiographic Province (Stewart, 1980). The NTS, the Tonopah Test Range, and all but the southern corner of the NAFR Complex, are within the Great Basin (Figure 4-38). Similarity of the physical environment throughout the region allows general discussion of surface water of the NTS, the NAFR Complex, and the Tonopah Test Range. This general discussion of all the areas is centered on the NTS and, unless otherwise specified, referred to simply as "the region."

Discussion of specific areas are included where significant differences exist or where information at a local scale increases understanding and assists in the evaluation of impacts. Consistent with the Great Basin, hydrographic basins of the region have internal drainage controlled by topography (Figure 4-39). Streams in the region are ephemeral. Runoff results from snowmelt and from precipitation during storms that occur most commonly in winter and occasionally in fall and spring, and during localized thunderstorms that occur primarily in the summer (DOE, 1988). Much of the runoff quickly infiltrates into rock fractures or into the dry soils, some is carried down alluvial fans in arroyos, and some drains onto playas where it may stand for weeks as a lake (DOE, 1986). These playas emphasize a perennial water deficit that has characterized Nevada at least in historic times (French et al., 1984).

Floods on alluvial fans and playas in the region are most likely to have an impact on DOE facilities or activities. The discussion below gives definitions and mechanisms. The potential exists for sheet flow and channelized flow through arroyos to cause localized flooding throughout the NTS. However, because of the size of the NTS, no comprehensive floodplain analysis has been conducted in the NTS region to delineate the 100- and 500-year floodplains (see Tables 4-16 and 4-17). A rise in the surface elevation of any standing water on a playa creates a potential flood hazard.

Playas in the Yucca Flat weapons test basin and Frenchman Flat in the northeastern and eastern parts of the NTS, respectively, collect and dissipate runoff from their respective hydrographic basins (Figure 4-39). Control Point and News Knob arroyos (informal names), and Gap Wash, Red Canyon Wash, Tongue Wash, and the Aqueduct arroyos in the Yucca Flat weapons test basin pose a potential flood hazard to existing facilities. Control Point and News Knob arroyos have been assessed for flood hazard (Miller et al., 1994c).

Arroyos in Frenchman Flat that pose a potential flood hazard to existing facilities are Barren Wash, Scarp Canyon, Nye Canyon, and Cane Spring. The first three of these arroyos have also been assessed for flood hazard (Schmeltzer et al., 1993a and b; Miller et al., 1994a and b). Ground-surface disturbance and craters associated with underground nuclear tests have rerouted parts of natural drainage paths in areas of nuclear device testing. Some craters have captured nearby drainage, and headward erosion of drainage channels is occurring. However, this is considered to be negligible. In some areas of the NTS, the natural drainage system has been all but obliterated by the craters. The western half and southernmost part of the NTS have arroyos that carry runoff beyond the NTS boundaries during intense storms (Figure 4-39). Fortymile Canyon, the largest of these arroyos, originates on Pahute Mesa and intersects the Amargosa arroyo in the Amargosa Desert about 32 km (20 mi) southwest of the NTS. The Amargosa arroyo continues to Death Valley, California (ERDA, 1977).

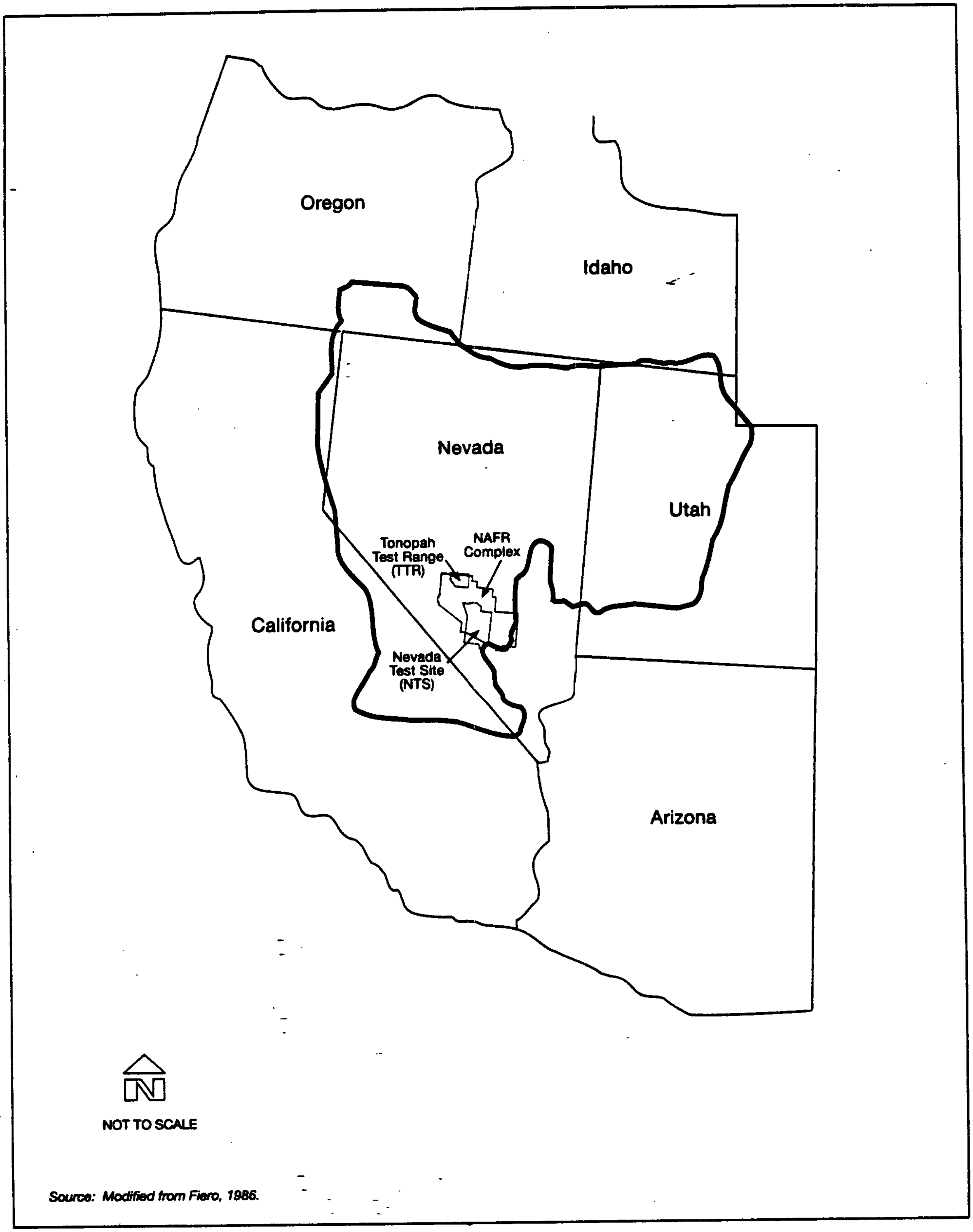


Figure 4-38. Great Basin

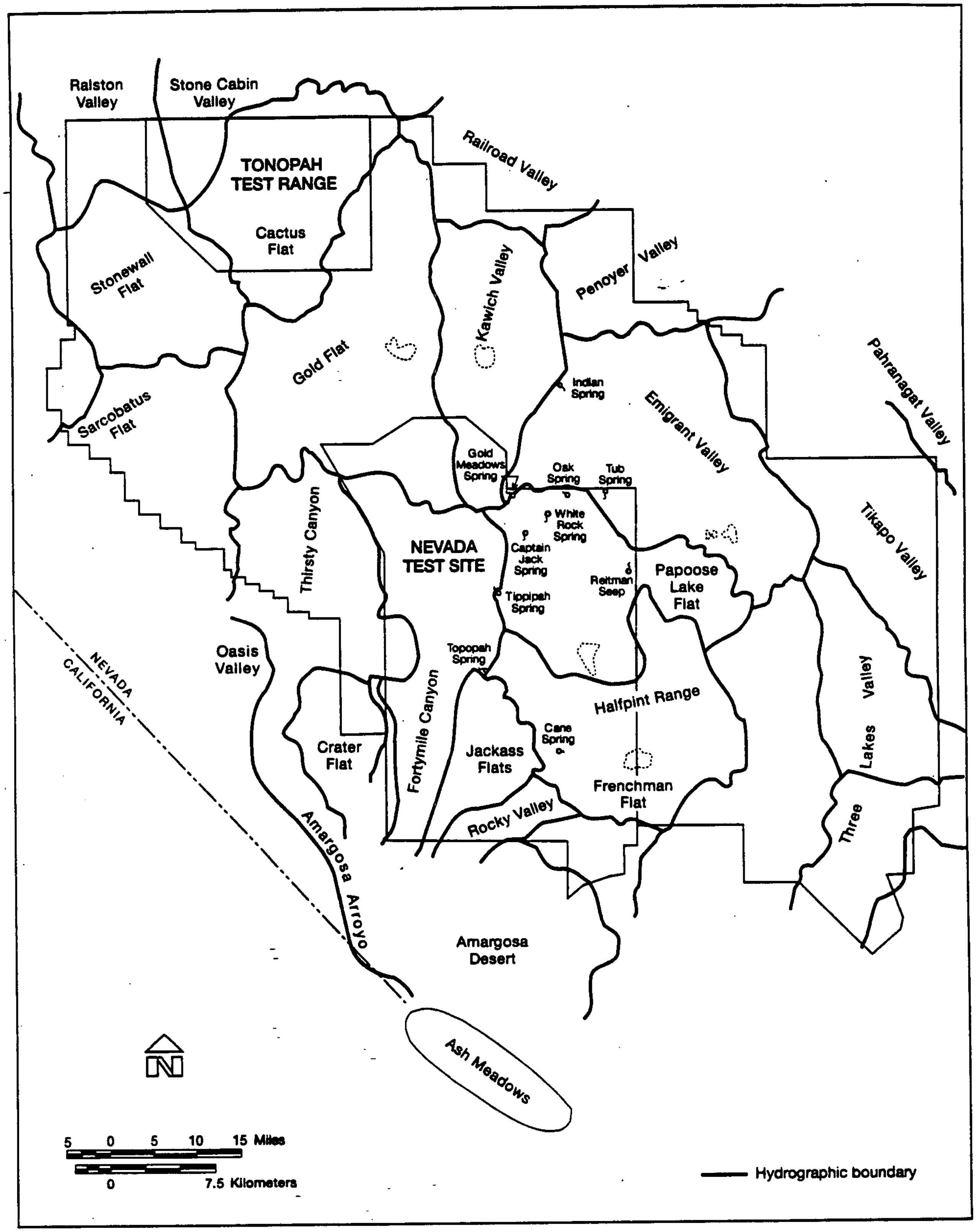


Figure 4-39. Hydrographic basins of the NTS, NAFR Complex, and Tonopah Test Range area

Table 4-16. Flood regulations relevant to waste management and other facilities on the NTS and NAFR Complex

Flood Regulations	Title
DOE Order 6430.1A	General Design Criteria
DOE-STD-1020-94	Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities
Executive Order 11988	Floodplain Management
Executive Order 11990	Protection of Wetlands
44 CFR Part 9	Floodplain Management and Protection of Wetlands
44 CFR Part 65	Identification and Mapping of Special Hazard Areas
10 CFR Part 1022	Compliance with Floodplain/Wetlands Environmental Review Requirements
40 CFR Part 264.18	Hazardous Waste Management Unit - Location Standards
40 CFR Part 264.193	Containment and Detection of Releases
40 CFR Part 270.14	Contents of Part B: General Requirements
NAC 444.8456	Location of Stationary Facility for Treatment, Incineration or Disposal of Hazardous Waste

Table 4-17. Applicable flood events and other information regarding regulations listed in Table 4-16

Regulations	25-yr, 6-hr	25-yr, 24-hr	100-yr, 6-hr	500-yr	PMP	Sediment Transport	Notes
DOE Order 6430.1A	X		X	X	X	X Also implied	References: EO 11988, EO 11990, 10 CFR Part 1022, UCRL 115910
DOE-STD-1020-94					X	X	
Executive Order 11988			X				
Executive Order 11990							Wetlands
44 CFR Part 9			X	X		Implied by references to other regulations	
44 CFR Part 65			X	X		X	Also FEMA Design Criteria Chapter 10
10 CFR Part 1022			X	X			
40 CFR Part 264.18			X				
40 CFR Part 264.193		X					
40 CFR Part 270.14			X			Requirement for flood hazard delineation map and consideration of other "special flooding"	

Areas prone to flooding surround Fortymile Wash, a major tributary of Fortymile Canyon. Tonopah Wash, which runs southwesterly across Jackass Flats from Jackass Divide in the south-central part of the NTS, is a major tributary to the Amargosa arroyo. Fortymile Canyon and Jackass Flats hydrographic basins pose a flood hazard to off-site areas (SAIC/DRI, 1991). Rock Valley arroyo trends westward from the southernmost part of the NTS to Ash Meadows in the east-central part of the Amargosa Desert (ERDA, 1977). Arroyos trending southward from Red Mountain pose a potential flood hazard to sewage lagoons that service Mercury.

Playas in Papoose Valley and Emigrant Valley on the NAFR Complex, northeast of the NTS, collect and dissipate runoff from these hydrographic basins. Arroyos originating in the Belted Range and Chalk Mountains cross Area 13 and trend to Groom playa in Emigrant Valley (DRI, 1988). Playas in Kawich Valley and Gold Flat, on the NAFR Complex north of the NTS, collect and dissipate runoff from the northern part of Pahute Mesa (ERDA, 1977).

Five hydrographic basins are within the boundaries of the Tonopah Test Range: most of Cactus Flat and parts of Stone Cabin Valley, Ralston Valley, Stonewall Flat, and Gold Flat (Figure 4-39). Playas in these hydrographic basins collect and dissipate runoff from these basins. Arroyos originating in the Cactus Range, Goldfield Hills, and Stonewall Mountain trend through Range 71.

SPRINGS AND IMPOUNDMENTS—Throughout the region, springs are the only sources of perennial surface water. These are restricted to some short reaches of the Amargosa arroyo and pools at some large springs (Figure 4-40). Most water discharged from springs travels only a short distance from the source before evaporating or infiltrating into the ground (DOE, 1986).

Discharges from springs, seeps, and marsh areas in the western hydrographic basins in the region range between less than one and several thousand gallons per minute; typically, discharges are several tens to several hundreds of gallons per minute in the larger springs. The largest discharge is at Crystal Pool in Ash Meadows (DOE, 1988). According to information provided by the U.S. Department of the Interior Texas, Nevares, and Travertine Springs in Death Valley (located downgradient of the NTS) provide a potable water supply for park visitors and a privately owned resort that includes restaurants, motels, hotels, and a golf course. Moore (1961) provides data on discharges from springs on the NTS and vicinity. The largest three of the nine springs listed, Indian, White Rock, and Cane Springs, discharge greater than 1 gal/min; all others discharge less than 1 gal/min. Prior to any actions that may result in discharges to these limited surface water occurrences, reviews will be made to ensure compliance with appropriate Executive orders and federal and state environmental laws and regulations.

A small lake, locally known as Crystal Reservoir, with a storage capacity of 2.3×10^6 m^3 (1,860 acre-feet [ac-ft]) is present in the Ash Meadows part of the Amargosa hydrographic basin (Figure 4-40). Water for the reservoir is supplied by a concrete flume from Crystal Pool (Giampaoli, 1986). The reservoir was recently drained and cleaned by the U.S. Fish and Wildlife Service.

Many impoundments have been constructed on the NTS for operations there. The impoundments on the NTS do not support any vegetation stands that qualify as wetlands. Any actions that could affect these impoundments will receive the same type of review for regulatory compliance as that discussed above for the spring discharge areas.

SURFACE WATER CHARACTERISTICS—Little data on characteristics of water in the region have been collected because all streams in the region are ephemeral, and only a few springs have been sampled. Moore (1961) presented results on chemical and radiological analyses for eight springs on the NTS (Table 4-18). Tabulated data suggest that concentrations of chemical and radiological constituents are within naturally occurring ranges.

As part of the DOE NTS Monitoring Program, potable water from groundwater wells, spring water, well reservoirs, waste disposal ponds, and sewage lagoons are routinely sampled for radiological substances in accordance with federal, state, and local regulations (DOE/NV, 1994a).

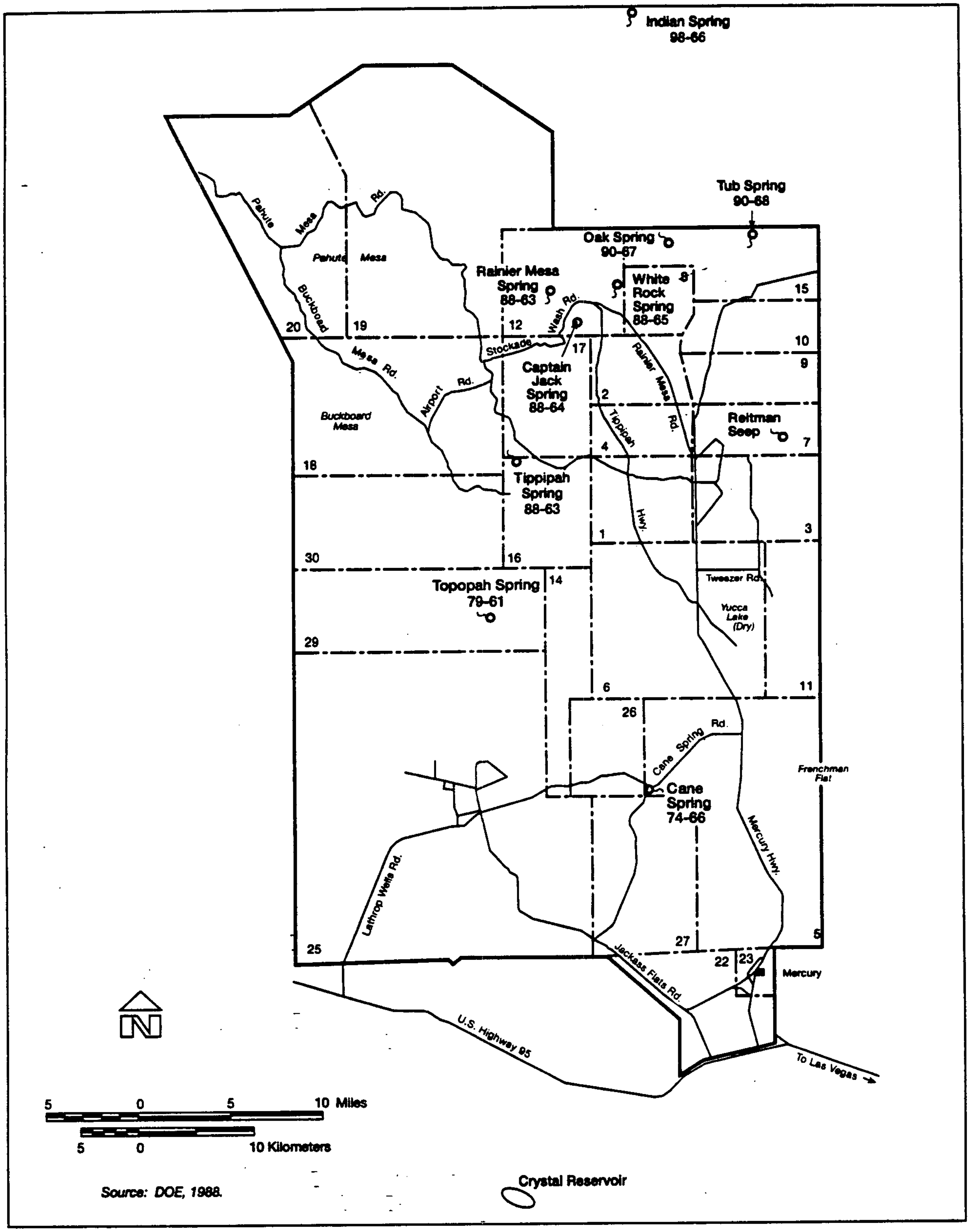


Figure 4-40. Location of springs on the NTS

Table 4-18. Chemical and radiochemical analyses of water from springs on the NTS

Spring No.	Date of Collection	°F	pH	Specific Conductance in Microohms at 25 °C	SiO_2[a]	Al[a]	Fe[a]	Mn[a]	Ca[a]	Mg[a]	Sr[a]	Na[a]	K[a]	HCO_3[a]	CO_3[a]	SO_4[a]	Cl[a]	F[a]	NO_3[a]	PO_4[a]	Total Dissolved Solids (ppm)[b]	Hardness (as $CaCo_3$)		Percent Sodium
																						Total	Noncarbonate	
74-66	9/19/57	66	7.9	425	64	.0	0.10	0.00[c]	32.0	9.2	0.0	37	7.8	163	0	28	20.0	0.5	19.0	0.25	298	118	0	399
74-66	3/24/58	64	8.0	403	63	.0	.00	.00	30.0	9.2	<.1	36	7.6	152	0	30	19.0	.7	18.0	.00	288	113	0	399
79-61	9/17/57	70	6.9	291	71	.2	.08	.00	20.0	3.9	.0	19	18.0	147	0	11	6.0	.7	.1	10	222	66	0	322
79-61	3/25/58	53	6.9	114	50	.3	.44	.00	7.2	1.0	<.1	14	6.4	48	0	15	3.0	.3	2.0	.9	123	22	0	50
83-63	9/17/57	53	7.7	207	53	.6	.31	.00	4.8	.1	.0	40	3.0	88	0	16	7.2	.2	4.6	.45	172	12	0	84
83-63	3/24/58	54	7.4	192	50	.0	.23	.00	4.8	.0	<.1	37	3.2	81	0	19	6.0	.3	4.2	.40	164	12	0	83
88-63	9/18/57	61	8.3	346	65	.2	.04	.00[c]	7.2	1.0	.2	66	4.0	158	2	18	14.0	.6	.6	2.2	256	22	0	84
88-64	5/1/59	56	6.9	188	43	.6	.95	.00[c]	3.2	.0	<.2	47	2.2	95	0	25	4.0	.4	.0	1.2	172	8	0	90
89-65	4/5/57	56	6.9	215	80	1.1	.62	.00	4.8	.0	.0	39	5.4	72	0	23	11.0	.4	4.9	.50	204	12	0	82
89-65	9/18/57	59	7.1	222	52	.1	.03	.00	4.0	.2	.0	42	5.4	78	0	29	8.0	.4	4.8	.65	184	11	0	84
89-65	3/21/58	48	7.2	197	119	.8	.44	.40[c]	6.4	.0	<.1	35	7.4	66	0	32	6.0	.6	4.8	.45	243	16	0	75
89-65	5/19/59	67	8.8	219	48	.7	.30	.00	4.8	.0	<.2	39	4.0	50	13	23	9.0	.6	1.9	.55	167	12	0	83
90-67	4/28/58	55	7.5	241	57	.1	.00	.00[c]	18.0	4.9	<.1	22	6.4	116	0	14	9.0	.3	.0	.10	189	65	0	40
90-68	4/30/59	52	7.1	260	64	.1	.13	.00	16.0	3.9	<.2	31	4.0	118	0	14	11.0	.4	.0	.21	202	56	0	52
98-66	5/1/58	50	7.2	358	61	.1	.08	.00	42.0	7.8	<.2	17	4.8	148	0	36	12.0	.4	.0	.00	254	137	16	211

[a] SiO_2=silica; Al=aluminum; Fe=iron; Mn=manganese; Ca=calcium; Mg=magnesium; Sr=strontium; Na=sodium; K=potassium; HCO_3=bicarbonate; CO_3=carbonate; SO_4=sulfate; Cl=chloride; F=fluoride; NO_3=nitrate; PO_4=phosphate

[b] Dissolved constituents given in parts per million

[c] In solution at time of analysis.

There is no known human consumption of surface water on the NTS. In fact, no public water supplies are drawn from springs in Amargosa Valley, which is located downgradient from the NTS along the primary pathway for surface water flow. The closest surface water supply that is used for public consumption is Lake Mead, which supplies a large portion of the water demand of metropolitan Las Vegas. Water availability and weather permitting, grab samples from open reservoirs, springs, containment ponds, and sewage lagoons are collected monthly. Analyses for gamma emitters, gross beta, and tritium are conducted monthly; analyses for plutonium-238, -239, and -240 are conducted quarterly; and analysis for strontium-90 is conducted annually.

The annual average for each radionuclide analyzed in surface waters is presented in Table 4-19, along with results from analysis of tunnel seepage. The annual averages for open reservoirs and natural springs are compared to the Derived Concentration Guides for ingested water. Gamma results for all sample locations indicated that radionuclide levels were consistently below the detection limit except for samples from the containment ponds. The containment ponds were constructed to catch contaminated runoff from the tunnel complexes. With the exception of containment ponds, no annual average concentration in surface waters was found to be statistically different from any other at the 5-percent significance level. The analytical results from the Area 12 containment ponds showed measurable quantities of radioactivity (DOE, 1993).

Open reservoirs have been established at various locations on the NTS for industrial uses. The annual average gross beta concentrations were compared to the Derived Concentration Guide for ingested water, listed in DOE Order 5400.5, even though there was no known consumption of these waters. The appropriate data are shown in Table 4-20 (DOE, 1993).

Of the nine natural springs found on the NTS, seven are consistently sampled. The other two springs, Tub Spring and Gold Meadows, are sampled when the discharge is large enough to allow sampling, which is infrequent. These springs are a source of drinking water for wild animals on the NTS. The annual average gross beta results for each spring are shown in Table 4-21 and compared to the strontium-90 Derived Concentration Guide for drinking water; however, the water is not used for human consumption. The highest result was for Reitman Seep, which was still below the Derived Concentration Guide (DOE, 1993). Spring discharge samples have also been analyzed for specific radionuclides (tritium, three isotopes of plutonium, and strontium). The average annual concentrations for these radionuclides are also below the Derived Concentration Guides based upon 4 millirem (mrem) effective dose equivalent for drinking water. Tritium averages were low in 1994, below 1.0 picocuries per liter (pCi/L), when eight of the springs were sampled (DOE, 1994b).

Nine of eleven sites related to containment ponds are sampled monthly: five ponds containing impounded waters from the tunnels, three liquid effluents discharged from the tunnels, and a contaminated laundry pond. All active containment ponds are fenced and are posted with radiological warning signs to prevent human access. These ponds are not fenced or flagged so as to prevent access by wildlife and migrating birds and are north of the range of the desert tortoise. The annual average of gross beta analyses from each sampling location is listed in Table 4-22 and compared to the Derived Concentration Guide for ingested water; however, the water is not used for drinking by humans (DOE, 1993).

Since the closing of the Area 6 Decontamination Facility Pond on November 8, 1992, wastewater has been discharged into holding tanks. Because the water and soil in the former pond are contaminated, grab water samples are collected from the pond monthly when possible (DOE, 1993).

As in the past, samples from the Areas 6, 12, and 23 sewage lagoons were collected quarterly during 1993. During the month of November, sampling was expanded to include all sewage lagoons that are in use, which amounted to an increase of six lagoons located in Areas 6, 12, 22, and 23. Each of the lagoons is part of a closed system used for evaporative treatment of sanitary waste. There was no known contact by the working population during the year. The annual gross-beta-concentration

Table 4-19. Radioactivity in NTS surface waters

(Annual average concentrations in units of picocurie per liter)							
Source of Water	Number of Locations	Gross β	Tritium	^{238}Pu	$^{239+240}$Pu	^{90}Sr[a]	% of DCG[b] Range
Open Reservoirs	15	5.7	-33[c]	0.0011	0.20	0.13	0.069 to 24
Natural Springs	7	9.3	5.4	0.03	0.46	0.24	0.007 to 33
Containment Ponds							
T Tunnel	3	260.0	3.1×10^7	0.028	0.81	ND[c]	([d])
N Tunnel	3	5.3	2.2×10^5	0.00076	0.047	NA[e]	([d])
E Tunnel	2	83	1.7×10^8	0.62	53	5.3	([d])
Decon Facility	1	53	1100	0.0	0.14	NA[e]	([d])
Sewage Lagoons	3	24	67	0.0011	0.0082	0.13	([d])

[a] Strontium-90 values are for one sample
[b] Derived Concentration Guide is based on value for drinking water (4 mrem effective dose equivalent)
[c] Below detection limit
[d] Not a potable water source
[e] Not analyzed.

Source: DOE/NV, 1994a.

Table 4-20. NTS open reservoir gross beta analysis results

		Gross Beta Concentration (picocurie per liter)				
Location	Number of Samples	Maximum	Minimum	Arithmetic Mean	Standard Deviation	Mean as %DCG[a]
Area 2, Mud Plant Reservoir	12	9.7	1.4	3.8	2.1	9.5
Area 2, Well 2 Reservoir	12	12.0	4.0	6.4	2.2	16.0
Area 3, Mud Plant Reservoir	12	18.0	2.8	11.0	3.5	28.0
Area 3, Reservoir	12	12.0	0.1	8.2	3.2	21.0
Area 5, UE-5c Reservoir	11	8.9	5.2	7.0	1.2	18.0
Area 5, Well 5b Reservoir	11	15.0	4.8	9.4	3.2	24.0
Area 6, Well 3 Reservoir	2	12.0	9.1	10.0	1.9	25.0
Area 6, Well C1 Reservoir	12	19.0	0.5	9.1	4.9	23.0
Area 18, Camp 17 Reservoir	11	8.7	2.8	4.2	1.6	11.0
Area 18, Well 8 Reservoir	3	6.1	3.8	5.1	1.2	13.0
Area 19, UE-19c Reservoir	10	12.0	1.4	3.4	3.0	8.5
Area 20, Well 20a Reservoir	7	12.0	1.1	4.3	3.6	11.0
Area 23, Swimming Pool	12	6.3	3.2	4.4	1.1	11.0
Area 25, Well J-11 Reservoir	12	6 5	3.7	5.2	0.9	13.0
Area 25, Well J-12 Reservoir	12	9 5	4.8	6.5	1.6	16.0

[a] Derived Concentration Guide based on strontium-90 value for drinking water (4 mrem effective dose equivalent).

Source: DOE/NV, 1994a.

Table 4-21. NTS natural spring gross beta analysis results, 1993

Location	Number of Samples	Gross Beta Concentration (picocurie per liter) Maximum	Minimum	Arithmetic Mean	Standard Deviation	Mean as %DCG[a]
Area 5, Cane Spring	12	24.0	2.0	9.3	6.3	23
Area 7, Reitmann Seep	12	100.0	19.0	36.0	23.0	90
Area 12, Captain Jack	8	18.0	5.0	9.1	4.1	23
Area 12, Gold Meadows	5	23.0	8.1	14.0	7.5	35
Area 12, White Rock Spring	12	1.3	7.0	9.9	1.9	25
Area 16, Tippipah Spring	12	7.3	3.2	4.6	1.1	12
Area 29, Tonopah Spring	10	8.4	4.2	5.7	1.5	14

[a] Derived Concentration Guide based on strontium-90 value for drinking water (4 mrem effective dose equivalent).

Source: DOE/NV, 1994a.

Table 4-22. NTS containment pond gross beta analysis results

Location	Number of Samples	Gross Beta Concentration (picocurie per liter) Maximum	Minimum	Arithmetic Mean	Standard Deviation	Mean as %DCG[a]
Area 6, Decontamination Pond	7	83.0	33.0	53.0	20.0	130.0
Area 12, E Tunnel Seepage	12	170.0	51.0	84.0	34.0	210.0
Area 12, E Tunnel Pond No. 1	10	130.0	53.0	82.0	29.0	210.0
Area 12, N Tunnel Seepage	5	22.0	-1.4[b]	6.8	9.2	17.0
Area 12, N Tunnel Pond No. 1[c]	(c)	(c)	(c)	(c)	(c)	(c)
Area 12, N Tunnel Pond No. 2	2	7.7	-4.3	1.7	8.5	4.3
Area 12, N Tunnel Pond No. 3	3	20.0	6.1	15.0	7.7	3.8
Area 12, T Tunnel Seepage	6	360.0	-3.9[b]	19.0	160.0	48.0
Area 12, T Tunnel Pond No. 1[c]	(c)	(c)	(c)	(c)	(c)	(c)
Area 12, T Tunnel Pond No. 2	4	310.0	170.0	260.0	58.0	650.0
Area 12, T Tunnel Pond No. 3	4	330.0	180.0	270.0	69.0	680.0

[a] Derived Concentration Guide based on strontium-90 value for drinking water (4 mrem effective dose equivalent)
[b] Below detection limit
[c] Pond dry.

Source: DOE/NV, 1994a.

averages for the three lagoons ranged between 2.0 and 3.1 pCi/L. The data for the new lagoons were similar. No radioactivity was detected above the minimum detectable concentrations for tritium and plutonium-238. Levels of strontium-90 slightly above the minimum detectable concentrations were detected in samples collected at the Area 6 Device Assembly Facility sewage lagoon, the Area 6 sewage lagoon, and the Area 12 sewage lagoon. Levels of plutonium-239 and -240 were also detected slightly above the minimum detectable concentration in two samples collected from the Area 6 sewage lagoon. No event-related radioactivity was detected by gamma spectrometry analyses (DOE, 1993).

All water discharges at the NTS are regulated by the state of Nevada. The NTS maintains compliance with required permits. Water-pollution control permits issued by the State are required for industrial and domestic wastewater discharges (DOE/NV, 1993). Discharge and monitoring requirements imposed by the State serve to prevent degradation of the surface waters (and groundwater) on the NTS.

4.1.5.2 ***Groundwater.*** Although the groundwater resources of the region are large, their physical availability is quite variable. All potentially affected areas are located within the Death Valley flow system. The Death Valley flow system is composed of 30 individual hydrographic basins and 41,440 km^2 (16,000 mi^2) of the Great Basin (Harrill et al., 1988). This flow system originates primarily from the infiltration of precipitation over mountainous areas and flows toward the regional groundwater depression at Death Valley or smaller depressions in Sarcobatus Flats, Oasis Valley, Ash Meadows, and the Amargosa Desert.

The groundwater within the eastern portion of the NTS and within Area 13 of the NAFR Complex flows toward the Ash Meadows discharge area. In most of the western portion of the NTS, it flows toward the Alkali Flat-Furnace Creek discharge area. In the western part of the Tonopah Test Range and the extreme northwest tip of the NTS, it flows toward the Oasis Valley and the Sarcobatus discharge areas and on to Death Valley.

Table 4-23 lists the hydrographic basins that include portions of the NTS, the perennial yields of these basins, DOE's water supply wells, and DOE's peak demand rates for water in each of the basins. The perennial yield is an estimate of the quantity of groundwater that can be withdrawn from a basin on an annual basis without depleting the reservoir (Scott et al., 1971). The perennial yield values are estimates used by the Nevada State Engineer for planning purposes and may be significantly greater if recharge is greater than current estimates. The perennial yield values could also be smaller if one-half of the underflow between some basins is not considered a part of the perennial yield of specific basins, e.g., Frenchman Flat. Such considerations reflect the uncertainties involved in developing the estimates presented in the published literature. As shown in Table 4-23, the peak demand associated with historic NTS actions has been a small fraction of the available perennial yield in Gold Flat, Kawich Valley, Frenchman Flat, Mercury Valley, and Fortymile Canyon. Only in Yucca Flat have the DOE groundwater withdrawals exceeded the published perennial yield. The peak demand of 1,124,935 m^3 (912 acre-feet) in 1989 exceeded the perennial yield of 431,719 m^3 (350 acre-feet) by a factor of 2.6. Historic data indicate that annual water withdrawals have exceeded the perennial yield of Yucca Flat since 1962, but only in 1967, 1969, and 1989 were more than 863,437 m^3 (700 acre-feet) withdrawn.

The effects of the DOE's water withdrawals have included the lowering of water levels in the vicinity of water supply wells and some localized changes in groundwater flow directions. Estimates of the drawdown in the vicinity of NTS water supply wells have been made by the U.S. Geology Survey (Young, 1972; Thordarson, 1983). In general, the effects of pumping NTS water supply wells is concentrated within a distance of a few thousand feet of the operating wells. As part of their Wellhead Protection Program for the NTS, the DOE recently completed capture zone models for each water supply well and mapped the area of influence for each well. These models used a very conservative approach that assumed that each well was run continuously for a period of ten years. The results of these analyses indicate that for each well, the area of influence is restricted, and only at

Table 4-23. Perennial yields and peak historic water demands for the 10 hydrographic basins on the NTS

Basin	Estimated Perennial Yield		DOE Water Supply Wells	Peak DOE Historic Water Demand		
	m^3/yr	acre-feet/year		m^3	acre-feet	yr
Gold Flat	$2.3x10^6$	1,900	1	$4.3x10^5$	345	1989
Kawich Valley	$2.7x10^6$	2,200	1	$5.2x10^5$	425	1989
Emigrant Valley	$3.1x10^6$	2,500	None	No Demand		
Yucca Flat	$4.3x10^5$	350	8	$1.0x10^6$	912	1989
Frenchman Flat	$1.9x10^7$	16,000	3	$6.5x10^5$	530	1962
Mercury Valley	$9.8x10^6$	8,000	1	$5.3x10^5$	428	1992
Rock Valley	$9.8x10^6$	8,000	None	No Demand		
Fortymile Canyon	$9.4x10^6$	7,600	3	$4.2x10^5$	340	1988
Oasis Valley	$2.5x10^6$	2,000	None	No Demand		
Amargosa Valley	$2.9x10^7$	24,000	None	No Demand		

Army Well 1 does the capture zone extend beyond the NTS boundaries. No impacts on springs or biological resources are anticipated as a result of the operation of these wells. The extent and magnitude of water-level declines in the vicinity of these supply wells is not considered a significant impact in Gold Flat, Kawich Valley, Frenchman Flat, Mercury Valley, and Fortymile Canyon.

Because the extraction rates in Yucca Flat exceed the perennial yield of the basin, the impacts of the water supply wells could be more significant and require special consideration. The capture of groundwater in excess of the perennial yield could have removed water from storage or decreased the downgradient subsurface discharge to Frenchman Flat or both. Long-term water-level data for three wells in Yucca Flat are presented in Clary et al. (1995) and show variable results. Water levels in Well UE-2ce have been affected by underground tests and declined about 24 m (80 ft) between 1977 and 1984, while water levels in Well UE-5n rose about 0.3 m (1 ft). At Well UE-2ce, water levels rose almost 8 m (25 ft) between 1984 and 1994. Records for Well TW-7 have been affected by underground nuclear detonations and show an overall trend of rising water levels between 1957 and 1980 and declining water levels from 1980 to 1994.

HYDROGEOLOGIC UNITS—The NTS and surrounding regions are hydrogeologically complex. Three principal hydrogeologic systems—valley-fill alluvium, Tertiary volcanic rocks (tuffs and lava flows), and Proterozoic and Paleozoic sedimentary rocks—have undergone several periods of extensive faulting and deformation. As evidence of the complex hydrogeology, Winograd and Thordarson (1975) identified six major aquifers and four major aquitards in the region. The general relationship of hydrogeologic units in southern Nevada is listed in Table 4-24 and shown graphically on Figure 4-41a and 4-41b.

The hydrologic basement, referred to as the lower clastic confining unit, is comprised of approximately low-permeability Cambrian and older quartzite and metamorphic rocks. This

Table 4-24. Major hydrogeologic units of the Death Valley flow system

Hydrogeologic Units	Primary Rock Types	Age
valley-fill aquifer	alluvium, playa	Late Tertiary to Quaternary
volcanic: lava flow aquifers welded-tuff aquifers tuff-confining units	rhyolite lava flows welded ash-flow tuffs nonwelded, zeolitized ash-flow tuffs	Miocene
carbonates and clastic rocks: upper carbonate aquifer upper clastic confining unit lower carbonate aquifer lower clastic confining unit	limestone shales and siltstones limestones and dolostones quartzites and other metamorphics	Pennsylvanian Mississippian Cambrian to Devonian Cambrian and Eocambrian

Sources: Modified after Waddell et al., 1984.

confining unit is regionally overlain by the lower carbonate aquifer, which is comprised of 4,000 to 5,000 m (13,120 to 16,400 ft) of relatively thick permeable limestones and dolostones, with thinner less permeable siltstones, shales, and quartzites.

Because of the past geologic history of uplift and erosion and structural deformation, the lower carbonate aquifer is not present in all areas, and rarely is the entire thickness of the unit present under the NTS or adjacent areas. Regional intrabasin flow is dominated by groundwater movement within the lower carbonate aquifer. Locally at the NTS, the lower carbonate aquifer is overlain by the upper clastic confining unit, which consists of low-permeability rocks of the Eleana and Chainman formations. In addition, Pennsylvanian-age limestones (or the upper carbonate aquifer) overlie the upper clastic confining unit in limited areas of the NTS. Flow through the upper carbonate aquifer is discontinuous and, therefore, considered less significant than flow through the regional lower carbonate aquifer.

Groundwater flow on Pahute and Rainier Mesas is through thick sequences of Tertiary volcanic rock, originating from calderas of the southwest Nevada volcanic field. Thinner sequences of these volcanic rocks overlie the upper carbonate aquifer and clastic confining units within some areas of the Yucca and Frenchman Flats. Tertiary volcanic rocks consist of ash flows, lava flows, and air-fall tuffs. Local alteration of units (primarily by zeolitization) in older, deeper parts of the volcanic pile has resulted in lower transmissivities characteristic of the volcanic confining unit. Lava-flow aquifers (present near volcanic centers) are present in Jackass Flats, Pahute Mesa, Rainier Mesa, Timber Mountain, and associated proximal areas. Tuff aquifers within the volcanic aquifer hydrogeologic unit consist of ash-fall, welded, or bedded tuffs. Welded-tuff aquifers are present in the deepest parts of the Yucca Flat weapons test basin, Frenchman Flat, and Jackass Flats. Welded- and bedded-tuff aquifers are also present on the mesas, Timber Mountain, and associated proximal areas.

Tertiary- and Quaternary-age alluvium and playa lake deposits fill the intermontane valleys and locally overlie Tertiary and Paleozoic rocks. The valley-fill deposits comprise a sequence of gravel, sand, silt, and clay. The sediments vary widely,

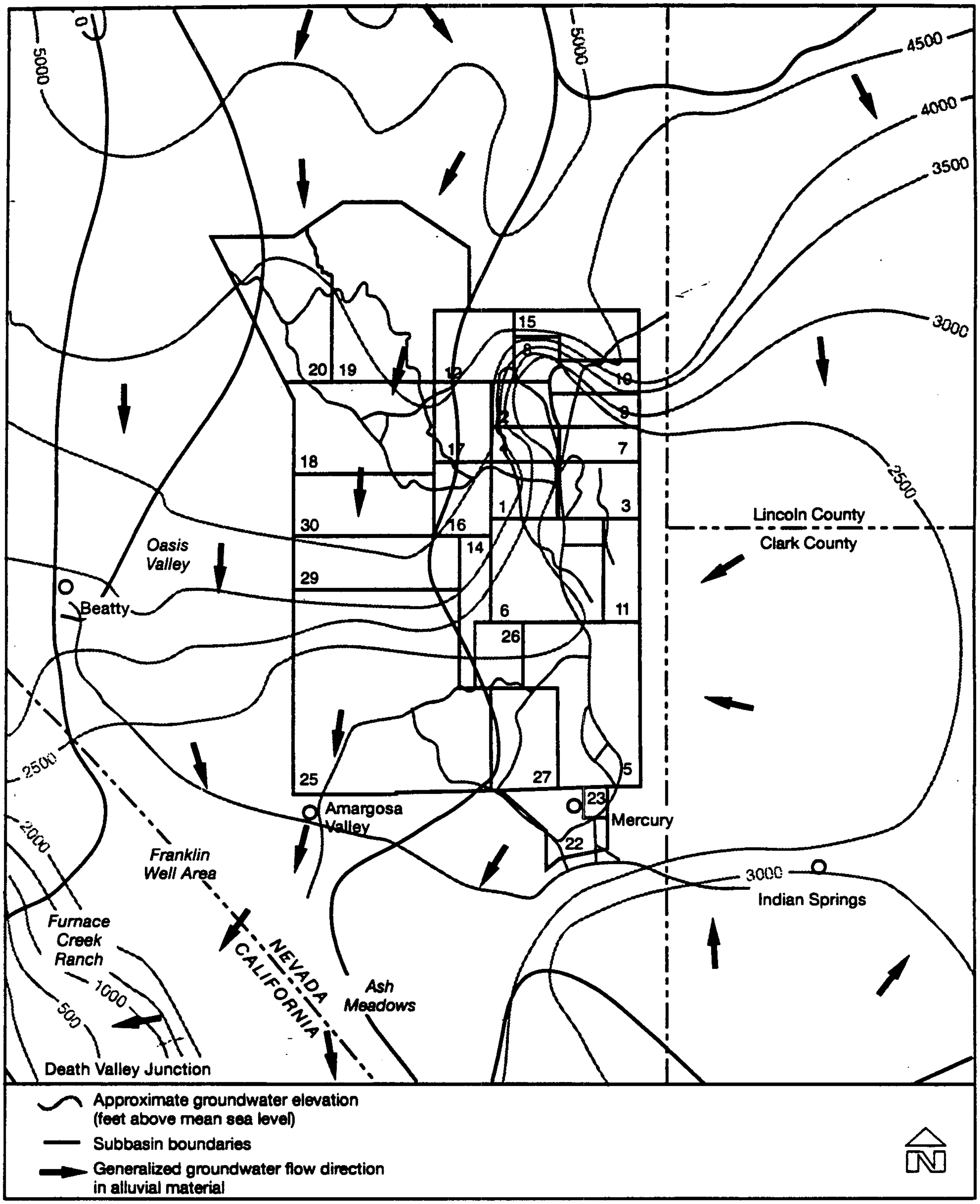


Figure 4-41a. Generalized potentiometric surface and groundwater flow directions

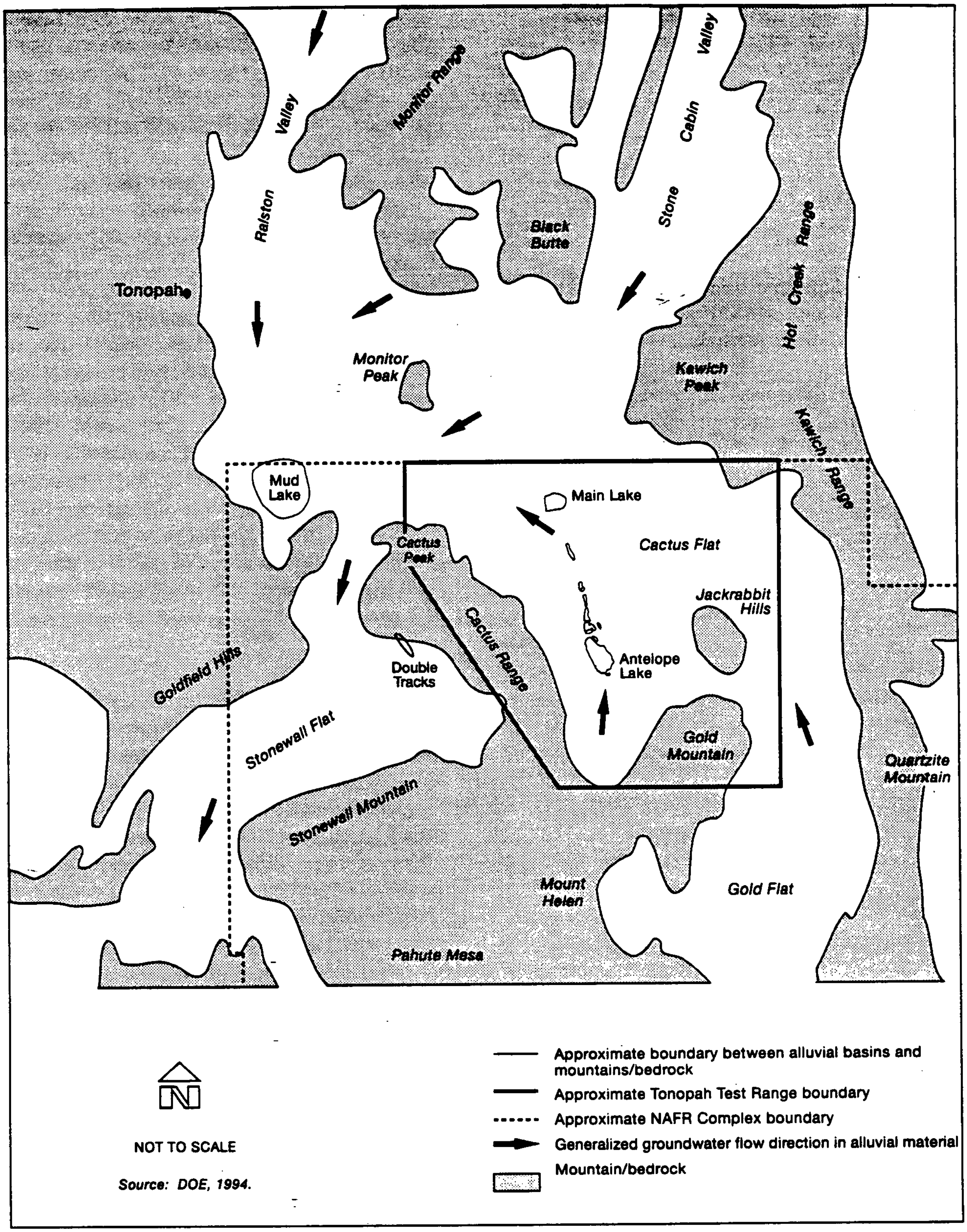


Figure 4-41b. Generalized alluvial material groundwater flow direction in the vicinity of the Tonopah Test Range

with clay predominating in the playa areas and in the gravels and sands under the alluvial fans. The permeability of these alluvial materials is quite variable with very low permeabilities associated with the fine-grained clays and silts, moderate permeabilities associated with poorly sorted mixtures and cemented or consolidated alluvium,and highest permeabilities occurring where the highest proportions of uncemented gravels and sands are located.

HYDROLOGIC/HYDRAULIC PROPERTIES—Transmissivity is defined as the rate at which groundwater flows through a unit width of an aquifer under a unit hydraulic gradient. Porosity is defined as the percentage of the volume of rock that is occupied by connected or isolated interstices (tiny open spaces). Estimated transmissivities and porosities for some of the principal hydrogeologic units are summarized in Table 4-25 (Winograd and Thordarson, 1975).

In general, water moves most rapidly through the fractured limestones and dolostones and less rapidly through valley-fill alluvium and fractured volcanic rocks; water moves most slowly through playa deposits, nonfractured volcanic rocks, quartzites, siltstones, and shales. In the limestones and dolostones, the relatively high transmissivities are associated primarily with fractures and dissolution features.

In the volcanic rocks, water movement occurs along bedding planes and cooling joints of lava-flow sheets and welded-flow units. In some locations, the overlying unaltered volcanic section is abundantly fractured and has retained its permeability. In the valley-fill deposits, transmissivity is dependent on the amount of clay and mineralization and on the degree of consolidation.

GROUNDWATER OCCURRENCE—Occurrences of groundwater are discussed in separate subsections for water levels and for groundwater flow and gradients.

Water Levels—The depth to the groundwater in wells at the NTS varies from about 79 m (260 ft) below land surface in the extreme northwest part of the NTS and about 160 m (525 ft) below land surface in portions of Frenchman Flat and Yucca Flat weapons test basin (Winograd and Thordarson, 1975) to more than 610 m (2,000 ft) under the upland portions of Pahute Mesa (Russell, 1994). Perched groundwater is known to occur in some parts of the NTS, mainly in the volcanic rocks of the Pahute Mesa area.

Groundwater Flow and Gradients—The present conceptual groundwater flow model for the Death Valley flow system is derived primarily from Winograd and Thordarson (1975) and updated by Waddell et al. (1984) and Laczniak et al. (1996). More recently, additional conceptual models of the system have been published by PAL Consultants (1995), Faunt (1994), and D'Agnese (1994). Groundwater flows generally south and southwest. The flow system extends from the water table to a depth that may exceed 1,494 m (4,900 ft) where the transmissivity of the rocks becomes much smaller (ERDA, 1977).

The rates of flow are quite variable, reflecting the types of aquifers present, the degree of fracturing and secondary dissolution of carbonate aquifers, and the hydraulic gradients that are present in a given area. In general, average flow rates over broad areas were estimated by Winograd and Thordarson (1975) to range from 2 to 201 meters per year (m/yr) (7 to 660 feet per year [ft/yr]), but rates can be much lower or much higher over short distances in certain geologic settings. Significant components of vertical groundwater flow are present in certain areas. For example, in the Frenchman Flat area, groundwater recharge derived from Indian Springs Valley on the east and the Yucca Flat weapons test basin on the north moves primarily downward into the underlying carbonate aquifers.

According to information provided by the U.S. Department of the Interior, flow rates may increase in the vicinity of Ash Meadows. The National Park Service is concerned that contaminant transport may be accelerated toward Devils Hole and Ash Meadows. Because contaminants that remain in the underground testing areas are almost exclusively contained in the alluvial and volcanic aquifers, they must first migrate out of these aquifers and into the carbonates. Therefore, DOE's efforts to model these contaminants has concentrated on the rate of transport between the aquifers, currently thought to be significantly slower than in the carbonates. The DOE will continue to participate in cooperative investigations with the National Park Service concerning environmentally sensitive areas downgradient of the NTS.

WATER BALANCE—Within the Death Valley flow system, recharge occurs as underflow from upgradient areas and from infiltration of precipitation primarily in the northern and eastern mountain ranges, while discharge occurs primarily in the southern and western low-lying valleys. Discharge locations are controlled by the presence of low-permeability materials that force groundwater to the land surface or by the lower elevations of Death Valley.

Recharge—The groundwater underlying the NTS and surrounding areas is derived from two sources: underflow from basins upgradient of the area and from recharge over the upland areas within the NTS boundaries.

Cumulative underflow from adjacent areas is significant (see Figure 4-41a). Harrill et al. (1988) estimated underflow of 3.9×10^7 m^3 /yr (32,000 acre-feet/year) discharge from Indian Springs Valley westward into Frenchman Flat.

Table 4-25. Summary of hydraulic properties of major hydrogeologic units

Hydrogeologic Unit	Approximate Range of Transmissivities: m^2 per day	Approximate Range of Transmissivities: ft^2 per day	Approximate Range of Porosities (%)
Limestones and dolostones	0.11 to 10,996	1.2 to 118,360	1 to 12
Tuff confining units	0.0016 to 180	0.017 to 1,936	20 to 48
Lava flow aquifers	0.00021 to 5.0	0.002 to 54	32 to 45
Tuff aquifer (welded)	0.00024 to 2,299	0.0025 to 24,748	7 to 36
Tuff aquifer (bedded)	Not Available	Not Available	20 to 53
Valley-fill aquifer	0.0019 to 340	0.02 to 3,658	10 to 54

They estimated that the underflow of 6.2×10^6 m^3/yr (5,000 acre-feet/year) and 1.2×10^6 m^3/yr (1,000 acre-feet/year) is derived from Kawich Valley and Gold Flat, respectively. estimated that small to moderate volumes of water (0.1 to 7.4×10^6 m^3/yr [80 to 6,000 acre-feet/year]) may enter the carbonate aquifer in the Ash Meadows groundwater basin by underflow from the northeast. Thus, the total underflow onto the NTS is at least 4.7×10^7 m^3/yr (38,000 acre-feet/year), based on Harrill et al. (1988), and could be as high as 5.4×10^7 m^3/yr (44,000 acre-feet/year) if the inflow suggested by Winograd and Thordarson (1975) is considered.

Upland recharge occurs predominately by slow percolation of surface water through the unsaturated zone that overlies the water table. Most of this recharge is restricted to higher elevations where precipitation is greatest and along upland canyons and alluvial fans adjacent to upland areas. Recharge from upland areas of the NTS is far more limited, about 4.2×10^6 m^3/yr (3,400 acre-feet/year), one-tenth of that derived from underflow. Most of the recharge originates over the upland areas of Pahute Mesa, Timber Mountain, and the Belted Range.

Discharge—Most of the natural annual discharge from the Death Valley flow system is transpired by plants or evaporated from soil and playas in the Amargosa Desert and Death Valley. This discharge is estimated to be about 2.1×10^7 m^3/yr (17,000 acre-feet/year) from the Ash Meadows area and about 1.1×10^7 m^3/yr (9,000 acre-feet/year) from the Alkali Flat-Furnace Creek Ranch area (Rush, 1970). Less than 1×10^6 m^3/yr (a few hundred acre feet/year) may continue southward through alluvium of the Amargosa arroyos, and as much as 6.2×10^6 m^3/yr (5,000 acre-feet/year) yearly may flow westward from the Amargosa Desert to springs in Death Valley (ERDA, 1977).

Discharge at Ash Meadows and Oasis Valley is structurally controlled; the presence of low-permeability rocks retards regional flow. This geologic setting creates high water levels that result in local spring discharge and evapotranspiration. However, some water may flow into the Alkali Flat-Furnace Creek Ranch area and discharges at springs near Furnace Creek Ranch (Winograd and Thordarson, 1975).

Within the NTS, groundwater discharge is much smaller and is limited to a few springs in the upland areas and several wells. The springs discharge waters from perched zones in the upland areas. Discharge from the springs is small; three springs discharge between 8 and 30 liters per minute (L/min) (2 and 8 gal/min), while the rest discharge less than 4 L/min (1 gal/min) (DOE, 1988). The springs are important sources of water for wildlife, but they are too small to be of use as a water supply source. The chemistry of these springs is summarized in Tables 4-18, 4-19, and 4-21 in the surface hydrology section (4.1.5.1). Well pumping varies from year to year and ranges between 1.2 and 2.5 million m^3/yr (1,000 and 2,000 acre-feet/year) (Russell, 1994).

Discharge to springs and wells is small compared to the natural discharge of groundwater from the NTS through subsurface flow to Rock Valley and the Amargosa Desert, which totals an estimated 5.2×10^7 m^3/yr (42,000 acre-feet/year) (Harrill et al., 1988).

GROUNDWATER QUALITY—Groundwater quality within aquifers on the NTS is generally acceptable for drinking water and industrial and agricultural uses. According to EPA guidelines for groundwater classification, all hydrologic units that supply drinking water to the NTS are classified as Class II groundwater (Chapman, 1994). Class II refers to groundwater that is either currently being used as a source of drinking water or that could be a source of drinking water.

Recent updates in the interpretation of chemical analyses of groundwater collected at and near the NTS are discussed in Chapman and Lyles (1993). Table 4-26 presents a summary of water chemistry data for selected wells and compares the results to

Table 4-26. Summary of 1993 water chemistry data for select wells on the NTS

Well Name	Calcium (mg/L)[a]	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Alkalinity (mg/L)	Hardness[b] (mg/L)	pH (unitless)	Sp. Cond.[c] (μS/cm)[d]	TDS[e] (mg/L)
Army Well 1	44	22	5	39	261	0	15	1.07	1.9	55	214	201	7.96	542	312
Well 5b	8	2	11	93	161	10	23	0.85	2.7	58	148	28	8.6	496	338
Well 5c	2	1	7	134	278	24	10	1.04	1.5	33	264	9	8.93	572	396
Well 4	24	8	5	48	149	7	12	0.8	6.8	42	134	93	8.26	401	288
Well 4a	22	6	6	55	159	5	9	0.81	NA	35	138	80	8.22	385	283
Well C	74	29	14	125	576	0	33	1.09	1.6	66	472	304	7.38	1,070	639
Well C1	73	28	13	121	578	0	34	1.14	0.6	66	474	298	7.47	1,070	639
Well 8	8	1	3	30	71	5	7	0.81	1.3	14	66	24	8.28	196	149
UE-16d	79	24	7	30	356	0	11	0.56	0.6	58	292	296	7.89	645	401
J-12	15	2	5	41	120	0	8	1.8	2	25	98	46	8.15	277	209
J-13	12	2	5	44	124	0	7	2.26	2.2	18	102	38	7.97	280	209
EPA[f] DWS	NS[g]	NS	NS	NS	NS	NS	250	2.0	10.0	250	NS	NS	6.5 to 8.5	NS	500

NOTE: The following elements are present in trace quantities below Safe Drinking Water Act limits: arsenic, boron, chromium, iron, manganese, selenium, silver, barium, cadmium, copper, lead, mercury, silica, and zinc.

NA=not applicable.

[a] Milligrams per liter = parts per million
[b] Hardness is expressed as calcium carbonate
[c] Specific conductivity
[d] Microsiemen per centimeter
[e] Total dissolved solids
[f] EPA Drinking Water Standards
[g] No standard exists.

Source: REECo, 1991.

the EPA Drinking Water Standards. Water chemistry varied from a sodium-potassium-bicarbonate type to a calcium-magnesium-carbonate type, depending on the mineralogical composition of the aquifer source.

Wells producing from the mesas (predominantly the volcanic aquifer system) yielded water containing between 150 and 200 milligrams per liter (mg/L) (parts per million [ppm]) of total dissolved solids. Ash Meadows groundwater produced higher values of total dissolved solids, ranging from 275 to 460 mg/L (275 to 460 ppm). Water from Wells C and C1 in the southern part of the Yucca Flat weapons test basin (Figure 4-42) had about 650 mg/L (650 ppm) of total dissolved solids that slightly exceed the primary recommended limit of 500 mg/L (500 ppm), but falls within the secondary limit of 1,000 mg/L (1,000 ppm) of total dissolved solids (EPA, 1992). Additionally, Wells 5B and 5C had pH values of 8.6 and 8.9, respectively, which slightly exceed the primary EPA drinking water standard for pH of 8.5. One well on the NTS produces water with fluoride concentrations that equal or exceed guidelines for continuous use (ERDA, 1977). Periodic groundwater monitoring for volatile organic compounds is performed at the NTS. Results from groundwater monitoring indicate that, except for one occurrence in 1992, no volatile organic compounds are present. In 1992, one volatile organic compound, 1,1,1,-trichloroethane, was detected in a sample collected from Area 6 Well 4a at a concentration of 2.1 μg/L (2.1 parts per billion), which was well below the drinking water standard of 200 mg/L (200 parts per million) Annual Site Environmental Report, 1991, (DOE/NV, 1992b). At that time, Well 4a had been recently developed and had not yet been connected to a distribution system. Samples for analysis from Well 4a were taken in May 1992. These analyses did not indicate the presence of volatile organic compounds, Annual Site Environmental Report, 1992, (DOE, 1993). Trends from recent analysis indicate no further presence of volatile organic compounds is expected to be detected in potable water wells (Annual Site Environmental Reports for years, (DOE/NV, 1992b, 1993, 1994a, and 1995b).

Much of what is known about radiologic sources in the groundwater and contaminant migration is derived from studies conducted by the Hydrologic Resources Management Program, and the Environmental Restoration Program. Monitoring programs are discussed in a later section and general findings of the other programs are discussed below.

RADIOLOGIC SOURCES IN GROUNDWATER—With respect to the current disposition of radioactivity at the NTS, it is important to note the difference between the total radionuclide source term and the hydrologic source term. The total radionuclide source term is considered as the total activity from all underground tests that were conducted beneath the water table or within 101 m (330 ft) of the top of the water table. Table 4-27 summarizes the isotopes and their remaining activities as of January 1, 1994. The total remaining inventory under, or within 101 m (330 ft) of, the water table is estimated to be 1.1 x 10^8 Ci (Benjamin, 1995). Of this quantity, an estimated 7.7 x 10^7 Ci is isolated on Pahute Mesa, and an estimated 3.5 x 10^7 Ci is isolated at the other testing areas, predominantly Yucca Flat and Frenchman Flat. These activities represent the remaining isotopes that could be available to the groundwater regime. There is considerable uncertainty concerning the actual quantity of this radioactivity that can enter the groundwater regime-- that is, the hydrologic source term. Most investigators have concluded that much of the radioactivity, exclusive of tritium, released during an underground detonation remains in the melt glass in the original cavity, especially the refractory isotope species, while the more volatile nuclides tend to condense on the chimney rubble. Refractory species include plutonium, rare earth elements, zirconium, and alkaline earth elements; the volatile species include alkali metals, ruthenium, uranium, antimony, tellurium, and iodine. The most mobile isotopes are the gaseous species, including argon, krypton, and xenon, which tend to rise through the chimney and may ultimately seep out to the surface.

The mechanisms by which radionuclides can enter the groundwater include leaching from the melt glass and condensation in the cavity and chimney; injection into fractures outside the cavity during the

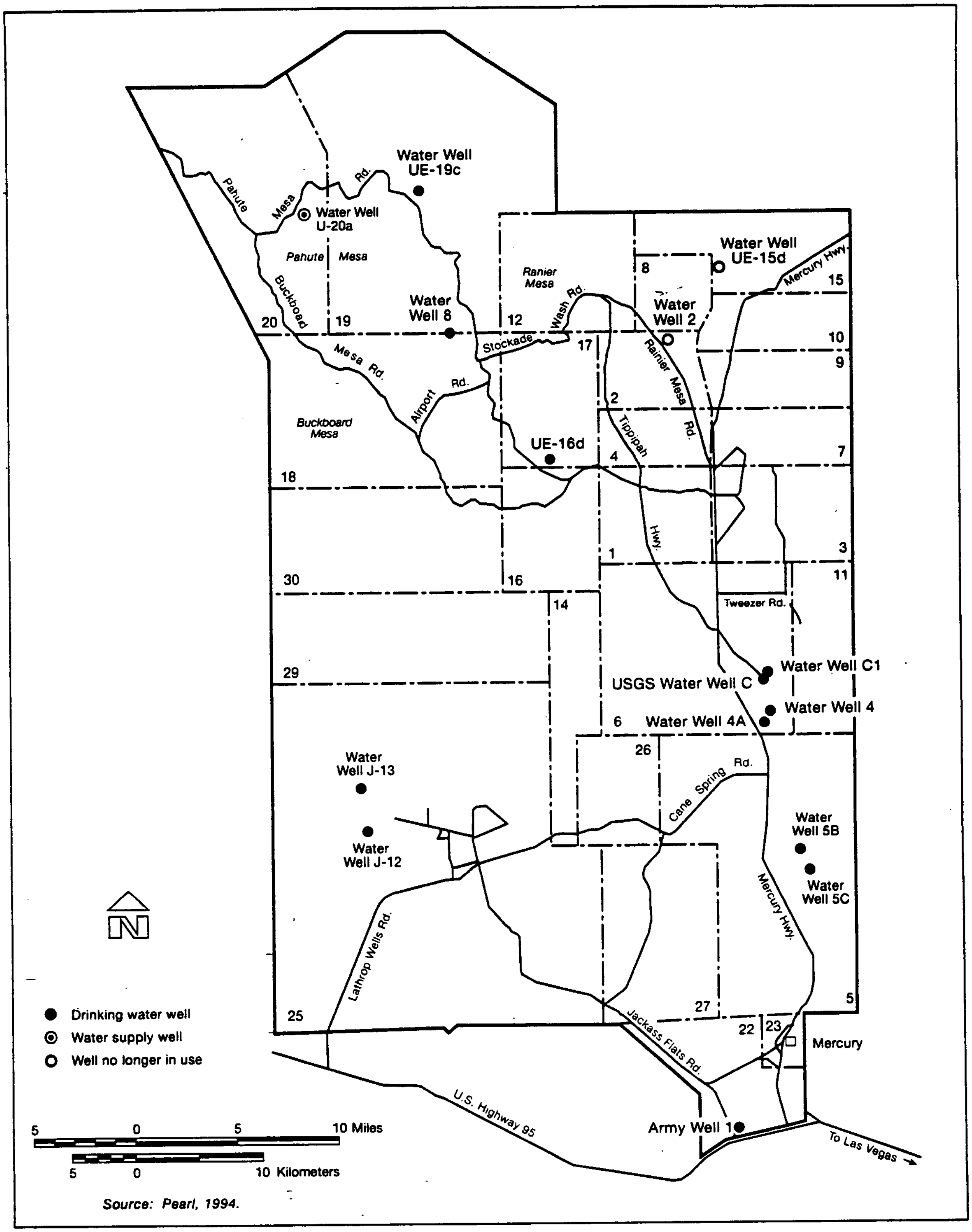


Figure 4-42. Groundwater quality sampling locations on the NTS

Table 4-27. Remaining isotope inventory under or within 100 m (330 ft) of the water table (Page 1 of 2)

Isotope	Curie Not On Pahute Mesa	Curie On Pahute Mesa
Hydrogen-3	3.07×10^{7}	6.99×10^{7}
Carbon-14	8.60×10^{2}	5.55×10^{2}
Aluminum-26	4.17×10^{-2}	8.94×10^{-3}
Chlorine-36	2.27×10^{2}	2.14×10^{2}
Argon-39	9.61×10^{2}	1.85×10^{3}
Krypton-40	2.47×10^{2}	4.69×10^{2}
Calcium-41	1.70×10^{3}	1.64×10^{3}
Nickel-59	4.23×10^{1}	3.99×10^{1}
Nickel-63	5.14×10^{3}	4.21×10^{3}
Krypton-85*	6.88×10^{4}	1.49×10^{5}
Krypton-85	5.40×10^{4}	9.54×10^{4}
Strontium-90	7.26×10^{5}	1.19×10^{6}
Strontium-90	8.93×10^{5}	1.84×10^{6}
Zirconium-93	2.63×10^{1}	4.17×10^{1}
Zirconium-93	3.11×10^{1}	6.17×10^{1}
Niobium-93m	6.35×10^{3}	7.59×10^{3}
Niobium-94 a	8.26×10^{-3}	1.44×10^{-2}
Niobium-94g	1.95×10^{2}	1.73×10^{2}
Technetium-99	1.90×10^{2}	3.07×10^{2}
Technetium-99	2.23×10^{2}	4.32×10^{2}
Palladium-107	1.01	1.67
Palladium-107g	9.70×10^{-1}	1.57
Cadmium-113	6.17×10^{2}	1.38×10^{3}
Cadmium-113m	4.83×10^{2}	1.16×10^{3}
Tin-121*	2.42×10^{3}	5.14×10^{3}
Tin-121m	1.95×10^{3}	4.31×10^{3}
Tin-126	2.88×10^{1}	6.02×10^{1}
Tin-126	2.35×10^{1}	4.92×10^{1}
Iodine-129*	6.51×10^{-1}	1.29
Iodine-129	5.50×10^{-1}	9.45×10^{-1}
Cesium-135	2.32×10^{1}	4.47×10^{1}
Cesium-135g	2.00×10^{1}	3.17×10^{1}
Cesium-137*	1.09×10^{6}	2.15×10^{6}
Cesium-137	9.15×10^{5}	1.51×10^{6}
Samarium-151*	3.69×10^{4}	6.90×10^{4}
Samarium-151	3.23×10^{4}	5.71×10^{4}
Europium-150	8.86×10^{1}	1.11×10^{3}
Europium-152*	8.03×10^{-2}	1.90×10^{-1}
Europium-152	6.40×10^{4}	3.29×10^{4}
Europium-154	4.84×10^{4}	1.55×10^{4}
Holmium-166*	1.22×10^{-2}	1.88×10^{-2}
Holmium-166m	5.06×10^{1}	4.48×10^{1}
Thorium-232 Device	4.01×10^{-4}	5.84×10^{-2}
Thorium-232 Soil	1.77×10^{1}	3.38×10^{1}
Uranium-232	3.65×10^{2}	2.55×10^{2}
Uranium-233	1.50×10^{2}	1.71×10^{2}

Table 4-27. Remaining isotope inventory under or within 100 m (330 ft) of the water table (Page 2 of 2)

Isotope	Curie Not On Pahute Mesa	Curie On Pahute Mesa
Uranium-234 Device	1.41×10^{2}	1.23×10^{2}
Uranium-234 Soil	8.85	1.67×10^{1}
Uranium-235 Device	3.79	1.66
Uranium-235 Soil	4.15×10^{-1}	7.94×10^{-1}
Uranium-236	3.42	4.73
Uranium-238 Device	7.00	2.19
Uranium-238 Soil	8.83	1.67×10^{1}
Neptunium-237	1.10×10^{1}	3.65×10^{1}
Plutonium-238	1.18×10^{4}	7.16×10^{3}
Plutonium-239	2.88×10^{4}	1.93×10^{4}
Plutonium-240	7.42×10^{3}	6.20×10^{3}
Plutonium-241	1.03×10^{5}	9.00×10^{4}
Plutonium-242	4.52	3.36
Americium-241	6.83×10^{3}	4.67×10^{3}
Americium-243	3.42	1.79×10^{-1}
Curium-244	2.35×10^{3}	2.97×10^{3}
Total Activity	3.27×10^{7}	7.30×10^{7}
Total Fission Products	2.09×10^{6}	4.21×10^{6}
Total Source Term	3.48×10^{7}	7.72×10^{7}
NTS Grand Total	1.12×10^{8}	

* Fission products.

first milliseconds after the test; and interactions between gaseous species and the groundwater.

The leaching of radionuclides from the rubble is probably an important pathway for tests that were conducted under the water table or in or under perched aquifers. Once detonation has occurred, the groundwater within the cavity area is vaporized and some portion of this vapor is forced by the shock wave out of the cavity and into the surrounding host rock. With time, groundwater gradually flows back into the cavity and chimney and comes into direct contact with the radionuclides that have condensed onto the chimney rubble. Depending on the solubility of the radionuclides, the groundwater dissolves the residues until chemical equilibrium has been achieved. Once dissolved, the radionuclides are available for migration through groundwater flow.

Leaching of radionuclides from the melt glass and cavity rubble probably has occurred to some degree. According to Borg et al. (1976), past studies have asserted that (1) less than 1 percent of the radionuclides in the melt glass near the bottom of the chimney will be sorted onto the chimney rubble and (2) most of the tritium will be mixed with the water in the chimney and cavity at times for about 1 year, and some tritium may be trapped in the melt glass. The leaching of radionuclides from the melt glass probably occurs over extended periods of time with the leachate available for transport through groundwater flow. The release of radionuclides through the leaching pathway continues to be an area of active research and, with time, a better understanding of the true hydrologic source term could be had.

Fracture injection provides the final pathway for the introduction of radionuclides into the hydrogeologic regime. Water vapor discharged from the cavity immediately following the detonation is seismically pumped into the fractures that are formed by the test and through other fractures that are opened by the shock wave. As discussed previously, the area over which this phenomenon occurs is believed to be about 3 cavity radii from the cavity. Thus, for a cavity with a diameter of 610 m (2,000 ft), the injection of radionuclides into rock fractures is expected to occur outward to a distance of 914 m (3,000 ft) from the cavity. Following the achievement of equilibrium conditions, radionuclides that have been injected into fractures under the water table are available for transport through groundwater flow.

As noted in the preceding discussion, tritium is one of the most mobile of the radionuclides present in the subsurface environment surrounding an underground nuclear test. It is also present at higher concentrations than other radionuclides for a period of 100 to 200 years following a test, and is generally believed to be present principally as part of a free water molecule rather than being bound in the puddle glass that contains the large majority of the radionuclides remaining after a test. Tritium is known to migrate when induced by nearby pumping, while many other radionuclides remain in or near the cavity (Bryant, 1992). Therefore, tritium represents the radionuclide of greatest concern to users of groundwater for at least the next 100 years because of its mobility and high concentration. It is for these reasons that, in assessing the impacts from the groundwater pathway, tritium is the radionuclide used in the modeling processes discussed in later chapters of the EIS. Other radionuclides either do not move as rapidly and are not a consequence in the assessments, or are of much lower concentrations.

About a dozen instances of migration of radionuclides other than tritium have been documented (Nimz and Thompson, 1992). The largest distance of migration does not exceed 500 meters (1,640 ft). Migration of tritium is more difficult to interpret, but is thought to have migrated no more than several kilometers.

As noted by Borg et al. (1976), the analysis of water samples for specific isotopes at random sites on the NTS is complicated and "it is possible that only relative or quantitative conclusions could ever be made from such data. Such conclusions, nonetheless, may be important." In recent years, the drilling of new characterization wells and the retrofitting of existing boreholes and wells by the Environmental Restoration Program have provided valuable new data that are now being integrated into the overall database so that new evaluations can be made. These studies and planned future studies covered by this EIS will help to reduce the current levels of uncertainty concerning both the mechanisms and consequences of radionuclide transport via groundwater flow at the NTS. The other pathway by which radionuclides are known to have migrated from the cavity and chimney is the air pathway.

While radionuclides that remain in the environment are of the most significance, there are also other materials that are used in testing that may be available for groundwater transport. Table 4-28 lists the materials that are introduced into the subsurface as part of the actual testing and during post-detonation drillback operations. The nonradioactive species include numerous metals, organic compounds, and drilling products. Following the detonation, most of the metals are either vaporized or undergo neutron activation and are accounted for in the radionuclide inventory. The fate of the organic compounds and drilling fluids is not fully understood. No estimates are available concerning the total quantity of these materials that may still remain in the subsurface at the NTS.

From a regional perspective, the distribution of the radionuclide source term can be determined by the location of underground tests. In other words, a traditional "plume map" can be approximated by the map of underground tests on Plate 2, Volume 2. Only one of those tests, Corduroy, in Yucca Flat, was conducted in the carbonate aquifer. The remainder were conducted in the alluvial or volcanic aquifers. Within the areas of testing significant quantities of clean water remain because of the limited migration of radionuclides in the groundwater.

WATER SUPPLY—There are physical, environmental, legal, and administrative limitations on the availability of the water resources from the NTS and surrounding regions for development of water supplies.

The physical limitations are due to the water-yielding properties of the aquifers present. In

Table 4-28. Materials used in underground nuclear testing

Fuels, Detectors, Tracers	Rack and Canister Materials	Organic Compounds	Drilling and Stemming Materials
Americium[a]	Aluminum	Alcohol	Bentonite
Curium[a]	Arsenic	Anionic Polyacrylamide	Cement
Neptunium	Barite	Coal-Tar Epoxy	Gel
Plutonium	Beryllium[a]	Complex Fluorescing Compounds[b]	Gravel
Tritium	Boron	Galacto-Mannans $(C_6H_{10}O_5)_n$	Modified Starch
Uranium	Cadmium	Laser Dyes[c]	Neoprene®
Lithium	Chrome Lignosulfate	Liquid Anionic Polyelectrolyte	Polyethylene
Yttrium[a]	Chromium	Paraformaldehyde	Pregelatinized Starch
Zirconium[a]	Copper	Phenolic	Sand
Thulium	Gold	Polystyrene	Sepiolite
Lutetium[a]	Iron	Polyvinyl Chloride	Soda Ash
	Lead[d]	Two-Part Epoxy	Sodium Montmorillonite
	Lithium		Surfactant TF Foamer
	Magnetite[e]		Teflon™
	Nickel[a]		
	Osmium		
	Potassium Chloride		
	Sodium Hydroxide		
	Tantalum		
	Thallium		
	Tungsten		
	Zinc[a]		

[a] Less than 100 grams (3 ounces) typically used
[b] Fluorescing compounds and laser dyes used in some detector packages may contain potentially hazardous organic constituents
[c] Contains theophylline, ethylenediamine, carbonic acid disodium salt
[d] Extensive quantities of lead (57.2 metric tonnes) are typically used as shielding material for device canisters and racks
[e] Magnetite is naturally occurring Fe_3O_4 containing thorium and other heavy rare earths.

Source: Bryant and Fabrika-Martin, 1991.

general, well yields are poorest in volcanic rocks of Pahute Mesa and in the fine-grained playa sediments of Emigrant Valley and Cactus, Yucca, and Frenchman Flats.

Well yields are moderate to high in the fractured volcanic rocks of the southwest part of the NTS, in the fractured carbonate rocks that underlie the eastern part of the facility, and from the alluvium where adequate saturated thicknesses are present. The production capacities of the existing watersupply wells range from about 644 to 2,650 L/min (170 to 700 gal/min) with a total capacity of about 11,356 L/min (3,000 gal/min) or about 6.0 x 10^6 m^3/yr (4,840 acre-feet/year).

Beyond the physical availability of the water, there are water chemistry limitations that render portions of the NTS unsuitable for groundwater development. As discussed in the previous section, more than 230 nuclear tests have been conducted below or in close proximity to the water table (Bryant and Fabrika- Martin, 1991). These tests have resulted in contamination of the near test environment with radionuclides (Borg et al., 1976), and localized contamination of groundwater has occurred as a result of some tests (Nimz and Thompson, 1992). Because of these underground tests, much of Yucca Flat, portions of Frenchman Flat, and portions of Pahute Mesa may require restrictions to additional groundwater development.

There are sensitive environments downgradient of the NTS, including Death Valley, Devils Hole, and the wetland environment at Ash Meadows. A number of federal and state laws prohibit the development of water supplies that would adversely impact these environments (Dudley and Larson, 1976).

As part of their groundwater investigations being conducted through the Environmental Restoration Program, the DOE is developing regional groundwater flow and tritium transport models that include the NTS and the Ash Meadows area. These models will be of use in evaluating the effects of past DOE actions and future DOE groundwater withdrawals on the NTS. The DOE is also working with the National Park Service in evaluating observed water level fluctuations at Devils Hole.

Water-resource use in support of the primary missions of the NTS is not subject to state water appropriation laws. The NTS, under the Federal Reserve Water Rights doctrine, is entitled to withdraw the quantity of water necessary to support the NTS missions. Water used for other actions that are determined to be outside the mission will require the appropriation of the water in accordance with Nevada's water law. Presently, the water resources of the Alkali Flat-Furnace Creek Ranch basin are fully appropriated, and it may not be legally possible to develop or use water in the western part of the NTS for purposes beyond the missions of the facility. Unappropriated groundwater is available in the Ash Meadows basin and is subject to the rights of the senior water rights holders.

Administrative limitations on the groundwater resources are primarily related to ongoing tests and activities. Extensive site characterization activities are in progress by both the Environmental Restoration Program and Yucca Mountain Projects, and experiments are being conducted by the Hydrologic Resources Management Program.

A considerable quantity of groundwater is in storage in the sediments and rocks underlying the NTS and surrounding regions. An estimated 2.7×10^9 m^3 (2.2×10^6 acre-feet) of groundwater are held in storage in the upper 30 m (100 ft) of the saturated zone in the Yucca Flat basin, Frenchman Flat, Mercury and Rock Valleys, and Fortymile Canyon (Scott et al., 1971). With certain limitations, this groundwater is an available resource for development of water supplies at the NTS. Well water is produced from the upper carbonate, volcanic tuff, and valley-fill aquifers.

<u>WATER USE</u>—Historically, domestic, industrial, and construction water supplies were provided by 15 water wells dispersed across the NTS, as shown in Figure 4-5. In the past several years as nuclear testing activities declined and the demand for water decreased accordingly, the total number of water wells supporting NTS operations has decreased to 12; a list of active water wells on the NTS is given in Table 4-29. Drinking water on the NTS is currently provided by 11 wells and is supplemented by bottled water in remote areas. Construction and fire-control water are supplied by other wells in addition to the potable water supply wells. Springs and seeps are not used for water-supply purposes.

Groundwater is used by small communities and scattered population areas. The communities of Indian Springs and Beatty used approximately 8.0×10^5 m^3 (660 acre feet) and 5.0×10^5 m^3 (390 acre feet) of groundwater, respectively, for potable, industrial/ commercial, and agricultural purposes in 1992 (Wood, 1994). The Saint Joe Bullfrog Mine, located west of Beatty, used approximately 2.0×10^6 m^3 (1,640 acre feet) of groundwater in 1992 for potable and operation supply needs. In scattered population areas, groundwater usage was estimated for 1992 by areas as follows: Amargosa Valley, 8.0×10^6 m^3 (6,500 acre feet); Pahranagat Valley, 6.3×10^6 m^3 (5,100 acre feet); Penoyer Valley, 1.5×10^7 m^3 (12,300 acre feet); and Three Lakes Valley, 4.0×10^5 m^3 (350 acre feet) (Wood, 1994). Near Ash Meadows, groundwater usage is limited because of impacts on water levels in Devils Hole. The Devils Hole pupfish, an endangered species, relies on maintenance of the existing water level provided by spring flow for its continued existence (Dudley and Larson, 1976) (Section 4.1.6, Biological Resources). In addition, the U.S. Supreme Court has ruled that maintenance of water levels in Devils Hole has precedence over water uses for other purposes in the area. A study for the Las Vegas Valley Water District (Avon and Durbin, 1994) found no statistical correlation between water usage on the NTS and water levels in Devils Hole.

Preliminary groundwater modeling was performed as part of this EIS, and additional, detailed modeling is underway. As part of the groundwater investigations being conducted through the

Table 4-29. Summary of 1993 water well and discharge information for the NTS

Well Name	Aquifer	Depth		Static Water Level (depth)		Pump Setting (depth)		Yield		[a]Annual Pumpage (Mm^3 [b])	Annual Pumpage ac-ft
		m	ft	m	ft	m	ft	m /min	yd^3/min		
Army Well 1	Carbonate	593.14	1,945	210.31	690	289.86	951	2.01	2.6	0.4178	338.7
Well 5c	Alluvial	361.80	1,187	211.23	693	238.96	784	1.23	1.6	0.2393	194
Well 5b	Alluvial	274.32	900	208.48	684			1.02	1.3	0.1126	91.31
Well 4	Volcanic	450.80	1,479	286.82	941	387.40	1,271	2.46	3.2	0.2856	231.51
Well 4a	Volcanic									0.4172	338.22
Well C	Carbonate	518.46	1,701	470.61	1,544	473.35	1,553	1.02	1.3	0.2390	193.78
Well C1	Carbonate	520.29	1,707	471.83	1,594	484.94	1,591	1.06	1.4	0.0357	28.95
Well 8	Volcanic	1,673.35	5,490	327.05	1,073	374.29	1,228	1.51	1.9	0.1185	96.11
UE-16D	Carbonate	914.40	3,000	230.12	755	330.10	1,083	0.73	.94	0.1813	146.95
J-12	Volcanic	347.17	1,139	225.25	739	250.55	822	3.09	4.0	0.0945	76.64
J-13	Volcanic	1,063.14	3,487	283.16	929	350.82	1,151	2.57	3.4	0.1584	128.38
UE-5c[c]	Alluvial									0.0278	22.52
UE-19c[d]	Volcanic									0.0269	21.79
U-20a[c]	Volcanic									0.1058	85.80
									Total Usage	2.4606	1994.66

[a] Well yields calculated from controlled pump tests are typically within one order of magnitude of driller's estimates
[b] Million cubic meters
[c] Construction water well
[d] No longer in use.

Environmental Restoration Program, the DOE is developing regional groundwater flow and tritium transport models that include the NTS and these environmentally sensitive areas. These models will be of use in evaluating the effects of past DOE actions and future DOE groundwater withdrawals on the NTS. The results of these models are not yet available, but they will be available for future National Environmental Policy Act reviews prior to the construction of projects that are expected to result in significant adverse impacts. The DOE is also working with the National Park Service in evaluating observed water level fluctuations at Devils Hole.

The National Park Service continues to implement projects, collect data, support research, and conduct studies to investigate the probable cause of the decline of the Devils Hole pool level.

MONITORING PROGRAMS—On-site water wells and select off-site wells are monitored in accordance with the Safe Drinking Water Act and the Nevada Administrative Code regulations (REECo, 1991). Concurrently, the DOE monitors on-site wells and select off-site wells for specific radionuclides (not related to Safe Drinking Water Act requirements) (DOE/NV, 1993). Additionally, the state of Nevada performs independent monitoring. Analytical results for all monitoring activities are published in Annual Site Environmental Reports.

The following is a brief description of the six existing NTS groundwater monitoring programs:

- Environmental Surveillance Program - Radiological and nonradiological monitoring for Safe Drinking Water Act and DOE Order 5400.1 compliance

- U. S. Geological Survey Water-Level Monitoring Program - Monitoring for DOE Order 5400.1 compliance

- EPA Long-Term Hydrologic Monitoring Program - Radiological monitoring of nonwater supply wells and DOE Order 5400.1 compliance

- Radioactive Waste Management Site Assessment Program - Monitoring for Areas 3 and 5 Resource Conservation Recovery Act Part B permit

- Underground Test Area Corrective Action Unit Monitoring Program - Monitoring of far-field and near-field wells for specific groundwater quality parameters

- Hydrologic Resources Management Program - Monitoring in support of the investigation of the effects of underground testing on the hydrogeology, hydrochemistry, and radiochemistry of the NTS.

Under the Hydrologic Resources Management Program, the DOE has sponsored research by the Desert Research Institute, the U.S. Geological Survey, and the National Laboratories to help understand the groundwater flow directions and velocities and the mechanisms of radionuclide migration. Research under this program has included the development of chemical and isotopic models, a detailed evaluation of the hydrology of Yucca Flat, recharge and runoff studies, exploratory drilling and aquifer testing, shot-specific investigations, and radionuclide distribution studies.

As discussed previously, evidence for the transport of radionuclides produced by underground nuclear testing is scarce. The approximate areas of underground contamination, including the groundwater and vadose zones, have been estimated. Most available information is derived from borings drilled in support of underground testing rather than for investigating radionuclide transport. Nimz and Thompson (1992) summarized data collected as part of the Hydrology and Radionuclide Migration Program, the program's predecessors, and other agencies. Five cases were documented in borings as evidence of prompt injection of radionuclides into rock surrounding nearby cavities (a mechanism that does not involve transport in groundwater).

Nimz and Thompson (1992) reported five cases where radionuclide transport occurred in groundwater, and recent drilling for the Environmental Restoration Program has detected three more. However, one of the cases involved pumping for over 16 years to induce migration. Present studies are aimed at determining the nature and extent of the migration of contaminants. Other data suggest that U.S. Geological Survey Water Well A, UE-15d Water Well, and Test Well B Exploration Hole have produced low activities of approximately 100 to 150 pCi/L (Lyles, 1993), but levels have since dropped significantly.

The DOE sponsors several monitoring efforts by NTS contractors, the U.S. Geological Survey, and the EPA on and around the NTS. The objectives of the monitoring include detection of radionuclide migration from underground nuclear tests, assurance of the water supply network on the NTS, compliance with waste disposal permits, determination of aquifer characteristics, and research into the mechanisms of radionuclide migration. The types of monitoring currently underway include the following:

Water Supply—Water supply wells on the NTS are monitored in accordance with the Safe Drinking Water Act and the Nevada Administrative Code regulations (REECo, 1991) by the DOE and, independently, the state of Nevada. In addition, off-site municipal and private water supply wells are monitored as a courtesy to assure that no radionuclides related to underground testing are present.

Ambient Water Quality—Approximately 30 monitoring wells and 10 springs are sampled on and around the NTS to detect the presence of radionuclides. These wells serve to establish the quality of water in and around the NTS. No test-related contamination has been detected offsite, and contamination onsite is limited to the extent described above.

Radioactive Waste Management—Three groundwater monitoring wells are located at the Area 5 Radioactive Waste Management Site as part of the Resource Conservation and Recovery Act compliance requirements. No contamination has been detected.

Characterization and Research—Approximately 50 wells are presently in use to characterize groundwater conditions regionally or near underground nuclear tests. These wells are part of the Underground Test Area project and the Hydrologic Resources Management Program. Some are monitored on a regular basis, and many of these wells may be incorporated into the long-term monitoring network in the future.

Water Level—Approximately 70 wells are monitored to determine the level of the groundwater surface on and around the NTS. This information is used to help determine the effects of water usage on water quantity, for groundwater flow modeling, and to predict the occurrence of water in new wells and emplacement holes.

4.1.6 Biological Resources

The NTS is located along the transition zone between the Mojave Desert and Great Basin (Beatley, 1975, 1976). As a result, this site has a diverse and complex mosaic of plant and animal communities representative of both deserts, as well as some communities common only in the transition zone between these deserts. This transition zone extends to the east and west far beyond the boundaries of the NTS. Thus, the range of almost all species found on the NTS also extends far beyond the site, and there are few rare or endemic species found there (Table 4-30 and Appendix E).

Elevation is the most obvious factor affecting the distribution of plant and animal communities on the NTS and surrounding areas. Elevations increase from south to north, from a low of 819 m (2,688 ft) in Jackass Flats to a high of 2,341 m (7,679 ft) on Rainier Mesa (O'Farrell and Emery, 1976). Climate differences associated with this increase in elevation cause a change from Mojave Desert communities in the south to Great Basin communities in the north (Beatley, 1975).

The diversity of biological communities in this region is also influenced by topography. The valleys in the southern and western parts of the NTS (e.g., Jackass Flats, Rock Valley, and Mercury Valley) have drainage outlets. In contrast, the two large valleys on the eastern side of the NTS (Frenchman Flat and the Yucca Flat weapons test basin) and Emigrant Valley to the northeast (where Area 13 is located), are closed basins. The lack of

Table 4-30. Species listed as endangered, threatened, or candidates under the Endangered Species Act that may be found in the areas addressed under the NTS, Tonopah Test Range, Central Nevada Test Area, Project Shoal Area, Dry Lake Valley, Eldorado Valley, and Coyote Spring Valley[a]

	NTS[b]	TTR[c]	CNTA	PSA	DLV	EV	CSV
Endangered							
falcon, peregrine[d]	✓	✓	✓	✓			
Threatened							
tortoise, desert[e]	✓				✓		✓
eagle, bald[d]	✓	✓	✓	✓			✓
Candidates - Category 1[f]							
milkvetch, Beatley[g]	✓						
Candidates - Category 2[h]							
Plants							
Eggvetch, Clokey's	✓						
Cholla, Blue Diamond	✓						
Birds							
Plover, mountain	✓						

[a] Compiled from the following sources: Bradley and Moor, 1975; Beatley, 1976, 1977a,b; O'Farrell and Emery, 1976; Rhoads and Williams, 1977; Rhoads et al., 1978, 1979a,b; Castetter and Hill, 1979; Clark County, 1990; Medica, 1990; Medica et al., 1990; Mendoza, 1995; 50 CFR Part 17, 1993; DOI, 1992; Cooper, 1993; EG&G/EM, 1993a, b, and c, in prep; Harlow, 1994a; NAC, 1994.
[b] Includes Area 13
[c] Tonopah Test Range includes Double Tracks test area
[d] Animal species listed by the State of Nevada as endangered
[e] Animal species listed by the State of Nevada as threatened
[f] Taxa for which the U.S. Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened
[g] Plant species listed by the state of Nevada as "threatened with extinction" and "fully protected"
[h] Taxa that may warrant listing, but for which substantial biological information to support a proposal is lacking.

surface water drainage and cold air drainage out of these closed basins has created soil conditions, temperatures, and biotic communities that differ from those found at similar elevations in the open basins (Beatley, 1975 and 1976).

The North Las Vegas Facility is in the Southern Basin and Range Ecoregion. It was built on cleared, previously disturbed land that is now mostly covered by buildings, pavement, or landscaping. Exceptions include about 11 acres of undeveloped land at the western end of the North Las Vegas Facility (the designated area for proposed new construction associated with the National Ignition Facility), an open area, and a stormwater detention basin. No original undisturbed native vegetation remains on the site.

Few wildlife species exist at the North Las Vegas Facility because it is located in an urbanized area and contains little vegetation. The only species that exists are those adapted to urban habitats which may include small mammals such as house mouse (*Mus musculus*) and Norway rat (*Rattus norvegicus*); and ubiquitous bird species such as American robin (*Turdus migratorius*), European starling (*Sturnus vulgaris*), house finch (*Carpodacus mexicanus*), house sparrow (*Passer domesticus*), and rock dove (*Columba livia*).

FLORA—The following descriptions of vegetation are taken from Beatley (1976) and O'Farrell and Emery (1976), unless otherwise stated. The flora of the NTS has been studied extensively; over 700 plant taxa in at least 67 families have been found. One-third of these plant taxa are in three families: *Asteraceae* (sunflowers), *Poaceae* (grasses), and *Polygonaceae* (buckwheats). The scientific names of all plants mentioned in this section are presented in Appendix E.

Mojave Desert plant communities are found at elevations below approximately 1,219 m (4,000 ft) on the alluvial fans and valley bottoms of Jackass Flats, Rock Valley, and Mercury Valley, and on the alluvial fans of Frenchman Flat. Creosote bush is the visually dominant shrub, and it is associated with a variety of other shrubs, depending on soil type and elevation. Shadscale is codominant with creosote bush on most alluvial fans where desert pavement is well defined. On deep, loose soil, such as exists on southern Jackass Flats and northeastern Frenchman Flat, creosote bush is codominant with white bursage and is associated with species such as winterfat and Indian ricegrass. Range ratany, Nevada ephedra, and Fremont indigo bush are common in both communities. At roughly 1,067 to 1,219 m (3,500 to 4,000 ft) along the northern and eastern slopes of Jackass Flats and the western half of Frenchman Flat, creosote bush grows with hopsage and wolfberry.

Two plant communities are unique to the transition between the Mojave Desert and Great Basin Desert. The first is best developed at elevations from 1,219 to 1,524 m (4,000 to 5,000 ft) on alluvial fans and valley bottoms in the middle third of the NTS. The dominant shrub in this community is blackbrush, which occurs in mixed stands with creosote bush on the northern alluvial fans of Jackass and Frenchman Flats below about 1,372 m (4,500 ft). At higher elevations (e.g., in the bottom of Tonopah and Mid Valleys and on the western slopes of the Yucca Flat weapons test basin), blackbrush occurs in large, nearly monotypic stands. The second unique transition community occurs in the bottom of the enclosed Frenchman and Yucca Flat weapons test basins, where the trapped winter air is too cold for typical Mojave Desert plants (Beatley, 1974 and 1975). The most abundant shrubs in these areas are hopsage and three species of wolfberry. Winterfat also is common in silty soils. Shadscale, four-winged saltbush, and horsebrush also can be found in certain regions of enclosed basins. Little or no vegetation grows on the playas in these basins.

Plant communities typical of the desert that lie in the Great Basin occur at elevations generally above 1,524 m (5,000 ft) in the northern third of the NTS and in Area 13. Most of the basin floor is covered with shadscale, and winterfat is also common. On deep, loose soils at middle elevations (1,372 to 1,686 m [4,500 to 5,500 ft]), the plant community is dominated by four-winged saltbush. Sagebrush begins to appear at 1,524 m (5,000 ft) and is the dominant plant on large parts of Pahute Mesa and Rainier Mesa, as well as elsewhere in the northwest part of the NTS. Big sagebrush is the most abundant shrub on sites with deep soils in this area, and black sagebrush is most abundant on the shallow soils of slopes and uplands. Pinyon pine and Utah juniper are codominant with sagebrush above 1,829 m (6,000 ft), and form an open shrub-woodland.

Sites on the NTS with vegetation or soil modified by nuclear test activities, construction, or other disturbances usually have plant communities that are different from adjacent undisturbed areas. Some of the species that colonize disturbed areas (e.g., cheesebush and punctate rabbitbrush) are native plants that usually occur in washes. However, most species found on disturbed sites are ephemeral, introduced plants such as red brome, cheatgrass, Russian thistle, and red-stemmed filaree (Hunter, 1992a). Natural succession of disturbed areas on the NTS is generally a slow process. Studies of natural succession in the Mojave Desert have shown that several decades, or even centuries, may be required to establish similar plant cover and productivity (Webb and Wilshire, 1980; Angerer et al., 1994). Because of the increased and more consistent precipitation, succession rates in the Great Basin Desert are generally much quicker than those in the Mojave Desert. Active revegetation of sites can greatly enhance secondary succession. Studies have been conducted on the NTS and other sites in the arid southwestern United States to assess and improve revegetation techniques for arid environments (Wallace, 1980; EG&G/EM, 1995b; Schaller and Sutton, 1978; Allen, 1988). Variables that have been determined to be important in revegetation success are: adequate moisture during seed germination and establishment; favorable soil conditions including depth, texture, fertility, and reduced compaction; and species adapted or native to the site. Reclamation trials at Yucca Mountain and at NTS and Tonopah Test Range sites have shown that revegetation of disturbed areas is practical and that equivalent density and cover of vegetation can be accomplished much quicker (3-10 years) than through natural succession (EG&G/EM, 1995b).

Soils on the NTS and Area 13 that were contaminated during safety shots and are to be cleaned as part of the Soils Media Corrective Action Unit of the Environmental Restoration Program were only slightly disturbed. Therefore, the biological communities on those sites are generally similar to adjacent, undisturbed sites (Moor and Bradley, 1974; Rhoads, 1974; Hunter, 1994a).

The only biological communities on and around the NTS that are not widespread are those associated with springs or other permanent sources of water. There are at least 10 springs and 23 manmade impoundments on the NTS (Greger and Romney, 1994b). Most natural springs are on the mesas and mountains in the northern part of the NTS (Figure 4-40); most reservoirs are scattered through the valley bottom to the east and south. There are no springs in the valley bottom areas. Groundwater under the NTS flows primarily to the south and west and discharges from springs in Ash Meadows, Oasis Valley, and Death Valley (see Section 4.1.5, Hydrology). Most of the springs at the NTS support wetland (hydrophytic) vegetation, such as cattail, sedges, and rushes which likely constitute wetlands as defined by the U.S. Army Corps of Engineers pursuant to Section 4.04 of the Clean Water Act. Because there have been no plans to negatively affect these water sources, studies to characterize them and determine their potential as "jurisdictional wetlands" were deferred until the summer of 1996.

FAUNA—Over 1,000 species of arthropods have been identified on the NTS, but this probably represents a small fraction of the arthropod species present (O'Farrell and Emery, 1976). About 80 percent of these species are insects; ants, termites, and darkling beetles are the most common insect taxa.

Vertebrate species have been studied much more thoroughly. Approximately 279 vertebrate species have been observed on the NTS, including 54 species of mammals, 190 species of birds, 33 species of reptiles, and 2 species of introduced fishes (O'Farrell and Emery, 1976; Castetter and Hill, 1979; Medica, 1990; Medica et al., 1990; EG&G/EM, 1993c). Eighty-six percent of the bird species on the NTS are transients (O'Farrell and Emery, 1976). The scientific names of all animals in this section are presented in Appendix E.

Many of the predators and scavengers in this region are everywhere throughout the area. These include coyotes, bobcats, common ravens, red-tailed hawks, loggerhead shrikes, speckled rattlesnakes, and gopher snakes. Other common species are the long-tailed pocket mouse, desert woodrat, white-tailed antelope squirrel, black-tailed jackrabbit, black-throated sparrow, horned lark, Say's phoebe, western kingbird, side-blotched lizard, and desert horned lizard.

Many animal species on the NTS are common only in the Mojave Desert habitats to the south or the Great Basin Desert habitats to the north. Typical Mojave Desert species found on the NTS include kit fox, Merriam's kangaroo rat, desert tortoise, chuckwalla, western shovelnose snake, and sidewinder snake. Typical Great Basin species in this region include cliff chipmunk, Great Basin pocket mouse, mule deer, northern flicker, scrub jay, Brewer's sparrow, western fence lizard, and striped whipsnake. About 60 wild horses live on the northern part of the NTS, usually on or near Rainier Mesa (Greger, 1994).

Some animal species on the NTS are typically found only in restricted habitats. Desert kangaroo rats are associated with loose, sandy soils at lower elevations. Dark kangaroo mice are restricted to fine, gravel-like soils at higher elevations. Chuckwallas occur primarily in rocky outcrops. Desert night lizards are usually found in stands of yuccas. Many of the birds on the NTS, including almost all of the waterfowl and shorebirds, use the playas in Frenchman and Yucca Flat weapons test basin, artificial ponds at springs, and sewage lagoons during their migration and/or during winter (Hayward et al., 1963). Bats often seek food over these water sources. Wild horses occur in the northern half of the NTS and their distribution may be related to the location of man-made ponds. Camp 17 pond, in the northwest corner of Area 18, and Well 2 pond, in the northeast corner of Area 2, are heavily used by horses. During field surveys conducted in the summer and fall of 1995, a total of 52 horses were observed, and an estimated 35 horses appeared to consistently use the Camp 17 pond and 17 horses consistently used the Well 2 pond (EG&G/EM, 1995a). Deer most likely use these ponds as well.

As described in Section 4.1.5.1, surface runoff periodically ponds on the playas in Yucca and Frenchman flats. The length of time that water remains on playas, and the extent to which playas are used by migratory shorebirds are not routinely monitored. However, water has been observed on the playas for periods of days to months following rainstorms. Occasionally, migratory shorebirds have been observed if the playas have water on them during the spring or fall migratory season. If radionuclides and other contaminants were in these ephemeral ponds, migratory birds could be exposed to them. Because of the episodic nature, the short duration of ponding on playas, and the relatively small numbers of birds that visit during the migratory seasons, the hypothetical exposures would be infrequent and brief.

Several species of State-designated game animals occur in this region, including 1,500 to 2,000 mule deer (Giles and Cooper, 1985) and an unknown number of mountain lions, desert and Nuttall's cottontails, chukar, Gambel's quail, mourning dove, and several species of waterfowl. Bighorn sheep and pronghorns inhabit surrounding areas and may on occasion stray onto the NTS (O'Farrell and Emery, 1976). Bobcats and kit foxes are the only State-designated fur-bearing animals on the NTS. Bighorn sheep are hunted on the NAFR Complex. No other hunting or trapping is allowed on the NTS or the NAFR Complex.

<u>ENDANGERED AND THREATENED SPECIES</u>—Only one animal species listed as endangered, the peregrine falcon, has been reported on the NTS. The bald eagle (down-listed in 1995 from an endangered to a threatened species) has also been reported on the NTS. Both of these birds are rare migrants in this region and have been sighted on the NTS only once (Castetter and Hill, 1979; Greger and Romney, 1994a). The state of Nevada lists these two species as endangered (Table 4-30).

The only other animal species found on the NTS which is listed by the U.S. Fish and Wildlife Service as threatened is the Mojave Desert population of the desert tortoise. The state of Nevada classifies the desert tortoise as a threatened species. Desert tortoises are found throughout the Mojave Desert plant communities in the southern half of the NTS (Figure 4-43). The abundance of tortoises on the NTS is low to very low relative to other areas within the range of this species (EG&G/EM, 1991; U.S. Fish and Wildlife Service, 1992; Rautenstrauch et al., 1994). The NTS contains less than 1 percent of the total desert tortoise habitat of the Mojave Desert population. Desert tortoises are not found on Area 13.

No plants that have been listed as threatened or endangered are known to occur on the NTS (50 CFR Part 17.11 and 17.12; Mendoza, 1995a).

There are three species (one animal and two plants) which are candidates for listing under the Endangered Species Act (61 FR 7596) and which are known to occur or may occur on the NTS. The U.S. Fish and Wildlife Service published the latest list of candidate plants and animals on February 28, 1996. Prior to this, 12 animal and 12 plant species found on the NTS or Area 13 were classified as candidates (Mendoza, 1995a). The updated Notice of Review has removed 11 of the 12 animals and all of the 12 plants from candidate status. Therefore, the following discussion of candidate species differs from that in the Draft NTS EIS issued in January 1996.

The mountain plover is the only candidate animal which is known to occur onsite. It is an uncommon migrant through the area.

Two candidate plants may occur on the NTS. Clokey's egg-vetch was recently discovered in the Belted Range of the NAFR Complex, just north of the NTS (Knight and Smith, 1996). It was found along the margins of a pinyon-juniper community near Indian Spring. This plant may occur in a

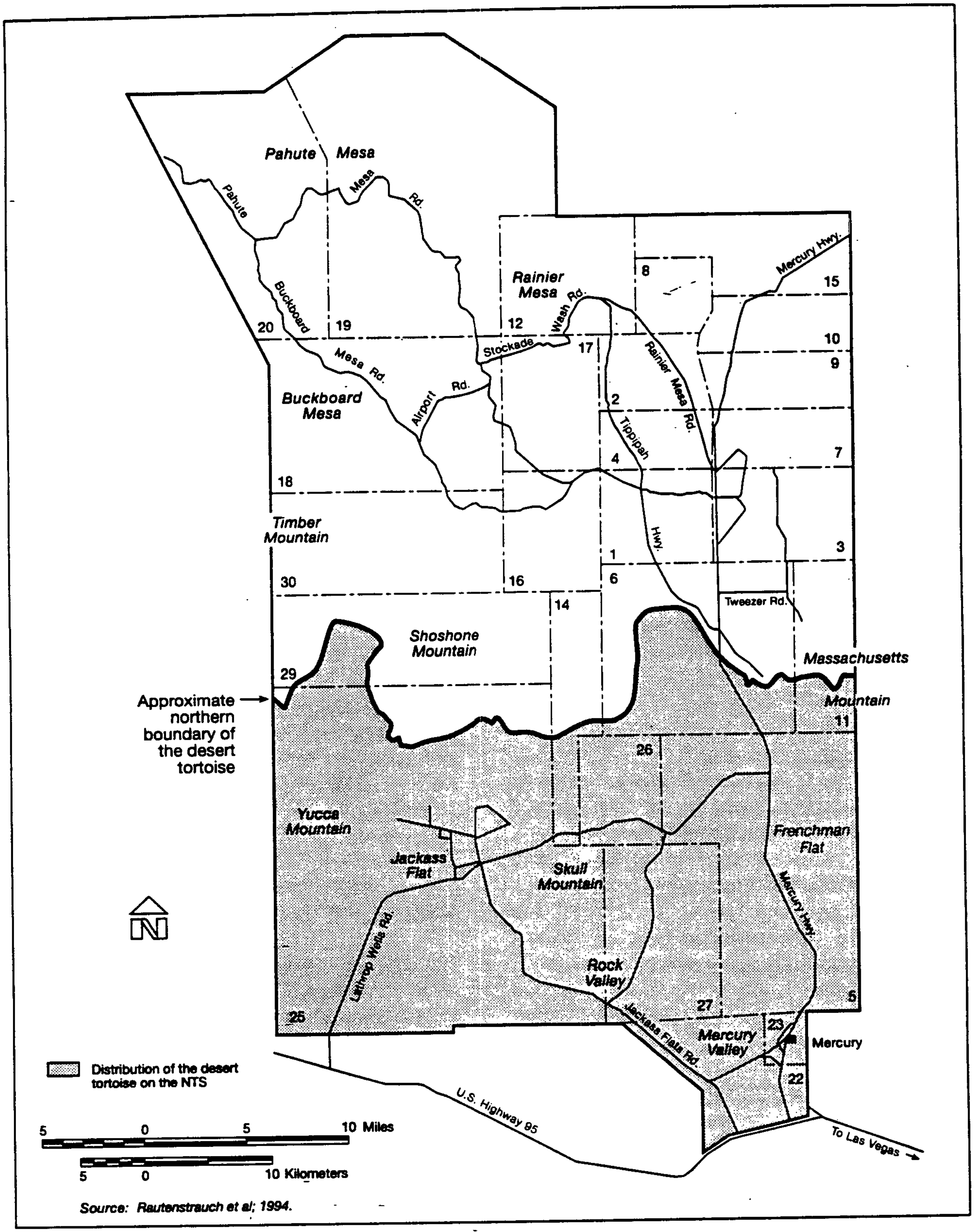


Figure 4-43. Approximate distribution of the desert tortoise on the NTS

similar habitat in the Belted Range which extends onto the NTS.

The Blue Diamond cholla may possibly have been collected on the NTS in the western Spotted Range below Mercury Ridge in Area 23. It was identified as another cholla species when first collected in 1967, and taxonomic verification of this NTS specimen is being pursued.

There also are a number of other endangered, threatened, or candidate species associated with the springs off the NTS that may be affected by NTS activities. For example, the endangered Devils Hole pupfish is endemic to the spring at Devils Hole National Monument, 27 km (17 mi) south of the NTS. At Ash Meadows National Wildlife Refuge, located 32 km (20 mi) south of the NTS, there are one endangered and six threatened plants, four endangered fishes, and one threatened invertebrate (U.S. Fish and Wildlife Service, 1994). In addition, the candidate species Amargosa toad and Oasis Valley speckled dace are found in wetlands in the Oasis Valley.

The North Las Vegas Facility is located within urban Las Vegas on previously disturbed land within a fenced site. It is not expected that any threatened, endangered, or rare species exist. No designated critical habitats for federal-listed species exist at the North Las Vegas Facility. The facility is within the range of the federal-listed desert tortoises; however, urbanized areas of Clark County are not considered tortoise habitat. No desert tortoises were found during an off-site survey of undeveloped land located near the western boundary of the North Las Vegas Facility.

OTHER SPECIES OF CONCERN—Some other species of concern which are known to occur or may occur on the NTS or Area 13 include the spotted bat (classified by the state of Nevada as threatened), the banded gila monster (classified as State-protected), over 20 state-protected birds (predominately hawks and owls), and one plant, Beatley milkvetch designated as "fully protected" by the State). Three of these State-protected animal species, the spotted bat, western burrowing owl, the white-faced ibis, and the Beatley milkvetch had been classified as Category 2 candidates for listing under the Endangered Species Act. The Beatley milkvetch had been classified as a Category 1 candidate. All were recently removed from candidate status (61 FR 7596). These species are known to occur on the NTS. Vocalizations of the spotted bat were recorded on Pahute Mesa in 1992 (EG&G/EM, 1993c). Burrowing owls are common and are permanent residents throughout the NTS but the white- faced ibis is an uncommon migrant (Hayward et al, 1963).

No documented sightings or specimens of banded gila monsters have been made on the NTS.

EFFECTS FROM PAST RADIOLOGICAL AND PROJECT ACTIVITIES—A number of studies were conducted to document the types and extent of disturbances to the biological resources that may have resulted from projects. Although much of the focus was on determining the fate and effects of radionuclides, especially transuranics (Dunaway and White, 1974; Gilbert et al., 1988; Howard and Fuller, 1987; Howard et al., 1985; O'Farrell and Emery, 1976; White and Dunaway, 1975, 1976, 1977, 1978; White et al., 1977a.,b.), long-term impacts due to nuclear tests and nonradiological causes were also investigated (Hunter, 1992b, 1994b, c, d, 1995).

In areas where atmospheric tests, safety tests, or cratering experiments were conducted, there were measurable changes in the species composition and abundance of plants and animals. Immediately following some tests that deposited fallout containing beta-emitters, shrubs that were more radiosensitive, such as sagebrush, were killed and a grass disclimax was established. The projects also involved nonradiological physical and mechanical disturbances that altered the characteristics of the soils, and usually resulted in the removal of the shrubs which are a key component of the structure and functioning of these desert ecosystems. The ecological changes observed were similar to effects associated with other human activities that disturb desert habitats, and few could be attributed solely to radiological impacts.

A herd of cattle was allowed to graze the northwestern part of the NTS for 25 years (Smith and Black, 1984). Periodically, tissues of cattle, deer, and bighorn sheep were analyzed for concentrations of radionuclides. Results of this program suggested that since 1956 no significant amounts of biologically available radionuclides were contributed by activities on the NTS. Except for periods immediately following the deposition of close-in fallout, tissue concentrations of cesium-137 and strontium-90 reflected the deposition of worldwide fallout. Concentrations of tritium were within the ranges present in the general environment, except in tissues of animals that had access to point sources of tritium such as the Sedan Crater or the containment ponds in Area 12.

Hypothetical dose commitments for daily ingestion of NTS beef over varying lengths of time were less than 2 percent of the Federal Radiation Council or the International Commission on Radiological Protection guidelines. Both the calving rate of the herd, which exceeded 85 percent annually, and the 180-day weaning weight, usually greater that 18 kg (400 lbs), were above average. Routine necropsy and histopathological examinations revealed no harmful health effects that could be attributed to ionizing radiation in herbivores maintained for a lifetime on the NTS.

Concentrations of radionuclides in soils, plants, and animals in the vicinity of some past tests were above general background levels. Concentrations usually decreased by factors of 10 between soils-plants and plants-animals. Chromosomal aberrations were observed in cells of spiny sagebrush collected from Area 11, but the yields may not have been greater than what would be observed in the population naturally, and whether they were valuable or detrimental to the population was undetermined. Depressed levels of circulating lymphocytes and total leukocyte counts were found in kangaroo rats collected in areas comtaminated with plutonium, but they were considered to be physiologically inconsequential. Gross pathological changes in native mammals appeared to be minimal and nonspecific. Reproduction in and recruitment to mammalian populations inhabiting contaminated areas was largely responding to changes in the food supply of winter annual plants, not to levels of radiation.

The long-term consequences of past DOE activities were studied at past ground zero locations above which atmospheric tests were conducted, within subsidence craters formed following underground tests, in burned areas, on compacted drill pads and scrapes, and along roadsides. One of the major findings was that ecological impacts resulting from DOE programs on the NTS did not differ in type or magnitude from those resulting from other human activities that disturb desert ecosystems. Changes in the vegetation resulted from changes in patterns and amounts of precipitation. Changes in the species composition of vertebrates appeared to be linked to the structure of the vegetation associations, and changes in abundance were in response to altered food supplies which were linked to vegetation.

Changes to the structure and function of ecosystems were restricted to the immediate vicinity of project sites, and few long-term effects could be attributed to radiological impacts. Concentrations of radionuclides did not produce genetic or cytological abnormalities that appeared to be detrimental to species or populations either in the short- or long-term. Restoration of disturbed sites will likely follow the routes and rates of succession observed in comparable, manipulated desert ecosystems.

In spite of the extensive environmental and monitoring programs conducted since the 1950s, impacts of nonradiological contaminants on wildlife are unknown. Drill sites established for the Environmental Restoration Program include plastic-lined ponds to collect and evaporate fluids. In 1994, remains of seven birds were found in one of three ponds that contained water (Greger, 1995). Although the causes of death could not be determined, and no chemical analyses of the water were performed, a hypothesis was proposed that birds may have been trapped in the steep sumps because detergents used during drilling may have removed protective oils, which caused hypothermia, which in turn inhibited flight.

There are 18 known populations of Beatley milkvetch, 14 on the NTS and 4 on the NAFR Complex, 3.5 to 8 km (2.2 to 5 mi) west of the NTS (Blomquist et al., 1992). These 18 populations cover areas ranging in size from 700 m^2 (837 yds^2) to 120 acres and are restricted to isolated sites typically located on volcanic soils in the pinyon-juniper-sagebrush vegetation association at elevations between 1,850 m and 2,271 m (6,070 to 7,450 ft).

4.1.7 Air Quality and Climate

Air quality in a given location is described as the concentration of various pollutants in the atmosphere. Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. This section describes existing air quality conditions. Topics discussed include climatology, meteorology, and ambient air quality at the NTS and Area 13.

CLIMATOLOGY AND METEOROLOGY—The climate at the NTS and Area 13 is characterized by limited precipitation, low humidity, and large diurnal temperature ranges. The lower elevations are characterized by hot summers and mild winters, which are typical of other Great Basin areas. As elevation increases, precipitation increases and temperatures decrease (DOE, 1986).

Annual precipitation at higher NTS elevations is about 23 cm (9 in.), which includes snow accumulations. The lower elevations receive approximately 15 cm (6 in.) of precipitation annually, with occasional snow accumulations lasting only a few days (Quiring, 1968).

Precipitation in the summer falls in isolated showers, which cause large variations among local precipitation amounts. Summer precipitation occurs mainly in July and August when intense heating of the ground beneath moist air masses triggers thunderstorm development and associated lightning. A tropical storm occasionally will move northeastward from the coast of Mexico, bringing heavy precipitation during September and October (DOE, 1995f).

Elevation influences temperatures on the NTS. At an elevation of 2,000 m (6,560 ft) on Pahute Mesa, the average daily maximum and minimum temperatures are 4 °C to -2 °C (40 °F to 28 °F) in January and 27 °C to 17 °C (80 °F to 62 °F) in July. In the Yucca Flat weapons test basin at an elevation of 1,195 m (3,920 ft), the average daily maximum and minimum temperatures are 11 °C to -6 °C (51 °F to 21 °F) in January, and 36 °C to 14 °C (96 °F to 57 °F) in July. Elevation at Mercury is 1,314 m (4,310 ft), and the extreme temperatures are 21 °C to -11 °C (69 °F to 12 °F) in January and 43 °C to 15 °C (109 °F to 59 °F) in July (DOE, 1995f).

The annual average temperature in the NTS area is 19 °C (66 °F) (NOAA, 1991). Monthly average temperatures range from 7 °C (44 °F) in January to 32 °C (90 °F) in July. Relative humidity readings (taken four times per day) range from 11 percent in June to 55 percent in January and December (DOE/NV, 1995f).

Average annual wind speeds and direction vary with location (Figure 4-44). At higher elevations on Pahute Mesa, the average annual wind speed is 16 kph (10 mph). The prevailing wind direction during the winter months is north-northeasterly, and during the summer months winds are southerly.

In the Yucca Flat weapons test basin, the average annual wind speed is 11 kph (7 mph). The prevailing wind direction during the winter months is north-northwesterly, and during the summer months is south-southwesterly. At Mercury, the average annual wind speed is 13 kph (8 mph), with northwesterly prevailing winds during the winter months, and southwesterly prevailing winds during the summer months. Figure 4-45 shows the annual wind direction frequencies and mean wind speeds for 1990 at Desert Rock, the U.S. Geological Survey, and National Oceanographic and Atmospheric Administration Air Resources Laboratories near Mercury. The wind speeds were measured from a height of 10 m (33 ft) above the ground.

Wind speeds in excess of 97 kph (60 mph), with gusts up to 172 kph (107 mph), may be expected to occur once every 100 years (Quiring, 1968). Additional severe weather in the region includes occasional thunderstorms, lighting, tornados, and sandstorms. Severe thunderstorms may produce high precipitation that continues for approximately one hour and may create a potential for flash flooding (Bowen and Egami, 1983). Few tornados

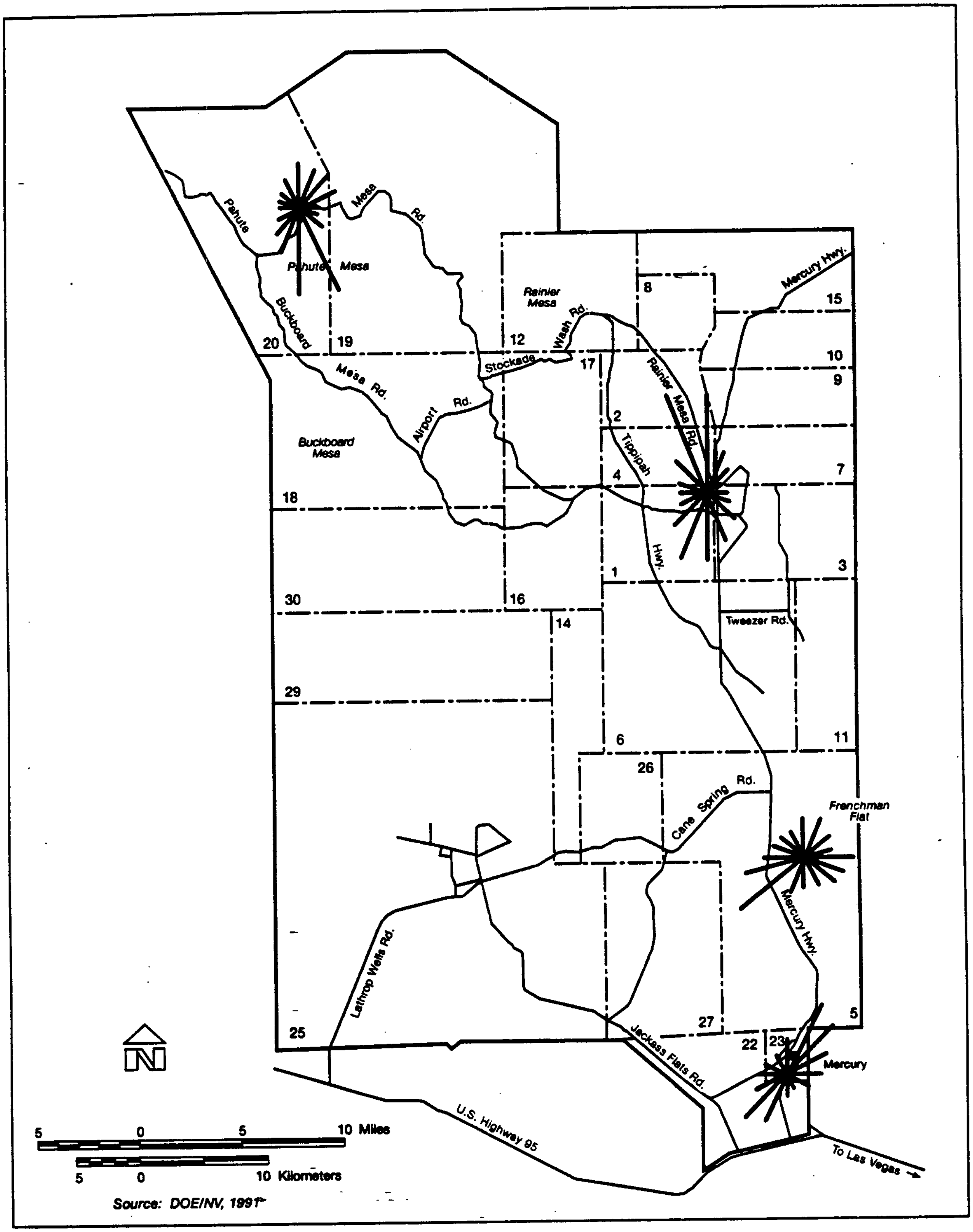
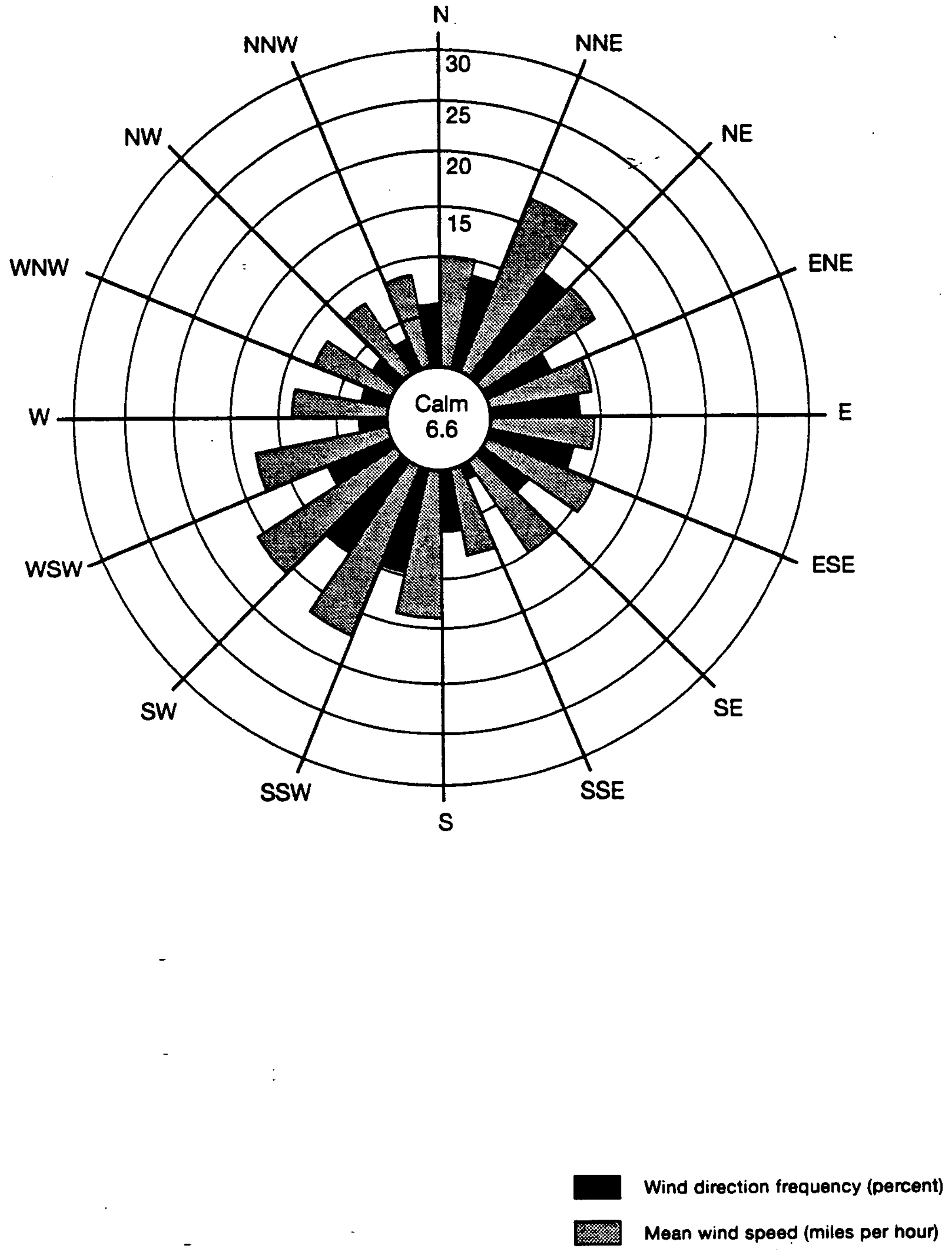


Figure 4-44. 10m (33ft) wind roses for NTS in 1990



Source: Engineering Science, 1990.

Figure 4-45. Wind direction frequencies and mean wind speed near Mercury, Nevada have been observed in the region and are not considered a significant event. The estimated probability of a tornado striking a point at the NTS is extremely low (3 in 10 million years) (Ramsdell and Andrews, 1986).

AMBIENT AIR QUALITY—The NTS is located in the Nevada Intrastate Air Quality Control Region 147. The region has been designated as attainment with respect to the National Ambient Air Quality Standards (40 CFR Part 81.329). The nearest nonattainment area is the Las Vegas area, located 105 km (65 mi) southeast of the NTS. The Las Vegas Valley Hydrographic Area 212, located in Clark County, is classified as moderate nonattainment for carbon monoxide and serious nonattainment for fugitive dust (PM_{10}). The remaining portion of Clark County is designated as unclassifiable/attainment for these pollutants (40 CFR Part 81.329).

An area is designated by the EPA as being in attainment for a pollutant if ambient concentrations of that pollutant are below the National Ambient Air Quality Standards, and nonattainment if violations of the National Ambient Air Quality Standards occur. In areas where insufficient data are available to determine attainment status, designations are listed as unclassified. Unclassified areas are treated as attainment areas for regulatory purposes. The applicable National Ambient Air Quality Standards and Nevada State Ambient Air Quality Standards are presented in Table 4-31.

Prevention of Significant Deterioration is a regulation incorporated in the Clean Air Act that limits increases of pollutants in clean air areas (attainment areas) to certain increments even though ambient air quality standards are being met. The Prevention of Significant Deterioration Program is implemented in large part through the use of increments and area classifications. The Clean Air Act area classification scheme for Prevention of Significant Deterioration establishes three classes of geographic areas and applies increments of different stringency to each class. Air quality impacts, in combination with other Prevention of Significant Deterioration-permitted sources in the area, must not exceed the maximum allowable incremental increases presented in Table 4-32. Facilities planning construction or modifications of a facility that is located in an attainment area may be subject to Prevention of Significant Deterioration regulations if classified as a "major" source or "major" modification. A new source is major if it is one of 28 listed sources and has the potential to emit more than 100 tons per year of a regulated pollutant or more than 250 tons per year of a regulated pollutant, regardless of its source type. A modification is major if it will occur at an existing major source and will cause emission increases of regulated pollutants above "significant" emission rate levels defined in the regulations. Major sources must first obtain a Prevention of Significant Deterioration permit for either a new facility or modifications from the state where the facility is located (40 CFR Part 52.21).

The nearest Prevention of Significant Deterioration Class I areas to the NTS are the Grand Canyon National Park, 208 km (130 mi) to the southeast, and the Sequoia National Park, 169 km (105 mi) to the southwest (DOE, 1995f). The NTS has no sources subject to Prevention of Significant Deterioration requirements.

Ambient air quality at the NTS is not currently monitored for criteria pollutants or hazardous air pollutants, with the exception of radionuclides. Elevated levels of ozone or particulate matter may occasionally occur because of pollutants transported into the area or because of local sources of fugitive particulates (Bowen and Egami, 1983). Ambient concentrations of other criteria pollutants (sulfur dioxide, nitrogen oxides, carbon monoxide, and lead) are probably low because there are no large sources of these pollutants nearby. The nearest significant source of pollutants is the Las Vegas area (DOE, 1995f). Ambient air quality data for the NTS is summarized in Table 4-33. These measurements were recorded during the period from August 15, through September 15, 1990. Monitoring stations were located in Area 23 at Building 525; Area 6 at Building 170; and Area 12 at the sanitation department office trailer. Based on the data collected during this study (Engineering Science, 1990), the NTS is well within all applicable federal and state ambient air quality standards.

Table 4-31. Ambient air quality standards

Pollutant	Averaging Time	Nevada Standards[a] Concentration	National Standards[b] Primary[c,d]	National Standards[b] Secondary[c,e]
Ozone	1 hour	235 $\mu g/m^3$ [f] (0.12 ppm) [g]	235 $\mu g/m^3$ (0.12 ppm)	Same as primary
Ozone-Lake Tahoe Basin, #90	1 hour	195 $\mu g/m^3$ (0.10 ppm)	None	None
Carbon monoxide <u>less than</u> 5,000 ft above mean sea level	8 hours	10,000 $\mu g/m^3$ (9.0 ppm)	10 mg/m^3 (9.0 ppm)	Same as primary
At or greater than 5,000 ft above mean sea level	8 hours	6,870 $\mu g/m^3$ (6.0 ppm)	10 mg/m^3 (9.0 ppm)	Same as primary
Carbon monoxide at any elevation	1 hour	40,000 $\mu g/m^3$ (35 ppm)	40 mg/m^3 (35 ppm)	Same as primary
Nitrogen dioxide	Annual arithmetic mean	100 $\mu g/m^3$ (0.05 ppm)	100 $\mu g/m^3$ (0.05 ppm)	Same as primary
Sulfur dioxide	Annual arithmetic mean	80 $\mu g/m^3$ (0.03 ppm)	80 $\mu g/m^3$ (0.03 ppm)	Same as primary
	24 hours	365 $\mu g/m^3$ (0.14 ppm)	365 $\mu g/m^3$ (0.14 ppm)	Same as primary
	3 hours	1,300 $\mu g/m^3$ (0.5 ppm)	None	1,300 $\mu g/m^3$ (0.50 ppm)
(Suspended) particulate matter <u>as</u> <u>PM_{10}</u>	Annual (geometric) arithmetic mean	(75) 50 $\mu g/m^3$	(75) 50 $\mu g/m^3$	Same as primary
	24 hours	150 $\mu g/m^3$	(260) 150 $\mu g/m^3$	(150 $\mu g/m^3$)
Lead (Pb)	Quarterly arithmetic mean	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	Same as primary
Visibility [h]	Observation	In sufficient amount to reduce the prevailing visibility to less than 30 mi when humidity is less than 70 percent	There is no national standard for visibility	There is no national standard for visibility
Hydrogen sulfide[i]	1 hour	112 $\mu g/m^3$ (0.08 ppm)	There is no national standard for visibility	There is no national standard for visibility

[a] These standards must not be exceeded in areas where the general public has access

[b] These standards, other than for ozone and those based on annual averages, must not be exceeded more than once per year. The ozone standard is attained when the expected number of days per calendar year with a maximum hourly average concentration above the standard is equal to or less than one

[c] Concentration is expressed first in units in which it was adopted and is based on a reference temperature of 25 °C and a reference pressure of 760 millimeter (mm) of mercury. All measurements of air quality must be corrected to a reference temperature of 25 °C and a reference pressure of 760 mm of mercury (1,013.2 millibars); parts per million (ppm) in this table refers to ppm by volume or micromoles of pollutant per mole of gas

[d] National primary standards are the levels of air quality necessary, with an adequate margin of safety, to protect the public health

[e] National secondary standards are the levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant

[f] Micrograms per cubic meter

[g] Parts per million by volume or micromoles per mole of gas

[h] For the purposes of this section, prevailing visibility means the greatest visibility that is attained or surpassed around at least half the horizon circle, but not necessarily in continuous sectors

[i] The ambient air quality standard for hydrogen sulfide does not include naturally occurring background concentrations.

NOTE: All values are corrected to reference conditions. These standards of quality for ambient air are minimum goals, and it is the intent of the State Environmental Commission in this section to protect the existing quality of Nevada's air to the extent that it is economically and technically feasible. (Environmental Commission Air Quality Reg. §§ 12.1-12.1.6, eff. 11/7/75; A and renumbered as §12.1, 12/4/76; A 12/15/77; 8/28/79; §§ 12.2-12.4, eff. 11/7/75; § 12.5, eff. 12/4/76; A 8/28/79) (NAC A 10/19/83; 9/5/84; 12/26/91.)

Source: NAC, 1995.

Table 4-32. Maximum allowable pollutant concentration increases under Prevention of Significant Deterioration regulations

Pollutant	Averaging Time	Maximum Allowable Increment ($\mu g/m^3$)[a]		
		Class I	Class II	Class III
Particulate matter (PM_{10})	Annual	4.0	17.0	34.0
	24 hours	8.0	30.0	60.0
Sulfur dioxide (SO_2)	Annual	2.0	20.0	40.0
	24 hours	5.0	91.0	182.0
	3 hours	25.0	512.0	700.0
Nitrogen oxides (NO_x)	Annual	2.5	25.0	50.0

[a] Microgram per cubic meter.

Source: 40 CFR Part 52.21, 1995.

Table 4-33. Ambient air quality data for the NTS, 1990

Monitoring Station	Time Period	Ambient Concentration ($\mu g/m^3$)[a]									
		Sulfur Dioxide			Carbon Monoxide		Nitrogen Oxides	Particulate Matter[b]		Lead	Ozone
		Annual	Max. 24-Hour	Max. 3-Hour	Max. 8-Hour	Max. 1-Hour	Annual	Annual	Max. 24-Hour	Max. Calendar Quarter	Max. 1-Hour
Area 23	8/15/90 to 9/15/90	(c)	39.3	65.4	1,374	1,374	(c)	(c)	78.3	(c)	(c)
Area 6	8/15/90 to 9/15/90	(c)	0	0	1,145	1,947	(c)	(c)	20.2	(c)	(c)
Area 12	8/15/90 to 9/15/90	(c)	15.7	52.4	2,290	2,748	(c)	(c)	45.4	(c)	(c)

[a] Migrograms per cubic meter

[b] Particulate matter less than 10 microns in diameter

[c] Not measured.

Source: Engineering Science, 1990.

The criteria air pollutants emitted at the NTS include particulates from construction, aggregate production, and surface disturbances, and fugitive dust from vehicles traveling on unpaved roads; various pollutants from fuel-burning equipment, incineration, and open burning; and volatile organics from fuel storage facilities (DOE, 1995f). A summary of emission estimates for sources at the NTS is presented in Table 4-34. Emissions of hazardous air pollutants from current NTS sources are below regulatory requirements (DOE, 1995f).

RADIOLOGICAL AIR QUALITY—The DOE maintains an extensive network of air sampling stations for radiological parameters, such as particulates, tritium, noble gases, and reactive gases. Past activities at the NTS have resulted primarily in radioactive effluents from underground weapons testing. Some radioactivity detected by on-site air monitoring stations is attributed to the resuspension of soils contaminated from past aboveground nuclear weapons testing (1951 to 1962).Monitoring of airborne particulate matter, noble gases, and tritiated water vapor on the NTS in 1993 indicated on-site levels that were consistent with background concentrations (Table 4-35). The external exposure monitoring network indicated a stable level of gamma radiation levels from year to year. Airborne releases of radioactivity have occurred from past aboveground weapons testing, but in recent years no radioactivity from operations at the NTS has been detected at off-site monitoring stations.

During 1993, the radiation dose to the maximum exposed individual was estimated to be 0.004 mrem at Indian Springs (DOE, 1994b), which is well below the EPA standard of 10 mrem per year. This effective dose equivalent was based on calculations using the CAP88 air dose assessment model (an air dispersion model developed by the EPA to predict effective doses). This computer code uses site-specific radionuclide emission data, on-site meteorological data, and dose conversion factors to predict the effective dose equivalent.

Historically, releases have occasionally occurred to the ground surface and atmosphere as a result of underground testing. There have been five categories of releases: (1) venting that occurred when containment failed and there was a rapid, massive release; (2) seeps that occurred when containment failed and there was a small, slow release shortly after the test; (3) late-time seeps that released gases to the surface a few days or weeks after the test; (4) controlled tunnel purging to allow recovery of equipment and data; and (5) operational releases that are small and occur when core or gas samples are collected. According to the Office of Technology Assessment (OTA, 1989), prior to 1971, a total of 2.5×10^7 curies were released from underground tests at the NTS. After a 1971 Atomic Energy Commission review (following a 6.7×10^6 Ci release from the Baneberry test), new containment procedures were implemented. From 1971 through 1988, 54,000 Ci were released, and of this amount 11,000 Ci were unintentionally released through containment failure. Seeps continue to emit radioactive gases from the underground testing areas. The DOE maintains an extensive network of monitoring stations on the at NTS and at off-site locations to monitor extensive network of monitoring stations on the at NTS and at off-site locations to monitor conditions. The results of this monitoring measure the concentrations of gross beta, plutonium, noble gases, and tritiated water vapor in air rather than the total inventory of radionuclides.

In 1990, the average concentrations never approached the Derived Concentration Guides for inhalation for samples collected either on or off the NTS. The results of monitoring in 1990 found xenon, a key noble gas indicator, was detected only for a short period after underground tests.

The total inventory of 1990 releases to the atmosphere from underground tests through seepage of gaseous radionuclides is estimated at about 66 Ci. Of this quantity, some was related to ventilation of tunnels where tests were conducted. The 1990 monitoring of the G Tunnel Complex indicated that ventilation resulted in a release of 28 Ci of airborne tritium into the atmosphere.

No nuclear tests were performed at the NTS in 1993; therefore, the radiological monitoring consisted primarily of routine air sampling throughout the NTS. In 1993, samples of air exhausted through the ventilation duct at the P Tunnel portal (used for underground testing in

Table 4-34. NTS source emission inventory, 1993

Pollutant	Source	Emission Rate (lbs/hour)
Particulate matter (PM_{10})	Area 12 boiler	2.8
	Area 23 boiler	3.6
	Area 23 boiler	2.8
	Area 23 incinerator	0.75
	Area 6 boiler	2.9
	Area 1 rotary dryer	7.1
Sulfur dioxide (SO_2)	Area 12 boiler	2.8
	Area 23 boiler	3.1
	Area 23 boiler	2.8
	Area 23 incinerator	3.0
	Area 6 boiler	2.5

Source: NDCNR, 1988a, b, c, 1989a, b, and 1990.

Table 4-35. NTS radioactive emissions – 1993, airborne effluent releases

	Curies		
Facility Name	Tritium	Krypton-85	Plutonium
Area 3	NA*	NA	1.0×10^{-3}
Area 5, Radioactive Waste Management Site	2.9×10^{-1}	NA	NA
Area 9, Bunker	NA	NA	7.5×10^{-4}
Area 12, Containment Ponds	7.4×10^{2}	NA	NA
Area 12, P Tunnel Portal	3.7	NA	NA
Areas 19 and 20, Pahute Mesa	NA	1.6×10^{2}	NA
Total	$\mathbf{7.08 \times 10^{2}}$	$\mathbf{1.6 \times 10^{2}}$	$\mathbf{1.8 \times 10^{-3}}$

* Not applicable.

Source: DOE/NV, 1994b.

horizontal mines) indicated emissions of 3.7 Ci of gaseous radioactivity in the form of tritiated water vapor due to seepage within the tunnel from nuclear tests performed in previous years. Air samples collected around the Area 5 Radioactive Waste Management Site indicated trace amounts of tritium at the boundary and no measurable activity away from the area. Air samples collected in Area 3 and at the Area 9 bunker indicated levels of plutonium-239 and -240 above background. Measured krypton-85 levels on Pahute Mesa were approximately 1 pCi/m³ higher than the NTS average because of atmospheric pumping from past nuclear events.

Using the data from the highest annual average concentration, replacing the diffuse source with an equivalent point source, and using the CAP88 Systems Laboratory, Las Vegas has an extensive air monitoring network throughout central and southern Nevada and the southern portion of Utah and California for a total of 27 monitoring sites. The EPA's off-site air monitoring network air concentration data indicated doses far below those modeled with the CAP88-PC model. The gamma exposure rates are measured weekly throughout the year at these sites. The CAP 88-PC model estimated a dose of 0.004 mem to a hypothetical maximum exposed individual. The actual data from the EPA's air monitoring network indicated that the air concentration would have to be 14 times higher than measured values to achieve the modeled dose. Table 4-36 summarizes the annual contributions to the effective dose equivalent in 1993 due to operations at the NTS as estimated by the CAP88-PC computer model.

4.1.8 Noise

Noise is defined as sound that is undesirable because it interferes with speech communication and hearing, is intense enough to damage hearing, or is otherwise annoying. The characteristics of sound include parameters such as amplitude, frequency, and duration. The decibel (dB), a logarithmic unit that accounts for the large variations in amplitude, is the accepted standard unit measurement of sound.

When measuring sound to determine its effects on the human population, A-weighted sound levels (dBA) are typically used to account for the response of the human ear (ANSI/ASME, 1983). Human responses to sounds are lowest at low and high frequency levels and greatest in the middle frequency range. A-weighted sound levels represent adjustments to sound levels that are made according to the frequency content of the sound. Examples of typical sound levels are shown in Figure 4-46.

Noise levels often change with time; therefore, to compare levels over different time periods, several descriptors were developed that take into account this time-varying nature. These descriptors are used to assess and correlate the various effects of noise on man, including land-use compatibility, sleep and speech interference, annoyance, hearing loss, and startle effects.

The day-night average sound level was developed to evaluate the total community noise environment. The day-night average sound level is the average dBA during a 24-hour period with 10 dB added to nighttime levels (between 10 p.m. and 7 a.m.). This adjustment is added to account for the increased sensitivity to nighttime noise events. The day-night average sound level was endorsed by the EPA and is mandated by the U.S. Department of Housing and Urban Development, the Federal Aviation Administration, and the DoD for land-use assessments.

The day-night average sound level is sometimes supplemented with another noise level measurement, primarily the equivalent sound level. The equivalent sound level is the dBA level of a steady-state sound that has the same dBA sound energy as that contained in the time-varying sound being measured over a specific time period. The major noise sources at the NTS include equipment and machines (e.g., cooling towers, transformers, engines, pumps, boilers, steam vents, paging systems, construction and material-handling equipment, and vehicles), blasting and explosives testing, and aircraft operations. No NTS environmental noise survey data are available. At the NTS boundary, away from most facilities, noise from most sources is barely distinguishable above background noise levels.

The acoustic environment in areas adjacent to the NTS can be classified as either uninhabited desert or small rural communities. In the uninhabited desert, the major sources of noise are natural physical phenomena such as wind, rain, and wildlife activities, and an occasional airplane. The wind is the predominant noise source. Desert noise levels as a function of wind have been measured at an upper limit of 22 dBA for a still desert and 38 dBA for a windy desert (Brattstrom and Bondello, 1983).

A background sound level of 30 dBA is a reasonable estimate. This is consistent with other estimates of sound levels for rural areas. The rural

Table 4-36. Summary of effective dose equivalents from NTS operations during 1993

	Maximum EDE[a] at NTS Boundary[b]	Maximum EDE to an Individual[c]	Collective EDE to Population Within 80 kilometers of the NTS Sources
Dose	4.8×10^{-3} mrem	$3.8 \pm 0.57 \times 10^{-3}$ mrem	1.2×10^{-2} person-rem
Risk of Cancer[d]	1.728×10^{-7} latent cancer fatalities		
Location	Site boundary 58 km (36 mi) SSE of NTS Area 12	Indian Springs, 80 km (50 mi) SSE of NTS Area 12	21,750 people within 80 km (50 mi) of NTS sources
NESHAP[e] Standard	10 mrem per year	10 mrem per year	NA[f]
Percentage of NESHAP	0.05	0.04	NA[f]
Background	97 mrem	97 mrem	1,747 person-rem
Risk of cancer (from background)[d]	3.492×10^{-3} latent cancer fatalities		
Percentage of Background	5.0×10^{-3}	4.0×10^{-3}	6.9×10^{-4}

[a] Effective dose equivalent
[b] The maximum boundary dose is to a hypothetical individual who remains in the open continuously during the year at the NTS boundary located 60 km 37 ml) south-southeast from the Area 12 tunnel ponds
[c] The maximum individual dose is to a person outside the NTS boundary at a residence where the highest dose rate occurs as calculated by CAP88 (Version 1.0) using NTS effluents listed in Table 5.1 of the 1993 Annual Site Environmental Report document (DOE/NV, 1994a) and assuming all tritiated water input to the Area 12 containment ponds was evaporated
[d] Assume individual exposed to dose per year for lifetime (72 years)
[e] National Emission Standards for Hazardous Air Pollutants
[f] Not applicable.

Source: DOE/NV, 1994a.

communities day-night average sound level has been estimated in the range of 35 to 50 dB (EPA, 1974). A background sound level of 50 dB is a reasonable estimate for Mercury.

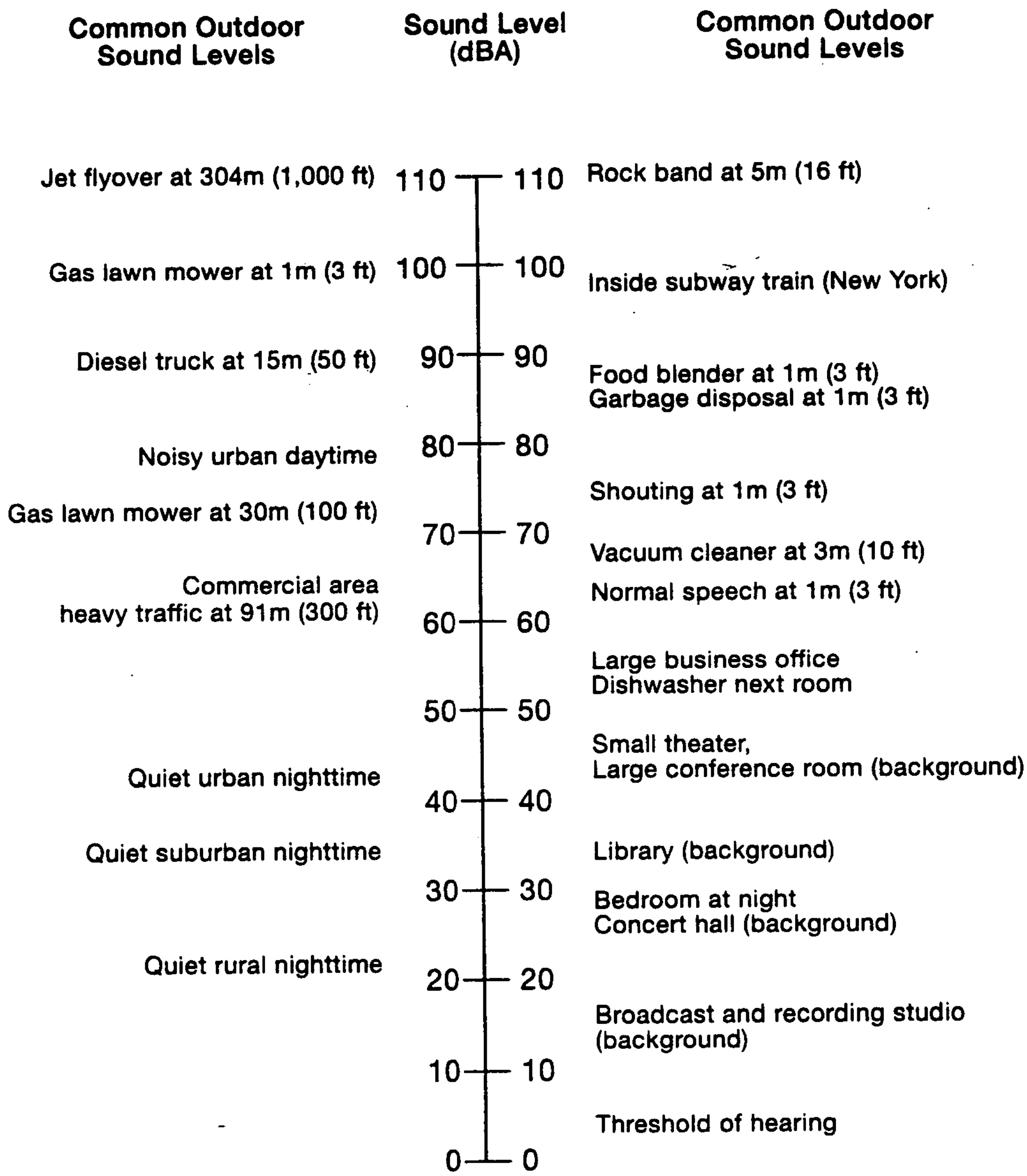
Except for the prohibition of nuisance noise, neither the state of Nevada nor local governments have established specific numerical environmental noise standards.

At the North Las Vegas Facility, noise background levels are those that would be expected in an urbanized industrial area.

4.1.9 Visual Resources

Visual resources include the natural and man-made physical features that give a particular landscape its character and value as an environmental factor. The feature categories that form the overall impression a viewer receives of an area include landform, vegetation, water, color, adjacent scenery, scarcity, and man-made (cultural) modification (BLM, 1980).

Criteria used in the analysis of visual resources for this EIS include scenic quality, visual sensitivity, and distance and/or visibility zones from key public viewpoints.



Source: Modified from U.S. Department of Transportation, 1980

Figure 4-46. Comparative A-weighted sound levels

There are three scenic quality classes. Class A includes areas that combine the most outstanding characteristics of each physical feature category. Class B includes areas in which there is a combination of some outstanding characteristics and some that are fairly common. Class C includes areas in which the characteristics are fairly common to the region. Visual sensitivity for this analysis was based solely on the volume of travel on public highways because these roads are the only key public viewpoints from which the study areas are seen. Study areas that are visible from highways with 3,000 or more average annual daily traffic were average daily traffic were assigned a medium sensitivity level. Study areas that are visible from highways with annual average daily traffic below 1,000 were assigned a low sensitivity level.

Visual quality and sensitivity may be magnified or diminished by the distance and/or visibility of the landscape from key view points (BLM, 1980). The landscape scene can be divided into three basic distance zones: foreground, 0 to 0.8 km (0.5 mi); middleground, 0.8 km (0.5 mi) to 8 km (5 mi); and background/seldom seen, 8 km (5 mi) to infinity. Seldom-seen views also include those portions of the landscape that cannot be seen from a key viewpoint because the viewer's line of sight is blocked by terrain, vegetation, or some other physical feature.

The NTS is located in a transition area between the Mojave Desert and the Great Basin. Vegetation ranges from grasses and creosote bush in the lower elevations to juniper, pinyon pine, and sagebrush in elevations above 1,524 m (5,000 ft). The topography of the NTS consists of a series of mountain ranges arranged in a north-south orientation separated by broad valleys. A portion of the site is characterized by the presence of numerous subsidence craters resulting from past nuclear testing. Scenic views related to geologic features are numerous within this region. The southwestern Nevada volcanic field, which includes portions of the NTS, is recognized by researchers to be a classic example of a nested, multicaldera volcanic field. The scenic quality of the NTS ranges from Class B to Class C. The areas of the NTS visible from U.S. Highway 95 are common to the region. Therefore, they have been designated as Class C.

The area surrounding the NTS consists of unpopulated to sparsely populated desert and rural lands. Because the NTS is surrounded to the east, north, and west by the NAFR Complex and to the south by lands controlled by the U.S. Bureau of Land Management, the main public views into the interior of the NTS are from U.S. Highway 95. Because the southern boundary of the NTS is surrounded by various mountain ranges, including the Spector Range, Striped Hills, Red Mountain, and the Spotted Range, views from U.S. Highway 95 are limited to Mercury Valley and some portions of the southwestern sector of NTS which can be seen from Amargosa Valley. Traffic on U.S. Highway 95 at the Mercury exit is approximately 3,600 vehicles per day (NDOT,1993a). Therefore, portions of the NTS visible from this area would have a high sensitivity level.

The North Las Vegas Facility occupies approximately 80 acres in the city of North Las Vegas, Nevada. The area can be described as an urbanized industrial area, and visual resources are typical for such an area.

4.1.10 Cultural Resources

The following sections describe the cultural resources of the NTS and North Las Vegas Facilities. Resources are described in two ways. First, archeological resources are described in accordance with the provisions of the National Historic Preservation Act of 1966 and the Archaeological Resources Protection Act of 1979, as these acts are implemented through consultations and the programmatic agreement between the SHPO and the DOE/NV. The second description of resources, which begins at the unnumbered section entitled "Sites of American Indian Significance," describes cultural resources from the American Indian cultural perspective, as provided by the American Indian Writers Subgroup of the Consolidated Group of Tribes and Organizations. This section is in italics.

Archaeological research indicates that important cultural resources exist at the NTS. These resources range from sites associated with the earliest prehistoric people in the New World to structures associated with the development of nuclear testing. At the time of contact with the Euroamericans in the mid-1800s, the area was occupied or used by the Southern Paiute, Western Shoshone (Steward, 1938), and Owens Valley Paiute (Stoffle and Evans, 1988). Historic contexts commonly employed on the NTS are the Paleoindian, Early, Middle and Late Archaic, Shoshonean and Historic periods. The latter has been subdivided into contexts concerned with mining, ranching, transportation and communication, nuclear testing and research, and American Indians. Those sites dating to the Cold War era and associated with nuclear testing and development are considered of particular relevance because they occur at only a few locations across the United States.

Current knowledge of the NTS cultural resources is the result of over 20 years of surveys and data recovery, most conducted prior to NTS activities. In addition to preactivity surveys and studies, in 1990 the DOE entered into a Programmatic Agreement with the SHPO and the Advisory Council for Historic Preservation, which implemented the Long-Range Study Plan for Negating Potential Adverse Effects to Historic Properties on Pahute and Rainier Mesas. This is a comprehensive program that examines in depth an 11-percent geographic sample of the cultural resources on the two mesas. As a result of these programs 4.68 percent of the NTS (40,491 acres) has been surveyed for cultural resources. The Long-Range Study Plan and other programs have produced a large archaeological database that is the foundation for the information presented in this document. Some sites, particularly mining, ranching, and nuclear testing sites, are known but have yet to be studied and recorded. At least 600 buildings, structures and objects dating to the Cold War era have been identified on the NTS, but these have not been systematically recorded or evaluated for significance. The sites included here are those that have been systematically recorded. Determinations of eligibility for the cultural resources have been made through consultations between the DOE and the SHPO. However, many of the older sites have not been evaluated for National Register of Historic Places eligibility. In many cases, the site records do not indicate any National Register of Historic Places recommendations. Based on current knowledge, all areas of the NTS have the potential to contain archaeological sites that are considered significant because they meet the criteria of eligibility for the National Register of Historic Places. As a result, the boundaries of the NTS mark the area of potential effect for cultural resources. The following section documents previous work conducted on the NTS and North Las Vegas Facilities, and evaluates the sites according to types and eligibility for listing on the National Register of Historic Places.

<u>RECORDED CULTURAL RESOURCES</u>—Over 1,700 archaeological sites have been identified on the NTS. The terminology used here to define site types is derived from the Desert Research Institute's Branch Technical Procedures Manual (DRI, 1990). Site types are grouped into prehistoric and historic categories. Prehistoric sites include temporary camps, extractive localities, processing localities, localities, caches, and stations. One other prehistoric site type is the residential base. Historic site types include mining sites, ranching sites, and transportation and communication sites. Other historic types are those related to nuclear testing and research.

Temporary camps are defined as occasional operational centers for prehistoric task groups or population groups. These sites were the hub of resource collection activities where processing, manufacturing, maintenance, and living activities were likely to take place. Consequently, the inventory of artifacts and features at these sites often reflects a number of different activities. The diversity of these assemblages makes them useful when characterizing prehistoric occupations. Extractive localities are resource procurement areas, such as quarries, water catchment basins, hunting blinds, and plant resource extraction locations. Processing localities are areas where resources, such as stone tools, plants, and animals, are processed. Localities are places where these types of activities took place, but lack sufficient information to discern which activity is represented. These sites are marked by low artifact diversity when compared to temporary camps. Caches are temporary places used for storing either resources or artifacts. Stations are locations where special purpose task groups gather to exchange information about game movement, routes of travel, and ritual activities. Stations include rock cairns marking travel routes, isolated rock art, geoglyphs, observation points, and overlooks. A residential base is a location of extended occupation for prehistoric people. Historic sites are grouped according to major themes commonly encountered in the DOE project areas. These allow some characterization of an extremely variable resource. The major themes within which historic sites are grouped include mining, ranching, and transportation and communication. Other historic contexts are nuclear testing and research, and American Indian activities.

Documents that provide further information used to assess resources found on the NTS include Pippin (1984, 1986, 1992), Reno and Pippin (1985), and Worman (1969). The characteristics and significance of these resources are summarized in this EIS in terms of eligibility for the National Register of Historic Places. The data are presented according to hydrographic boundaries (State of Nevada Engineer's Office, 1974). These boundaries provide a useful way to organize the data in a comparable manner to other studies presented in this document. Those sites recorded as a result of DOE activities, including the Yucca Mountain Site Characterization Project, are considered in the following sections. (Figure 4-47 and Table 4-37).

Mercury Valley—This basin is bounded by the Spotted Range and the Specter Range (State of Nevada Engineer's Office, 1974). Twenty-one archeological reconnaissance surveys have been conducted within that portion of Mercury Valley that lies within the NTS. Approximately 214 acres were surveyed for cultural resources. Only four sites have been recorded as a result of these surveys. Of these, three are classified as localities, and one is a historic site. None of these sites is considered eligible for listing on the National Register of Historic Places.

Rock Valley—This basin is bounded by the Specter Range to the south and the Skull Mountains to the north (State of Nevada Engineer's Office, 1974). Most of the Rock Valley hydrographic basin lies within NTS boundaries. Nine archaeological reconnaissance surveys have been conducted within Rock Valley. Approximately 432 acres have been surveyed for cultural resources. Seventeen sites have been recorded as a result of these studies. One of the sites is an extractive locality, 15 are localities, and 1 is a temporary camp. Three of these sites have been determined eligible for listing on the National Register of Historic Places.

Fortymile Canyon-Jackass Flats—Jackass Flats is bounded by the Skull Mountains to the south and the Shoshone Mountains to the north (State of Nevada Engineer's Office, 1974). Almost the entire basin, with the exception of the extreme western edge and the southwest corner, lies within NTS boundaries. One hundred fifty-six archaeological reconnaissance surveys have been conducted within the Fortymile Canyon-Jackass Flats basin. Approximately 12,177 acres have been surveyed for cultural resources. The Fortymile Canyon-Jackass Flats area has a very high density of recorded sites. This density is partially a reflection of the intensity of archaeological survey which has occurred in the area. There have been 371 cultural resources sites recorded as a result of these surveys. This total includes 35 temporary camps, 15 extractive localities, 59 processing localities, 236 localities, 7 caches, 1 station, 1 residential base, 8 historic sites, and 9 untyped sites. Currently, 106 of these sites are eligible for listing on the National Register of Historic Places.

Buckboard Mesa—This hydrographic area includes Buckboard Mesa and part of Pahute Mesa. The entire hydrographic basin is within NTS boundaries. It is bounded by the Shoshone Mountains and the Eleana Range on its eastern boundary (State of Nevada Engineer's Office, 1974). Fifty-one archaeological reconnaissance surveys have been conducted within that portion of Buckboard Mesa that lies within the NTS. Approximately 4,190 acres have been surveyed for cultural resources. The Buckboard Mesa area has a very high density of recorded sites. This density may be a reflection of the intensity of archaeological survey which has occurred in the area. To date, 470 sites have been recorded in the Buckboard Mesa hydrographic region. This total includes

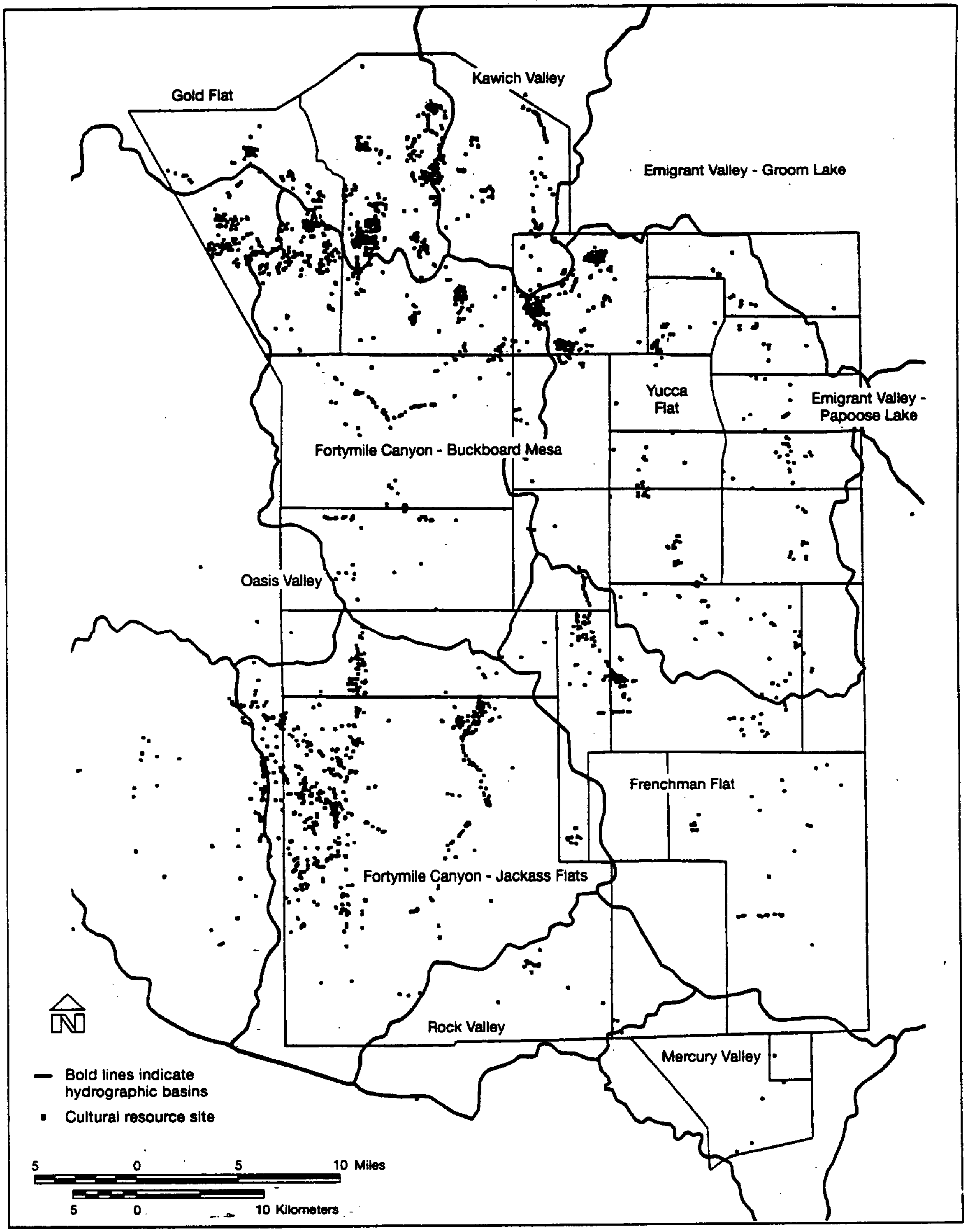


Figure 4-47. Recorded cultural resources on the NTS

Table 4-37. Types of sites found within the hydrographic basins of the NTS

Basin	Prehistoric Site Types							Historic Site Types		Untyped Sites	NR Eligible
	RB	TC	EL	PL	LO	CA	STA	HI	NT	UT	NR
Mercury Valley	0	0	0	0	3	0	0	1	0	0	0
Rock Valley	0	1	1	0	15	0	0	0	0	0	3
Fortymile Canyon & Jackass Flats	1	35	15	59	236	7	1	8	0	9	106
Buckboard Mesa	0	103	6	94	203	5	1	3	0	54	327
Oasis Valley	0	14	1	20	82	0	0	0	0	2	49
Gold Flat	0	25	1	96	124	10	0	2	0	1	169
Kawich Valley	0	9	0	25	37	0	0	2	0	8	58
Emigrant Valley & Groom Lake Valley	0	0	0	0	5	0	0	0	0	0	0
Yucca Flat	4	54	10	34	126	56	0	38	5	13	130
Frenchman Flat	1	2	2	38	52	0	0	2	2	0	49
Totals	**6**	**243**	**36**	**366**	**883**	**78**	**2**	**56**	**7**	**87**	
Total NTS Sites										**1,764**	**891**

Site type codes: RB=residential base; TC=temporary camp; EL=extractive locality; PL=processing locality; LO=locality; CA=cache; STA=station; HI=historic; NT=nuclear testing; UT=untyped; NR=National Register.

103 temporary camps, 6 extractive localities, 94 processing localities, 203 localities, 5 caches, 1 station, 3 historic ranching sites, and 54 untyped sites. Currently, 327 of these sites have been determined eligible for listing on the National Register of Historic Places. The large number of localities recorded in the Buckboard Mesa region suggest that this region was highly used by mobile groups during their annual round. These kinds of sites can often provide important information about the technological orientation of prehistoric people.

Oasis Valley—Only the eastern portion of this basin is within the NTS boundaries. This region includes parts of Pahute Mesa. Twenty-nine archaeological reconnaissance surveys have been conducted within that portion of Oasis Valley that lies within the NTS. Approximately 3,445 acres have been surveyed for cultural resources. To date, 119 cultural resources sites have been recorded in the part of the Oasis Valley hydrographic basin that is within NTS boundaries. This total includes 14 temporary camps, 1 extractive locality, 20 processing localities, 82 localities, and 2 untyped sites. While many of the smaller localities are not eligible for listing on the National Register of Historic Places, 49 of the sites are eligible for listing on the National Register of Historic Places.

Gold Flat—The southern part of this basin is within the NTS and includes part of Pahute Mesa. A wide range of site types can be found in the area. Forty-eight archaeological reconnaissance surveys have been conducted within that portion of Gold Flat Valley that lies within the NTS. Approximately 6,140 acres have been surveyed for cultural resources. Currently, 259 sites have been recorded as a result of these surveys. This total includes 25 temporary camps, 1 extractive locality, 96 processing localities, 124 localities, 10 caches, 2 historic sites, and 1 untyped site. To date, 169 of these sites are eligible for listing on the National Register of Historic Places.

Kawich Valley—Only the southern part of this hydrographic basin is within the boundaries of the NTS and includes a portion of Pahute Mesa. Twenty-one archaeological reconnaissance surveys have been conducted within that portion of Kawich Valley that lies within the NTS. Approximately 2,635 acres have been surveyed for cultural resources. There are 81 sites that have been recorded as a result of these surveys. This total includes 9 temporary camps, 25 processing localities, 37 localities, 2 historic sites, and 8 untyped sites. To date, 58 sites are eligible for listing on the National Register of Historic Places (see Table 4-37).

Emigrant Valley-Groom Lake Valley—Only a small portion of this basin is within the NTS boundaries. This basin includes part of the Belted Range and part of Groom Lake Valley (State of Nevada Engineer's Office, 1974). Two archaeological reconnaissance surveys have been conducted within that portion of Emigrant Valley and Groom Lake Valley that falls within the NTS. Approximately 60 acres have been surveyed for cultural resources. Five localities have been identified within NTS boundaries. None of these localities has been found to be eligible for listing on the National Register of Historic Places. This small sample of sites is not necessarily representative of the hydrographic basin as a whole.

Yucca Flat Weapons Test Basin—The Yucca Flat basin area is bounded by the Eleana Hills to the west and the Halfpint Range to the east. Several isolated mountains form the southern boundary of the Yucca Flat basin (State of Nevada Engineer's Office, 1974). Most of the basin lies within NTS boundaries. One hundred twenty-two archaeological reconnaissance surveys have been conducted within the Yucca Flat hydrographic basin. Approximately 7,785 acres have been surveyed for cultural resources. This region is rich in cultural resources and includes sites from virtually all categories. There have been 340 sites recorded in the Yucca Flat weapons test basin hydrographic basin. This total includes 54 temporary camps, 10 extractive localities, 34 processing localities, 126 localities, 56 caches, 4 residential bases, 38 historic sites, 5 nuclear testing sites, and 13 untyped sites. Historic structures associated with nuclear testing are common here, but most have not been recorded and evaluated. To date, 130 sites in the Yucca Flat hydrographic basin are eligible for listing on the National Register of Historic Places. One site, Sedan Crater, is listed on the National Register of Historic Places.

Frenchman Flat—This area is bounded by the Spotted Range on the east; Mine Mountain/ Massachusetts Mountain on the north; the Shoshone Mountains, Lookout Peak, and Skull Mountains on the west, and the Ranger Mountains on the south (State of Nevada Engineer's Office, 1974). Only the western half of this hydrologic basin is within the NTS boundaries. Forty-two archaeological reconnaissance surveys have been conducted within Frenchman Flat hydrologic basin. Approximately 3,305 acres have been surveyed for cultural resources. There are 99 archaeological sites recorded as a result of these surveys. Of these, 2 are temporary camps, 2 are extractive localities, 38 are processing localities, 52 are localities, 1 is a residential base, 2 are historic sites, and 2 are related to nuclear testing and research. Forty-nine of the sites have been determined eligible for listing on the National Register of Historic Places. Historic structures relating to the development of nuclear weapons may also be eligible for listing on the National Register of Historic Places as a historic district.

SITES OF AMERICAN INDIAN SIGNIFICANCE—The Consolidated Group of Tribes and Organizations has had a long-standing relationship with the DOE since 1987. The group is comprised of 17 tribes and organizations, representing the Southern Paiutes, Western Shoshones, and the Owens Valley Paiutes. Each of these groups has substantiated cultural and historic ties to the NTS and the surrounding areas. The Consolidated Group of Tribes and Organizations has been instrumental in providing guidance by actively participating in the DOE's American Indian Religious Freedom Act Compliance Program, the Native American Graves Protection and Repatriation Act activities, the American Indian Monitoring Program, and the Yucca Mountain Site Characterization Project.

Numerous sites have been identified within the NTS boundaries that are important to American Indian people. Some of these sites have been identified through visits to the area by tribal representatives during American Indian Religious Freedom Act consultations.

These visits are summarized in Stoffle et al. (1990a) and Stoffle et al. (1994b). Any project that may impact sites of American Indian significance will include consultations with American Indian tribes and other potentially affected cultural groups before activities are initiated.

With respect to North Las Vegas, a historic site (Kyle Ranch) is located less than 1.6 km (1 mi) southwest of the proposed National Ignition Facility location; however, no archaeological remains (prehistoric or historic) are likely to be present because of the heavy past disturbance of the surface and near-surface sediment. No historic structures exist at the proposed National Ignition Facility location, nor have any American Indian cultural resources been identified at the North Las Vegas Facility in the course of past consultation with potentially affected tribal organizations.

The following information pertaining to cultural resources on the NTS is provided by the American Indian Writers Subgroup of the Consolidated Group of Tribes and Organizations.

<u>AMERICAN INDIAN CULTURAL RESOURCES</u>—The CGTO knows, based upon its collective knowledge of Indian culture and past American Indian studies, that American Indian people view cultural resources as being integrated. Thus, certain systematic studies of a variety of American Indian cultural resources must be conducted before the cultural significance of a place, area, or region can be fully assessed. Although some of these studies have been conducted on the NTS and nearby lands, many studies still need to be completed. In some portions of the NTS, a number of American Indian studies have been conducted, while in other areas studies have not begun. A number of studies are currently planned.

Indian people can fully assess the cultural significance of a place and its associated natural and cultural resources when all studies have been completed, and our governments and tribal organizations have reviewed the recorded thoughts of our elders and have officially supported these conclusions. American Indian studies focus on one topic at a time so that tribes and organizations can send experts in the subject being assessed. The following is a list of studies that are required for a complete American Indian assessment:

1. *Ethnoarchaeology*
   the interpretation of the physical artifacts produced by our Indian ancestors

2. *Ethnobotany*
   the identification and interpretation of the plants used by our Indian people

3. *Ethnozoology*
   the identification and interpretation of the animals used by Indian people

4. *Rock art*
   the identification and interpretation of traditional Indian paintings and rock peckings

5. *Traditional cultural properties*
   the identification and interpretation of places of central cultural importance to a people, called Traditional Cultural Properties; often Indian people refer to these as "power places"

6. *Ethnogeography*
   the identification and intrepretation of soil, rocks, water, and air

7. *Cultural landscapes*
   the identification and interpretation of spatial units that are culturally and geographically unique areas for Indian people.

When all of these subjects have been studied, then it is possible for Indian people to assess three critical issues: (1) what is the natural condition of this portion of our traditional lands? (2) how have DOE's ground-disturbing and monitoring activities altered and/or impacted American Indian cultural resources? and (3) what impacts will proposed alternatives have on either furthering existing changes in the natural environment or restoring our traditional lands to their natural condition? Indian people believe that the natural state of their traditional lands was what existed before 1492, when Indian people were fully responsible for the continued use and management of these lands.

The NTS and nearby lands were central to the Western Shoshone, Owens Valley Paiute, and Southern Paiute people (Figure 4-48). The lands were central in the lives

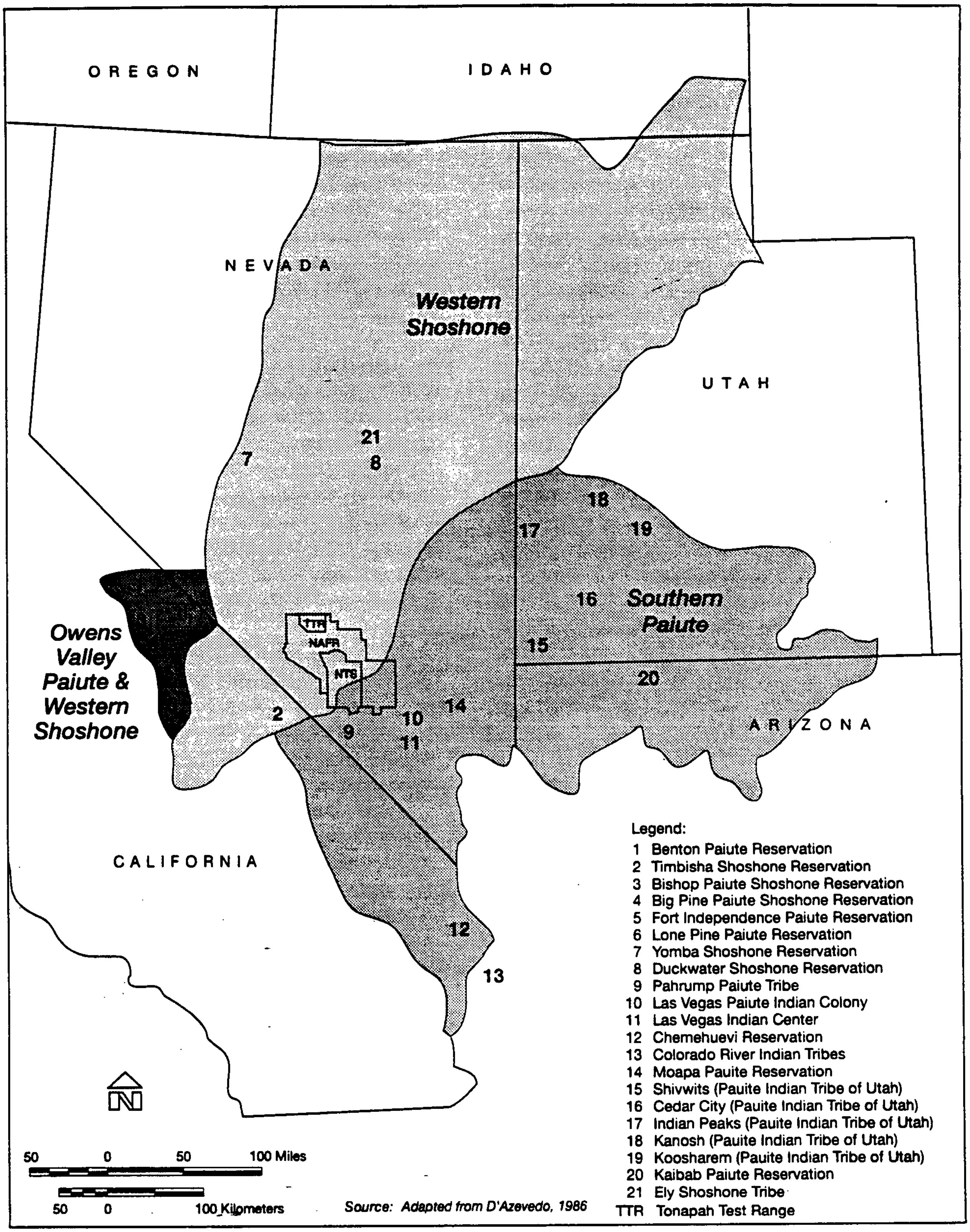


Figure 4-48. American Indian region of influence for the NTS EIS

of these people and so were mutually shared for religious ceremony, resource use, and social events (Stoffle et al., 1990a). When Europeans encroached on these lands, the numbers of Indian people, their relations with one another, and the condition of their traditional lands began to change. European diseases killed many Indian people, European animals replaced Indian animals and disrupted fields of natural plants, Europeans were guided to and then assumed control over Indian minerals, and Europeans took Indian agricultural areas. The withdrawal of Nevada lands for the use of the War Department as an aerial bombing and gunnery range in 1942 (Executive Orders No. 8578 of October 1940, and No. 9019 of January 12, 1942) and later the final land withdrawal of February 12, 1952 (Public Law Order 805), for use by the Atomic Energy Commission, continued the process of Euroamerican encroachment on these Indian lands. Pollution and destruction followed in the form of bombs and atomic testing, thus causing some places to become unusable again for Indian people. On the other hand, many places were protected by this land withdrawal because pothunters were kept from stealing artifacts from rock shelters and European animals were kept from grazing on Indian plants. The forced removal of Indian people from the NTS lands was combined with their involuntary registration and removal to distant reservations in the early 1940s. Indian people were thus removed from lands that had been central in their lives for thousands of years.

Despite the pollution and destruction of some cultural resources and the physical separation from the NTS and neighboring lands, the Indian people continue to value and recognize the central role of these lands in their continued survival. Recognizing this continuity in traditional ties between the NTS and Indian people, in 1985 the DOE began long-term research involving the inventory and evaluation of American Indian cultural resources in the area. This research was designed to comply with the American Indian Religious Freedom Act, which specifically reaffirms the First Amendment of the United States Constitution's rights of American Indian people to have access to lands and resources essential in the conduct of their traditional religion. These rights are exercised not only in tribal lands but beyond the boundaries of a reservation (Stoffle et al., 1994b).To reinforce their cultural affiliation rights and to prevent the loss of ancestral ties to the NTS, 17 Tribes and Organizations have aligned themselves together to form the CGTO. This group is formed by officially appointed representatives who are responsible for representing their respective tribal concerns and perspectives. The CGTO has established a long-standing relationship with the DOE. The primary focus of the group has been the protection of cultural resources. The DOE and the CGTO have participated in cultural resource management projects, including the Yucca Mountain Project (Stoffle 1987; Stoffle et al., 1988a; 1989a; 1990a), and the Underground Weapons Testing Project (Stoffle et al., 1994b). These studies are used in this report, along with the collective knowledge of the CGTO, as the basis of the comments in this NTS EIS.

The cultural resource management projects sponsored by the DOE have been extremely useful for expanding the inventory of American Indian cultural resources beyond the identification of archaeological remains and historic properties. To date, 107 plant and more than 20 animal species present on the NTS have been identified by Indian elders as part of their traditional resources. These plant and animal species are discussed in the following sections (see Table 4-38, Traditional-Use Plants and Table 4-39, Traditional-Use Animals).

<u>Mercury Valley</u>—The CGTO knows that the Mercury Valley hydrographic area contains a wide range of important cultural resources, including plants, animals, and archaeology sites. This knowledge comes from frequent visits by the CGTO members to this area. Observed plants in this valley include Indian ricegrass (Oryzopsis hymenoides), prince's plume (Stanleya pinnata), yucca (Yucca Baccata), and sacred datura (Datura meteloides). These plants represent sources of food, fiber, and medicine. Some important animal resources are rabbit, turtle, coyote, and chuckwalla. These and other Indian cultural resources found in Mercury Valley were and continue to be critical in the lives and culture of Indian peoples. No systematic American Indian studies have been conducted in Mercury Valley; therefore, at this time, it is not possible to completely assess the cultural significance of this area.

<u>Rock Valley</u>—The CGTO knows that the Rock Valley hydrographic area contains a wide range of important cultural resources, including plants, animals, archaeology sites, and minerals. One formal American Indian plant study involving elder Indian plant experts was conducted in Rock Valley as part of the Yucca

Table 4-38. American Indian traditional-use plants present in the NTS area
(Page 1 of 4)

Scientific Name	Common Name	GC[a] UTTR[b]	YM[c]	PM[d]/RM[e]
Ambrosia dumosa	*White bursage*	X		
Amelanchier utahensis	*serviceberry*		X	
Amsinckia tesselata	*fiddleneck*		X	
Anemopsis californica	*yerba mansa*		X	
Arabis pulchra	*wild mustard*		X	
Artemisia ludoviciana	*sagebrush, wormwood*	X	X	
Artemisia nova	*black sagebrush*	X		X
Artemisia tridentata	*big sagebrush*		X	X
Atriplex canescens	*four-winged saltbush*	X		
Atriplex confertifolia	*shadscale*		X	
Brodiaea pulchella	*desert hyacinth*		X	
Calochortus bruneaunis	*sego lily*			X
Calochortus flexuosus	*mariposa lily*		X	
Carex spp.	*sedge*	X		
Castilleja chromosa	*Indian paintbrush*		X	
Castilleja martinii	*narrowleaf paintbrush*			X
Ceratoides lanata	*winterfat*			X
Chenopodium fremontii	*Fremont goosefoot*			X
Chrysothamnus nauseosus	*rabbitbrush*	X	X	X
Cirsium mohavense	*desert thistle*		X	
Coleogyne ramosissima	*black brush*		X	
Coryphantha vivipara var. desertii	*fishhook cactus*	X	X	
Coryphantha vivipara var. rosea	*foxtail cactus*			X
Datura meteloides	*jimsonweed*	X	X	
Descurainia pinnata	*tansy mustard*		X	
Distichlis spicata	*salt grass*		X	
Echinocactus polycephalus	*cotton-top cactus*		X	
Echinocereus englemannii	*hedge hog cactus*	X	X	
Eleocharis palustris	*spikerush*			X

Table 4-38. American Indian traditional-use plants present in the NTS area
(Page 2 of 4)

Scientific Name	Common Name	GC[a] UTTR[b]	YM[c]	PM[d]/RM[e]
Elymus elymoides	*squirrel tail*			X
Encelia virginensis var.actonii	*brittlebush*		X	
Ephedra nevadensis	*Indian tea*	X	X	X
Ephedra viridis	*Indian tea*		X	X
Eriastrum eremicum	*desert eriastrum*			X
Eriogonum inflatum	*desert trumpet*		X	
Erodium cicutarium	*herringbill*			X
Euphorbia albomarginata	*rattlesnake weed*		X	X
Geastrum spp.	*earthstar*		X	
Gilia inconspicua	*gilia*			X
Grayia spinosa	*spiny hop sage*			X
Gutierrezia microcephala	*matchweed*	X	X	
Juncus mexicanus	*wire grass*		X	
Juniperus osteosperma	*juniper, cedar*	X	X	X
Krameria parvifolia	*range ratany*		X	
Larrea tridentata	*creosote bush, greasewood*	X	X	
Lewisia rediviva	*bitter root*			X
Lycium andersonii	*wolfberry*	X	X	
Lichen	*lichen*		X	X
Lycium pallidum	*wolfberry*		X	
Menodora spinescens	*spiny menodora*		X	
Mentzelia albicaulis	*desert corsage*		X	X
Mirabilis multiflora	*four o'clock*	X		X
Nicotiana attenuata	*coyote tobacco*			X
Nicotiana trigonophylla	*Indian tobacco*	X	X	
Opuntia basilaris	*beavertail cactus*	X	X	
Opuntia echinocarpa	*golden cholla cactus*		X	
Opuntia erinacea	*Mojave prickly pear*	X	X	
Opuntia polycantha	*grizzly bear cactus*			X

Table 4-38. American Indian traditional-use plants present in the NTS area
(Page 3 of 4)

Scientific Name	Common Name	GC[a]/ UTTR[b]	YM[c]	PM[d]/RM[e]
Orobanche corymbosa	*broomrape, wild asparagus*			X
Oryzopsis (Stipa) hymenoides	*Indian ricegrass*	X	X	X
Penstemon floridus	*Panamint beard tongue*			X
Penstemon pahutensis	*Pahute beard tongue*			X
Peraphyllum ramosissimum	*squawapple*		X	
Phragmites australis	*cane, reed*	X	X	
Pinus monophylla	*pinyon pine*		X	X
Prosopis glandulosa	*mesquite*	X	X	
Prosopis pubescens	*screwbean*		X	
Psorothamnus polydenius	*dotted dalea*		X	
Purshia glandulosa	*buckbrush*		X	
Purshia mexicana	*cliffrose*			X
Purshia tridentata	*buckbrush*			X
Quercus gambelii	*scrub oak*		X	X
Rhus aromatica	*skunkbush, sumac*			X
Rhus trilobata var. anisophylla	*squawbush*		X	
Rhus trilobata var. simplicifolia	*squaw bush*	X	X	
Ribes cereum	*white squaw currant*			X
Ribes velutinum	*desert gooseberry*			X
Rosa woodsii	*woods rose*			X
Rumex crispus	*curly dock, wild rhubarb*		X	
Salix exigua	*willow*	X	X	
Salix gooddingii	*black willow*	X	X	
Salsola iberica	*Russian thistle*	X		X
Salvia columbariae	*chia sage*		X	
Salvia dorrii	*purple sage, Indian tobacco*	X	X	
Sarcobatus vermiculatus	*greasewood*	X		
Sisymbrium altissimum	*tumbling mustard*			X
Sphaeralcea ambigua	*globe mallow*	X	X	X

Table 4-38. American Indian traditional-use plants present in the NTS area
(Page 4 of 4)

Scientific Name	Common Name	GC[a]/UTTR[b]	YM[c]	PM[d]/RM[e]
Stanleya pinnata	*Prince's Plume*	X	X	X
Stephanomeria sp. spinosa	*spiny wire lettuce, gum bush*		X	X
Stipa speciosa	*bunchgrass*		X	
Streptanthella longirostris	*wild mustard*		X	
Streptanthus cordatus	*wild mustard*		X	
Suaeda torreyana	*seepweed*		X	
Symphoricarpos longiflorus	*snowberry*		X	
Symphoricarpos spp.	*snowberry*			
Tessaria sericeae	*arrowweed*	X	X	
Thamnosma montana	*turpentine bush*	X	X	
Thelypodium integrifolium	*wild cabbage*		X	
Typha domingensis	*cattail*		X	
Typha latifolia	*cattail*	X	X	
Veronica anagallis-aquatica	*speedwell*		X	
Vitis arizonica	*wild grape*	X	X	
Xylorhiza tortifolia	*desert aster*		X	
Yucca baccata	*banana yucca*	X	X	X
Yucca brevifolia	*Joshua tree*		X	
Yucca spp.	*yucca*		X	
Yucca schidigera	*Mojave yucca, Spanish bayonet*		X	

[a] Colorado River Corridor
[b] Utah Test and Training Range
[c] Yucca Mountain
[d] Pahute Mesa
[e] Rainier Mesa.

NOTE: American Indian traditional-use plants present in the NTS area are identified in the project reports entitled American Indian Plant Resources in the Yucca Mountain Area, Nevada (Stoffle et al., 1994b) and American Indian Cultural Resources on Pahute and Rainier Mesas, NTS. This table includes traditional-use plants identified in the Colorado River Corridor Study and in the Utah Test and Training Range Study that are also present at the NTS.

Table 4-39. American Indian traditional-use animals present at the NTS

Scientific Name	Common Name
Alectoris chukar	*chukar*
Ammospermophilus leucurus	*white-tailed antelope squirrel*
Amphispiza bilienata	*black-throated sparrow*
Aquila chrysaetos	*golden eagle*
Buteo jamaicensis	*red-tailed hawk*
Callipepla gambelii	*Gambel's quail*
Canis latrans	*coyote*
Cicadidae spp.	*cicada*
Cnemidophorus tigris	*western whiptail lizard*
Canis latrans	*coyote*
Colaptes auratus	*northern flicker*
Crotalus spp.	*rattlesnake*
Eutamias dorsalis	*cliff chipmunk*
Felis concolor	*mountain lion*
Felis rufus	*bobcat*
Formicidae formicinae	*mound-building ant (red and black ant)*
Gopherus agassizii	*desert tortoise*
Haliaeetus leucocephalus	*bald eagle*
Odocoileus hemionus	*mule deer*
Ovis canadensis	*bighorn sheep*
Sauromalus obesus	*chuckwalla*
Spizella breweri	*Brewer's sparrow*
Stagmomantis spp.	*praying mantis*
Sylvilagus spp.	*cottontail*
Vulpes velox	*kit fox*
Zenaida macroura	*mourning dove*

NOTE: American Indian traditional-use animals are identified in the project report entitled American Indian Cultural Resources on Pahute and Rainier Mesas, NTS (Stoffle et al., 1994b). This table presents only a partial list of traditional-use animals present at the NTS. To date, no systematic or extensive animal studies have been conducted at the NTS.

Mountain Project. A total of 32 medicine and food plants in upper Rock Valley were identified as part of the Yucca Mountain Project ethnobotany study (Stoffle et al., 1989b).

Another 10 traditional-use plants were identified at the northeast base of Little Skull Mountain near the divide between Rock Valley and Jackass Flats (Stoffle et al., 1988a). Some of the important animals in the valley include rabbit, turtle, coyote, and whiptail lizard, which were used for food, ceremony, and eye surgery.

Systematic American Indian studies of animals and archaeology have not been conducted in Rock Valley; therefore, a complete assessment of the cultural significance of this area is not possible at this time.

Fortymile Canyon-Jackass Flats—The CGTO knows that the Fortymile Canyon and Jackass Flats hydrographic area contains a wide range of important cultural resources, including plants, animals, archaeology sites, minerals, and power places. Three formal plant studies were conducted in this area as part of the Yucca Mountain Project, which identified 13 traditional-use plants (Stoffle et al., 1988a). Fifteen formal ethnoarchaeological studies were conducted in this area as part of the Yucca Mountain Project, which identified numerous archaeological resources in this area, dating as early as Clovis (10,000 years ago) (Stoffle et al., 1989a). Also present in this area are important minerals, which were extracted by Indian people to make tools and other stone artifacts. Traditional quarry sites and localities are associated with these mineral resources. At least one power place, known to be associated with Indian ceremonies, is located in this area. Fortymile Canyon is well known among Indian people who continue to use either its traditional Shoshone name Dogowya Hunumpi (Snake Wash) or the Owens Valley name Towahonupi (Snake Canyon) to describe it. The canyon was a significant crossroads where numerous traditional Indian trails from distant places like Owens Valley, Death Valley, and the Avawatz Mountains came together (Stoffle et al., 1989a). While many American Indian studies have been conducted in this area, other cultural resources have not been systematically studied. Other needed studies include rock art (which is called in Southern Paiute tumpituxwinap or literally "storied rocks" [Stoffle et al., 1995]), power places, and animals.

Buckboard Mesa—The CGTO knows that the Buckboard Mesa hydrological area contains a wide range of important cultural resources including plants, animals, archaeology sites, minerals, and power places. Two ethnoarchaeology site visits have been conducted in this area. One study was focused on a power rock and a series of petroglyph panels located at the southern end of Buckboard Mesa (Stoffle et al., 1994b), and the second study included a visit to rock shelters containing obsidian nodules, artifacts, and Indian rock paintings. To the north of Buckboard Mesa is an extensive area of obsidian nodules that were significant in many ways to Indian people. Scrugham Peak, a volcanic cone, was preliminarily identified by Indian people as a place of traditional power and ceremony. A full cultural assessment of this place and its role in the Buckboard Mesa area awaits systematic American Indian Traditional Cultural Property studies. While some American Indian studies have been conducted in this area, only a few archaeology sites have been assessed. There have been no systematic studies of plants, animals, and Traditional Cultural Properties.

Oasis Valley—The CGTO knows that the Oasis Valley hydrographic area is a part of the agricultural core area of a much larger Indian district called Ogwe'pi *by the Indian people who used this farming, gathering, and medicine area. The cultural significance of the* Ogwe'pi *District is well-established by document research (Stoffle et al., 1989a), one plant area study, and one archaeology study area (Stoffle et al., 1994b) and by interviews conducted during the 1930s. According to Indian people interviewed in the 1930s (Steward, 1938), the* Ogwe'pi *District contained agricultural lands next to springs and streams in Oasis Valley itself, while the uplands formed by nearby mountains contributed pine nuts and deer to the diet of the Indian people (Stoffle et al., 1990b). The* Ogwe'pi *District was an important place for Indian trade and ceremonialism. Mineral hot springs were used by Indian people for curing, thus further increasing the cultural importance of the Oasis Valley core area. During much of the historic period, Indian people continued to live in Oasis Valley and use the surrounding uplands of the* Ogwe'pi *District. Much of the Oasis Valley hydrological basin has not been systematically studied by American Indian people. Therefore, at this time, it is not possible to fully assess the cultural significance of all places in the Oasis Valley.*

Gold Flat—The CGTO knows that the Gold Flat hydrographic area contains a wide range of important cultural resources including plants, archaeology sites, and power places. This conclusion is based on American Indian studies conducted along the central and northern portions of Pahute Mesa. These studies identified 42 species of Indian plants found in this area (Stoffle et al., 1994b). American Indian archaeological studies in this area document the presence of living areas, food and tool processing areas, burial sites, and power places. Initial animal studies indicate the presence of culturally significant species, such as hawks and eagles. At this time, it is not possible to make a full cultural assessment of this hydrological area because only the Pahute Mesa has been studied, and additional studies are planned to assess rock art and traditional cultural properties.

Kawich Valley—The CGTO knows that the Kawich Valley hydrological area contains a wide range of important Indian cultural resources, including plants, animals, archaeology sites, and places of both power and ceremony. This knowledge comes from a series of systematic American Indian studies on Pahute Mesa regarding plants and animals and by selected observations by individual Indian people. A total of 42 plants were identified from 6 plant locations, 36 of which are still used today (Stoffle et al., 1994b). Interviews with Indian experts about animals indicated a number of culturally significant species, including hawks and eagles, and a unique species of ant valued as both food and medicine. Archaeological studies at sites indicate the presence of living areas and places where food and plants were processed (Stoffle et al., 1994b). Kawich Valley contains an important trail used within the current memory of Indian people. Members of the Kawich family visited this area and recounted family memories of Kawich Valley and the use of the Pahute Mesa. Individual Indian people identified places in Gold Meadows where places of power and ceremony traditionally occurred, but no systematic interviews on this issue have been conducted. The CGTO has recommended that the Gold Meadows area be set aside for special protection and use by Indian people because of the concentration and variety of Indian cultural resources it contains (see Appendix G containing EIS-American Indian Meeting Report April, 1995). The cultural significance of the entire Kawich Valley hydrological area cannot be assessed at this time because studies have been limited to Pahute Mesa and because both Traditional Cultural Property and animal studies are planned for the area.

Emigrant Valley—The CGTO knows that the Emigrant Valley hydrological area contains a wide variety of important cultural resources, including plants, animals, and archaeology sites, because it is next to Gold Meadows and Rainier Mesa areas (Stoffle et al., 1994b). Indian people have requested access to this area but have not been permitted to either visit or conduct systematic interviews here; therefore, all current information about this area derives from recorded and unrecorded Indian oral history. It is known that an Indian man who received the Anglo name Panamint Joe Stuart was from the Belted Range, which is the western boundary of the Emigrant Valley (Steward, 1938). Steward's Indian interviews conducted in the 1930s indicated that in the late 1800s there were 15 known locations of Indian camps in the Belted Range (Steward, 1938). Steward's interviews revealed that the Indian people of these Belted Range villages associated with the Indian people in the Kawich Range to the east and the Beatty people to the southwest. These data support the tentative conclusion of the CGTO that the two valleys have similar levels of cultural significance. No systematic Indian studies have been conducted in Emigrant Valley, so a complete cultural assessment is not possible at this time.

Yucca Flat weapons test basin—The CGTO knows that the Yucca Flat weapons test basin hydrological area contains a wide variety of culturally important Indian resources including plants, animals, archaeology sites, rock paintings, and ceremonial areas. Systematic American Indian studies have been conducted along the southern rim and base of Rainier Mesa, in the Eleana Range, on the northeastern flank of Shoshone Mountain, and along the western edge of Yucca Flat weapons test basin itself. Plant studies indicate that 2 species are located in the more arid lowlands, 13 species at Tippipah Spring, 21 species at Captain Jack Spring, 11 species at White Rock Spring, and 4 species on the mesa rim (Stoffle et al., 1988a). The few interviews with Indian people about animals observed in this area do indicate that many significant animals are present, including mountain lion, deer, and hawks. The area is archaeologically complex with major camps located at permanent springs and food and tool processing places scattered throughout the area. All the springs in this area were permanent Indian camps. White Rock Spring, Toshatimbibah, *had a major settlement called* Tunava *in the late 1880s and was a central place for interethnic gatherings. Indian people came to these ceremonies from distant communities. These ceremonies included major annual rabbit drives and dances that lasted up to a month (Steward, 1938). This spring was the home of a regional chief whose name was* Wangagwana *(Steward, 1938). The White Rock Spring was occupied by Indian people until the 1930s and used until the mid-1950s after the NTS was officially withdrawn from public use. The cultural significance of the western portion of this hydrological area is well established; however, no studies have been conducted in the central, eastern, and southern portions of this area. Because additional American Indian studies are planned and some areas have not been studied, a full cultural assessment of this area is not possible at this time.*

Frenchman Flat—The CGTO knows that the Frenchman Flat hydrological area contains a wide variety of plants, animals, and archaeology sites of cultural importance to Indian people. Systematic studies of both plants and archaeology sites have been conducted in the west-central portion of this area. A total of 20 plant species were identified at 2 plant study locations, with 2 species identified on a flat area near the eastern flank of Mt. Sayler and another 18 species identified at Cane Spring (Stoffle et al., 1988a). A complete cultural assessment of this area is not possible at this time because past studies were geographically and topically restricted.

CULTURAL RESOURCES, AREA 13—Area 13 lies in the southern Great Basin, an area with a prehistory that may span the past 10,000 years or more. Properties ranging from the early prehistoric period to historic mining and ranching sites are found in the region. Archaeological research in the vicinity of Area 13 has been extremely limited. This limitation makes characterization of the cultural resources extremely difficult. Archaeological reconnaissance in the area includes a survey of three soil test units (Beck, 1993) in Emigrant Valley, a Class II cultural resources reconnaissance of the entire Groom Range (Reno and Pippin, 1986), and Class II survey of the Nellis Air Force Bombing and Gunnery Range (Bergin et al.,1979). Because these surveys only sampled this large area, it is likely that additional undiscovered resources occur within the project area.

At the time of contact with Euroamericans in the mid-1800s, the area was used by bands of Western Shoshone people centered around the Belted and Kawich Mountain Ranges (Steward, 1938) and by Southern Paiutes centered in the Pahranagat Valley (Fowler and Fowler, 1971). The project area lies adjacent to the boundary between these two groups. Ethnographic studies have focused on the central areas within these two districts, thus little is known about the interaction of these groups along the frontier of their tribal boundaries. Therefore, this region is important archaeologically.

An area of potential effect for the cultural resources in the Area 13 region is based on research performed in the area for three proposed test units for soil treatability studies. The site is on the NAFR Complex within the Emigrant Valley, adjacent to the northeast corner of the NTS. Emigrant Valley is bounded by the Halfpint Range to the south and southwest, the Belted Range to the northwest, and the Groom Range to the northeast (State of Nevada Engineer's Office, 1974).

RECORDED CULTURAL RESOURCES—Few sites have been recorded directly within the area of potential effect for Area 13. Five sites, one temporary camp, and four processing localities (Brooks et al., 1978) have been identified in the general vicinity. In the same year, the University of Nevada, Las Vegas recorded four more processing localities (Jenkins, 1978). As part of the Nellis Air Force Base Bombing and Gunnery Range survey, two of the previously mentioned sites were relocated, and two more processing localities were found. Other surveys for roads and fencelines identified more sites. Three are temporary camps, three are extractive localities, seven are processing localities, and one is a mining area (Clerico, 1978; Steinberg, 1980; Bunch, 1984).

The most extensive cultural resource reconnaissance work in the project area was conducted by the Desert Research Institute as part of a 6 percent sample survey of the Groom Range (Reno and Pippin, 1986). A total of 160 sites were recorded during this survey, including 30 temporary camps, 17 extractive localities, 63 processing localities, and 53 localities. This sample provides a background against which predictive models may be generated. Similar types of sites may be expected in Area 13, although frequencies may be quite different. Many of these sites have been recommended as eligible for listing on the National Register of Historic Places.

SITES OF AMERICAN INDIAN SIGNIFICANCE—The CGTO knows that Area 13 contains significant cultural resources, including plants, animals, archaeology sites, and places of historic value to Indian people. This is known from Indian interviews conducted in the 1930s (Steward, 1938) and recent plant, animal, and archeology studies conducted south of this area in comparable environments (Stoffle et al., 1990a; Stoffle et al., 1994b). These studies document long-term and extensive involvement of Indian people in these traditional lands. These were among the last areas lived in before Indian people were forced out of the area to live on more distant Indian reservations. As a result of oral history, Indian people know there are various types of cultural resources located in this study area, but *cannot provide site-specific information about these areas at this time. No Indian people officially representing the CGTO have visited Area 13 or any other portion of the NAFR Complex, although such interviews have been requested and one initial meeting with a NAFR Complex archaeologist has occurred. Therefore, it is not possible to fully assess the cultural significance of Area 13 at this time.*

4.1.11 Occupational and Public Health and Safety/Radiation

The health and safety of site workers and the general public is discussed in this section. In addition, a brief discussion of the NTS health and safety program is presented.

OVERVIEW—The potential for activities at the NTS to impact the health and safety of the general public is minimized by a combination of the remote location of the NTS, the sparse population surrounding it, and a comprehensive program of administrative and design controls.

Visitors to the NTS, including individuals and tour groups, are subject to essentially the same safety and health requirements as workers. Safety briefings are provided as appropriate (e.g., tunnel entry), personal protective equipment is provided when necessary, and radiation dosimeters may be issued along with badges as part of the visitor-control process. Visitors may request radiation dosimeters even though none might be required in the areas visited. Secondary access control is provided when necessary for safety or security reasons. Access to areas of the NTS where working conditions require special hazard controls (e.g., the Radioactive Waste Management Sites) is restricted through the use of signs, fences, or barricades.

The health and safety of NTS workers is protected by adherence to the requirements of federal and state law, DOE orders, and the plans and procedures of each organization performing work on the NTS. A program of self-assessment for compliance with these requirements is conducted by each of the Maintenance and Operations contractors and by the DOE. In addition, workers are protected from the specific hazards associated with their jobs by training, monitoring the workplace environment, using personal protective equipment, and using administrative controls to limit their exposures to radioactive or chemical pollutants. Worker access to areas of the NTS that present working conditions requiring special hazard control is restricted through the use of signs, barriers, and fences, as appropriate.

CRITERIA—All work at the NTS is performed according to the safety and health requirements of the Occupational Safety and Health Administration as codified in Title 29 CFR Parts 1910 and 1926. The DOE orders also provide direction for worker safety and health programs (see Appendix C).

To integrate the activities of a number of contractors and NTS users and to avoid discontinuities in the health and safety program, the NTS is operated under the standard operating procedures of the NTS Operations. The relevant procedures include the following NTS standard operating procedures:

- 5401 Environment, Safety, and Health Coordination Responsibilities (DOE, 1990)
- 5402 Radiological Safety (DOE, 1995b)
- 5409 Management of Hazardous Materials and Hazardous Wastes (DOE, 1993)
- 5410 Industrial Hygiene (DOE, 1995c)
- 5411 Nuclear Criticality Safety (DOE, 1995d)
- 5412 Explosive Safety (DOE, 1995e)
- 5415 Safety and Fire Responsibilities (DOE, 1991).

Procedures relevant to specific aspects of the nuclear testing program are also part of the standard operating procedures of the NTS Operations.

INSTITUTIONAL SAFETY PROGRAMS—The NTS supports the following on-site safety services provided by the Maintenance and Operations contractor and available to all users:

- Fire department

- Occupational medicine department
- Radiological safety services, including a radioactive material control to ensure that material leaving the NTS is not contaminated
- Industrial hygiene services.

Workers at the North Las Vegas Facility may be exposed to other hazards in the workplace. Workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. Workers are also protected by strict adherence to federal standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals utilized in facility processes, ensures that these standards are not exceeded. The North Las Vegas Facility stores and uses few hazardous materials in amounts greater than the threshold planning quantities that require reporting under federal regulations.

RADIOLOGICAL HEALTH—The *Nevada Test Site Annual Site Environmental Report-1993* (Annual Site Environmental Report) (DOE/NV, 1994a) provides ambient exposure levels at numerous locations on the NTS. The Annual Site Environmental Report contains detailed information regarding ongoing radiological monitoring at the NTS and also provides some information regarding safety shots conducted on the NAFR Complex (Area 13).

Radiation exposure levels of the NTS indicate that during 1993, exposure rates varied on the NTS from 90 to 4,300 milliroentgen (mR)/yr. A group of locations that were not, to the best available knowledge, influenced by radiological contamination served as control areas for the NTS and on parts of the NAFR Complex and Tonopah Test Range. The average exposure rate from all of these control areas was 0.36 mR/day or 131 mR/yr. A complete listing of all of the exposure measurements can be found in Volume 2 of the Annual Site Environmental Report.

The North Las Vegas Facility provides calibration services using specialized radiation fields for a variety of instrument test packages in support of the DOE/NV operations. Based on operating data for the year 1993, workers at the North Las Vegas Facility received an average radiation dose of 82 millirem per year, and the maximally exposed worker received a dose of 440 millirem. The worker population received a collective dose of 0.57 roentgen equivalent man (rem) which would result in a risk of 2.3×10^{-4} of a single fatal cancer in the worker population. These doses are in addition to natural background radiation which would contribute about 300 millirem per year to each individual and a collective dose of about 2.1 rem to the worker population (based on seven monitored workers).

RADIOLOGICAL EFFLUENTS—Radiological effluent in the form of air emissions and liquid discharges is released as a routine part of operations on the NTS. Radioactivity in liquid discharges released to on-site waste treatment or disposal systems (containment ponds) is monitored to assess the efficacy of treatment and control and to provide a quantitative and qualitative annual summary of released radioactivity. Air emissions are monitored for source characterization and operational safety, as well as for environmental surveillance purposes.

Environmental surveillance on the 3,496-km^2 (1,350-mi^2) NTS is designed to cover the entire area, with emphasis on areas of past nuclear testing and present operational activities. In 1994, there were 54 samplers collected for air particulate and reactive gases, 19 samplers collected for tritiated water vapor in atmospheric moisture, and 10 samplers collected for air for analysis of noble gas content. Grab samples were collected frequently from springs, water supply wells, open reservoirs, containment ponds, and sewage lagoons. Thermoluminescent dosimeters were placed at 201 locations on the NTS.

Data from these networks are summarized as annual averages for each monitored location. Locations with concentrations above the NTS average are assumed to reflect on-site emissions. These emissions arise from diffuse (areal) sources and from particular operational activities (e.g., radioactivity buried in the low-level waste site).

Approximately 2,700 air samples were analyzed by gamma spectroscopy. All isotopes detected by gamma spectroscopy were naturally occurring in the environment (potassium-40, beryllium-7, and members of the uranium and thorium series), except for fixed instances where very low levels of cesium-137 were detected. A slightly higher average was found in samples in certain areas, but that level was calculated to be only 0.01 percent of the Derived Air Concentration Guide for exposure to the public.

Surface water sampling was conducted quarterly at 12 well reservoirs, 8 springs, 1 containment pond, and 9 sewage lagoons. A grab sample was taken from each of these surface water sites for analysis of gross beta, tritium, gamma-emitters, and plutonium isotopes. Strontium-90 was analyzed once per year for each location. Water samples from the springs, reservoirs, and lagoons contained background levels of gross beta, tritium, plutonium, and strontium. Samples collected from the containment pond contained detectable levels of radioactivity, as would be expected. Water from on-site supply wells and distribution systems was sampled and analyzed for radionuclides. The supply-well average gross beta activity was 2 percent of the Derived Concentration Guide; gross alpha was 40 percent of the drinking water standard; strontium-90 was measured at about 1 percent of the Derived Concentration Guide; and plutonium-239, -240, and -238 were all below detectable levels.

External gamma radiation exposure data from the on-site thermoluminescent dosimeter network indicated that gamma exposure rates recorded during 1994 were statistically lower than the data collected in 1993. Recorded exposure rates on the NTS ranged from 54 mrem/yr in Mercury to 3,679 mrem/yr for a radioactive material storage area in Area 5. The 1994 sitewide average for boundary and control stations of 111 mrem/yr was about 23 percent lower than 1993.

RADIOLOGICAL CONTAMINATION—As discussed in previous sections, radiation-contaminated areas on the NTS, the NAFR Complex, and the Tonopah Test Range primarily resulted from safety tests that began in 1951 and continued through the early 1960s. Nuclear explosive tests conducted through the 1950s were predominantly atmospheric tests. These tests involved the detonation of a nuclear explosive device placed on the ground surface, on a steel tower, suspended from tethered balloons, or dropped from an aircraft. Several of the tests were non-nuclear; i.e., safety tests, involving destruction of a nuclear device with non-nuclear explosives. Since 1962, nearly all tests have been conducted in sealed vertical shafts drilled into the valley floor of Yucca Flat weapons test basin and the top of Pahute Mesa, or in horizontal tunnels mined into the face of Rainier Mesa. Other nuclear testing over the history of the NTS has included the BREN Tower and the nuclear ramjet experiment conducted in Area 26 by Lawrence Livermore National Laboratory. Waste disposal facilities for radioactive and mixed waste are located at Areas 3 and 5.

The *Contaminated Areas Report* published by Reynolds Electrical and Engineering Co. Inc. (1992) provides a complete listing and maps of all the identified radiation-contaminated areas on the NTS. This report also includes the contaminated areas that are found on the Tonopah Test Range and the NAFR Complex. Areas are considered contaminated if the radiation level is above background levels. A total of 235 contaminated areas exist on the NTS, the Tonopah Test Range, and the NAFR Complex. These areas are either posted and/or fenced, depending on their level of contamination. There are 135 km^2 (52 mi^2) of posted areas and 13 km^2 (5 mi^2) of fenced areas. Most of the contaminated areas on the NTS are a direct result of weapons tests. These areas include craters, mud pits, cellars, and muck piles. In addition to those areas, there are a number of other contaminated locations associated with tunneling and the tests conducted within tunnels. The bulk of the contaminated areas associated with tunnels are located in Area 12 and include such areas as contaminated muck piles, tunnel ponds, and holding areas for contaminated items exiting the tunnels.

Buildings used for the safe handling of spent nuclear rods and for nuclear rocket development from reactors are also listed as contaminated areas. These buildings, located in Area 25, include maintenance, assembly, and disassembly facilities and test cells. Other contaminated areas include a few core testing laboratories and the EPA Farm site in Area 15. Storage sites for radioactive material and wastes and for other miscellaneous sites make up the remainder of contaminated areas on the NTS. The current radionuclide content in most of the contaminated areas is fission products (predominately cesium-137) that have not totally decayed. Plutonium-239 is the other primary radionuclide appearing on the NTS.

ECOLOGICAL STUDIES—Studies conducted under programs sponsored by the DOE/NV included monitoring the plants and animals on the NTS to assess changes over time in their ecological conditions and to provide information needed to document NTS compliance with environmental laws, regulations, and orders (Hunter, 1992b, 1994b,c, 1995). The monitoring effort has been arranged into three interrelated phases of work: (1) a series of five undisturbed study plots in test-impacted ecosystems that are monitored at 1- to 5-year intervals to establish natural baseline conditions; (2) a series of study plots in representative disturbed areas that are monitored at 3- to 5-year intervals to determine impacts of disturbance, document site recovery, and investigate natural recovery processes; and (3) observations of birds and large mammals throughout the NTS.

In 1994, during the seventh full year of flora and fauna monitoring, surveys were conducted at numerous sites for perennial and ephemeral plants, mammals, and reptiles. Many of these sites included paired disturbed and undisturbed plots. Three baseline sites were monitored, and perennial and ephemeral plants were measured at all of them. Sites in disturbed areas are monitored on a 3-year cycle. Baseline measurements were also made near the Device Assembly Facility in Frenchman Flat (Woodward et al., 1995).

Monitoring of wild horses continued for the fifth consecutive year. All horses, including foals, were individually identified. Field observations were also made of raptors, mule deer, and raven in appropriate habitats throughout the NTS. Desert tortoises in the Rock Valley study enclosures were monitored in the spring and fall, and free-roaming tortoises were marked and measured when encountered by chance.

GROUNDWATER PROTECTION—The DOE/NV instituted a long-term Hydrological Monitoring Program in 1972 to be operated by the EPA under an interagency agreement. In 1994, groundwater was monitored on and off the NTS and at five sites in other states to detect the presence of any radioactivity that may be related to nuclear testing activities. No radioactivity was detected above background levels in the groundwater sampling network surrounding the NTS. Low levels of tritium, in the form of tritiated water vapor, were detected in on-site wells, as has occurred previously. None of the levels exceeded 33 percent of the National Primary Drinking Water Regulation level.

Monitoring and surveillance on and around the NTS by DOE contractors and NTS user organizations during 1994 indicated that operations on the NTS were conducted in compliance with applicable federal and DOE regulations and guidelines. All discharges of radioactive liquids remained on site in containment ponds, and there was no indication of potential migration of radioactivity to the off -site area through groundwater. Surveillance around the NTS indicated that airborne radioactivity from diffusion, evaporation of effluent, or resuspension was not detectable off site, and no measurable net exposure to members of the off-site population was detected through the off-site dosimetry program.

OFF-SITE ENVIRONMENTAL SURVEILLANCE—The off-site radiological monitoring program has been conducted around the NTS since 1992 by the EPA's Environmental Monitoring Systems Laboratory, Las Vegas, under an interagency agreement with the DOE. Prior to 1972, monitoring was performed by the U.S. Public Health Service. The objectives of the Off-Site Environmental Surveillance Program are to assure nearby residents of the safety of the air and water, to provide a long-term environmental baseline, and to detect contamination from DOE activities, if present." This program consists of several extensive environmental sampling, radiation detection, and dosimetry networks.

For the first three quarters of 1994, the Air Surveillance Network was made up of 30 continuously operating sampling locations surrounding the NTS, and 77 standby stations (operated 1 week each quarter) in all states west of the Mississippi River. The 30 Air Surveillance Network stations included 18 located at Community Radiation Monitoring Program stations described below. During 1994, no airborne radioactivity related to current activities at the NTS was detected on samples from the Air Surveillance Network.

The Noble Gas and Tritium Surveillance Network initially consisted of 21 off-site noble gas samplers (8 on standby) and 21 tritium-in-air samplers (7 on standby) located outside the NTS, in associated and exclusion areas, and in Nevada, California, and Utah. During 1994, no radioactivity that could be related to NTS activities was detected at these sampling stations.

The Milk Surveillance Network consisted of 24 sampling locations within 244 km (186 mi) of the NTS and 115 standby Milk Surveillance Network locations throughout the major milk sheds west of the Mississippi River. The levels of analytes in both milk networks have decreased over time since reaching a maximum in 1964. The results from these networks are consistent with previous data.

Other foods were analyzed regularly; most of this food was meat from domestic or game animals collected on and around the NTS. The strontium-90 levels in samples of animal bone remained very low, as did plutonium-239 and -240 in both bone and liver samples. Beets and apples from several off-site locations contained normal potassium-40 activity. Small amounts of plutonium-239, -240, and -238 were found on a few samples.

In 1994, external exposure was monitored by a network of 127 thermoluminescent dosimeters and 27 pressurized ion chambers. The ion chamber network in the communities surrounding the NTS indicated that background exposures, ranging from 73 to 164 mrem/yr, were consistent with previous data and well within the range of background data in other areas of the United States.

Sampling of Long-Term Hydrological Monitoring Program wells and surface waters around the NTS showed only background radionuclide concentrations. The program also included groundwater and surface-water monitoring at locations in Colorado, Mississippi, New Mexico, Alaska, and Nevada where underground tests were conducted.

A network of 18 Community Radiation Monitoring Program stations is operated by local residents. Each station was an integral part of the Air Surveillance, the Noble Gas and Tritium Surveillance, and the Thermoluminescent Dosimeter networks. In addition, the stations are equipped with a pressurized ion chamber connected to a gamma-rate recorder. Samples and data from these Community Radiation Monitoring Program stations were analyzed and reported by Environmental Monitoring Systems Laboratory, Las Vegas, and interpreted and reported by the Desert Research Institute, University of Nevada system. All measurements for 1994 were consistent with previous years and were within the normal background range for the United States.

No radioactivity attributable to current NTS operations was detected by any of the off-site monitoring networks. However, based on the NTS releases reported, atmospheric dispersion model calculations indicated that the maximum potential effective dose equivalent to an off-site individual would have been 0.0038 rem, and the dose to the population within 80 km (50 mi) of the emission sites would have been 0.012 person-rem. The hypothetical person receiving this dose would also have been exposed to 97.0 rem from natural background radiation.

In North Las Vegas, radiation doses to the public as a result of routine operations at the North Las Vegas Facility are too low for measurement. Two very small atmospheric releases of radioactivity occurred in 1995. Calculated doses to the public from these releases are estimated to be a fraction of one millirem and are well within regulatory limit of 10 millirem/year for the airborne pathway. These calculated doses are in addition to natural background radiation of about 300 millirem per year per person.

<u>American Indian Perceived Risks</u>——*Indian people believe that various perceived risks are present and occur as a result of DOE activities. Although there are no Indian words for terms such as* radiation *in the Indian language, early ethnographic studies supported by the DOE, documented a traditional view of radioactivity which centers on the perception by Indian elders of radiation being produced by an* angry rock *(Stoffle, et al., 1989a). Briefly this view is as follows:*

> *Rocks have power. It is recognized that some rocks have more or different power than others. Breaking a rock or removing if from its place without fully explaining these actions not only releases*

> *the power inherent in the rock, but also angers the rock.*
>
> *Rocks can also be self-willing, inasmuch as they can reveal themselves to people and act on people. Crystals, for example have a self-willing, animate power and will reveal themselves to a person whom they desire to be with. If this person picks them up, the person will have great luck. The luck, however, is taken away from others and eventually people will come to recognize this fact and single out the excessively lucky person as having used some nonhuman power at the expense of his or her people...Usually the person takes the crystal back to where it had revealed itself and returns it with an explanation of why it was being returned.*

Radioactivity was interpreted as being the angry action of a powerful rock that had been quarried without its permission and had its power used for purposes it did not agree to. Now the remains of the rock (radioactive waste) is angry and it is taking its anger out on things around it. Plants, animals, people, water, and even the air itself can be hurt or even killed by the radiation from the angry rock. Indian people express the belief that past radiation releases have contaminated plants and animals traditionally used for foods and medicines. Spiritual people believe that they can see and feel radiation; it has unique colors. This is why they cannot eat nor collect some plants, animals, and minerals in some areas. It is now impossible for Indian people to go to certain places, do certain ceremonies, and eat certain foods because radiation from the angry rock has been released.

Air: Living and Dead—Indian people express the belief that the air is alive. There are different kinds of air with different names in Indian language. The Creator puts life into the air which is shared by all living things. When a child is born, they pull in the air to begin their life. The mother watches carefully to make sure that the first breath is natural and that there is no obstruction in the throat. It is believed that if the day of birth is a windy day, it is a good day and the child will have a good life. According to one elder:

> *The seasons - like winter, spring, summer, and fall - they're all important when a child comes into the world because their spirit is tied in with the harvest, or hunt, they say that it gets kinda like into their blood and they become hunters or farmers.*

You can listen to the wind; the wind talks to you. Things happen in nature. Our people had weather watchers, who are kinds of people who will know when crops and things should be done. They watch the different elements in nature and pray to ask the winds to come and talk about these things. Sometimes you ask the north wind to come down and cool the weather. The north wind is asked to blow away the footsteps of the people who have passed on to the afterlife. That kind of wind helps people; it is positive. The wind also brings you songs and messages. Sometimes the messages are about healing people, a sign that the sickness is gone now from the person, or that it's coming to get that sickness to take it away, or it's coming to bring you the strength that you need to deal with the illness.

But air can be destroyed by radiation that has been released by the angry rock, thus causing pockets of dead air. There is only so much alive air which surrounds the world. If you kill the living air, it's gone forever and cannot be restored. Dead air lacks the spirituality and life necessary to support other life forms. Airplanes crash when they hit dead air. One member of the CGTO compared this Indian view of killing air with what happens when a jet flies through the air and consumes all the oxygen, producing a condition where another jet cannot fly through the air. The atomic blast consumes the oxygen like the jet, killing the air. While this comparison of the western science view of dead air from burning seems close to the Indian perspective, the latter has a "life force" component that makes killing air more significant than just consuming its natural components.

Some Indian people who were present during the aboveground atomic blasts, believe that the *sickness they have today came from the radiation. To some of those people the effects of the radiation were in addition to what happened when the air itself was killed. Some elders today say, that even when the plants survive the effects of radiation, the dead air killed them or made them lose their power, their spiritual power to heal things.*

Blast Radiation—The aboveground atomic detonations were witnessed by many Indian people. Today these Indian eyewitness accounts are told with retrospective assessment of the risks that were involved by being close to the blasts and from using the natural resources in the area. Indian people continued to regularly enter the NTS to hunt and collect long after the atomic testing began. Today, the eyewitnesses are elders talking about when they were younger in the 1950s. A few of these accounts are provided in order to explain to non-Indian people the Indian perception of risk derived from these experiences.

A Western Shoshone woman, who still lives near the NTS, recounted her memories of being a young woman during the blasts. According to her:

> *After the bombs (aboveground atomic explosions), my people (Shoshone people) would kill the animals in the area and find something wrong with them. They would kill a deer, but when the hide was skinned off it would just pull apart. When they saw the mushrooms going up (atomic bomb blasts), they knew something was bad. The people (my family and others) were in the mountains picking pine nuts when one of the blasts went off; it felt like an earthquake. I was there, about 8,000 feet. The little animals ran away. The old people looked up into the swaying trees and asked what would happen to those little (bird) nests up there. We Indian people do not go up in the trees, so we will not disturb the birds.*
>
> *After some of the blasts occurred, the old people told us not to pick the pine nuts off the ground, so after that time we took the green cones from the trees. This made fewer pine nuts available to us. Lots of animals seemed different after the blasts. The migrating birds did not come through after that. The rabbits, of which we were eating a lot at that time, were not right. We developed a way to test them for sores. Many rabbits we could not even skin properly, the skin would just fall apart. The chuckwallas and tortoises disappeared, like the migrating birds. The old people told us that the plants are not maturing properly, so the tortoises and chuckwallas are dying. Both the Indian women and the Indian cattle lost their unborn children (through miscarriage) at this time.*
>
> *Many of the essential plants were affected by the blasts, either directly or because the rain would not come. Those old basket makers would say the willows were really brittle after that, they were hard and would not split easily. Even the greasewood became bad too - it is related to the tortoises and the playas (dry lakes) - the Shoshone songs sing about the tortoises and the greasewood together. The old ones would say that when the plants go away, it (what we need to live) will not be there for us anymore. So, we will go away too. One elder is remembered as saying, "What will become of us?" You know they (the elders) would talk like that when they saw what was changing around them.*

A Southern Paiute man remembered his mother (who is still living) telling him stories of the atomic blasts and their effects on plants and animals. His mother would travel with her family to hunt and gather plants. They (old Paiutes) say that the deer would come down over the Bare Mountains and collapse. People would eat other deer that they had killed for themselves, but when they tried to make clothing out of the hides, the hides would fall apart. Plants in the area don't grow as big anymore and were not preferred because they lost some of their power as food and medicine.

A Southern Paiute woman recounted the story of one of her tribal elders who personally experienced *the blasts. This elder currently lives on the Colorado River Indian Reservation hundreds of miles to the south of the NTS, thus again reinforcing the need to talk with Indian people regardless of where they live today. (Name withheld) is a 78-year-old Chemehuevi woman who lived in this area when she was young. She was here when the blasting occurred and she remembers the white flashes. She has vivid recollections of seeing all of this and now that she is older, she has cancer and is real afraid. She feels good when she comes to the NTS as part of the CGTO studies, but she is real afraid of the rocks and the plants because of what has happened. She says that what happened to them, happened to her.*

Perceptions such as these are well-known among the Western Shoshone, Southern Paiute, and Owens Valley Paiute people of this region. These perceptions of risks from radiation are frightening, and remain an important part of our lives. We will always carry these thoughts with us. Today, people are afraid of many things and places in this whole area, but we still love to come out and see our land. We worry about more radiation being brought to this land.

If the DOE wants to better understand our feelings about the impact of radiation on our cultures, they should support a study of risks from radiation designed, conducted, and produced by the CGTO. At this time there has not been a systematic study of American Indians perceptions of risk. Therefore, it's not possible to provide action by action estimation of risk perception impacts. We believe it is a topic that urgently needs to be studied so that Indian people may better address the actual cultural impacts of proposed DOE actions. There have been recent workshops funded by the National Science Foundation to understand how to research the special issue of culturally based risk perception among American Indian communities, and at least one can be more fully understood by research that deeply involves the people being considered. To understand our view of radiation is to begin to understand why we responded in certain ways to past, present, and future DOE activities.

4.1.12 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on minority populations and low-income populations.

This section presents a summary of the demographic analysis prepared to analyze the potential impacts to low-income and minority populations affected by the programs discussed in this EIS. Demographic analysis is the first step in determining disproportionately high and adverse human health or environmental effects to low-income and minority populations. This analysis sets the stage for the impact analysis presented in Chapter 5. Demographic analysis includes defining the region of influence, census block groups, low-income populations, minority communities, and the thresholds for calculating a low-income or minority community census block group.

All program activities described in this EIS are located in Clark, Nye, or Lincoln counties. The region of influence for Environmental Justice includes these counties for this NTS EIS. The Consolidated Group of Tribes and Organizations has identified areas on the NTS and nearby lands as culturally important to the American Indian people. The American Indian region of influence for the NTS area is shown on Figure 4-48. Although many of the American Indian groups live outside Clark, Nye, and Lincoln counties, the American Indian people continue to value and recognize traditional ties to the NTS and surrounding area. In recognition of this tie, the DOE has established a relationship with the group. Specific aspects of the participation of the group in DOE cultural resource management projects are discussed in the Cultural Resources section.

Census block groups, which are clusters of blocks within the same census tracts, have been delineated for Clark, Nye, and Lincoln counties. Census block groups do not cross county or census tract boundaries, and generally contain between 250 and 550 housing units (U.S. Bureau of the Census, 1993).

For the purpose of analysis, low-income populations are individuals living within a census block group whose income is below the poverty level. Households are classified as being below the poverty level if their total family income or unrelated individual income is less than the poverty threshold specified for the applicable family size. For example, the weighted average threshold for a four-person family is $12,674 for the 1990 census. This reflects the different consumption requirements of families based on their size and composition (U.S. Bureau of the Census, 1994).

The U.S. Bureau of the Census identifies four racial classifications, including (1) white; (2) black; (3) American Indian, Eskimo, or Aleut; and (4) Asian or Pacific Islander. Hispanic is not considered a race by the U.S. Bureau of the Census; it is considered an origin. To determine the number of minorities for each census block group for the purpose of analysis, the white race category less whites of Hispanic origin were subtracted from the total census block group population (U.S. Bureau of the Census, 1994).

Within each census block group for each county, percentages were calculated of low-income and minority communities. The denominator used was the tricounty total 1990 population of 763,015. To determine whether a census block group percentage was meaningfully larger than other census block group percentages, thresholds (the average absolute deviation from the mean) for low-income and minority communities were determined. If a census block group percentage was larger than the threshold, it was considered a low-income or minority community census block group and was appropriately shaded. This methodology was chosen to avoid designating a large census block group as low-income or minority when its population is extremely low. For example, a 3,126-km² (1,207-mi²) census block in Nye County had a population count of 51 in 1990. The total number of people under the poverty line was 23. With some methodologies, this entire large census block group would be designated a poverty area and would have been shaded.

Clark County is subdivided into 318 census block groups. Ninety-one of the census block groups are made up of low-income populations (Figure 4-49). The 57 census block groups that constitute minority communities are also illustrated.

Nye County is divided into 25 census block groups. One of these census block groups has low-income communities above the threshold level percentage, and none has minority communities. Lincoln County contains eight census block groups. No census block groups have low-income or minority communities above the threshold level percentage (Figure 4-50).

Using a Geographic Information System, the transportation routes discussed in Appendix I were layered over census block groups shown in Figures 4-49 and 4-50. The Geographic Information System indicated the total mileage of transportation routes and how many miles of these routes traveled through areas of minority and/or low income populations. Less than 2 percent of the routes in Clark County and 0.02 percent of the routes in Nye County travel through areas of low income or minority populations.

4.2 Tonopah Test Range

The Tonopah Test Range comprises 1,616 m² (624 mi²) and has been used by the DOE since the early 1950s. The facility is surrounded on three sides by the NAFR Complex and to the north by the U.S. Bureau of Land Management's open range. The town of Tonopah is located 32 km (20 mi) northwest of the main gate of the Tonopah Test Range and is approximately 241 km (150 mi) northwest of Las Vegas.

Sandia National Laboratories has been the facility operator and site manager of the facility since it was established. The laboratory facilities support their mission in stockpile stewardship, as well as research and design of new weapons and weapon components. The facility offers a unique test bed for testing DOE and DoD weapons. The DOE in the early 1960s conducted several safety-related tests on nuclear weapons, resulting in surface soil contamination of three sites (Clean Slates I, II, and III) that have been managed appropriately since the program.

The existing environmental conditions of the Tonopah Test Range are described in this section.

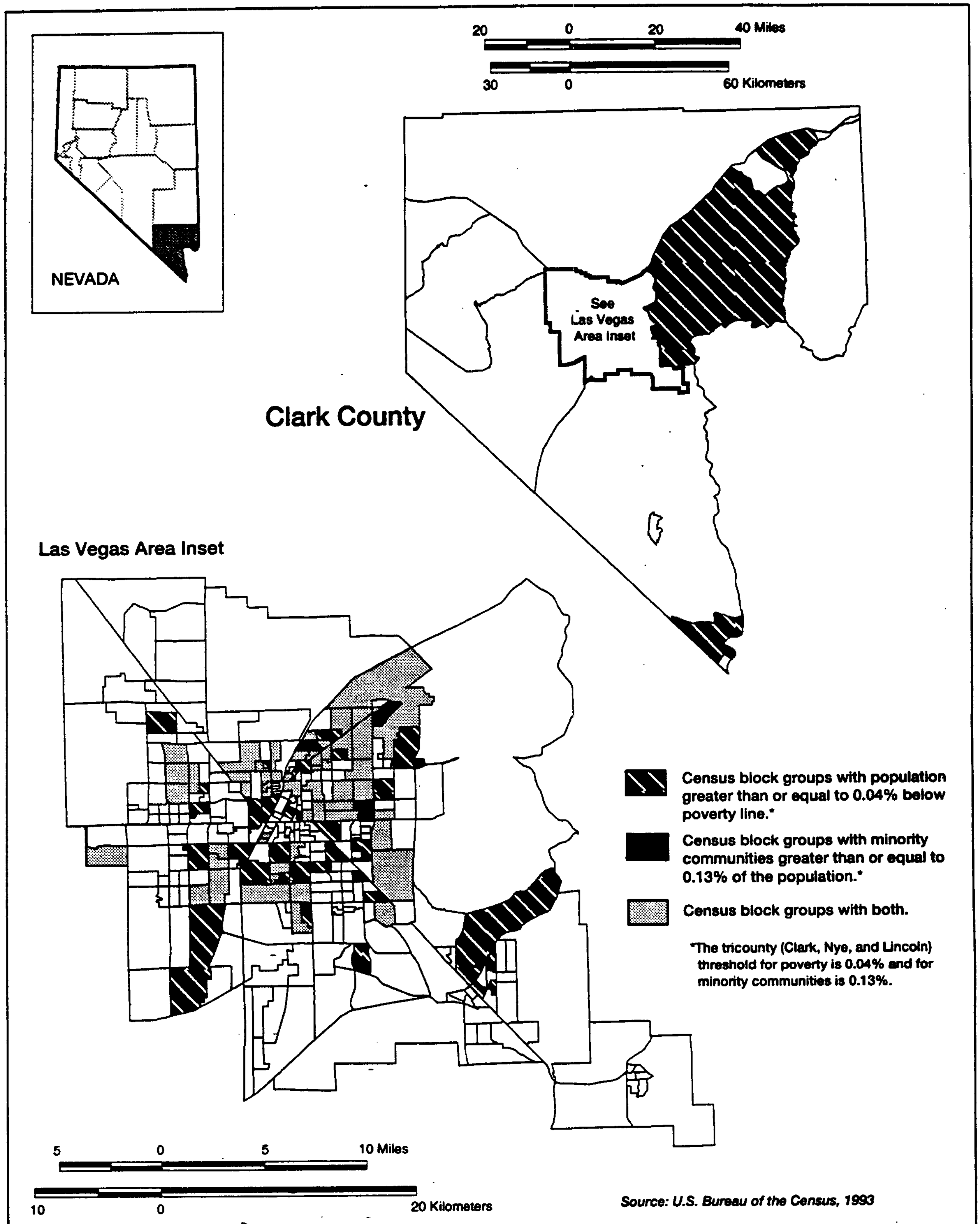


Figure 4-49. Clark County census block groups

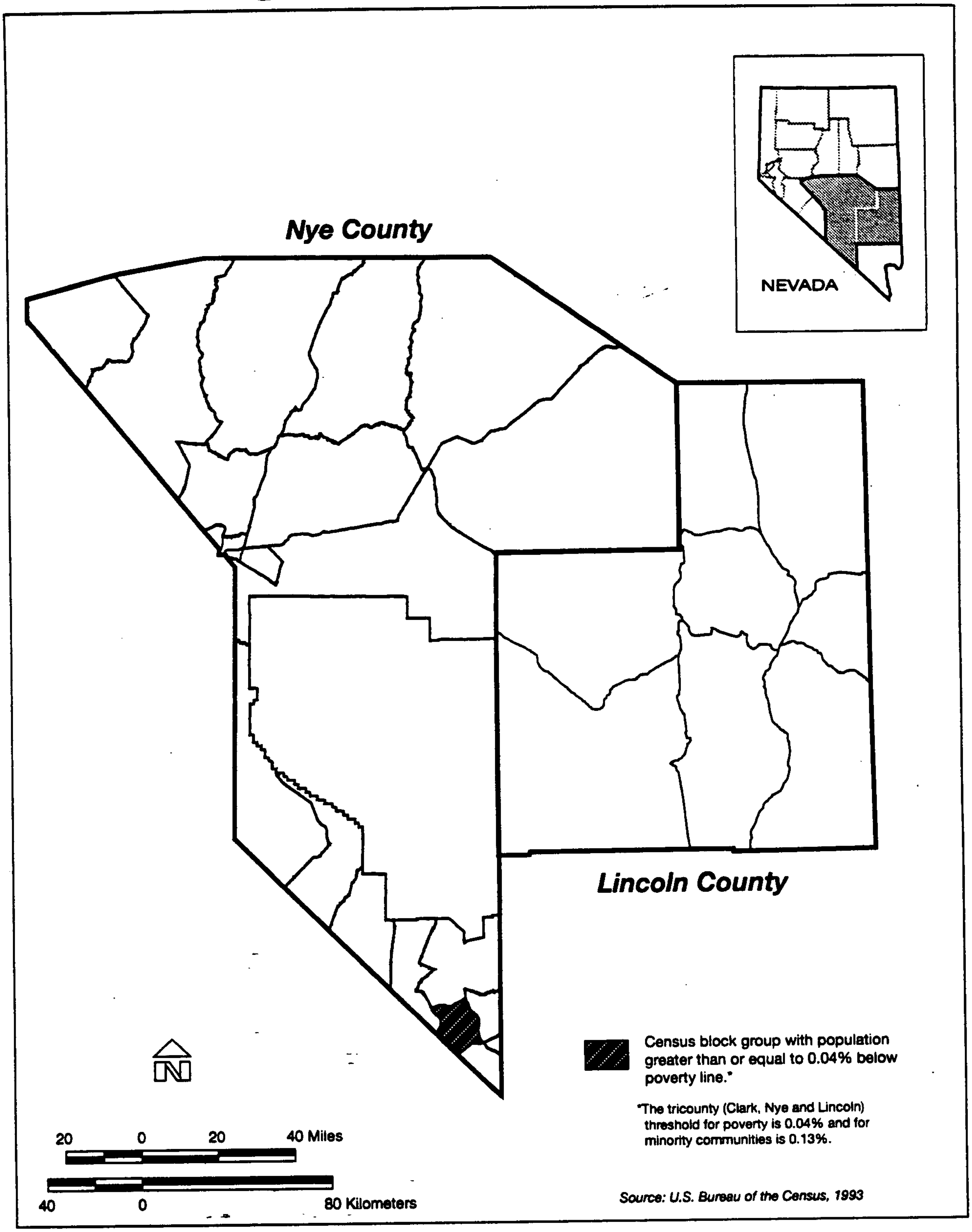


Figure 4-50. Nye and Lincoln counties census block groups

4.2.1 Land Use

Land resources are an important consideration for decisions regarding site use. The land-use analysis determines whether there is enough land available for the proposed facilities and required buffers and identifies conflicts between the proposed project and existing or projected on- and off-site land use. These analyses are necessary to determine whether public lands would be managed in a manner consistent with existing and projected land uses. To make decisions with respect to locating facilities at the Tonopah Test Range, the DOE must consider several issues, that is, the constraints and opportunities related to land resources. These include whether conflicts exist with the administrative framework and whether adequate resources are available and viable.

The known land-use constraints and opportunities at the Tonopah Test Range are outlined in this section. Land-use constraints include those features of the Tonopah Test Range, either natural or manmade, that preclude or limit the future activities that can be conducted in a specific location or area. Opportunities are the best and highest use of the land that can be accomplished within constraints.

Many of the constraints identified throughout Chapter 4 are those resulting from historic land uses, primarily from nuclear weapons safety tests and conventional weapons testing that resulted in radioactive contamination. Public Law 99-606, which consolidated the NAFR Complex under a single land withdrawal, authorizes the use of the withdrawn lands by other federal agencies for "defense-related" uses. For example, a Memorandum of Understanding between the DOE and the U.S. Air Force grants to the DOE the use of portions of the Tonopah Test Range. Consequently, many of the constraints on the DOE's use of land results from the fact that the Tonopah Test Range is used by many other federal agencies, including the U.S. Air Force, for test programs. Because of the nature of many historic and ongoing activities and their consequences, specifically the ongoing use of portions of the Tonopah Test Range by the U.S. Air Force and past DOE safety tests (see Section 4.1.4.3), land use will continue to be constrained in some areas of the Tonopah Test Range during the 10-year period covered by this EIS and likely well into the future. Based on more than 30 years of operations and the information collected, many of the consequences of past weapons testing and other activities are well understood and documented. For example, between the late 1960s through 1985, non-nuclear weapons testing was conducted at several locations on the Tonopah Test Range. Several of these tests resulted in the dispersion of depleted uranium, beryllium, and other hazardous materials. Some of these areas have been designated for no further use until remediation is complete. Many of the consequences described in this chapter were previously presented in the 1975 Environmental Assessment (ERDA, 1975) and in the EIS prepared by the DOE for U.S. Air Force operations in 1990. The information serves as a basis for evaluating the potential impacts of future actions.

The DOE and U.S. Air Force activities include the construction of remote, fully serviced facilities in the early 1980s to support the development of the F-117A fighter plane. This facility is now operated solely by the U.S. Air Force. Although the full impacts of this operation are not considered in this EIS, they will be fully analyzed during the preparation of the U.S. Air Force EIS for the 2001 land withdrawal.

Information for each affected resource is included in the specific resource discussions in this chapter. In addition, Section 4.2.2.3, Transportation of Materials and Waste, identifies the transportation of low-level waste from the Tonopah Test Range to the NTS.

4.2.1.1 Public Land Orders and Withdrawals. The Tonopah Test Range, which is part of the NAFR Complex encompasses 1,616 km² (624 mi²). The NAFR Complex has been closed to public entry since the 1940s when it was withdrawn for military use. Since 1956, the Tonopah Test Range has been managed by the DOE under a Memorandum of Understanding with the U.S. Air Force. A five-party agreement between the U.S. Air Force, the U.S. Bureau of Land Management, the U.S. Fish and Wildlife Service, Nevada Division of Wildlife, and the Energy Research and Development Administration (now the DOE) was instituted for the purpose of protecting, developing, and managing the natural resources, wildlife, vegetation, and watersheds on the NAFR Complex, the NTS, and the Tonopah Test Range. The U.S. Bureau of Land Management had previously developed a wild horse range for the protection of wild horses and burros over a portion of the area.

*4.2.1.2 **Land Use Designations**.* The eastern portion of the Tonopah Test Range is designated as part of the 394,000 acres Wild Horse Range that is located in the north-central portion of the NAFR Complex. The Nevada Wild Horse Range is managed by the U.S. Bureau of Land Management under a 1974 cooperative agreement in compliance with the Wild Horse and Burro Act of 1971. The goal of Public Law 92-195 is to protect wild horses from unauthorized actions, and require management of their habitat to achieve an ecological balance and a population of sound, healthy individuals.

With minor exception, the Tonopah Test Range is used by the DOE as a research, design, and testing ground for defense-related activities (Figure 4-51).

Area 3 of the Tonopah Test Range contains the majority of administrative and industrial facilities. Within this area is the fenced technical compound of Sandia National Laboratories. The facilities within the compound are administrative and research-related facilities.

Area 9 of the Tonopah Test Range contains all facilities that directly support the DOE weapons testing program. Rocket launchers, Davis gun support equipment, and weapon storage facilities are located in this area. Additionally, ground-to-air related tests are initiated from this facility.

Area 10 of the Tonopah Test Range is occupied by the U.S. Air Force Northern Remote Base. These facilities include the industrial area and housing area. These facilities and activities are not being evaluated in this EIS. U.S. Air Force activities associated with these facilities will be evaluated in the U. S. Air Force EIS for the 2001 land withdrawal.

The remaining land on the Tonopah Test Range is open and used for testing and military training programs. All uses of the Tonopah

Test Range are coordinated activities to ensure they are within scope of the land use of the area.

*4.2.1.3 **Site-Support Activities**.* Minor industrial and housing areas (Areas 10A and 10B, respectively) were developed by the U.S. Air Force within the Tonopah Test Range. Other facilities operated by Sandia National Laboratories in Areas 3 and 9 exist on a smaller scale.

FACILITIES—The Tonopah Test Range contains approximately 105 major buildings, providing a gross 15,004 m^2 (161,505 ft^2) of space. The Tonopah Test Range facilities also include approximately 90 smaller buildings, including towers and small sheds.

SERVICES—Services available at the Tonopah Test Range include law enforcement and security, fire protection, and health care.

Law Enforcement and Security—Law enforcement for the Tonopah Test Range is provided by Nye County Sheriff's Department. Security on the site is provided by Advanced Security, Inc.

Fire Protection—Fire protection services on the Tonopah Test Range are provided by Sandia National Laboratories and the U.S. Air Force.

Health Care—A medic serves the Tonopah Test Range medical needs. If serious care is required, the patient is either transferred to the town of Tonopah or airlifted to Las Vegas, depending on the medical needs.

UTILITIES—Utilities at the Tonopah Test Range include water systems, wastewater systems, and electrical systems.

Water Systems—A number of water wells have been drilled on or near the Tonopah Test Range to supply water to the facility (Figure 4-52). Well 6 provides potable water to the Sandia National Laboratories facilities, while several other nonpotable wells service the Tonopah Test Range for construction and industrial activities. The water use for DOE operations is 64,345 m^3/yr (17 million gal/yr).

The U.S. Air Force has developed a water distribution system of six potable wells to service the industrial and housing areas. The estimated water usage by the U.S. Air Force is 9.5×10^5 m^3/yr (2.5×10^7 gal/yr). There is an impoundment on the southwestern portion

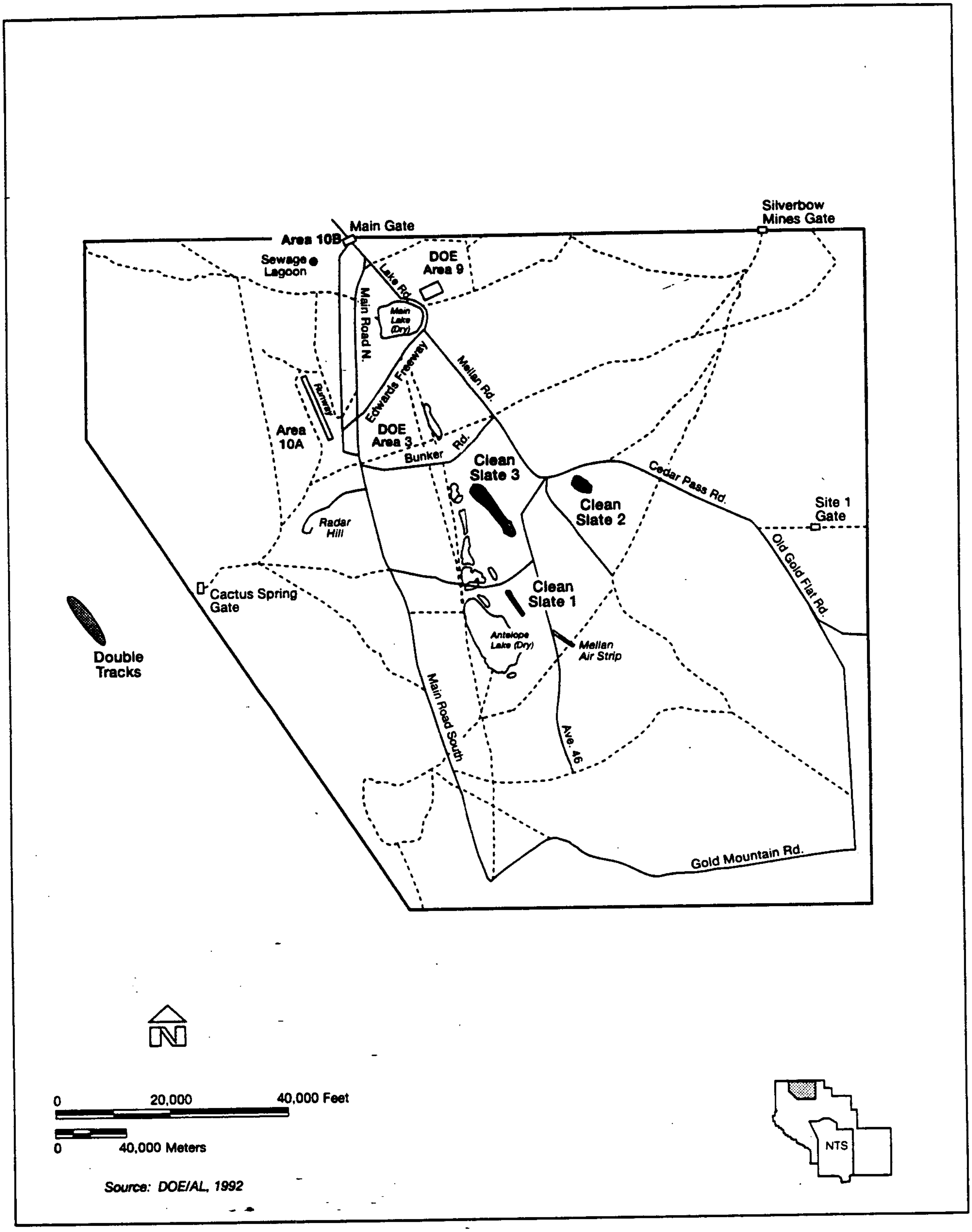


Figure 4-51. Tonopah Test Range detail

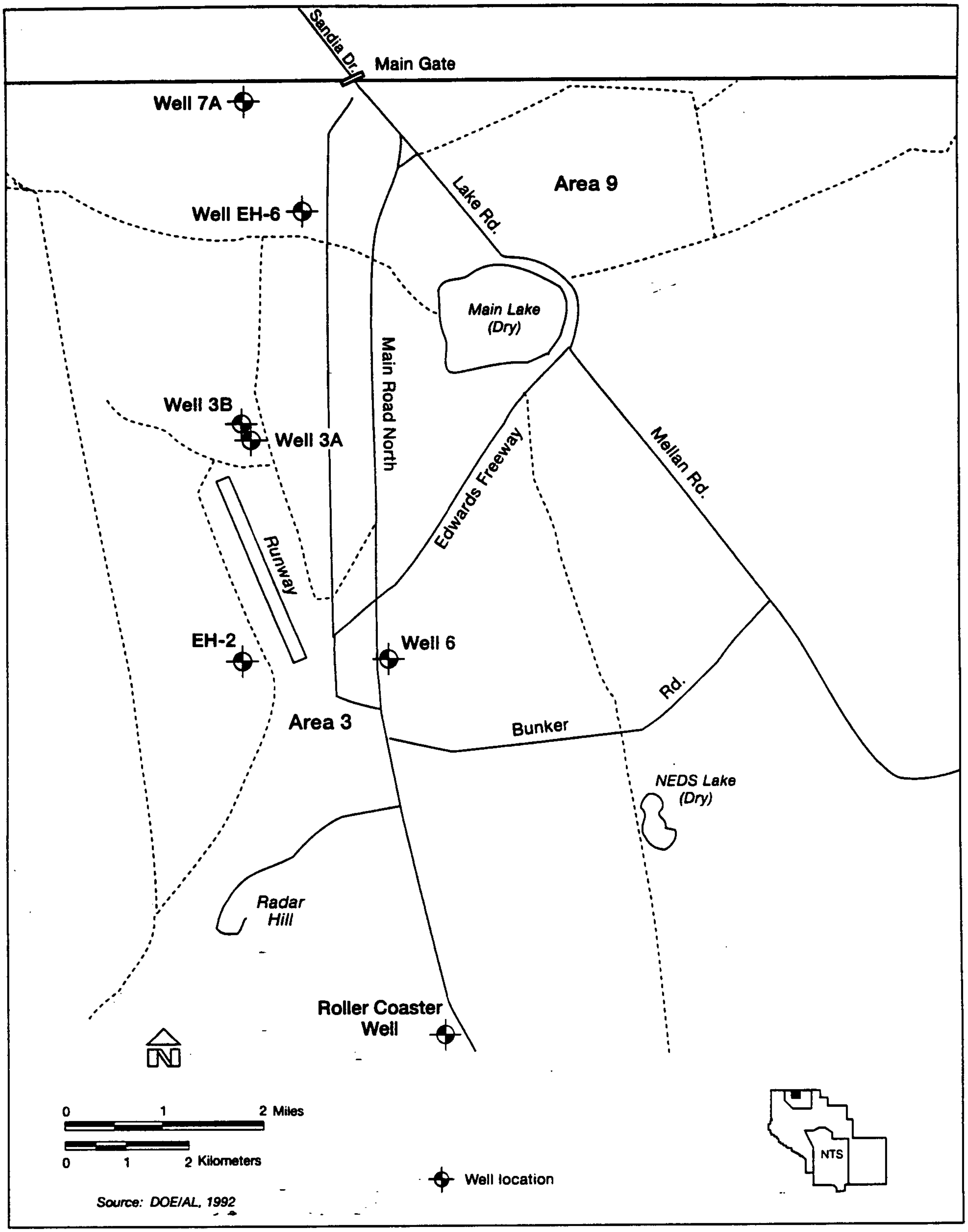


Figure 4-52. Domestic wells supporting the Tonopah Test Range

of the Tonopah Test Range that was used to store water during activities there. Other impoundments have been constructed by the DOE in the Tonopah Test Range area to provide water for the wild horse population.

Wastewater Systems—Sewage at the Tonopah Test Range is collected and pumped to the wastewater treatment unit located approximately 2.4 km (1.5 mi) southwest of the main gate. Effluent lines and three lift stations connect all DOE and U.S. Air Force facilities to the wastewater treatment unit. This treatment unit is designed to treat raw sewage in compliance with secondary treatment standards. Treatment is accomplished by an aerobic stabilization pond, followed by two parallel evaporation basins. The system allows for final disposal of the wastewater by evaporation and percolation.

Five septic tanks are still in use at remote locations on the Tonopah Test Range (DOE/AL, 1992). Their associated leachfields are used as the only means of treatment for septic tank wastes. These remote septic tanks are occasionally pumped into vacuum trucks and transported off site for ultimate disposition.

Electrical System—Power to DOE facilities at the Tonopah Test Range is supplied by the Sierra Pacific Power Company. Sierra Pacific has two supply lines to the Tonopah Test Range: one is 120 kV, and a backup line is 60 kV. Sierra Pacific transformers step the voltage down to 13.8 kV for the DOE distribution system. The remaining power line supplies the U.S. Air Force facilities. All remote operations are supplied with electrical power by portable generators.

COMMUNICATIONS—Communications at the Tonopah Test Range are supported by a regional system. The Tonopah Test Range telecommunication system employs digital telephone switching, fiber-optic transmission, microwave, two-way radio, voice privacy, data transmission systems, general-and-special-purpose data communications, and teleconferencing services.

The Tonopah Test Range also has a ground-to-air communication system that supports all air-to-ground testing programs. The VHF and UHF communication capability is reliable within a radius of 322 km (200 mi) of the range, depending on the altitude, while high-frequency communication can be reliable for thousands of miles.

Other modes of communication at the Tonopah Test Range include automated data processing equipment, automated office support systems, and information systems. Computer systems encompass general purpose, stand-alone, data management, word processing, engineering, computer-aided drafting, and computer-aided manufacturing.

4.2.1.4 ***Airspace.*** The airspace over the Tonopah Test Range is restricted area R-4809. The airspace is managed by the DOE and designated for joint use by the DOE and U.S. Air Force. Civilian aircraft may gain permission to use the facility in case of in-flight critical emergencies. This area is authorized for supersonic activity above 1,762 m (2,500 ft) above ground level with prior authorization from the appropriate agencies. The area is restricted for live ordnance unless the conditions enforced by the DOE and the U.S. Air Force are met. Currently, flying operations over the Tonopah Test Range are characterized moderate to heavy. The range has a 3,048-m (10,000-ft) concrete runway which can accommodate aircraft rated up to and including heavy cargo aircraft. The runway is lighted and marked for nighttime operations.

4.2.1.5 ***Waste Management.*** The following section addresses solid, hazardous, and radioactive waste management at the Tonopah Test Range.

SOLID WASTE MANAGEMENT—Tonopah Test Range sanitary waste from DOE and U.S. Air Force operations are disposed of in a Class II solid waste landfill. The Tonopah Test Range landfill is located just east of the U.S. Air Force industrial area. The materials disposed of are characterized as rubbish, construction debris, and sanitary waste from food service areas. The sanitary landfill currently in operation consists of one active cell.

HAZARDOUS WASTE MANAGEMENT—The DOE hazardous waste management activities are defined as a small quantity generator and operate in compliance with the Resource Conservation and

Recovery Act under an EPA identification number. All hazardous waste generated at the Tonopah Test Range can be stored up to 180 days at the facilities storage area. All waste is then transported off site for ultimate disposition by a subcontractor.

RADIOACTIVE WASTE MANAGEMENT

Current plans are to remediate the radioactively contaminated areas on the Tonopah Test Range through excavation and disposal of surface soils. Disposal volume estimates are based on the level of cleanup, but are expected to be large. The remediation waste generated from cleanup of the contaminated soils would be transported to the Area 3 Radioactive Waste Management Site for disposal.

4.2.2 Transportation

The following sections discuss baseline transportation activities at the Tonopah Test Range with respect to on-site traffic, off-site traffic, transportation of materials and waste, and other transportation.

4.2.2.1 On-Site Traffic. The Tonopah Test Range on-site transportation consists of 190 km (118 mi) of primary paved roads, 37 km (23 mi) of secondary paved roads, 182 km (113 mi) of primary compacted dirt roads and 63 km (39 mi) of secondary dirt roads. The two primary traveled paved roads on the Tonopah Test Range traverse north-south and east-west. These roads support the majority of the daily traffic, as well as traffic during operations. The dirt roads are used for secondary daily travel, but are primarily used during testing activities. A total 480 km (298 mi) of roads on the Tonopah Test Range are used on a regular basis.

The roadway system on the Tonopah Test Range is jointly maintained by the DOE and the U.S. Air Force. No personally owned vehicles are permitted on the site. Workers either drive government-supplied vehicles from the main entry of the Tonopah Test Range or ride government-supplied bus transportation to the work site. The majority of the on-site traffic is attributed to security support and facility operations. The average estimated mileage traveled on the Tonopah Test Range during 1994 was 2.5×10^6 km (1.6×10^6 mi), driven by 96 government vehicles.

4.2.2.2 Off-Site Traffic. The primary highway access to the main entry gate of the Tonopah Test Range is via U.S. Highway 6 to north-south alternate Road 504. U.S. Highway 6 links U.S. Highway 95 and U.S. Highway 93 and is an all-weather, two-lane paved roadway. U.S. Highway 6 in the vicinity of the Tonopah Test Range (near Warm Springs) carried less than 500 annual average daily traffic in 1993. Regional traffic conditions in Clark and Nye counties are presented in Section 4.1.2.2.

4.2.2.3 Transportation of Materials and Waste. All material and waste are taken off site for management at other facilities, including the NTS, or at commercial waste facilities. No radioactive or hazardous waste disposal activities are conducted at the Tonopah Test Range. The primary roads used for waste and material transportation are discussed in Section 4.2.2.2.

4.2.2.4 Other Transportation. Because of the remote location of the Tonopah Test Range, the majority of the workers are flown from Las Vegas to the Tonopah Test Range on a daily basis. The DOE uses a DeHavilland seven-commuter airplane to transport the workers. The plane is flown an average of four daily round trips per week and transports approximately 30 individuals daily. The plane is maintained at DOE facilities in Las Vegas and uses U.S. Air Force facilities on the Tonopah Test Range during operations.

The U.S. Air Force maintains an active base on the Tonopah Test Range. This facility is 929 m^2 (10,000 ft^2). The existing runway and navigation aids are open to the DOE and the U.S. Air Force on an as-needed basis. The facility is lighted for night operations. The adjacent airfield is used by the DOE in support of its mission at the Tonopah Test Range. This facility supports approximately 15 sorties per week for DOE operations. The remaining sorties are in support of the U.S. Air Force and other organizations at the Tonopah Test Range.

Mellan airstrip is located on the southern portion of the Tonopah Test Range. This airstrip supports DOE and U.S. Air Force training programs and is used sporadically. There are no support facilities associated with this airstrip.

4.2.3 Socioeconomics

The majority of DOE/NV workers, including those assigned to projects at the Tonopah Test Range, live in Clark or Nye counties (DOE, 1994b). An analysis of socioeconomic conditions in Clark and Nye counties is presented in Section 4.1.3.

4.2.4 Geology and Soils

Geology and soils at the Tonopah Test Range are addressed in this section. The discussion includes a description of physiography, geology, including geologic resources, and soils.

*4.2.4.1 **Physiography***. The Tonopah Test Range is located in the lowland portions of Cactus Flat and Stonewall Flat. Cactus Flat is a topographically closed basin with a total area of 1,044 km^2 (403 mi^2). Stonewall Flat is topographically open and encompasses 987 km^2 (381 mi^2). The Kawich Range on the east and northeast of the Tonopah Test Range rises to elevations of 2,438 m (8,000 ft) to more than 2,743 m (9,000 ft). To the west in the Cactus Range, which separates the two basins, the maximum elevation is 2,281 m (7,482 ft). On the south, Cactus Flat is separated from Gold Flat by the volcanic hills around Gold Mountain (about 1,829 m [6,000 ft]) and a low topographic divide through the alluvium to the east. Stonewall Flat is bounded on the south by Stonewall Mountain, which has a maximum elevation of 2,522 m (8,275 ft). On the west, Stonewall Flat is bounded by the Goldfield Hills, which rise to an elevation of almost 2,134 m (7,000 ft). On the valley floors of both basins, the dominant features are a number of small playas and the many washes that drain the upland areas.

The general appearance of the range is of great bareness. The playas support no vegetation, while the lower slopes and mountains support brush, some Joshua trees, and juniper. Only above 2,134 m (7,000 ft) are limited woodlands present.

*4.2.4.2 **Geology***. The general geologic conditions and mineral deposits of the Tonopah Test Range have been described by the Nevada Bureau of Mines and Geology. The general geology of the area is comprised of two major geologic units: volcanic rocks and alluvium. Intrusive igneous rocks and a few isolated outcroppings of Paleozoic sediments occur in the Cactus Range.

The total thickness of volcanic rocks outcropping in the Cactus and Kawich Ranges and underlying the valley-fill deposits has been estimated to be as much as 6,096 m (20,000 ft). The Tertiary volcanics are composed of a series of welded and nonwelded ash-flow tuffs and basalts, andesites, dacites, and rhyolites. The Kawich Range is a horst that is bounded on the east by normal faults. The northern part of the range (adjacent to the Tonopah Test Range) is primarily composed of Tertiary tuffs, lavas, and intrusions of Miocene tuff.

The Cactus Range is also a horst that is bounded by an elliptical ring of fractures that suggests a collapsed cauldron. Some of these fractured areas were subsequently intruded with stocks, sills, and dikes. The central part of the range comprises minor Paleozoic sediments, a small granite mass, and a thick sequence of widespread Tertiary volcanic rocks. The hills to the south of Mellan comprise a series of lava ridges separated by valleys of tuff. The hills are capped with rubble formed from weathering and breccias in the lava piles, and breccias formed by the structural deformation (faulting and tilting) of the lava ridges.

The total thickness of alluvium is unknown. Exploratory drilling in Cactus Flat indicates that the thickness exceeds 305 m (1,000 ft). The alluvium is primarily coarse- to medium-grained and is derived from the volcanic rocks of the highlands. Volcanic ash is present in the alluvial deposits.

The Walker Lane shear zone is a major northwest to southeast trending regional structural element that transects the Tonopah Test Range. The Walker Lane is a transcurrent fault zone that extends several hundred miles through western Nevada, merging to the southwest with the Las Vegas shear zone. Numerous volcanic centers are located within or immediately east of the Walker Lane, including the Goldfield, Cactus Range, Stonewall Mountain, and Mount Helen centers. Volcanic calderas are absent over the test range but are present immediately to the east, south, and west on the NAFR Complex.

The geologic hazards present at the Tonopah Test Range are similar to those described for the NTS and include seismicity, volcanism, and geotechnical hazards. These hazards are discussed in Section 4.1.4.2 for the region comprising both the NTS and the Tonopah Test Range.

GEOLOGIC RESOURCES—The geologic resources of the Tonopah Test Range include metals, industrial minerals, and aggregate. The Tonopah Test Range has been the site of historic mining at the Silver Bow, Antelope Springs, Cactus Springs, Wilsons, and Mellan mining districts. The Tonopah Test Range is also adjacent to a number of other mining districts, most notably the Goldfield, Gold Crater, Golden Arrow, Stonewall, Gold Reed, and Jamestown districts. Appreciable quantities of silver and gold have been produced from the Silver Bow district. The Antelope Springs district produced silver and minor amounts of gold. The Cactus Springs district produced small quantities of silver, and there are reports of turquoise, gold, and copper in the area. The Wilsons district produced small quantities of gold and silver in the early 1900s. Minor production of gold and silver came from the Mellan district. Of these areas, only the Silver Bow district is classified as having high potential for locatable minerals.

Immediately to the east of the Goldfield district in the area between the Tonopah Test Range and Goldfield, there is moderate to high potential for the occurrence of quartz-alunite gold deposits. Although gold, silver, and lead have been produced from the Gold Crater and Stonewall districts, production from these areas had ceased by the mid-1930s, and the remaining potential for mineral resources is low.

No geothermal resources have been identified, and the potential for oil and gas resources is considered low. There are no reported occurrences of coal, tar sands, or oil shale on the Tonopah Test Range or adjacent areas on the NAFR Complex. Similarly, no economic deposits of industrial minerals have been identified. Although no uranium deposits have been identified, there are speculative resources of uranium. Tertiary volcanic rocks and tuffaceous sedimentary rocks of silicic compositions occur on the Tonopah Test Range and the NAFR Complex. Other uranium host environments are located elsewhere in the Great Basin.

The aggregate resources of the Tonopah Test Range are considerable. Sand and gravel deposits are present, and the quality and quantity of these resources are likely to be sufficient to meet future demands for construction, roads, and other uses. The aggregate resources do not have any unique value compared to other areas throughout southern Nevada.

4.2.4.3 Soils. The following soils information was extracted from the *Soil Inventory of Tonopah Management Environmental Impact Area* report prepared by Earth Environmental Consultants, Inc. for the U.S. Bureau of Land Management (Cox et al., 1977).

The Tonopah Test Range is situated in the Basin and Range physiography between the elevations of 1,676 and 2,377 m (5,500 and 7,800 ft). Approximately 15 percent of the soil survey is comprised of mountainous terrain with the remaining portion consisting of alluvial fans, ephemeral washes, valley floors, and dry lake beds. The soil parent material consists of a variety of igneous and sedimentary rock with rhyolitic tuffs and ignimbrite being the most common rock.

Strongly cemented silica pans (i.e., duripans), formed primarily from igneous sources, are the most common feature on most bejadas. These pans usually occur near the surface. In general, soil depth (i.e., depth to restrictive layer) increases from the topslope/shoulder slope of the alluvial fan, downslope to the footslope/toeslope. Indurated hardpans and cemented layers can range from a few inches to several feet in thickness.

The 1977 soil inventory was conducted as a third order survey and mapped to the soil series level. Soil mapping units were derived from field descriptions and delineated on aerial photographs at a scale of 1:31,680 with the exception of Ione, which was delineated on a 1:63,360 photograph. The minimum size of the soil mapping units is

10 acre. A quality assurance procedure, called a field correlation, was conducted by the Soil Conservation Service, U.S. Department of Agriculture, State Soil Scientist.

Soil Mapping Units consist of consociations, associations, complexes, and miscellaneous areas on the landscape such as rock outcrops, areas with excessive stone, or very steep eroded slopes. The following three out of 10 Soil Orders are found in the survey area:

- Mollisols--soils that contain a horizon rich in bases
- Aridisols--dry soils with low organic matter
- Entisols--young soils with little or no development of soil horizons.

The soils of the Tonopah Test Range and adjacent areas can be separated into four general categories based primarily upon the following physiographic position:

- Valley bottoms and dry lake beds (i.e. playas)
- Upper erosional portion of the alluvial fans
- Mountains and hills.

The valley bottom and dry lake bed soils occur in the central portions of both Cactus and Stonewall Flats. These very deep, poorly drained saline and alkali, fine-textured soils occur on slopes generally less than 1 percent. These low-lying areas are usually points of groundwater discharge. Therefore, depth to groundwater is usually fairly shallow and is manifested by discharging springs or plants that indicate in shallow water table (i.e., usually within 15 m [50 ft] below ground surface). These plants are called phreatophytes with greasewood being the most common in the area. There is periodic flooding from runoff and the shrink-swell potential is generally high due to the abundance of smectitic clays. This can present problems with most construction projects. The corrosion hazard for steel and concrete is high due to the high concentrations of salts. Soil families include:

- Typic Salorthids (e.g., Saltair soil series)
- Typic Haplaquolls (e.g., Hutton soil series).

The lower, depositional portion of the alluvial fan consists of deep to very deep, well-drained, very coarse (coarse sand) to medium-textured (very fine sandy loam/loam) gravelly soils that occur on slopes ranging from gently sloping(2 to 4 percent) to strongly sloping (8 to 15 percent) slopes. The coarser-textured, very gravelly to extremely gravelly soils are located in the ephemeral washes (i.e., arroyos) and are subject to periodic flash floods.

The soils on the actual dissected alluvial fan are generally moderate-textured, gravelly soils that are often covered with desert pavement. Soil families include:

- Typic Torriorthents (e.g., Fang and Cliffdown soil series)
- Typic Camborthids (e.g., Alcorn and Dun Glen soil series)
- Typic Calciorthids (e.g., Puddle).

The upper, erosional portion of the alluvial fan consists of older, very shallow (less than 25 cm [10 in.] thick) to moderately deep (between 51 and 102 cm [20 and 40 in.] in thickness) moderate to well drained, very coarse (coarse sand) to medium textured (very fine sandy loam/loam) gravelly to extremely stony soils. Some soils contain an old, well developed, fine textured (i.e., high in clay) subsoil called an argillic horizon. The presence of a duripan is common and is usually found between 38 and 76 cm (15 and 30 in.) below the ground surface, however, in some areas may be exposed at the surface. Slopes range from moderately sloping (4 to 8 percent) to moderately steep (15 to 30 percent). Soil families include:

- Xerollic Durorthids (e.g., Ursine soil series)
- Xerollic Durargids (e.g., Ratto, Olson, Indian Creek, and Deer Lodge soil series).

The upland mountains and hills consist of rock outcrops, areas with excessive stone, or very steep eroded slopes that generally contain a thin mantle of alluvial or colluvial soils usually less than 25 cm (10 in.). These soils can range in texture from coarse to fine, gravelly to extremely stony, and are dependent upon primarily age and parent material for textural composition. Slopes generally range from moderately steep (15 to 30 percent slopes) to extremely steep (>75 percent). These soils usually have a severe erosion hazard because of their slopes and runoff is generally rapid.

The historic use of the Tonopah Test Range has created certain site-specific restrictions for some surface soils. The clean slates sites included an open detonation on a concrete pad, and detonation in igloo-like structures with varying amounts of earth-cover to simulate accidents in open storage and weapons magazines. Depleted uranium and plutonium were used as a tracer in these Clean Slate tests. The areas that were contaminated with radioactivity from the tests (Figures 4-35 through 4-37) and associated decontamination areas and disposal sites are the subject of Environmental Restoration Program activities that will resolve their ultimate disposition. Until the appropriate investigations have been completed and remedial decisions are made, the soils in these areas are not suitable for use and have been fenced and posted. These sites were studied in the late 1970s by the Nevada Applied Ecology Group. One objective of the studies was to estimate the amount and distribution of plutonium in the soil.

Samples were primarily collected from the top 5 cm (2 in.) of the soil profile. A few profile samples were collected to a depth of 25 cm (10 in.). In almost all profiles, plutonium was detected in the 25 cm (10 in.) increment. Deeper profiles from Clean Slate 1 and 3 showed plutonium at less than 1 pCi/g at a depth of 32.5 cm (12.8 in.) (Essington, 1987).

Estimated areas of plutonium concentrations in soils range from less than 1 acre at greater than 400 pCi/g, through 6 acres at greater than 200 pCi/g, and 81 acres at greater than 40 pCi/g. Clean Slate 2 has 17 acres at greater than 400 pCi/g, 26 acres at greater than 200 pCi/g, and 170 acres at greater than 40 pCi/g. Clean Slate 3 has 17 acres at greater than 400 pCi/g, 49 acre at greater than 200 pCi/g, and 180 acres at 740 pCi/g (DOE/NV, 1995c).

Because of the similarities in the types of tests conducted and the consequences of those tests, additional discussion of the affected soils can be found in Section 4.1.4.3, NTS soils.

4.2.5 Hydrology

Surface water and groundwater at the Tonopah Test Range are addressed in this section.

4.2.5.1 Surface Hydrology. Hydrographic basins of the Tonopah Test Range are shown in Figure 4-53. Cactus Flat is a closed basin; runoff from the Cactus Range and Kawich Range drains to a series of small, north-trending playas in the lowlands along the axis of the valley. Stonewall Flat is open, with a small quantity of surface water discharged to Lida Valley. The runoff over the two basins has not been gauged, but has been estimated at 1.5×10^6 m^3/yr (1,200 acre-feet/year) for Cactus Flat and 4.9×10^5 m^3/yr (400 acre-feet/year) for Stonewall Flat. No perennial streams exist in any of the basins on the Tonopah Test Range. The many washes that drain the upland areas occasionally convey ephemeral flow that ponds on the playa areas.

4.2.5.2 Groundwater. The Tonopah Test Range encompasses portions of five hydrographic basins that comprise portions of two regional groundwater flow systems (Figure 4-39). Past DOE operations have been concentrated in two areas: in the lowland portions of Cactus Flat and in Stonewall Flat. Groundwater that originates as precipitation over the Kawich Range flows west and then southwest under the Tonopah Test Range, ultimately discharging in Death Valley as springs and evapotranspiration. Some groundwater may flow northwest off the Tonopah Test Range and into the Southern Marshes flow system, with discharge at Mud Lake, Alkali Flat, and Clayton Valley. The generalized directions of regional groundwater flow are shown in Figure 4-39.

The depth to groundwater under Cactus Flat ranges from about 27 m (90 ft) to about 137 m (450 ft) below land surface. Groundwater is derived from

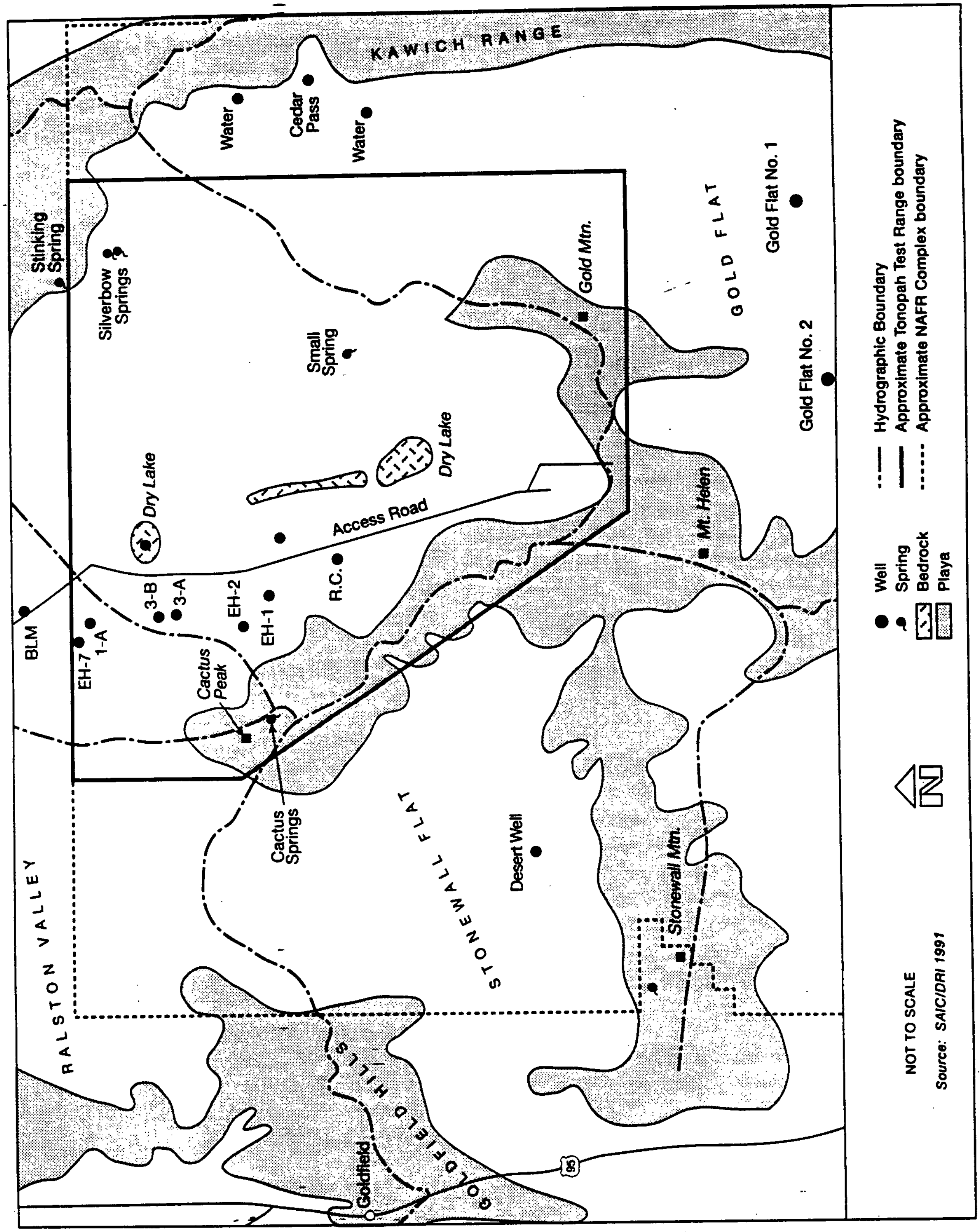


Figure 4-53. Hydrographic basins and water resource features at Tonopah Test Range.

precipitation over the upland areas; there is no subsurface recharge from neighboring basins. The total recharge has been estimated at only 7.4 x 10^5 m^3/yr (600 acre-feet/year). Groundwater discharge, totaling only a little more than 1.2 x 10^6 m^3/yr (1,000 acre-feet/year), is through subsurface underflow to the southwest into Stonewall Flat and Gold Flat. No groundwater is discharged to evapotranspiration by phreatophytes.

The groundwater under Stonewall Flat ranges in depth from about 31 m (100 ft) to more than 84 m (275 ft) below land surface. Groundwater is derived from recharge over the upland areas (only about 1.2 x 10^5 m^3/yr [100 acre-feet/year]) and an unknown quantity of subsurface inflow from Cactus Flat. An estimated 2.5 x 10^5 m^3/yr (200 acre-feet/year) is discharged through underflow to Lida Valley. No groundwater is discharged to evapotranspiration in Stonewall Flat.

Several springs are located in the north Kawich Range and along the eastern flanks of the Cactus Range. Four spring areas have been mapped within the boundaries of the Tonopah Test Range: Silver Bow Springs on the flank of the Kawich Range, Small Spring near Mellan on the valley floor, and Cactus Spring and Antelope Springs near the base of the Cactus Range. Stinking Spring is located immediately to the north of the Tonopah Test Range, and Rose Spring is located about 10 km (6 mi) to the east, in the Cedar Pass area. There are no mapped springs within the Tonopah Test Range portions of Stonewall Flat or the NAFR Complex. Willow Springs is located about 2 km (1 mi) to the west of the NAFR Complex in the Goldfield Hills. Gauging data are very limited for these springs, and water chemistry data are lacking. A single 1963 discharge measurement of 15 L/min (4 gal/min) was reported for a spring located near the mapped location for Cactus Spring.

The quality of water on the Tonopah Test Range is generally good and is suitable for domestic purposes, livestock, wild horse, and wildlife use. There are a number of areas where the groundwater may have been impaired by past activities at the facility. The nuclear safety tests conducted at the Clean Slates sites on the Tonopah Test Range have resulted in surface soil contamination. Although groundwater contamination has not been detected at these sites, there is the potential for downward migration of some contaminants into the water table. Other potential sources of groundwater contamination include french drains, septic tanks and leachfields, underground storage tanks, landfills, and sewage lagoons.

There are about 1.5 x 10^7 m^3/yr (12,500 acre-feet/year) of water rights in the five hydrographic basins associated with the Tonopah Test Range. Almost 4.9 x 10^6 m^3/yr (4,000 acre-feet/year) of this total are surface water rights; the remainder (about 1.0 x 10^7 m^3/yr [8,500 acre-feet]) represents groundwater rights. Currently, defense-related federal water rights total 2.2 x 10^6 m^3/yr (1,775 acre-feet/year), of which only 1.8 x 10^5 m^3/yr (148 acre-feet) are surface water rights. Table 4-40 lists the water rights status for each of the basins that encompass portions of the Tonopah Test Range. Federal water rights are limited to two basins, Cactus Flat and Stone Cabin Valley. Both basins are over appropriated; i.e., the appropriations exceed the perennial yield in each basin. It is unlikely that additional water rights can be obtained in the area without groundwater mining (the removal of groundwater from storage).

Groundwater on the Tonopah Test Range has been used for domestic, industrial, and construction purposes. Groundwater is pumped from a number of wells, depending on the location of range activities and the total demand for water. Records identifying historic pumping are not available; water use in 1988 was 4.7 x 10^5 m^3/yr (380 acre-feet), and this value is probably representative of long-term use. About 80 percent 2.9 x 10^5 m^3/yr (240 acre-feet/year) of the domestic water is pumped from a U.S. Bureau of Land Management well located north of the Tonopah Test Range on public land in Stone Cabin Valley. The remaining 20 percent of domestic water and water for construction and industry is withdrawn from wells located in Cactus Flat (about 1.2 x 10^5 m^3/yr [100 acre-feet/year]) and Gold Flat (about 4.9 x 10^4 m^3/yr [40 acre-feet/year]).

All water supply wells installed at the Tonopah Test Range were completed in the alluvium. Well yields range from approximately 23 to 606 L/min (6 to

160 gal/min). These yields are based on water-supply well-construction completion records prepared by the driller.

4.2.6 Biological Resources

The following description of vegetation was taken from EG&G Energy Measurements (1995) unless otherwise stated. The scientific names of plants and animals mentioned in this section are given in Section 2.6 of Appendix E, Biological Resources.

The Tonopah Test Range is within the Great Basin desert. The lowest elevation on the Tonopah Test Range is approximately 1,600 m (5,250 ft); the highest elevation is approximately 2,301 m (7,550 ft).

The dominant flora of the valley bottoms on the Tonopah Test Range include shadscale, budsage, winterfat, and galleta grass. Less common plant species are horsebrush, greasewood, desert globemallow, and desert prince's plume. Big sagebrush occurs in wash bottoms near the playa lakes. On the bajadas above the valley floor, shadscale, budsage, winterfat, and Indian ricegrass are dominant. At higher elevations, greasewood, wolfberry, hopsage, and desert prince's plume are common. Pinyon-juniper woodlands occur at the highest elevations.

Animal species on the Tonopah Test Range include all species found in the Great Basin desert on the NTS. Some of the most common animal species include side-blotched lizards, desert-horned lizards, horned larks, chisel-toothed kangaroo rats, little pocket mice, and wild horses (Bradley and Moor, 1975). State-designated game animals that occur on the Tonopah Test Range include mule deer, bighorn sheep, pronghorn, mountain lions, desert and Nuttall's cottontails, chukar, and mourning dove.

Vegetation samples were collected on the Tonopah Test Range in 1973 (Romney, 1975) and again in 1990 and 1991 (EG&G/EM, 1993d). Recent plutonium levels in samples of vegetation ranged from 4.0 x 10^{-5} to 3.9 x 10^{-2} nCi/g dry vegetation, and have not changed substantially over the past 25 years. Many studies in arid and semiarid environments (Francis, 1973; Price, 1973; Romney, 1977; Hanson, 1975; and Hakonson, 1975) have shown that most of the plutonium remains in the soil and is not readily transported. Very little of the contamination is incorporated into the biological components of the ecosystem in similar arid areas (Hakonson and Nyhan, 1980). Plutonium contamination of vegetation at the Tonopah Test Range and the NTS is concentrated mainly on the surface of vegetation and is generally not taken up by the roots and concentrated internally. Small mammals have been collected from the Tonopah Test Range for plutonium contamination analyses in 1974-1975 (Bradley and Moor, 1975) and from other contaminated sites off and on the NTS (Gilbert et al., 1988). From these studies, the following general conclusions can be made: very low levels of contamination (from undetectable levels to a few hundred femtocuries [10^{-15} Ci] per gm) were found in animals; desert rodents (which represent the primary consumer trophic level) have very low plutonium levels; most of the radioactivity in rodents is associated with the pelt and gastrointestinal tract and not internal organs or carcasses; and the plutonium contamination does not appear to concentrate up the food chain.

No current federal threatened, endangered, or candidate plant or animal species are known to occur on the Tonopah Test Range, although bald eagles and peregrine falcons may be rare migrants.

The U.S. Fish and Wildlife Service published the latest list of candidate plants and animals on February 28, 1996 (61 F.R. 7596). Prior to this, 10 animal and 5 plant species which were identified as potentially occurring on the Tonopah Test Range were classified as candidates (Mendoza, 1995b) and were addressed in the Draft NTS EIS (listed in Table 4-30). The updated Notice of Review has removed all of these species from candidate status. The western burrowing owl, a state-protected bird, is known to occur on this site.

4.2.7 Air Quality and Climate

This section describes the air quality conditions at the Tonopah Test Range. Climatology, meteorology, and ambient air quality are discussed.

CLIMATOLOGY AND METEOROLOGY—The climate is usually dry, but given to large diurnal and seasonal changes in temperature. Clear, sunny days prevail, and the winds are light to moderate. Rainfall is 13 to 15 cm (5 to 6 in.) per year in the valley, primarily resulting from summer thunderstorms. Dust storms are common in the spring, and strong dust devils occur in the summer.

The average temperature at the Tonopah Test Range is about 10 °C (50 °F); maximum temperatures are over 38 °C (100 °F), and minimum temperatures are below -29 °C (-20 °F). The average relative humidity is approximately 40 percent. The average annual snowfall is 30 to 33 cm (12 to 13 in.) (Schaeffer, 1968). Surface wind directions are predominantly from the west-northwest to northwest in the winter and from south to southeast in the summer. Local terrain tends to shift southerly surface winds to a more southeasterly direction. Highest wind speeds occur in mid-afternoon in all seasons, but especially in the spring; highest wind speeds are also strongest for south winds overall. In April, the most frequent wind direction between 1 p.m. and 4 p.m. is from the south, with an average speed of approximately 25 kph (16 mph). The annual average speed for south winds is 16 kph (10 mph). Nighttime wind speeds average approximately 10 km (6 mph). There is little diurnal wind direction variability in summer and winter; however, in late spring and autumn, the diurnal cycle is typically northwest nighttime flow and south to southeast afternoon flow (Schaeffer, 1968).

AMBIENT AIR QUALITY—The Tonopah Test Range is located within Nevada Intrastate Air Quality Control Region 147. Although ambient pollutant concentrations have not been measured on the Tonopah Test Range, ambient air quality characteristics are similar to the NTS (see Section 4.1.7). Ambient pollutant concentrations on the Tonopah Test Range are below the Nevada and National Ambient Air Quality Standards (Table 4-31). The Air Quality Control Region is designated as unclassifiable/attainment for all criteria pollutants.

4.2.8 Noise

The acoustic environment around the Tonopah Test Range and the NAFR Complex can be classified as uninhabited desert or small rural communities. The primary source of noise on the Tonopah Test Range and the NAFR Complex is from the DOE and U.S. Air Force aircraft operations and ordnance testing. Because the public is prohibited from entering the Tonopah Test Range and the NAFR Complex, public exposure to these noise sources is limited to occasional sonic booms produced by supersonic overflights of military aircraft (SAIC/DRI, 1991).

4.2.9 Visual Resources

The landscape character of the Tonopah Test Range is similar to the higher elevation areas of the NTS. The Tonopah Test Range is visible only from an access road off U.S. Highway 6; therefore, visual sensitivity would be low.

4.2.10 Cultural Resources

The resources recorded at the Tonopah Test Range are limited to certain environmental areas, while the archaeological sites within other areas are virtually unknown. Recorded properties cluster within the categories of extractive localities, processing localities, and mining and ranching, but other types of sites are known. Projectile points found on the Tonopah Test Range suggest that the area has been used for the last 10,000 years. At the time of the first European explorations of the area, groups of Western Shoshone people occupied the area. The Kawich band used much of the Tonopah Test Range, while groups from the areas came to Cactus Flat to collect seeds and hunt Beatty and Belted Mountain antelope and rabbits (Steward, 1938).

Based on current knowledge of cultural resources on the Tonopah Test Range, all areas have the potential to contain significant historic properties. Thus, the current Tonopah Test Range boundaries are considered the area of potential effect for cultural resources. To date, 11,549 acres have been surveyed for cultural resources on the Tonopah Test Range. The following section summarizes previous work conducted on the Tonopah Test Range, evaluates the sites according to their types, and assesses their eligibility for listing on the National Register of Historic Places.

Table 4-40. Water rights status for hydrographic basins at the Tonopah Test Range

Hydrographic Basin Number and Name	Perennial Yield		Total Committed Groundwater Resources		Comments
	m^3/yr	ac-ft/yr	m^3/yr	ac-ft/yr	
Ralston Valley	7.4×10^6	6,000	2.4×10^6	1,917	Basin designated by Order 742, Notice of Curtailment by Order 752. No Tonopah Test Range water rights or use.
Stonewall Flat	1.2×10^5	100	1.4×10^4	12	No Tonopah Test Range water rights or use.
Gold Flat	2.3×10^6	1,900	1.2×10^5	95	Estimated Tonopah Test Range water use in 1988 was 49,339 m^3 (40 ac-ft).
Cactus Flat	3.7×10^5	300	7.6×10^5	619	Estimated Tonopah Test Range water use in 1988 was 197,357 m^3 (160 ac-ft).
Stone Cabin Valley	2.5×10^6	2,000	2.5×10^6	2,033	Basin designated by Order 720. Estimated Tonopah Test Range water use in 1998 was 296,036 m^3 (240 ac-ft).

Sources: Buqo, 1996a.

RECORDED CULTURAL RESOURCES—Large reconnaissance surveys and overviews completed at the Tonopah Test Range include the Seafarer Project (Ferraro et al., 1975), the Mt. Diablo Baseline Survey (Brooks et al., 1976), and the NAFR Complex surveys (Ellis, 1979; Bergin and Roske, 1978; Bergin et al.,1979; Crownover, 1981). Numerous smaller reconnaissance surveys have been completed by the Desert Research Institute including those compiled for the development of a U.S. Air Force base supporting the F-117A on the Tonopah Test Range (DOE, 1988). Figure 4-53 shows the hydrographic basins, and Table 4-41 lists the types of sites found.

Gold Flat—Most of this hydrographic basin lies south of the Tonopah Test Range on the NAFR Complex. The portion that is within the Tonopah Test Range is divided from Cactus Flat at the Breen Creek drainage. Seven archaeological reconnaissance surveys have been conducted within that portion of Gold Flat that lies within the Tonopah Test Range. Approximately 950 acres were surveyed for cultural resources. Forty-four cultural resources sites have been recorded as a result of these surveys. Of this total, 4 are temporary camps, 31 are localities, and 9 are historic sites associated with mining or ranching. Forty sites have been recommended as eligible for the National Register of Historic Places.

Stonewall Flat—Most of Stonewall Flat lies outside of the Tonopah Test Range on the NAFR Complex. Only the extreme eastern portion lies inside the Tonopah Test Range boundaries. Stonewall Flat is differentiated from Cactus Flat by the Cactus Range. Only one archaeological survey has been conducted within the small portion of Stonewall Flat that lies within the Tonopah Test Range. Approximately 215 acres were surveyed for cultural resources. Thirteen sites have been recorded as a result of this survey. Other sites have been recorded in the portion of Stonewall Flat that falls within U.S. Air Force jurisdiction. Of the sites recorded,

Table 4-41. Types of sites found within the hydrographic basins of the Tonopah Test Range

Basin	Prehistoric Site Types							Historic Sites	NR Eligible
	RB	TC	EL	PL	LO	CA	STA	HI	NR
Gold Flat	0	4	0	0	31	0	0	9	40
Stonewall Flat	0	0	0	0	3	0	1	9	13
Ralston Valley	0	2	0	0	36	0	0	2	38
Cactus Flat	0	19	0	2	89	0	0	17	68
Stone Cabin Valley	0	3	0	6	87	0	0	3	63
Totals	**0**	**28**	**0**	**8**	**246**	**0**	**1**	**40**	**Total NR**
Total Tonopah Test Range Sites								**323**	**222**

Site type codes: RB=residential base; TC=temporary camp; EL=extractive locality; PL=processing locality; LO=locality; CA=cache; STA=station; HI=historic; NR=National Register of Historic Places.

three are localities, one is a station, and nine are historic mining and ranching sites. All of these sites have been recommended as eligible for the National Register of Historic Places.

Ralston Valley—The extreme southeastern corner of the Ralston Valley lies within the Tonopah Test Range boundaries. This drainage is divided from the Stone Cabin Valley drainage by the Monitor Hills. Only one archaeological survey has been conducted within the small portion of Ralston Valley that lies within the Tonopah Test Range. Approximately 170 acres were surveyed for cultural resources. Forty sites have been recorded as a result of this survey. Of these, 2 are temporary camps, 36 are localities, and 2 are historic. To date, 38 sites within the Ralston Valley hydrographic basin have been recommended as eligible for the National Register of Historic Places.

Cactus Flat—Most of the Cactus Flat hydrographic basin lies within the boundaries of the Tonopah Test Range. The basin is bounded by the Cactus Range, the Kawich Range, Gold Mountain, and the Breen Creek drainage. The Cactus Flat region has the highest density of archaeological sites recorded on the Tonopah Test Range. This may be a reflection of the intensity of survey that has occurred in this basin. Forty-eight archaeological surveys have been conducted within the Cactus Flat hydrographic basin and 9,795 acres have been examined. To date, 68 sites have been recommended as eligible for the National Register of Historic Places.

Stone Cabin Valley—The extreme southern portion of Stone Cabin Valley extends into the northern part of the Tonopah Test Range. It is bounded by the Monitor Hills and the Kawich Range. Six archaeological reconnaissance surveys have been conducted within that portion of Stone Cabin Valley that lies within the Tonopah Test Range. Approximately 420 acres were surveyed for cultural resources. A total of 105 sites have been recorded as a result of these surveys. This total includes 3 temporary camps, 6 processing localities, 87 localities, and 3 historic sites. To date, 63 sites have been recommended as eligible for the National Register of Historic Places.

SITES OF AMERICAN INDIAN SIGNIFICANCE—The CGTO knows that the

Tonopah Test Range contains significant cultural resources, including plants, animals, archaeology sites, and places of historic value to Indian people. This is known from Indian interviews conducted in the 1930s (Steward, 1938) and recent plant, animal and archeology studies conducted south of this area in comparable environments (Stoffle et al., 1990a; Stoffle et al., 1994b). These studies document long-term and extensive involvement of Indian people in these traditional lands. These were among the last areas lived in before Indian people were forced out of the area to live on more distant Indian reservations. As a result of oral history, Indian people know there are various types of cultural resources located in this study area, but cannot provide site-specific information at this time. No Indian people officially representing the CGTO have visited the Tonopah Test Range or any other portion of the NAFR Complex, although such interviews have been requested and one initial meeting with a NAFR Complex archaeologist has occurred. Therefore, it is not possible to fully assess the cultural significance of the Tonopah Test Range at this time.

4.2.11 Occupational and Public Health and Safety Radiation

The DOE's commitments to quality management of the Tonopah Test Range worker safety and health as well as environmental resources is evident by the establishment of many offices and departments to oversee environmental, safety and health issues.

OVERVIEW - The potential for activities at the Tonopah Test Range to impact the health and safety of the general public is minimized by a combination of the remote location of the Tonopah Test Range, the sparse population surrounding it, and a comprehensive program of administrative and design controls. Visitors to the Tonopah Test Range are subject to essentially the same safety and health requirements as the workers. Safety briefings are provided as appropriate, personal protective equipment is provided when necessary, and radiation dosimeters are issued to long-term visitors. Secondary access control is provided, when necessary, for safety and or security reasons. Operations with higher-than-normal hazards are fenced or barricaded. The health and safety of the Tonopah Test Range workers is protected by adherence to the requirements of federal and state law, DOE orders, and plans and procedures of each organization performing work on the range. A program of self-assessment of compliance with these requirements is conducted by the Sandia National Laboratories, support contractors, and the DOE. Workers are further protected from specific hazards associated with their jobs by training, monitoring the workplace environment, using personal protective equipment, and using administrative controls to limit their exposures to chemical or radioactive materials.

All DOE activities on the Tonopah Test Range are in compliance with all environmental and other requirements established by federal, state, and local agencies. The main environmental compliance activities included the operation of a less than 90-day storage area for hazardous waste, minimal cleanup activities associated with the Environmental Restoration Program, and compliance sampling for the public water distribution system as required by the Safe Drinking Water Act.

RADIOLOGICAL ENVIRONMENT - Radiological effluent in the form of air emissions are released into the environment as a routine part of operations at the Tonopah Test Range. These emissions are monitored for source characterization and operational safety, as well as for environmental surveillance purposes.

The environmental surveillance of the Tonopah Test Range is focused on the three safety test areas that include approximately 670 acres. Environmental surveillance activities conducted by the DOE and the EPA include air, water, and soil sampling at various locations on the Tonopah Test Range and surrounding areas. The data from these efforts are summarized as annual averages for each monitoring location.

CRITERIA - All work at the Tonopah Test Range is performed in accordance with the safety and health requirements of the Occupational Safety and Health Administration as codified in Title 29 CFR Parts 1910 and 1926. In addition, the following DOE orders provide direction for worker safety and health programs:

- 5480.7A Fire Protection
- 5480.8A Contractor Occupational Medical Program
- 5480.9A Construction Project Safety and Health Management
- 5480.10 Contractor Industrial Hygiene Program
- 5480.13A Aviation Safety
- 5480.16A Firearms Safety
- 5480.1B Environmental Safety and Health Programs for Workers
- 5480.23 Nuclear Safety Analysis Reports
- 5480.28 Natural Phenomena Hazards Mitigation
- N441.1 Radiological Protection for DOE Activities.

INSTITUTIONAL SAFETY PROGRAMS - The Tonopah Test Range supports the following on-site safety services provided by Sandia National Laboratories and other support contractors:

- Fire support services
- Occupational medicine services (limited critical care patients are transported into the town of Tonopah)
- Radiological safety services, including a radioactive material control program to assure that materials leaving the Tonopah Test Range are not contaminated
- Industrial hygiene services.

The above services can be expanded to meet the requirements of the Tonopah Test Range from Sandia National Laboratories' main facility in Albuquerque, New Mexico.

4.2.12 Environmental Justice

Existing demographic conditions for Environmental Justice are discussed in Section 4.1.12. This discussion includes conditions for the Tonopah Test Range region of influence.

4.3 Project Shoal Area

Project Shoal Area was a joint effort of the DoD and the Atomic Energy Commission to study the effects of different geological media (e.g., granite) on seismic waves produced by underground nuclear shots and to determine whether seismic waves produced from underground nuclear testing could be differentiated from natural earthquakes (DOE, 1988). The Project Shoal Area was selected as a potential site in 1961, and preparations for the test began in late 1962. The Project Shoal Area was a nuclear device with an estimated yield of 12.5 kt at 367 m (1,205 ft) belowground surface on October 26, 1963. The shot produced a rubble-filled chimney 52 m (170 ft) in diameter and 140 m (460 ft) high (Gardner and Nork, 1970).

Deactivation of the site began almost immediately after the test, with all surface equipment removed by January 31, 1964. The shaft was covered by a permanent concrete slab, and all exploratory boreholes leading to the cavity were permanently sealed. A preliminary site assessment, conducted by the Desert Research Institute in 1988, resulted in a Hazard Ranking System score of 3.52. This score does not meet the minimum score required for placement on the National Priorities List under Superfund.

Management recommendations listed in the report included groundwater monitoring of nearby wells and further investigations to quantify the nature and extent of potential contaminants (DOE, 1988).

Because the activities at the Project Shoal Area are restricted to environmental restoration actions, the alternatives do not have the potential to impact waste management, transportation, or socioeconomics at the Project Shoal Area. Therefore, the development of a detailed baseline for these issues is not warranted. A brief explanation for this decision follows:

- Waste Management—No waste management facilities exist at the Project Shoal Area. Any waste generated during the course of Environmental Restoration Program activities would be transported either to the NTS or a permitted hazardous waste facility

- Transportation—The Project Shoal Area is crossed by numerous roads used for accessing surrounding public lands. Access to the site during Environmental Restoration Program activities would generate only a minor amount of traffic on local roads. Transportation of investigation-derived waste and remediation-generated waste is discussed in Section 4.1.2.3

- Socioeconomics—No new facilities are proposed to be located at the Project Shoal Area. Only environmental restoration activities are planned at this location. Environmental restoration activities would be short-term and would require relatively few personnel (less than 10 at any given time).

4.3.1 Land Use

The Project Shoal Area is a 10.4 km^2 (4 mi^2) area located at an elevation of 1,585 m (5,200 ft) in the northern part of the Sand Springs Mountain Range. It is located 48 km (30 mi) southeast of Fallon, Nevada (Figure 4-54). The closest human population is represented by a private ranching operation 8 km (5 mi) to the west. The site is surrounded by unimproved rangeland covered with sparse, low vegetation.

4.3.1.1 Public Land Orders and Withdrawals. The Project Shoal Area was withdrawn in 1962 for the proposed Project Shoal Area test by Public Land Orders 2771 and 2834. This site consists of 2,560 acres. (SAIC/DRI, 1991).

4.3.1.2 Land-Use Designations. Characterization and testing activities began at the Project Shoal Area in late 1962. Upon completion of operations on October 28, 1963, site deactivation was initiated (AEC, 1970). All vehicles and equipment were returned to the NTS, including communications equipment, technical instruments, and radiation monitoring instruments. Roads and concrete pads remained on the site. After wire, cable, poles, and lumber were salvaged, the lease of facilities in Fallon was terminated, and site decommissioning was deemed completed on January 31, 1964. Control or prevention of entry into the subsurface in the area continues to be a necessity for security purposes and is defined as the exclusion zone. The exclusion zone lies between a depth of 55 m (180 ft) and 518 m (1,700 ft) below surface ground zero and 1,006 m (3,300 ft) laterally between those depths (AEC, 1970). Access to the land surface of the withdrawal area is currently uncontrolled. The site is bounded on all sides by public land. North and south of the Project Shoal Area, land is used for grazing.

The Navy has applied for a withdrawal which surrounds and overlaps the DOE withdrawal at the Project Shoal Area site. The DOE's present plan is to characterize and complete any required remediation so that the surface can be available for unrestricted public use. Access to the deep subsurface would remain excluded. Continued access by the DOE for monitoring of the subsurface would be long term.

The preliminary Hazard Ranking System score (EPA's ranking system for Superfund cleanup determination) for the Project Shoal Area is a low score based primarily on the assumption of a low probability for the migration of radionuclides, and there are no human drinking water receptors in the vicinity of the Project Shoal Area. The nearest population center is the town of Fallon, Nevada, located 45 km (28 mi) northwest of the site, although evidence of past ranching activities can be found closer to the site.

4.3.1.3 Site-Support Activities. This section provides a brief discussion of site-support activities at the Project Shoal Area.

<u>FACILITIES</u>—There are no existing facilities at the Project Shoal Area.

<u>SERVICES</u>—Services discussed for the Project Shoal Area include law enforcement and security, fire protection, and health care.

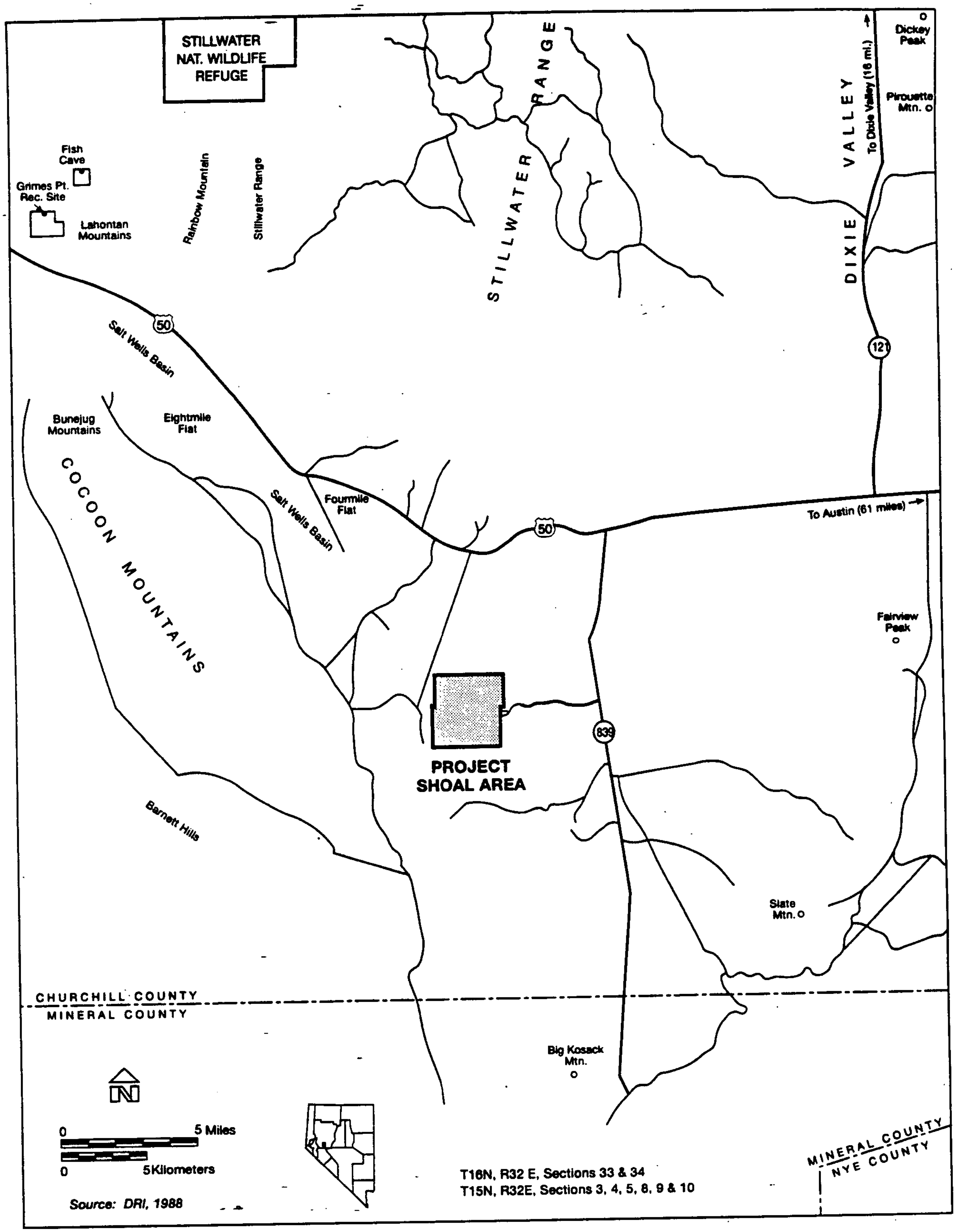


Figure 4-54. Project Shoal Area and surrounding area

Law Enforcement and Security—No security is provided at the Project Shoal Area. Law enforcement is provided by the Churchill County Sheriff's Department.

Fire Protection—Fire protection for the Project Shoal Area is provided by the U.S. Bureau of Land Management.

Health Care—No health care facilities currently exist at the Project Shoal Area.

UTILITIES—No utilities currently exist at the Project Shoal Area.

COMMUNICATIONS—No communication systems currently exist at the site.

4.3.1.4 Airspace. The airspace over the Project Shoal Area is part of the Fallon Range Training Complex located in restricted area R-4812. This area encompasses 453 km^2 (175 mi^2) of public land (see Figure 4-55). This restricted area is a joint-use area, and civilian aircraft are able to fly in the area when it is not being used for military training activities (SAIC/DRI, 1991).

4.3.2 Transportation

No public roads currently exist on the Project Shoal Area. Access to the site during environmental restoration activities would generate only a minor amount of traffic on local access roads and the immediate regional highway (U.S. Highway 50), which are currently underused. In 1993, the average daily traffic on U.S. Highway 50 near the site was 1,340 vehicles (NDOT, 1993a). This traffic volume is far below the capacity of U.S. Highway 50 at this location, which ranges from 10,000 to 20,000 vehicles.

4.3.3 Socioeconomics

The majority of DOE/NV workers, including those assigned to projects at the Project Shoal Area, live in Clark or Nye counties (DOE, 1994b). An analysis of socioeconomic conditions in Clark and Nye counties is presented in Section 4.1.3.

4.3.4 Geology and Soils

Physiography, geology, and soils are addressed in this section. Also discussed are seismic issues.

4.3.4.1 Physiography. The Project Shoal Area is within the Basin and Range Physiographic Province. Section 4.1.4.1 contains a description of this physiographic province. The area immediately surrounding the site is a high, gently rolling plateau, falling steeply away to valleys on the east and west (AEC, 1970).

The Project Shoal Area is located on Gote Flat in the northern portion of the Sand Springs Range. The range is a low, north-south-trending formation approximately 32 km (20 mi) long and 5 to 8 km (3 to 5 mi) wide. Total relief between the range and valley is 503 m (1,650 ft) (AEC, 1970). The range is bordered on the east and west by the similarly trending alluvial valleys of Fairview Valley and Fourmile Flat, respectively. Large faults are presumed to separate the range from the valleys to the east and west (AEC, 1963). Steeply dipping faults, joints, and shear zones with northwest and northeast orientations are prevalent in the range (AEC, 1970).

4.3.4.2 Geology. Sand Springs Range is composed chiefly of Cretaceous granitic rocks, bordered on both the north and south by Mesozoic metamorphic rocks. Tertiary and Quaternary alluvial and aeolian (wind-blown) deposits occupy the valleys (AEC, 1970). Locally, both the granitic and metamorphic rocks are overlain by Tertiary and Quaternary volcanic rocks, and the surface ground zero area is overlain by Quaternary alluvium. Numerous dikes composed of aplite-pegmatite, andesite, and rhyolite intrude the granite. The Project Shoal Area test was detonated in the Cretaceous granite.

There are 18 mines within 84 km (52 mi) of the Project Shoal Area surface ground zero. Two inactive tungsten mines are within 6 km (4 mi) of the site. The closest marginally active mine is a gold mine 8 km (5 mi) north of the site (AEC, 1970).

The area surrounding the Project Shoal Area is seismically active, and future earthquakes could cause rearrangement of the rubble in the test

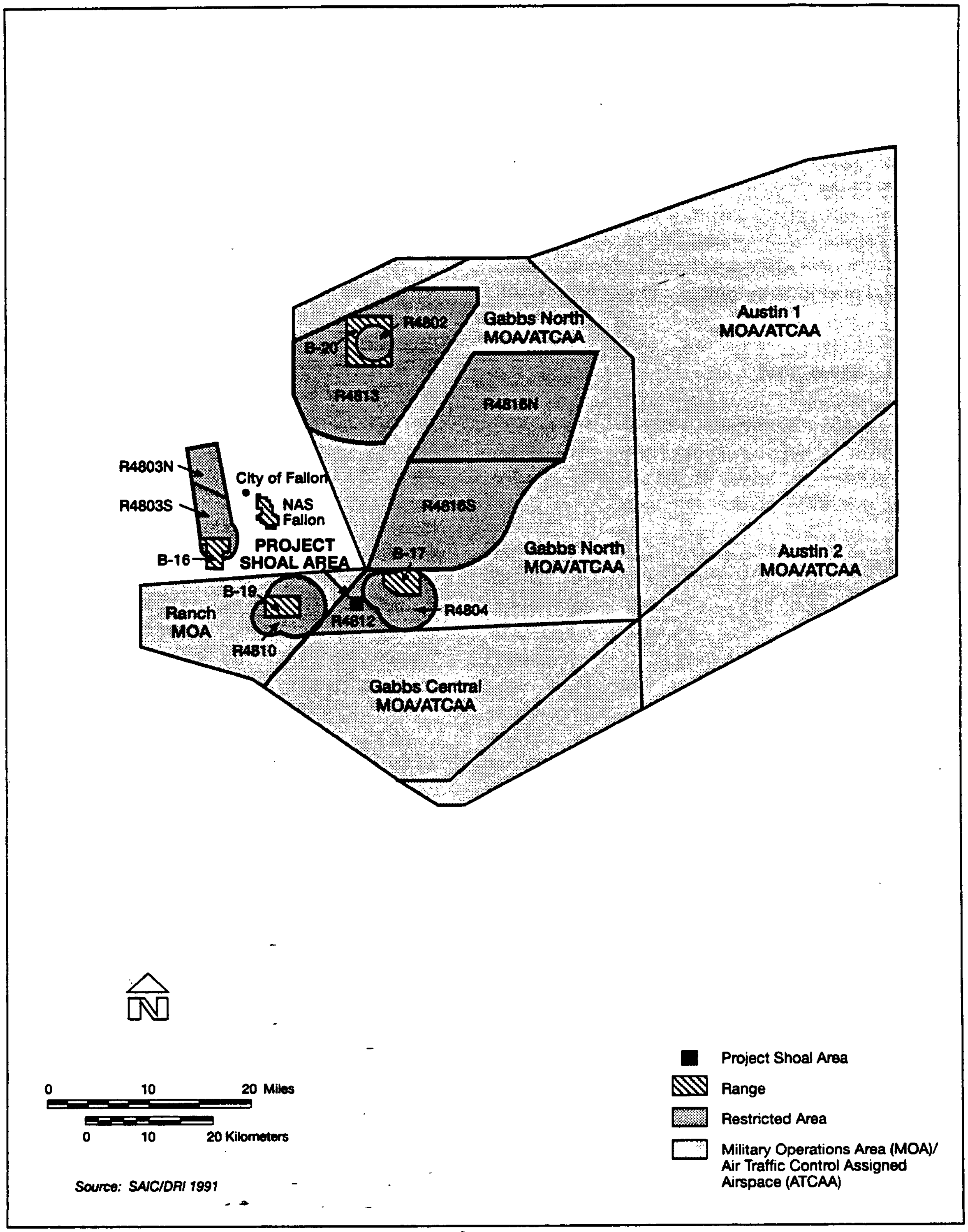


Figure 4-55. Project Shoal Area airspace

chimney and further collapse of the ceiling. However, with more than 244 m (800 ft) of granite between the top of the chimney and the land surface, a complete collapse of the chimney resulting in release of radioactivity to the surface is unlikely (DRI, 1988).

4.3.4.3 Soils. Soil at the Project Shoal Area consists of the Chill series, a gravelly, sandy loam with the soil surface covered by approximately 10 percent fine pebbles. The Chill series consists of very shallow and shallow well-drained soils, formed in residuum of granitic bedrock on low hills (Dahl, 1994).

4.3.5 Hydrology

This section addresses surface water and groundwater conditions at the Project Shoal Area. A discussion of wells in the vicinity is also presented in this section.

4.3.5.1 Surface Hydrology. The Project Shoal Area is within the Great Basin (AEC, 1970). There are no permanent bodies of water in the Project Shoal Area (DRI, 1988), only ephemeral streams fed by seasonal snow and rain. The ephemeral nature of the streams makes water monitoring difficult; consequently, there are no surface-water quality data. Ephemeral streams originating in the higher elevations of Aplite Ridge flow in an easterly direction across the site. The only springs in the area are the Bucky O'Neil Flowing Well, located 7.2 km (4.5 mi) northwest of surface ground zero on the edge of Fourmile Flat; and the Smith-James Spring, located 8 km (5 mi) southeast of surface ground zero on the edge of Fairview Valley.

4.3.5.2 Groundwater. The mountain range around the Project Shoal Area is a regional groundwater recharge area, with regional discharge occurring both in the Fourmile and Eightmile Flats area to the west of the range, and in the Humboldt Salt Marsh in Dixie Valley to the northeast of the range (Figure 4-56). The University of Nevada (1965) analyzed hydrologic data in the Project Shoal Area and concluded that a groundwater divide may exist northwest of the event and that the main component of lateral movement of groundwater near ground zero is southeast toward Fairview Valley. (Cohen and Everett, 1963) and (Glancy and Katzer, 1975) also identify a groundwater divide just west of the Project Shoal area, apparently based on a topographic divide. Though the hydraulic data suggest flow to the east from the site, hydrochemical parameters suggest flow to the west (University of Nevada, 1965), and available data are not sufficient to rule out either the east or west pathway.

At the Project Shoal Area, groundwater occurs within fractured granite. Hydraulic tests conducted at the time of the Project Shoal Area test showed that there was a range of conditions in the granite, depending on fracture geometry relative to the wells, but that overall the transmissive capacity was low. This transmission capacity is expected to be less than 2.5 m^2/day (200 gal/day/ft) (University of Nevada, 1965). In general, groundwater occurs about 290 m (951 ft) belowground surface in the immediate vicinity of the test, although a few high-altitude springs discharging from perched zones in the granite can be found to the south. In the adjacent valleys, groundwater occurs in alluvial material eroded from the highlands, and hydraulic testing indicated much higher transmissivities. These are on the order of 62 m^2/day (5,000 gal/day/ft) to 944 m^2/day (76,000 gal/day/ft) (University of Nevada, 1965). Granitic bedrock is relatively near the surface beneath a veneer of alluvium west of the Sand Springs Range. Farther to the west, and in Fairview Valley to the east, bedrock occurs at greater depths and is not penetrated by wells. Discharge of water originating in the Sand Springs Range occurs at springs and by evapotranspiration along the edge of the salt pan in Fourmile Flat. Data from a well completed in the alluvium between the range and the salt pan suggest that a counterflow of dense, saline water may be moving back toward the range from the playa, driven by buoyancy forces, with fresh water moving from the Sand Springs Range being confined to a thin lens at the top of the saturated zone (Chapman et al., 1995). The alluvium is much thicker in Fairview Valley, and the groundwater occurs in at least three separate aquifers separated by clay aquitards. No discharge to the surface occurs in Fairview Valley; rather, groundwater moves northward to discharge areas in Dixie Valley. The Long-Term Hydrologic Monitoring Program

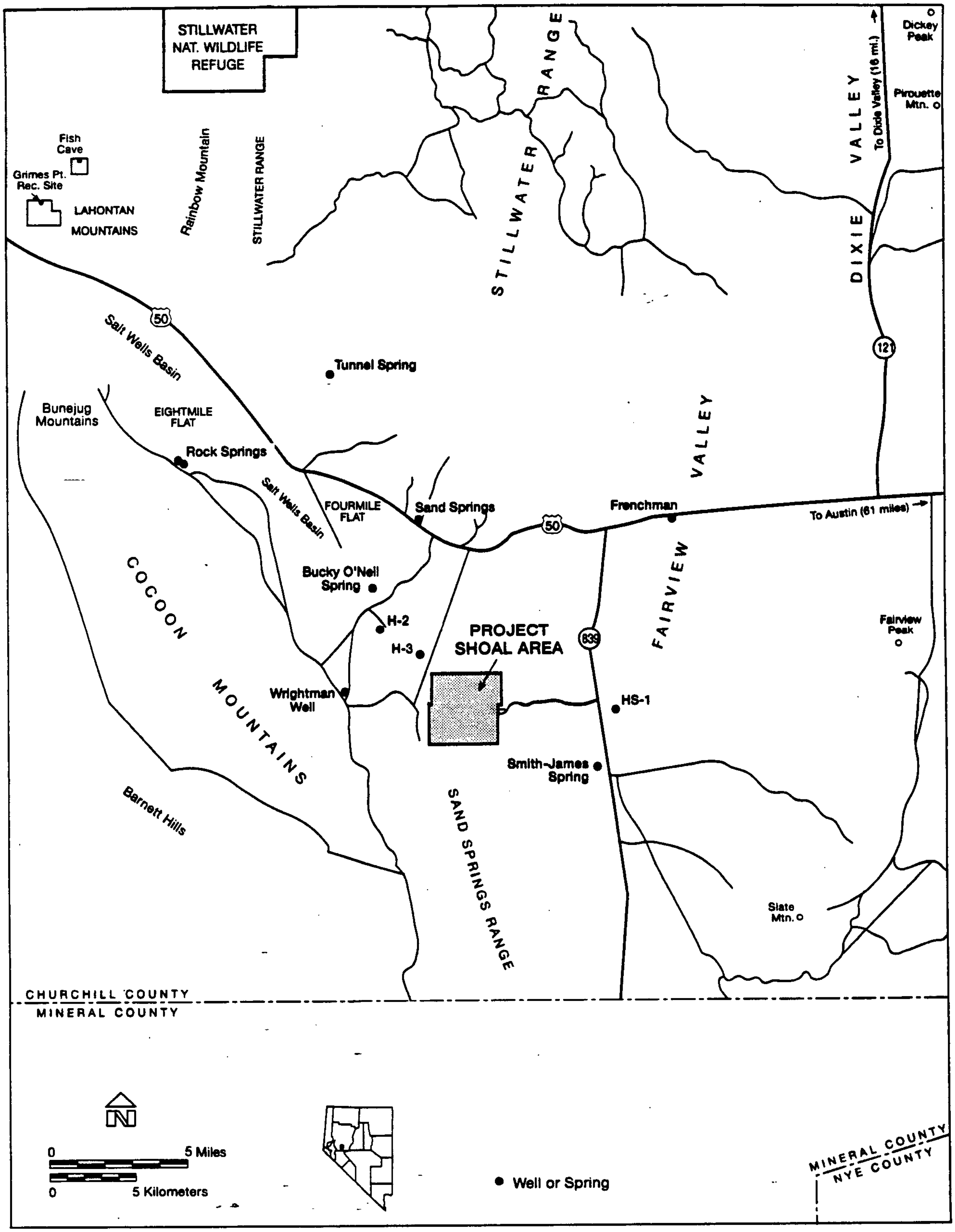


Figure 4-56. Location of wells and springs in the Project Shoal Area

samples one spring in the Sand Springs Range and five wells in the adjacent valleys. No contamination related to the Project Shoal Area test has been detected in these samples. The Environmental Restoration Program will evaluate the need for additional hydrology studies and expanded monitoring at the Project Shoal Area.

Six water wells exist within 4 miles of the site: one domestic water supply well, one livestock well, and four U.S. Bureau of Land Management exploratory wells. The only wells in the Sand Springs Range itself are associated with mining operations to the south of the Project Shoal Area. Groundwater is used in both of the adjacent valleys for stock watering, primarily on a seasonal basis. Groundwater quality is poor in the Fourmile Flat basin because of high dissolved solids, with better quality water found in Fairview Valley. Although there is a well at an apparently abandoned homestead in Fourmile Flat (Wightman Well), and there is a well at the location of a former store (known as Frenchman Station) in Fairview Valley, groundwater in the area is not currently used for private domestic supply. The perennial yield of Fairview Valley has been estimated at 16,741 m^3 (500 acre-feet) (Cohen and Everett, 1963). The yield of the Fourmile Flat area is unknown; it was grouped with a large area of the Carson Desert for the resource appraisal, but estimates of groundwater discharge exceeded estimates of groundwater recharge for the region (Glancy and Katzer, 1975).

4.3.6 Biological Resources

The scientific names of plants and animals mentioned in this section are given in Section 2.0 of Appendix E, Biological Resources. The Project Shoal Area is within the Great Basin desert. The vegetation surrounding the site varies with elevation and topography. Salt Wells Basin is located about 10 km (6 mi) northwest of the Project Shoal Area in Fourmile Flat and lies at an elevation of about 1,201 m (3,940 ft). This basin has a dry, saline lake bed vegetated only by saltgrass where sufficient moisture is available. Sand dunes are located along the northeast edge of the lake bed and extend along its eastern edge. The northern end of these dunes have no vegetation, but the southern extension contains sparse stands of greasewood, glandular indigo bush, four-winged saltbush, and shadscale. Several springs and wells occur around the lake bed and dunes. Sedges, rushes, and desert saltgrass are common where seep areas and overflow from the wells sustain small oases of vegetation.

Between the lakebed and the Sand Springs Range are shallow-sloped foothills dominated by the shrubs greasewood, shadscale, rabbitbrush, horsebrush, and glandular indigo bush. Steep, rocky slopes occur along a narrow zone between the shallow-sloped foothills and Gote Flat. These steep slopes are dominated by Nevada ephedra, rabbitbrush, horsebrush, big sagebrush, and snowberry. The highest elevations at this site, 1,500 to 1,800 m (4,920 to 5,910 ft), are dominated by big sagebrush.

It is likely that few animal species use the dry lake bed. Animal species occupying the surrounding habitats are probably widespread and similar to those described for the Tonopah Test Range and the Great Basin desert portions of the NTS. Chukar is the only common game species in the area (BLM, 1983).

No current federally threatened, endangered, or candidate plant or animal species are known to occur at the Project Shoal Area, although bald eagles and peregrine falcons may be rare migrants. The U.S. Fish and Wildlife Service published the latest list of candidate plants and animals on February 28, 1996 (61 F.R. 7596). Prior to this, 10 vertebrate species, 4 invertebrate species, and 2 plant species that were identified as potentially occurring at this site were classified as candidates (Mendoza, 1995b) and were addressed (Table 4-30). The updated Notice of Review has removed all but one of these species from candidate status. The mountain plover, which may be an uncommon migrant in the area, remains a candidate bird species. The western burrowing owl, one of over 20 State-protected bird species, is likely to occur on site.

4.3.7 Air Quality and Climate

This section includes a description of air quality conditions at the Project Shoal Area, including climatology, meteorology, and ambient air quality.

CLIMATOLOGY AND METEOROLOGY—Meteorological measurements are not available for the Project Shoal Area. Based on Nevada climatological maps of temperature and precipitation (Ruffner, 1980), temperatures would be 2 to 3 °C (4 to 5 °F) cooler than those on the Tonopah Test Range (see Section 4.2.7). Mean annual precipitation is estimated to be about 20 cm (8 in.). Wind patterns are similar to those that occur on the Tonopah Test Range.

AMBIENT AIR QUALITY—The Project Shoal Area is located in Nevada Intrastate Air Quality Control Region 147. There are no air-quality monitoring stations in the region. Because there are no significant sources of pollutant emissions in the region, the air quality is most likely good. Air Quality Control Region 147 is designated as unclassifiable/attainment for all criteria pollutants.

4.3.8 Noise

The acoustic environment around the Project Shoal Area can be classified as uninhabited desert or small rural communities. Noise measurements have not been made at the Project Shoal Area. The major sources of noise would be associated with prevailing meteorological conditions, such as wind, or would result from sonic booms produced by supersonic overflights of military aircraft. Training ranges used by the Naval Air Station, Fallon, are located several miles from the Project Shoal Area. These training ranges are used for gunnery, explosive ordnance, and bombing practice activities. C-weighted (L_{dn}) resulting from these range activities are less than 65 dB at the Project Shoal Area (SAIC/DRI, 1991). Noise from traffic on U.S. Highway 50, which is 6 km (4 mi) to the north, has negligible effect on the Project Shoal Area.

4.3.9 Visual Resources

The landscape character of the Project Shoal Area is typical of the Great Basin. Regional topography consists of mountain ranges arranged in a north-south orientation, separated by broad valleys. The landscape at the Project Shoal Area is common to the region. Therefore, scenic qualities have been designated Class C. State Route 839, which is 3 km (2 mi) east of the site, has an average daily traffic of 160 vehicles (NDOT, 1993a). Therefore, the sensitivity level would be low.

4.3.10 Cultural Resources

The Project Shoal Area lies in the western Great Basin, an area with a prehistory that may span the past 10,000 years or more. Properties ranging from the early prehistoric period to historic mining and ranching sites are known. Historical contexts are summarized in (Hardesty, 1982) and in (Bard et al. 1981). At the time of contact with Euroamericans in the mid-1800s, the area was used by the *Toedokado* band of the Northern Paiute (Stewart, 1939). Their territory centered around camps on the edge of the Carson Sink, northwest of the project area. Detailed information about the Northern Paiute can be found in (Stewart, 1939), (Bard et al., 1981) and (Fowler and Liljeblad, 1986).

The Project Shoal Area consists of three separate land areas with a total area of approximately 2,560 acres (SAIC/DRI, 1991). An area of potential effect for the cultural resources at the Project Shoal Area is based on research performed in the area for environmental restoration at the site. Environmental Restoration Program activities involve sampling wells and springs within 16 km (10 mi) of ground zero. Based on that sampling strategy, an area of potential effect was created and a stratified, random sample survey of the area of potential effect was conducted to characterize the cultural resources of the area.

RECORDED CULTURAL RESOURCES—Eleven archaeological sites have been recorded within the area of potential effect. Of the 11 sites, 1 is an extractive locality, 4 are processing localities, 1 is a station, and 5 are historic sites. Five sites have been recommended as eligible for listing on the National Register of Historic Places. Consultation with the SHPO regarding eligibility of these sites is not concluded.

SITES OF AMERICAN INDIAN SIGNIFICANCE—This study area is not within the traditional lands of the American Indian people represented by the CGTO. It is recommended by the CGTO that the DOE EIS team directly contact American Indian tribes and *organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake, and Lovelock Paiute Tribe.*

NOTE: The DOE/NV provided notification, as recommended by the Consolidated Group of Tribes and Organizations.

4.3.11 Occupational and Public Health and Safety and Radiation

Approximately 3×10^{11} Ci of radioactivity existed 1 minute after detonation of the Project Shoal Area test (Glasstone and Dolan, 1977). This amount of radioactivity was reduced by a factor of more than 2,000 during the first day after detonation. Virtually all radioactivity associated with the detonation is assumed to be confined to the puddle-glass mixture at the bottom of the shot cavity chimney. There is no evidence of venting of particulate matter during or after the explosion. Groundwater in the vicinity of the detonation is assumed to be contaminated with tritium. Historical groundwater monitoring in the vicinity of the Project Shoal Area has been performed by the EPA as part of the Long-Term Hydrologic Monitoring Program. Monitoring results demonstrate that the tritium concentration is below the EPA limit for drinking water (EPA, 1992).

Low groundwater velocities indicate that migration of radionuclides to the nearest water supply well would take 750 years (DRI, 1988). Calculations indicate that tritium would decay to negligible levels long before reaching potential receptors (DRI, 1988).

Minor levels of radioactivity were released and reached the surface during drilling and sampling operations subsequent to the detonation. The releases consisted of gases and vapors that were safely channeled into filters and traps. Historical records indicate that the radioactive material was slightly contaminated with short-lived radioisotopes of iodine and xenon. The radioactive material was placed in the post-shot mud pit and covered with several feet of uncontaminated earth. These isotopes have since decayed to negligible concentrations below detectable levels. A recent radiological survey of the surface showed no radiation levels above natural background (DRI, 1988).

4.3.12 Environmental Justice

Existing demographic conditions for Environmental Justice are discussed in Section 4.1.12.

4.4 Central Nevada Test Area

The existing environmental conditions of the Central Nevada Test Area are described in this section.

The Environmental Restoration Program activities at the Central Nevada Test Area would not have the potential to impact waste management, transportation, socioeconomics, or occupational health and safety. Therefore, development of a detailed baseline for these issues is not warranted. A brief explanation as to why these issues are not described is as follows:

- Waste Management—No waste management facilities exist at the Central Nevada Test Area. Any waste generated during the course of Environmental Restoration Program activities would be transported to either the NTS or a permitted hazardous waste facility.
- Transportation—No public roads currently exist at the Central Nevada Test Area. Access to the site during Environmental Restoration Program activities would only generate a minor amount of traffic on local roads. Transportation of investigation-derived and remediation-generated waste is discussed in Section 4.1.2.3.
- Socioeconomics—No new facilities will be located at the Central Nevada Test Area.
- Occupational Health and Safety—Any environmental restoration activities occurring at the Central Nevada Test Area would be required to comply with applicable DOE orders and directives concerning occupational health and safety as described in Section 4.1.11.

4.4.1 Land Use

The closest permanent habitation to the Central Nevada Test Area is the Hot Creek Ranch, located 16 km (10 mi) southwest of surface ground zero. The nearest population center is the town of Tonopah, located 97 km (60 mi) southwest of surface ground zero.

The Central Nevada Test Area is located in the north-central part of Hot Creek Valley, a remote desert area in south-central Nevada, 97 km (60 mi) northeast of Tonopah, in Nye County, Nevada, and 52 km (32 mi) northeast of Warm Springs, Nevada (Figure 4-57). A portion of this area is also within the Toiyabe National Forest. The Central Nevada Test Area was obtained by the Atomic Energy Commission for the purpose of developing potential alternative sites for nuclear testing activities. Several emplacement holes were drilled in anticipation of future events; however, Project Faultless was the only nuclear test conducted at the Central Nevada Test Area. The event was conducted on January 19, 1968, at a depth of 975 m (3,200 ft), and had a yield of approximately 1 megaton (DOE, 1994a).

*4.4.1.1 **Public Land Orders and Withdrawals**.* The Central Nevada Test Area consists of two non-contiguous areas that were withdrawn by Public Land Order 4338; 640 acres for the Project Faultless detonation, and Public Land Order 4748 (1,920 acres) for a total of 2,560 acres. (SAIC/DRI, 1991). Although surface is not controlled, subsurface access is restricted by the DOE.

*4.4.1.2 **Land Use Designations**.* Site-support activities, such as movable trailer modules for use as offices, dining facilities and dormitories, tanks, power lines, underground cables, and an airstrip existed only temporarily at the Central Nevada Test Area during preparation, testing, and demobilization. Demobilization activities began in 1973, when all facilities except the Base Camp, Control Point, Noname Hill, and the airstrip were removed. Numerous drillholes used for subsurface soil and groundwater sampling were plugged; however, four wells have been left open for hydrologic monitoring on the site (DRI, 1988). Aside from this long-term hydrologic monitoring site, land use is confined to cattle grazing and recreation.

*4.4.1.3 **Site-Support Activities**.* Site-support at the Central Nevada Test Area is described in this section.

FACILITIES—There are no existing facilities at the Central Nevada Test Area.

SERVICES—Services described at the Central Nevada Test Area are law enforcement and security, fire protection, and health care.

Law Enforcement and Security—No security is provided at the Central Nevada Test Area. Law enforcement is provided by the Nye County Sheriff's Department.

Fire Protection—Fire protection for the Central Nevada Test Area is provided by the U.S. Bureau of Land Management.

Health Care—No health care facilities currently exist at the Central Nevada Test Area.

UTILITIES—The Central Nevada Test Area does not contain utility systems.

COMMUNICATIONS—No communication systems are currently located at the site.

*4.4.1.4 **Airspace**.* The Central Nevada Test Area is not located beneath any special-use airspace used for DOE or defense-related purposes.

4.4.2 Transportation

No public roads currently exist on the Central Nevada Test Area. Access to the site during environmental restoration activities would generate only a minor amount of traffic on local roads and the immediate regional highway (U.S. Highway 6), which are currently under-used. In 1993, U.S. Highway 6 near Warm Springs carried an average of 145 to 210 vehicles per day. This traffic volume is far below the two-way vehicle capacity of U.S. Highway 6 at this location, which is approximately 1,700 vehicles per hour.

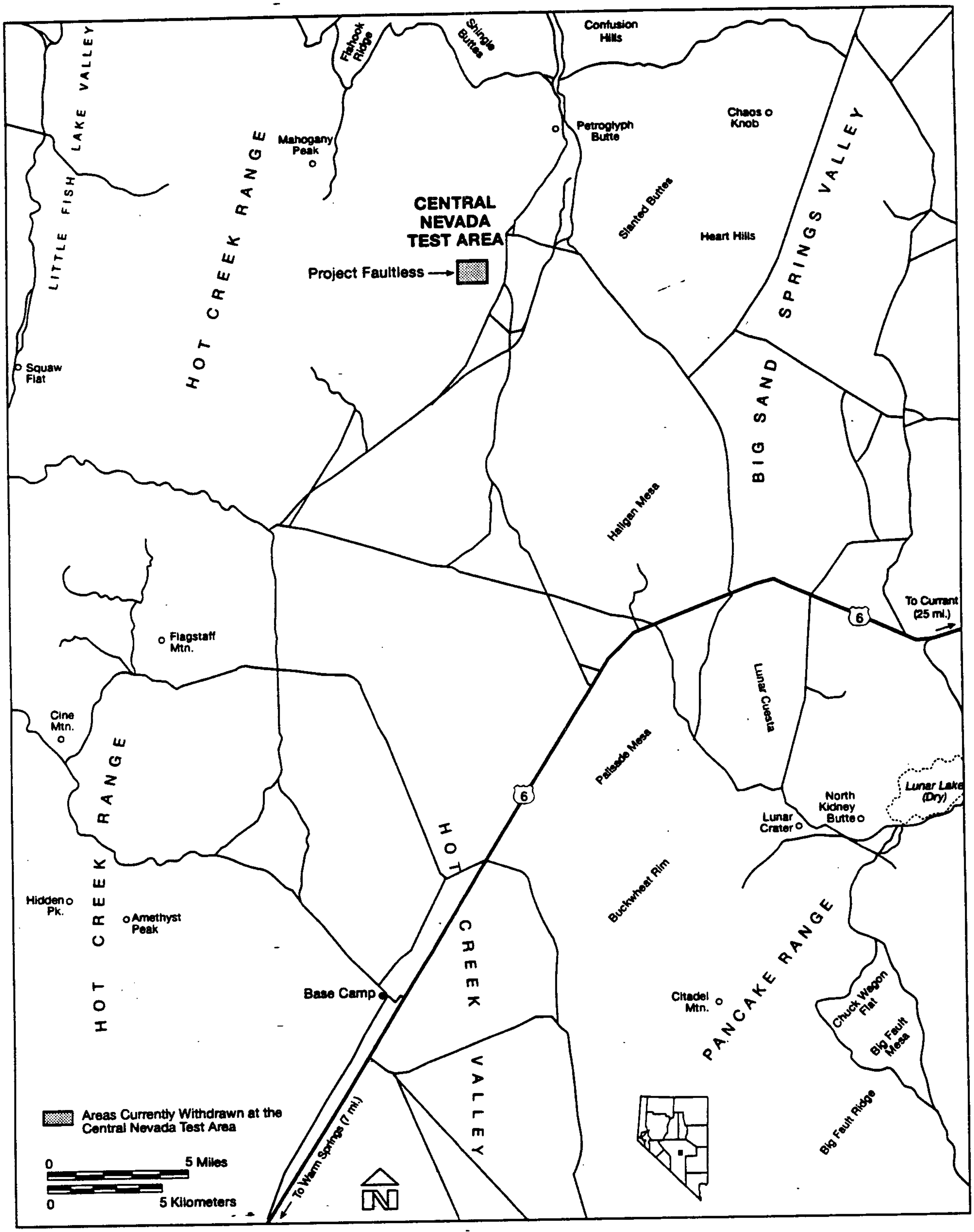


Figure 4-57. Central Nevada Test Area and surrounding area

4.4.3 Socioeconomics

The majority of DOE/NV workers, including those assigned to projects at the Central Nevada Test Area, live in Clark or Nye counties (DOE, 1994b). An analysis of socioeconomic conditions in Clark and Nye counties is presented in Section 4.1.3.

4.4.4 Geology and Soils

Physiography, geology, and soils are addressed in this section for the Central Nevada Test Area.

4.4.4.1 ***Physiography***. The Hot Creek Valley is within the Basin and Range Physiographic Province. See Section 4.1.4.1 for a description of this province. The valley is about 113 km (70 mi) long on its north-south axis and varies in width from 16 to 32 km (10 to 20 mi). The Project Faultless site is in the north-central portion of the valley (AEC, 1973b). The Hot Creek Range lies immediately to the west and rises to an elevation that is 1,219 m (4,000 ft) above the site.

4.4.4.2 ***Geology***. The mountains immediately west of the site are composed of volcanic rocks interlayered with sedimentary units (Stewart and Carlson, 1978). The thick alluvial fill of Hot Creek Valley displays little evidence of the structural framework or stratigraphy of the valley; therefore, the primary source of subsurface geologic data is the several exploratory holes that were drilled in the area. The Project Faultless emplacement hole (UC-1) penetrated alluvium from the surface to a depth of 732 m (2,400 ft). The alluvium is underlain by tuffaceous sediments and zeolitized tuff from 732 to 998 m (2,400 to 3,275 ft), which includes the total depth of the hole. The geologic media at the shot point consisted of tuffaceous sediments and zeolitized nonwelded tuffs (DRI, 1988).

The Project Faultless test, detonated in the saturated zone, created a large cavity. The estimated radioactivity at one minute after shot time was 3×10^{13} Ci. The event resulted in numerous surface fractures up to 2,743 m (9,000 ft) in length, with vertical displacement up to 5 m (15 ft) and horizontal offset up to 1 m (3 ft). The explosion resulted in the formation of an irregularly-shaped subsidence block of approximately 372 m^2 (4,000 ft^2), bounded by local faults in the surface ground zero area (DRI, 1988).

Although Hot Creek Valley has historically been the site of significant mineral production, most deposits have been fully developed and mining activity is now limited to a few small operations. According to (Kleinhampl and Ziony, 1984), historic production has included antimony, barite, gold, lead, silver, turquoise, uranium, and zinc. Most of this production came from two mining districts, the Morey District from 1866 to 1953 and the Danville District from 1866 to 1950.

Because of the proximity of Hot Creek Valley to the largest producing oil fields in Nevada (in Railroad Valley), there has been limited interest in oil and gas exploration. According to (Garside et al. 1988) and (Hess and Davis, 1995), only two oil wells have been drilled in Hot Creek Valley. The Hot Creek Federal No. 24-13 well was drilled in 1981 to a total depth of 3,361 m (11,028 ft). Although this well exhibited numerous gas shows below a depth of 2,710 m (8,890 ft), no oil was found, and no production came from the well. The other well, Warm Springs Federal No. 10-14, was drilled in 1981 to a total depth of 2,798 m (9,180 ft) with no reported shows of either gas or oil.

4.4.4.3 ***Soils***. Soils most likely encountered at the Central Nevada Test Area range from rock outcrops and stony-cobbly alluvial fans to fine-loamy, and sometimes calcareous, soils (Cox et al., 1977). These are also referred to as Xerollic Durargids, Xerollic Durarthids, and Typic Durargids.

4.4.5 Hydrology

This section contains the discussion of surface water and groundwater conditions at the Central Nevada Test Area. A discussion of wells in the vicinity is also presented in this section.

4.4.5.1 ***Surface Hydrology***. The Central Nevada Test Area, located in Hot Creek Valley, is within the Great Basin hydrographic region. This region is characterized by the alluvium-covered topographically closed valleys and elongated north-south trending mountain ranges typical of the Basin and Range Physiographic Province. Hot Creek Valley is bordered by the Hot Creek Range on the west and the Pancake Range on the east. The topography of the region controls the surface water drainage (DOE/NV 1992), with the higher elevations receiving more precipitation than the lower elevations. Perennial surface waters are limited to low-discharge springs that travel a short distance before evaporating or infiltrating back into the ground (DOE, 1986). The Hot Creek Range hosts numerous springs that flow away from the site. The nearest spring to the site is 5 km (3 mi) away. No perennial streams cross the Central Nevada Test Area, and there are no permanent surface water bodies. Morey Canyon and South Canyon are prominent ephemeral streams that pass through the Central Nevada Test Area to Moore's Station Wash, 2 km (1 mi) east of the site. Owing to the intermittent flows in these streams, there are no surface-water quality data from streams that cross the Central Nevada Test Area.

4.4.5.2 Groundwater. The hydrogeology of Hot Creek Valley is controlled in part by the basin-and-range topography. The valley is a long graben (an elongated depressed block of crust bounded by faults on its long sides) containing a sequence of Quaternary and Tertiary alluvial fill (up to 1,200 m [3,936 ft]) underlain by Tertiary volcanic rocks. The bounding ranges on either side of the valley contain Paleozoic carbonates overlain by Tertiary age volcanics (Thordarson, 1987). Boreholes close to the site penetrate approximately 610 m (2,001 ft) of alluvium underlain by tuffaceous sediments and volcanic rocks.

The watertable in Hot Creek Valley generally occurs within the alluvium, and groundwater flow is believed to follow the general direction of surface flow (Rush and Everett, 1966; Fiero, 1986). The depth to groundwater in wells drilled at the Central Nevada Test Area ranged from 66 to 168 m (215 to 551 ft) below land surface at the time of drilling in 1967. Recharge occurs in the higher mountain range to the west (Hot Creek Range), with groundwater flowing toward the east-central part of the valley (Figure 4-58). Discharge is by evaporation in low portions of the valley (the area around Twin Springs Ranch), with a minor amount of subsurface flow out of Hot Creek Valley to Railroad Valley (Rush and Everett, 1966). Little information is available on water flow in the bedrock aquifers of the valley. Differences in hydraulic head, water chemistry, and temperature suggest that the alluvium and volcanics are distinct water-bearing zones (Dinwiddie and Schroder, 1971). Head values in the upper 340 m (1,115 ft) of the section indicate that groundwater movement is generally south to southeast. Head values measured in units 1,500 to 2,100 m (4,920 to 6,888 ft) below land surface reveal that the deep component of the flow system moves northeast and east to Railroad Valley. Evaluation of vertical head gradients indicates a potential for downward flow in the north end of the valley (in the immediate test area), while an upward potential for flow exists over the southern part of the valley. Dinwiddie and Schroder (1971) concluded that vertical movement is slow relative to lateral flow, based on the anisotropy of hydraulic properties.

The Project Faultless test occurred in the tuffaceous sediment section, but the resultant cavity extended into the overlying alluvium. The pre-event water-table level was predicted to be reached between the years of 1993 and 2018 (Thordarson, 1987), with recent measurements indicating the level is still depressed by about 50 m (164 ft), but rising at a rate of approximately 8 m/yr (25 ft/yr) (Chapman et al., 1994). Although radionuclide transport from the chimney was not expected until the pre-event water level was reached, logging in the post-shot hole at the site has revealed horizons of water outflow, which, if representative of conditions outside the chimney, suggests that transport could already be occurring (Chapman et al., 1994). The Long-Term Hydrologic Monitoring Program includes sampling of five wells and one spring in Hot Creek Valley. No contamination related to the Project Faultless test has been detected in samples from those wells.

Private wells in Hot Creek Valley are believed to be completed in the upper part of the alluvium section. They are used for domestic, farming, and stock-watering purposes. The perennial yield of Hot Creek Valley is estimated at 7 x 10^6 m^3 (5,500 acre-feet) (Rush and Everett, 1966). Some springs in the area have elevated temperatures and chemical characteristics that indicate they could be discharge points for deeper, regional flow systems. The

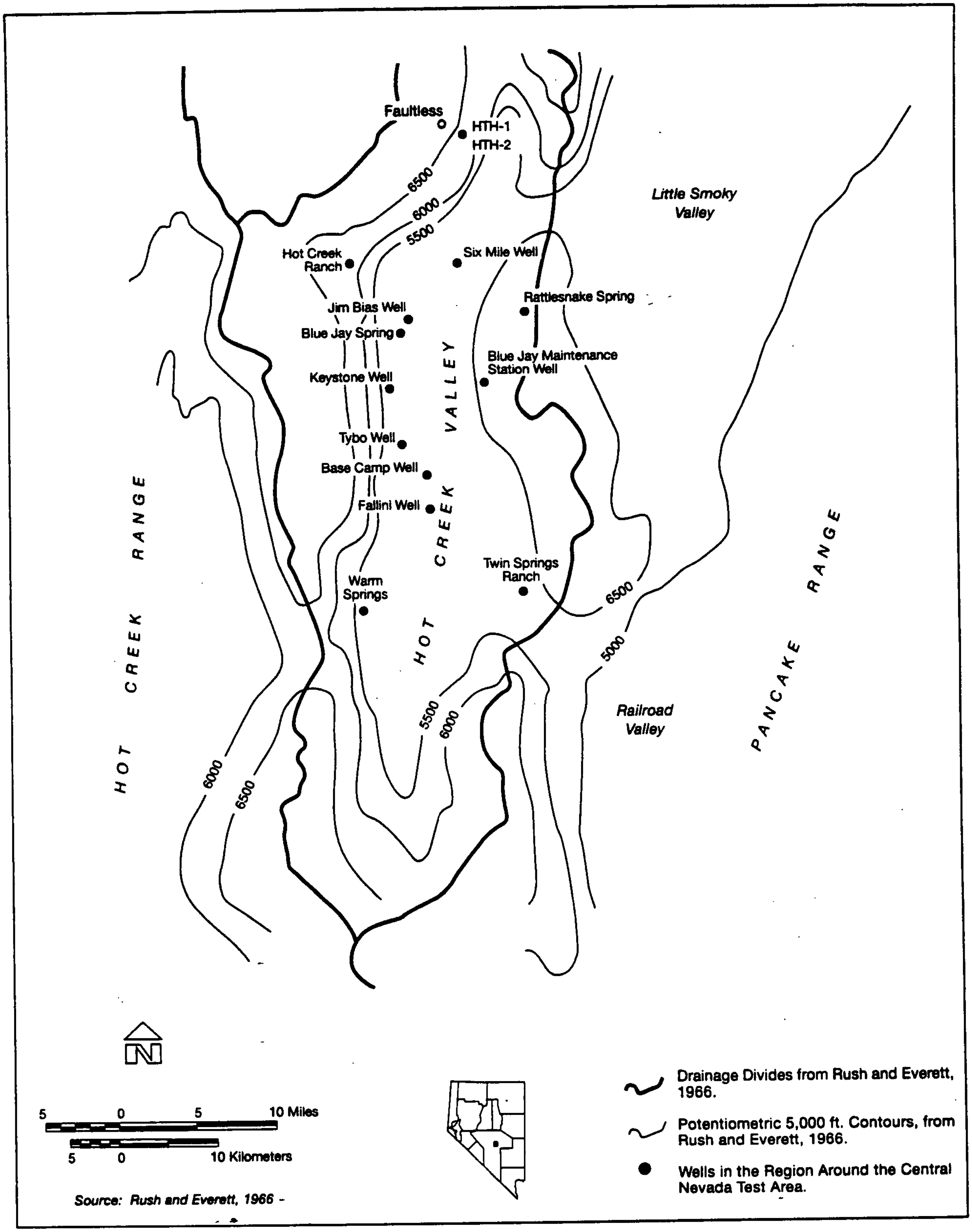


Figure 4-58. Hydrogeologic features of the Central Nevada Test Area

sparse data indicate that groundwater quality is generally good, although salinity increases in the natural discharge area near Twin Springs Ranch (Rush and Everett, 1966).

4.4.6 Biological Resources

The scientific names of plants and animals mentioned in this section are given in Section 2.0 of Appendix E, Biological Resources. The Central Nevada Test Area is at an elevation of about 1,861m (6,104 ft). This site and the rest of Hot Creek Valley has vegetation typical of the Great Basin region. The valley bottom is dominated by big sagebrush, with scattered rabbitbrush and Indian ricegrass. At the slightly higher elevations in the big sagebrush, with scattered rabbitbrush and Indian ricegrass. At the slightly higher elevations in the foothills surrounding the valley, sagebrush, pinyon pine, and juniper form an open woodland (EG&G/EM, 1993a). The most common plants found at the springs and wells in this valley and the surrounding mountains are sedges, rushes, and desert saltgrass. Disturbed sites in the valley are dominated by exotic weeds, such as halogeton, goosefoot, Russian thistle, and tansy mustard.

Animal species are probably similar to those found on the Tonopah Test Range. Mule deer are year-round inhabitants (BLM, 1993), and wild horses, pronghorn, and mourning dove are known to use springs in the area (EG&G/EM, 1993a).

No current federally threatened, endangered, or candidate plant or animal species are known to occur on the Central Nevada Test Area, although bald eagles and peregrine falcons may be rare migrants. The U.S. Fish and Wildlife Service published the latest list of candidate plants and animals on February 28, 1996 (61 FR 7596). Prior to this, 10 vertebrate species, 1 invertebrate species, and 5 plant species that were identified as potentially occurring at this site were classified as candidates (Mendoza, 1995b) and were addressed (Table 4-30). The updated Notice of Review has removed all of these species from candidate status. The western burrowing owl, 1 of over 20 state-protected birds, may occur at this site.

Five Category 2 candidate plant species may occur in the vicinity of the test area (Cooper, 1993; EG&G/EM, 1993a). None of these species was found within the test area during a survey in 1993 (EG&G/EM, 1993a); however, sanicle biscuitroot was found just south of the site. Sanicle biscuitroot is not endemic to this site and may be found throughout the southern half of Nevada, and in scattered populations in California (Blomquist, et al., 1995).

4.4.7 Air Quality and Climate

This section includes description of air quality conditions at the Central Nevada Test Area, including climatology, meteorology, and ambient air quality.

CLIMATOLOGY AND METEOROLOGY—Meteorological measurements are not available at this site. However, based on climatological maps of temperature and precipitation (Ruffner, 1980), temperatures would be 1 to 2 °C (2 to 4 °F) cooler than those on the Tonopah Test Range (Section 4.2.7). Mean annual precipitation is estimated to be about 20 cm (8 in.). Wind speed and direction characteristics are similar to those that occur on the Tonopah Test Range.

AMBIENT AIR QUALITY—The Central Nevada Test Area is located within Nevada Intrastate Air Quality Control Region. Ambient air quality has not been monitored for criteria pollutants at the Central Nevada Test Area. However, because of the lack of significant pollutant emission sources, the air quality is good. Air Quality Control Region 147 is designated unclassifiable/attainment for all criteria pollutants.

4.4.8 Noise

The acoustic environment of the Central Nevada Test Area and surrounding areas can be classified as uninhabited desert or small rural communities. Noise measurements have not been taken at the Central Nevada Test Area. The major sources of noise would be associated with prevailing meteorological conditions, such as wind. Traffic on U.S. Highway 6, which is 11 km (7 mi) to the southeast, would not have a significant acoustic impact at the Central Nevada Test Area.—The only projects anticipated for the Central Nevada Test Area are Environmental Restoration Program projects that would not create loud noises nor would they be affected by loud noises.

4.4.9 Visual Resources

The landscape character of the Central Nevada Test Area is typical of the Great Basin. Regional topography consists of mountain ranges arranged in a north-south orientation, separated by broad valleys. Because this site is located at the east base of the Hot Creek Range, scenic quality has been designated Class B. U.S. Highway 6, 19 km (12 mi) to the southeast, is the closest public highway. It has an average daily traffic of about 200 vehicles. Therefore, the sensitivity level would be low.

4.4.10 Cultural Resources

Archaeological research in the Central Nevada Test Area, and particularly in Hot Creek Valley, has documented the presence of significant cultural resources. Archaeological sites ranging from the early prehistoric period to historic mining and ranching sites are known. These sites have been identified, located, and evaluated by a variety of cultural resources surveys and excavations. A large gap exists in the archaeological database as the research conducted for the Project Faultless project was never incorporated in the statewide inventory. A large collection of between 20,000 and 30,000 artifacts, field notes, photographs, and other records on file at the University of Nevada, Las Vegas, indicates there are over 100 sites within the Central Nevada Test Area that have never been properly recorded (Edwards and Johnson, 1994).

Small bands of Western Shoshone people lived in the project area vicinity. Villages were located at Hot Springs and Twin Springs, while family camps were situated along Hot Creek and Tybo Creek (Steward, 1938 [Figure 4-48]). These groups harvested pine nuts in the southern part of the Hot Creek and Kawich Ranges. They often joined Kawich Mountain people for antelope and rabbit drives in Hot Creek Valley and the Kawich Mountains (Steward, 1938).

The Central Nevada Test Area includes three withdrawn areas of land totaling approximately 2,560 acres (SAIC/DRI 1988). Environmental restoration activities in the region of ground zero of the Project Faultless event have included sampling wells and springs up to 40 km (25 mi) from ground zero. Anticipated Environmental Restoration Program activities will include construction of wells. Thus, an area of potential effect for environmental restoration activities was created, and an overview of all recorded cultural resources and cultural resource surveys was performed.

<u>RECORDED CULTURAL RESOURCES</u>-Twenty-six cultural resource reconnaissance projects have been conducted in the area of potential effect. These projects and other recording projects have yielded just over 100 sites. Among the prehistoric cultural resources are two rock art sites, called stations. One of them, is called Moore's Station in (McLane, 1993:28) because of its proximity to that site. The other site is located in a rock shelter on Palisade Mesa. Prehistoric sites range from as few as four artifacts to extensive concentrations of artifacts and features. An additional site includes three large hearths and abundant flakes, flake tools, and groundstone. Most of the prehistoric sites that have been recorded in the area are smaller sites. The larger, more complex sites have a limited distribution and are in close proximity to water sources. A site found near Rattlesnake Springs includes groundstone and projectile points. Other sites in the area contain hearths and grayware pottery. Among the historic cultural resources are Moore's Station, Hobble Spring, Sixmile Well, a historic site, and Hot Creek Ranch. The latter has an additional site number assigned to the cemetery. Other historic sites in the area include the charcoal kilns located in Fourmile and Sixmile Canyons and the towns of Tybo and Morey (BLM, 1993). The charcoal kilns at Tybo are listed on the National Register of Historical Places. While the information contained in the U.S. Bureau of Land Management site files suggests that many of the other sites are eligible for the National Register of Historical Places, recommendations have not been made for most of them.

<u>SITES OF AMERICAN INDIAN SIGNIFICANCE</u>—The CGTO knows that there are a variety of cultural

resources contained at the Central Nevada Test Area. Information about this area comes from previous ethnographic research (Steward, 1938) and recent archaeology reports (Edwards and Johnson, 1994). The area contains a number of cultural resources of special interest to the CGTO, including hot springs, cold springs, petroglyph panels, and more than 100 archaeology sites. Earlier archaeology research conducted by the University of Nevada, Las Vegas, collected between 20,000 to 30,000 artifacts. The simple fact that so many artifacts were recovered from this small area indicated the long-term involvement of American Indian people with this site. The CGTO has requested the opportunity to visit the area as part of this EIS in order to more fully understand its cultural significance. Until this site visit occurs, it is impossible to more fully assess the cultural significance of this area.

4.4.11 Occupational and Public Health and Safety and Radiation

Radioactivity was contained during the Project Faultless test and subsequent drilling and sampling activities (DRI, 1988). A surface radiological survey conducted prior to demobilization of the Central Nevada Test Area detected no radioactivity (AEC, 1973c). A post-shot reentry hole (UC-1-P-2SR) drilled into the chimney serves as a standpipe for measuring water levels and allows samples to be taken of the water entering the chimney. The detonation caused water levels to immediately drop to 646 m (2,120 ft) (Thordarson, 1987). Water levels were observed to fluctuate over time; however, levels did not begin to rise continuously until September 1974 (ERDA, 1977).

Long-term hydrologic monitoring, conducted annually by the EPA, continues at the Project Faultless site. Numerous drillholes were established prior to the shot detonation to measure the effects on localized hydrology (Figure 4-58). Many of these holes were subsequently plugged and abandoned. Two hydrologic test holes, HTH-1 and HTH-2, were left open for monitoring, and Well UC-1-P-2SR remains open to allow sampling from above the shot cavity (DRI, 1988). Four wells and two springs are monitored for tritium on a yearly basis. Two wells, HTH-1 and HTH-2, are used as sampling points and are presumably located downgradient and within 1,494 m (4,900 ft) of the test site. An additional abandoned postdetonation hole (UC-1-P-1S) is periodically monitored (Chapman et al., 1994). In concert with multiple, ongoing groundwater monitoring programs, samples are analyzed for tritium, gross alpha, and gross beta radiation from one or more of the following sites: drill hole UC-1-P-2SR, drill hole HTH-1, HTH-2, Hot Creek Ranch domestic water supply well, 6-Mile Well, Blue Jay Springs, and Blue Jay Maintenance Station Well (DRI, 1988).

Tritium had not been detected in concentrations above background outside the chimney well until recently. Tritium (214 pCi/L) was detected in a water sample obtained from HTH-1 at 236 m (774 ft) in July 1992. The source of the tritium remains unresolved. The detection of tritium in HTH-1 could be the result of an earlier migrating pulse, recent surface recharge, or possibly inadvertent cross-contamination of the well (Chapman et al., 1994). Tritium concentrations in water samples taken from the reentry hole in 1976 varied with the depth of the sample. Results of the analysis ranged from a maximum value of 9.2×10^8 pCi/L at a depth of 789 m (2,590 ft), or 186 m (610 ft) above the detonation point, to a low of 2,200 pCi/L at 576 m (1,189 ft), or 399 m (1,310 ft) above the detonation point. Estimates made in 1977 indicated that radionuclides would not be expected to migrate away from the cavity region until water levels reached predetonation hydraulic equilibrium, estimated to be after 1997, based on average cavity fill rates (ERDA, 1977).

The preliminary Hazard Ranking System score (EPA's ranking system for Superfund cleanup determination) for the Central Nevada Test Area is a low score of 3.54. This score is based primarily on the assumption of a low probability for the migration of radionuclides and that there are no human drinking water receptors in the vicinity of the Central Nevada Test Area (DRI, 1988). Recent field studies by the Desert Research Institute have revealed a more complicated hydrologic system than previously thought (Chapman et al., 1994). As a result, flow away from the cavity may have begun sooner than anticipated and the existing monitoring wells may not be ideally located to intercept potential contaminant plumes.

The Central Nevada Test Area is currently being investigated as part of the DOE's Environmental Restoration Program. The DOE will evaluate the site in consultation with the state regulatory authority to determine what investigations may be required and what responses may be appropriate.

4.4.12 Environmental Justice

Existing demographic conditions for Environmental Justice are discussed in Section 4.1.12. This discussion includes conditions for the Central Nevada Test Area.

4.5 Eldorado Valley

The Eldorado Valley is southwest of Boulder City, Nevada. U.S. Highway 95 to Searchlight, Nevada, transects the valley in a north-south direction. The U.S. Bureau of Land Management patented 107,412 acres of Eldorado Valley to the state of Nevada, at which time this land was transferred to the city of Boulder City. Boulder City has designated 6,000 acres of this land for a Solar Enterprise Zone facility (DOE/NV, 1994b). This zone is excluded from a conservation easement within these transferred lands that is managed for the conservation, protection, restoration, and enhancement of the desert tortoise and its habitat. The DOE would enter into a partnership agreement with the solar industry, Nevada stakeholders, and university systems to develop the solar-generating facilities.

4.5.1 Land Use

Land in Eldorado Valley is used for a limited number of activities as discussed in the following Land-Use Designations section. Also discussed in this section are the site-support activities related to Eldorado Valley.

4.5.1.1 Public Land Orders and Withdrawals. This section is not applicable to Eldorado Valley.

4.5.1.2 Land-Use Designations. Land use in Eldorado Valley is limited primarily to grazing, light industry, and recreational use, including a raceway and windsurfing. Active grazing permits have been issued by the U.S. Bureau of Land Management for the Ireteba Peaks, McCullough Mountains, and Hidden Valley allotments. The Iretaba Peaks and McCullough Mountains allotments have historically provided forage for almost 2,300 animal unit months. The McCullough Mountains allotment is operated by the Nature Conservancy. There is some limited light industry in the northwestern-most part of the basin. The playa area is used for recreation, especially land sailing, and a raceway is situated near the southern end of the playa.

4.5.1.3 Site- Support Activities. Site support in the Eldorado Valley includes three power substations and transmission lines and two natural gas pipe lines.

<u>FACILITIES</u>—No facilities currently exist at the proposed location of a Solar Enterprise Zone facility in Eldorado Valley.

<u>UTILITIES</u>—Two existing 500-kV substations and a third substation under construction are within a few miles of the proposed Solar Enterprise Zone facility in Eldorado Valley: Southern California Edison's Eldorado Substation, Los Angeles Department of Water and Power's McCullough Substation, and the Marketplace Switching Station. When the Marketplace Switching Station is completed, these substations will connect the transmission systems of California, southern Nevada, and Arizona (DOE/NV, 1994b).

Two major Southwest Gas natural gas pipe lines transect Eldorado Valley. One pipe line is immediately adjacent to U.S. Highway 95, and the other pipe line is approximately 2 km (1 mi) west of the highway. Depending on where the proposed Solar Enterprise Zone facility is sited, the pipe lines could be immediately adjacent or up to 10 km (6 mi) away. Both pipe lines are main supply lines for the Las Vegas area and consequently are insufficient to support the Solar Enterprise Zone facility during winter months. An additional 51-cm (20 in) pipe line from an existing main line would be necessary; the nearest main gas pipe line is an

El Paso Gas pipe line south of Laughlin, Nevada, 110 km (68 mi) away (DOE/NV, 1994b).

SERVICES—Services discussed for Eldorado Valley include law enforcement and security, fire protection, and health care.

Law Enforcement and Security—Eldorado Valley is not secured or restricted. Law enforcement is provided by the Clark County Sheriff's Department.

Fire Protection—Fire protection for Eldorado Valley is provided by the U.S. Bureau of Land Management.

Health Care—For health care, first aid stations would be located near field activities, if required.

4.5.1.4 Airspace. Eldorado Valley is located underneath the southeastern portion of the Las Vegas Class B airspace that begins at 2,438 m (8,000 ft) mean sea level. All aircraft operating in this area must be under positive control of Las Vegas Approach Control (see Section 4.1.1.4).

4.5.2 Transportation

This section presents existing transportation at Eldorado Valley. Transportation is discussed with respect to on-site traffic, off-site traffic, transportation of materials and waste, and other transportation.

4.5.2.1 On-Site Traffic. This section is not applicable for Eldorado Valley.

4.5.2.2 Off-Site Traffic. U.S. Highway 95 runs north-south through Eldorado Valley and is a single lane in each direction. At the northern end of the valley, U.S. Highway 95 intersects U.S. Highway 93 approximately half the distance between Boulder City, Nevada and Henderson, Nevada. U.S. Highway 93/95 continues northwestward through Henderson and through Las Vegas where it intersects Interstate 15. At the southern end of the valley at Searchlight, Nevada, U.S. Route 95 intersects east-west trending State Route 164, also a single lane in both directions. State Route 164 intersects Interstate 15, 52 km (32 mi) west of Searchlight. U.S. Route 95 continues south of Searchlight for 30.6 km (19 mi), where it intersects State Route 163, and continues an additional 39 km (24 mi) south where it intersects U.S. Highway 40 at Needles, California. From U.S. Highway 95, State Highway 163 continues 34 km (21 mi) to Laughlin, Nevada, where it continues east through Arizona to Kingman as State Route 68. In 1993, U.S. Route 95 just south of Boulder City had an average annual daily traffic of 6,600 vehicles and operated at a level of service B.

4.5.2.3 Transportation of Materials and Waste. Transportation of waste and materials at a Solar Enterprise Zone facility location is not expected. Therefore, this section is not applicable.

4.5.2.4 Other Transportation. Air or rail transportation of workers or materials to Eldorado Valley has not been proposed; therefore, these facilities have not been examined in detail. The nearest rail line to the Eldorado Valley site is the Union Pacific line in Boulder City, which connects Boulder City with Las Vegas. No rail spur exists on a Solar Enterprise Zone facility site. Airfield facilities do not exist on the site. The nearest airfield is in Boulder City. Traffic information in the vicinity of a Solar Enterprise Zone facility in Eldorado Valley is presented in Section 4.5.2.2, Off-Site Traffic.

4.5.3 Socioeconomics

Eldorado Valley is located within Clark County, and this county's existing socioeconomic conditions are addressed and characterized in Section 4.1.3.

4.5.4 Geology and Soils

Physiography, geology, and soils are addressed in this section. Also briefly discussed are seismic activities and geologic resources.

4.5.4.1 Physiography. Eldorado Valley is a topographically closed basin of 1,373 km^2 (530 mi^2) (see Figure 4-59). Elevations range from about 2,152 m (7,060 ft) on the west at McCullough Mountain to 521 m (1,708 ft) at the playa in the north-central part of the valley. On the east, the Eldorado Mountains rise to elevations only slightly

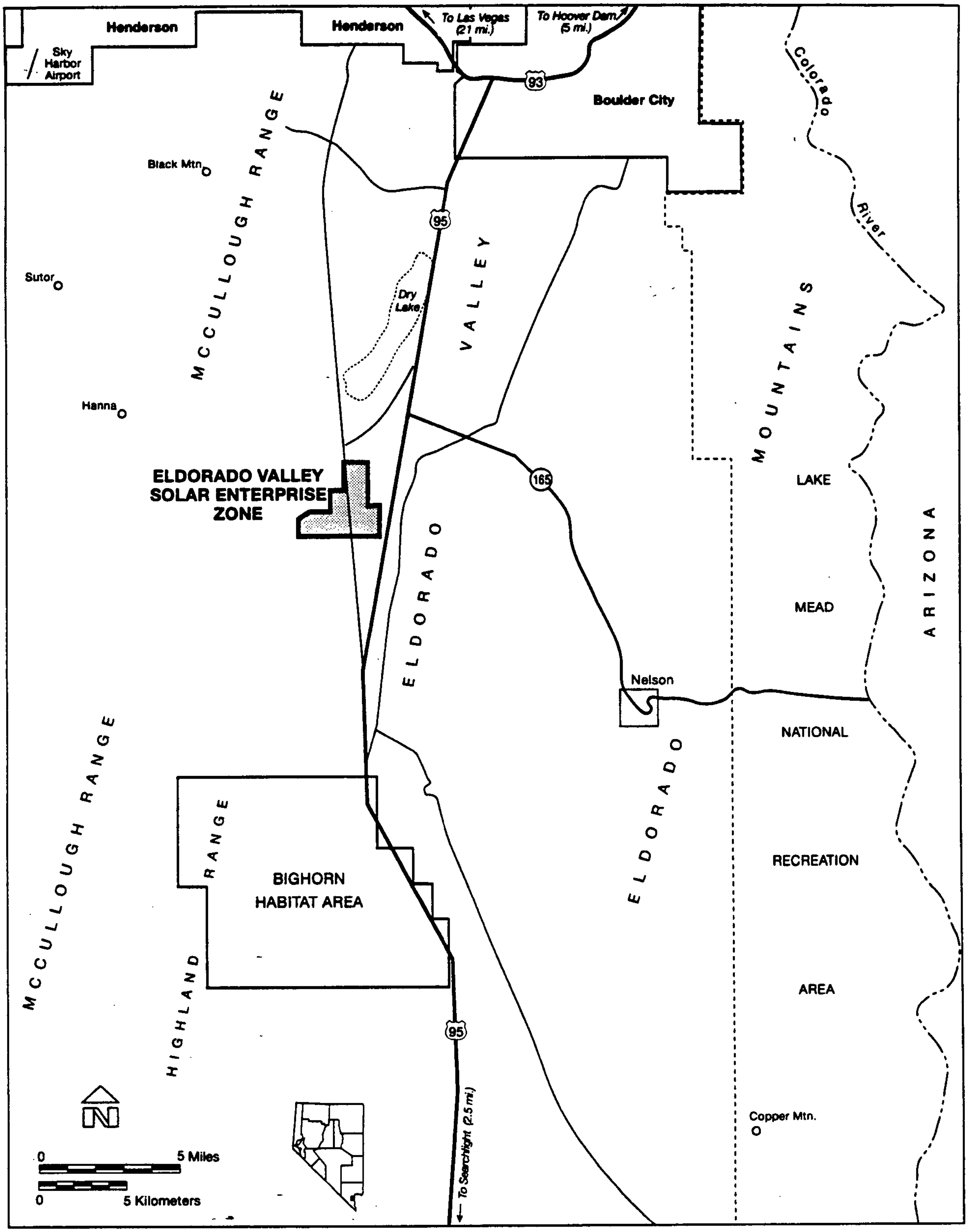


Figure 4-59. Eldorado Valley and surrounding area

above 1,524 m (5,000 ft). On the south, Eldorado Valley is separated from Paiute Valley by the Highland Range and unnamed highlands of the Searchlight district. On the north, Eldorado Valley is bounded by the Black Hills and the River Mountains. On the valley floor, the dominant feature is the playa in the north-central part of the basin and the numerous washes that drain the upland areas.

4.5.4.2 Geology. The general geologic conditions and mineral deposits of Eldorado Valley have been detailed by the Nevada Bureau of Mines and Geology (Longwell, et al., 1965). The general geology of Eldorado Valley includes a number of geologic units. The rocks and valley-fill deposits may be categorized into five types: (1) alluvial deposits, (2) older gravels, (3) volcanics, (4) granite, and (5) metamorphics.

Alluvial deposits occur in the valley-floor area and include interbedded sequences of gravel, sand, silt, and clay. These deposits are generally unconsolidated, but may be cemented in the vicinity of fault zones or where mineralized water is present. A test well near the playa penetrated more than 305 m (1,000 ft) of alluvium. Older gravels of Late Tertiary to Early Quaternary age crop out near the Searchlight area. These deposits are generally weakly consolidated, but include well-lithified fanglomerates, conglomerates, and arkoses.

Volcanic rocks of Quaternary, Tertiary, and Cretaceous ages crop out in the mountain masses of the northern half of the McCullough Range, the entire Highland Range, and in the northeastern Eldorado Mountains. Where present, the volcanic rocks reach thicknesses of 610 m (2,000 ft) to 1,219 m (4,000 ft) in some areas. These rocks include a number of discrete geologic units, including andesite, rhyolite, diorite, and tuff.

Granitic rocks of Tertiary and Precambrian age (including granites, quartz monzonites, and porphyritic granites) occur in the central and southern Eldorado Mountains. Granitic rocks of Tertiary and Precambrian age probably also form the basement complex under most of the valley. The thickness of granite is not known, but probably exceeds 1,524 m (5,000 ft). Metamorphic rocks comprising schists and gneisses of Precambrian age and metavolcanics of possible Precambrian age occur throughout the southern half of the McCullough Range. The thickness of these rocks is generally less than 610 m (2,000 ft).

The major geologic structures in Eldorado Valley include normal faults in the McCullough Range and Eldorado Mountains and in the Highland Springs Anticline in the northwest Highland Range. The major recognized faults include the McClanahan Fault in the McCullough Range and the Jeep Pass, Hidden Valley, Eldorado, and Welcome faults in the Eldorado Range.

<u>GEOLOGIC RESOURCES</u>—Potential mineral resources in Eldorado Valley include fluid minerals (oil, gas, and geothermal resources), nonenergy leasable minerals (primarily sodium and potassium compounds), salable minerals (common sand, gravel, and rock), and locatable minerals (metallic and nonmetallic mineral deposits). The U.S. Bureau of Land Management (BLM, 1992) has defined the level of potential for development of these mineral types.

The potential for geothermal is low and, although the oil and gas potential has been categorized by the U.S. Bureau of Land Management as moderate, there is only one oil lease within the valley. This area is located in the Railroad Pass area in the northernmost part of the basin. No oil or gas exploratory wells have been drilled in the basin.

The U.S. Bureau of Land Management (BLM, 1992) has categorized the sodium and potassium potential of Eldorado Valley as moderate in the north-central part of the basin and low elsewhere. Much of the area in the vicinity of the Eldorado playa has a high potential for salable minerals, primarily sand and gravel, with the rest of the areas of alluvium classified as having moderate potential. In the consolidated rock areas of the Eldorado Mountains and McCullough Range, the potential for salable minerals is low. The potential for locatable mineral resources is low over much of the valley. The potential for locatable resources is moderate in the McCullough Range and northern Highland Range, and high in the Eldorado Mountains and southern Highland Range.

Eldorado Valley contains portions of three mining districts: the Searchlight District, the Eldorado Canyon District, and the Alunite (Railroad Pass) District. Although production has been limited since the early 1950s, interest in these areas continues. The Searchlight District has been the most active, having produced millions of dollars worth of gold, silver, copper, and lead since 1897. Mining in the Eldorado District, located in and around Nelson, was initiated in 1857, and has since produced millions of dollars worth of gold, silver, copper, lead, and zinc. The Alunite District is located about five miles east of Boulder City and historically has produced minor amounts of gold, silver, and lead. Alunite is also present in the district, but has not been successfully developed. Because of the presence of these mining districts, hundreds of mining claims have been filed within Eldorado Valley. The Nevada Department of Transportation maintains about 10 material site rights-of-way in the valley, and there is 1 community pit.

4.5.4.3 Soils. The soils in Eldorado Valley are very deep, medium-textured saline and alkaline soils in the lowland areas; shallow, gravelly coarse-textured soils over the alluvial fans; and discontinuous, rocky gravelly coarse-textured soils in the mountain areas (BLM, 1992).

The soils in Eldorado Valley are susceptible to erosion by wind and water. The potential for erosion is generally slight except where the soils have been disturbed or along the banks of washes. There is also the potential for localized landslides on the steep slopes of the upland areas. The erosion susceptibility of the soils in Eldorado Valley ranges from low to moderate (BLM, 1992). Most of the erosion condition ranges from slight to moderate, but two areas of critical erosion condition have been identified within the basin.

4.5.5 Hydrology

Discussion of hydrology is divided into surface water and groundwater. Water supply in the vicinity is also discussed.

4.5.5.1 Surface Hydrology. The surface water resources of Eldorado Valley are very limited. Although not known, the annual runoff within the basin has been estimated at less than 1.0×10^5 m^3/yr (100 acre-feet/year) (Scott et al., 1971). Surface water runoff is very infrequent, occurring as ephemeral flow in the streambeds and, even less often, as ponded water on the playa in the north-central part of the basin. Surface water runs from the Boulder City Sewage Treatment Plant to the playa area. Flooding characteristics are probably similar to those in adjacent basins; i.e., shallow flash flooding over large areas.

4.5.5.2 Groundwater. Eldorado Valley is situated within the Las Vegas Flow System, a subsystem of the regional Colorado Flow System (Harrill et al., 1988). Groundwater that originates as precipitation over areas of higher elevation generally flows toward the axis of the basin and then north into Las Vegas Valley or eastward into the Colorado River Valley. (Harrill et al; 1988) indicate that an estimated 1.2 million m^3/yr (1,000 acre-feet/year) discharge into the Colorado River Valley.

Groundwater under Eldorado Valley occurs at depths ranging from about 84 to 98 m (275 to 320 ft) below land surface in the north-central part of the basin (Buqo and Giampaoli, 1988). The depth to water may be greater under the higher portions of the alluvial aprons that bound the valley floor. The groundwater is derived from two sources: recharge over the basin is 1.0×10^6 m^3/yr (1,100 acre-feet/year) and subsurface inflow from Hidden Valley (Rush and Huxel, 1966). The recharge derived from flow from Hidden Valley is believed to be minor; i.e., less than 370,050 m^3/yr (300 acre-feet/year) (Rush and Huxel, 1966).

Although there are a number of springs in the upland areas of Eldorado Valley, the combined discharge rate of these springs is small. The more significant springs include McCullough and Ora Hanna Springs in the McCullough Range; Cow Spring in the Highland Range; and Tule, Bridge, and Forlorn Horse Springs in the Eldorado Mountains. These springs provide an important source of water and habitat for wildlife. Eldorado Valley is a designated groundwater basin. The committed groundwater resources of 3.0×10^6 m^3/yr (2,390 acre-feet/year) are more than 4 times the perennial yield of 6.0×10^5 m^3/yr (500 acre-feet/year). Mining is by far the largest water user in the basin with total water rights of 3.0×10^6 m^3 (2,400 acre-feet). Small quantities of water (a total of only 3.0×10^4 m^3 or 24 acre-feet) have been appropriated for municipal, quasimunicipal, stock watering, and industrial use (Buqo, 1996). As of October 1994, there were two additional water right applications for 7.0×10^5 m^3/yr (540 acre-feet/year).

Water supplies in Eldorado Valley can be augmented through the importation of water from Boulder City. According to information presented by the Nevada Solar Enterprise Zone task force work group, Boulder City has the capability to provide 1.0×10^6 m^3/yr (1,000 acre-feet/year) to 3.0×10^6 m^3/yr (3,000 acre-feet/year) of treated effluent or irrigation water to meet water demands in Eldorado Valley.

WATER QUALITY—Groundwater in Eldorado Valley is predominantly a sodium-bicarbonate type with high concentrations of total dissolved solids and a medium to high salinity hazard (Rush and Huxel, 1966). Historic analyses of the groundwater from wells in Eldorado Valley indicate that concentrations of total dissolved solids, sulfate, and chloride exceed drinking water standards in some areas. Although data are generally lacking for metals and other trace constituents for the area, the presence of historic mining districts suggests that these constituents may be present in the groundwater in the vicinity of former mining areas. Iron, lead, manganese, mercury, and nitrate have been detected in groundwater at levels exceeding their respective maximum contaminant levels in the Searchlight area, according to information on file with the Clark County Department of Health Services (Buqo and Giampaoli, 1988).

4.5.6 Biological Resources

The scientific names of plants and animals mentioned in this section are given in Chapter 2 of Appendix E, Biological Resources. The Eldorado Valley is within the Mojave Desert. Creosote bush and white bursage are the dominant shrub species within the Solar Enterprise Zone. Dry washes in this area often have stands of catclaw acacia. To the north of this area, on the fine-textured saline or alkaline soils close to the playa, four-wing saltbush, shadscale, green ephedra, seep weed, and bud sage are the dominant plants (BLM, 1992).

Common animal species are similar to those described for the Mojave Desert habitats on the NTS. This site is not habitat for mule deer or bighorn sheep (BLM, 1992), although these species do occur in some of the surrounding mountain ranges.

The threatened desert tortoise is the only threatened or endangered species that occurs at this site (U.S. Fish and Wildlife Service, 1994). The density of desert tortoises in the area was estimated at 8 per km^2 (20 per mi^2). This site occurs immediately adjacent to the Paiute-Eldorado Critical Habitat Unit for the desert tortoise (U.S. Fish and Wildlife Service, 1994). The site is not a critical habitat for the desert tortoise (U.S. Fish and Wildlife Service, 1994). The Paiute-Eldorado Critical Habitat Unit lies immediately east and south of the site. The site was excluded by Boulder City from a conservation easement granted to Clark County for the conservation, protection, restoration, and enhancement of the desert tortoise. This easement (85,617 acres) surrounds lands designated for a Solar Enterprise Zone facility. No current candidate plant or animal species (61 FR 7596) are known to occur within the Eldorado Valley site. The banded gila monster, a state-protected species, may occur in this area (BLM, 1992).

No plant species are known to occur within the Eldorado Valley site that have been listed as threatened, endangered, or candidate under the Endangered Species Act or by the state of Nevada (16 U.S.C. 1531, 1973; BLM, 1992; 58 FR 188, 1993; NAC, 1994).

4.5.7 Air Quality and Climate

This section includes a description of the air quality conditions at Eldorado Valley, including climatology, meteorology, and ambient air quality.

CLIMATOLOGY AND METEOROLOGY—Although there are no weather stations in Eldorado Valley, the climate can be represented on the basis of stations in Boulder City and Searchlight. In general, Eldorado Valley exhibits the low humidity and low annual precipitation characteristic of the climate of Clark County. The warmest month is July, when the mean monthly maximum temperature is 40 °C (104 °F), and January is the coolest month with a mean monthly minimum of 0.5 °C (33 °F). The average monthly wind speed ranges from 11 kph (7 mph) in December to 18 kph (11 mph) in April and June. Diurnal variation in wind is common, reflecting the differential heating of the ground.

AMBIENT AIR QUALITY—Eldorado Valley is located within Nevada Intrastate Air Quality Control Region 147, which is designated unclassifiable/ attainment for all criteria pollutants. The closest Class I Prevention of Significant Deterioration area is Grand Canyon National Park, approximately 90 km (56 mi) east of Eldorado Valley. Because Eldorado Valley is largely undeveloped, there are few emission sources in the area. Typical sources include mining and milling operations; off-road vehicle, railroad, and aircraft traffic; and fugitive dust.

The closest nonattainment area to the Eldorado Valley is the Las Vegas Valley, which is a nonattainment area for PM_{10} particulates and carbon dioxide and borderline nonattainment for ozone. Eldorado Valley borders the Las Vegas Valley Air Quality Nonattainment Area on the west and north.

4.5.8 Noise

The acoustic environment of Eldorado Valley can be classified as uninhabited desert or small rural communities (Section 4.1.8). Noise measurements have not been made at the Eldorado Valley Solar Enterprise Zone facility site. The major sources of noise would be associated with prevailing meteorological conditions, such as wind. Traffic on U.S. Highway 95, which transects Eldorado Valley just east of the site, also generates noise.

4.5.9 Visual Resources

The landscape character of Eldorado Valley is typical of the Great Basin. Regional topography consists of mountain ranges arranged in a north-south orientation, separated by broad valleys. The existing viewscape includes two Bureau of Land Management Wilderness Study Areas located in the McCullough Range and one in the Eldorado Mountains, U.S. Highway 95, portions of Boulder City, power transmission lines, gravel quarries, and electrical substations. The Bureau of Land Management Wilderness Study Areas are 8 km (5 mi) from the proposed site. The landscape at Eldorado Valley is common to the region, and because of the amount of cultural modifications, the scenic quality has been designated as Class C. U.S. Highway 95 has an average daily traffic of 5,000 to 7,000 vehicles (NDOT, 1993a). Therefore, Eldorado Valley would have a high sensitivity level.

4.5.10 Cultural Resources

Eldorado Valley lies in southern Nevada, an area with a prehistory that may span the past 10,000 years or more. Properties ranging from the early prehistoric period to historic mining and ranching sites are known.

Groups of Southern Paiute and Mohave people lived within or used parts of the project area at the time of first European contact. The Colorado River defines the southern boundary of Southern Paiute territory where it formed the core of Mojave territory (Stoffle and Dobyns, 1982). Southern Paiute groups foraged widely for wild plant foods throughout southern Nevada and also practiced horticulture at select oases in the Las Vegas Valley and on the Virgin and Colorado Rivers. The Chemehuevi, a closely related group, took over much of Mohave Indian traits, including floodplain agriculture, and routinely cooperated with the Mohave in raids against enemies, such as the Cocopa and Halchidhoma. However, the Chemehuevi were occasionally at war with the Mohave themselves (Kelly and Fowler, 1986). The Mohave focused on floodplain agriculture, but also utilized wild plant and animal foods and fish.

Geographically, Eldorado Valley extends from Boulder City to Searchlight. The region of influence includes areas south of Boulder City adjacent to U.S. Highway 95 near the junction with State Route 60. A 2,000-acre zone is proposed for a parabolic trough generating station, while existing natural gas pipe line corridors would be used to bring an additional gas supply to the generating station.

RECORDED CULTURAL RESOURCES—Most of the cultural resources that have been recorded in the previously defined area have resulted from Transmission Line and Powerline Surveys (Dames and Moore, 1985; Rafferty, 1991). Prehistoric sites have been recorded around the perimeter of Eldorado Dry Lake. Two temporary camps have been recorded. One of the sites first recorded by (M.J. Rogers, 1939) includes numerous lithic artifacts and groundstone. Testing conducted in 1990 indicated that only surface deposits occur and that the integrity of the site had been compromised owing to hydraulic action (Dames and Moore, 1985). Both sites were recommended as ineligible for the National Register of Historic Places. Other sites date to the historic period. Most are isolated occurrences of cans, which may have been left behind by prospectors or the Hoover Dam construction workers passing through the area.

*SITES OF AMERICAN INDIAN SIGNIFICANCE—The CGTO knows that the Eldorado Valley study area contains a wide variety of cultural resources, including plants, animals, and archaeology sites. This knowledge derives from previous American Indian cultural resource studies of the area conducted during the Harry Allen-Warner Valley (Bean and Vane, 1979) and Intermountain Power Project (Stoffle and Dobyns, 1982; Stoffle et al., 1983) studies of American Indian concerns along various proposed power line routes, and the Ivanpah Generating Station study (Bean and Vane, 1982) conducted in a neighboring valley. Identified Indian plants include creosote (*Larrea tridentata*), desert trumpet (*Erigonum inflatum*), and Indian tea (*Nevada ephedra*). American Indian animals include bighorn sheep (*Ovis canadensis*), desert tortoise (*Gopherus agassizii*), and speckled rattlesnake (*Croatalus mitchellii*). The valley is associated with Indian funeral songs associated with the Cry Ceremonial. There are both spiritual and physical Indian trails associated with this valley. Eldorado Valley trails were used by Pahrump and Las Vegas Paiutes to travel to places along the Colorado River, especially Cottonwood Island. Traditional Indian trails are a significant American Indian cultural resource because they were both physical and spiritual paths (Laird, 1976). The Ivanpah Generating Study concluded that the McCullough Mountains (which define the western edge of Eldorado Valley) are of much concern to American Indian people, both Southern Paiute and Mohave. According to the Ivanpah study, these American Indian people have trails, sacred sites, plants, and animals of cultural importance in the McCullough Mountains, the associated Eldorado Valley, and in the Eldorado Mountains (Bean and Vane, 1982). A 1975 study of the Navajo-McCullough transmission line right-of-way further indicates the presence of traditional-use plants, early Pinto Series-style projectile points, numerous lithic scatters, and grinding stone fragments that "are related to the seed gathering activities possibly of the later Paiute peoples" (Brooks et al., 1975). Previous studies have been geographically limited to a few places within Eldorado Valley or in neighboring areas, so a complete cultural assessment of the Eldorado Valley is not possible without visiting other portions of the valley with American Indian people.*

4.5.11 Occupational and Public Health and Safety

The Eldorado Valley site proposed for siting a Solar Enterprise Zone facility is currently undeveloped desert. Baseline health and safety considerations associated with the environment include the potential for heat stroke and exhaustion (primarily during summer months), dehydration, and poisonous spider and snake bites. Other physical hazards include tripping or stumbling hazards associated with the desert terrain.

4.5.12 Environmental Justice

Existing demographic conditions for Environmental Justice are discussed in Section 4.1.12. This discussion includes conditions for Eldorado Valley.

4.6 Dry Lake Valley

The Dry Lake Valley site is near the Apex industrial area, several miles northeast of the intersection of U.S. Highway 93 and Interstate 15. The Nevada Power Company has identified 3,600 acres for development of a Solar Enterprise Zone facility.

The DOE would enter into a partnership agreement with the solar industry, Nevada stakeholders, and university systems to develop the solar-generating facilities. The area is bounded on the southwest by development in the Apex industrial area and on the southeast by Interstate 15 and the Dry Lake Range, which runs parallel to the highway.

4.6.1 Land Use

Land in Dry Lake Valley is used for a limited number of activities as discussed in the following Land Use Designations section. Also discussed in this section is the infrastructure related to Dry Lake Valley.

4.6.1.1 Public Land Orders and Withdrawals. This section is not applicable to Dry Lake Valley.

4.6.1.2 Land-Use Designations. Land use in Dry Lake Valley is limited to three types: industrial, municipal waste disposal, and land-use management by federal agencies. Industrial land use is limited to the Apex area immediately south of the proposed Solar Enterprise Zone facility site. Current industrial tenants at Apex include Kerr-McGee Chemical Corp., Chemstar Inc., and Georgia Pacific Corp. Silver State Disposal operates a waste landfill and waste processing facilities in the southern part of the basin east of Interstate 15.

4.6.1.3 Site-Support Activities. Site support in or adjacent to the Dry Lake Valley includes a power substation, a power tie, a phase shifter and autotransformer, and transmission lines; a natural gas pipe line ; a landfill; and a fiber-optic line (DOE/NV, 1994b).

SERVICES—Services discussed for Dry Lake Valley include law enforcement and security, fire protection, and health care.

Law Enforcement and Security—Dry Lake Valley is not secured or restricted. Law enforcement is provided by the Clark County Sheriff's Department.

Fire Protection—Fire protection for Dry Lake Valley is provided by the U.S. Bureau of Land Management.

Health Care—First aid stations would be located near field activities, if required.

UTILITIES—At the Dry Lake Valley site, located adjacent to the alternative Solar Enterprise Zone location, Nevada Power Company owns and operates a 345/230-kV substation, a 345-kV tie with Pacific Corp, a phase shifter, and a 345/230-kV autotransformer. A 230-kV line is also present that delivers power to the internal transmission system of Nevada Power Company. Nevada Power Company is currently constructing two power plants at the Dry Lake Valley site that will provide a total of 144 megaWatts (MW) and has plans for two additional plants that would provide an additional 144 MW. The current transmission capacity could accommodate 305 MW of solar-generated power; however, after the additional power plants are completed, the Dry Lake Valley system will be able to accommodate only 25 MW of additional power derived from alternate sources. This can only be achieved by investing in the construction of a generator bay. Transmission capacity greater than 25 MW would require additional transmission facilities. Up to 140 MW of solar power could be generated with the addition of a 48 km (30 mi) long, 230-kV circuit from the Dry Lake Valley to the Northwest substation, plus additional substation equipment. With either scenario, the total transmission capacity is relatively low because of plans for constructing gas combustion turbines at the site. Should this construction not occur, the transmission capacity would be greater.

Four natural gas pipe line s are within 187 km (116 mi) of the Dry Lake Valley: Transwestern Gas, 187 km (116 mi); El Paso Gas, 75 km (109 mi); Southwest Gas, 24 km (15 mi); and Kern River Gas, 2 km (1 mi). Nevada Power Company anticipates tapping the nearby Kern River pipe line to supply the new gas turbines at the site. However, results of studies related to land, water, and electric transmission capacity must be evaluated before determining whether this apparently readily available gas supply can be used. If so, it is assumed that all necessary natural gas infrastructure required for solar support would be in place.

4.6.1.4 Airspace. Dry Lake Valley is located east of the NAFR Complex underneath the northern portion of the Las Vegas Class B airspace that begins at 2,438 m (8,000 ft) mean sea level. All aircraft operating in this area must be under positive control of Nellis Approach Control (see Section 4.1.1.4).

4.6.2 Transportation

Transportation at Dry Lake Valley is discussed with respect to on-site traffic, off-site traffic, transportation of materials and waste, and other transportation.

4.6.2.1 On-Site Traffic. This section is not applicable to the Dry Lake Valley.

4.6.2.2 Off-Site Traffic. Interstate 15, a four-lane, divided freeway, is the major regional access to the Dry Lake Valley site. In 1993, Interstate 15 had an average annual daily traffic of 11,550 vehicles and operated at a level of service A. U.S. Highway 93 runs north and south from the intersection of southwest-northeast-trending Interstate 15. Las Vegas, Nevada, is 35 km (22 mi) southwest of this intersection, and Glendale, Nevada, is 42 km (26 mi) northeast of this intersection. At Glendale, State Highway 168 trends northwest for 39 km (24 mi) and connects with U.S. Highway 93.

4.6.2.3 Transportation of Materials and Waste. Transportation of waste and materials is not expected at the Solar Enterprise Zone facility site. Therefore, this section is not applicable to Dry Lake Valley.

4.6.2.4 Other Transportation. Air or rail transportation of workers or materials to the Dry Lake Valley has not been proposed; therefore, these facilities have not been examined in detail. The nearest rail line to the Dry Lake Valley site is the Union Pacific line that parallels Interstate 15 just east of the site. No rail spur exists on the Solar Enterprise Zone facility site. Airfield facilities do not exist on the site. The nearest airport is the North Las Vegas Air Terminal. Traffic information in the vicinity of the Dry Lake Valley Solar Enterprise Zone facility location is discussed in Section 4.6.2.2, Off-Site Traffic.

4.6.3 Socioeconomics

There are no residences in the Dry Lake Valley. Current land use, exclusive of federal land management, is for industrial purposes, such as manufacturing and municipal waste disposal. The valley is located in Clark County, Nevada, and general existing socioeconomic conditions are presented in Section 4.1.3.

4.6.4 Geology and Soils

The physiography, geology, and soil conditions in Dry Lake Valley are discussed in this section.

4.6.4.1 Physiography. The Dry Lake Valley is a topographically closed basin comprised of about 414 km^2 (160 mi^2) (Figure 4-60). Elevations within the basin range from about 1,219 m (4,000 ft) on the west in the Arrow Canyon Range, to about 601 m (1,970 ft) at Dry Lake Playa. The Dry Lake Range on the southeast rises to an elevation of only about 1,036 m (3,400 ft). On the south, the Dry Lake Valley is separated from the Las Vegas Valley by a narrow topographic divide. A somewhat broader divide on the north and northeast separates Dry Lake Valley from the California Wash. On the valley floor, the major features are the many washes that drain the bounding upland areas and the playa in the central part of the valley.

4.6.4.2 Geology. The general geologic conditions and mineral deposits of the Dry Lake Valley have been described by the Nevada Bureau of Mines and Geology (Longwell et al., 1965). The general geology of the valley comprises three major geologic units: alluvium, Tertiary valley-fill deposits, and Paleozoic carbonate rocks. The alluvium occurs over the valley floor and comprises interbedded gravels, sand, silt, and clay. The total thickness of alluvium is about 305 m (1,000 ft).

The Tertiary valley-fill deposits include the Muddy Creek Formation, which was deposited over a large area of Clark County. These deposits are found in the area between the Dry Lake Valley and the California Wash and probably occur under the entire valley floor area. The Muddy Creek Formation is comprised of a sequence of interbedded fine-grained and coarse-grained

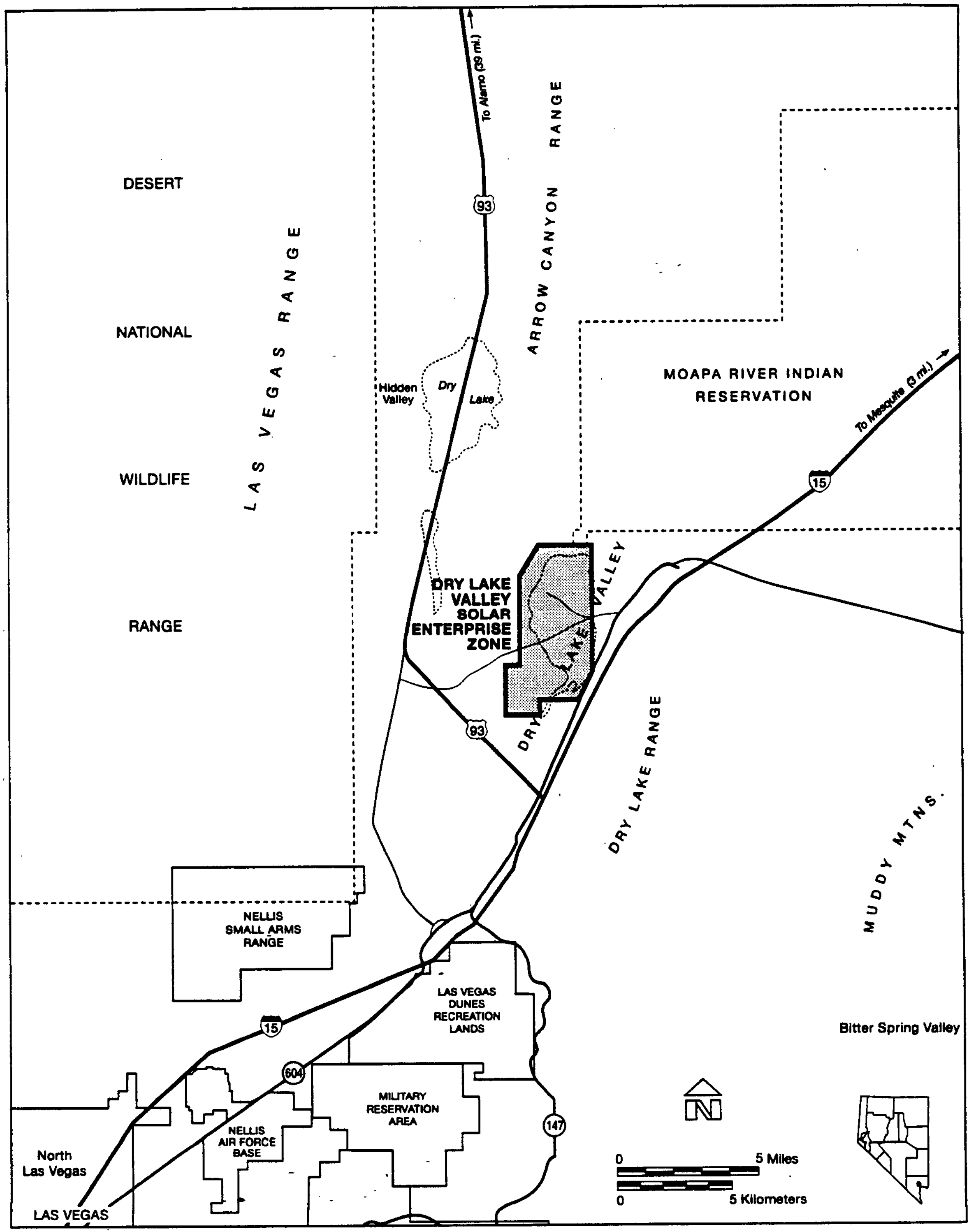


Figure 4-60. Dry Lake Valley and surrounding area

sediments, including claystone, siltstone, and minor sandstone. Gypsum is common in the more fine-grained deposits, and a conglomerate is common along the margins of the depositional basin. The thickness of the Muddy Creek Formation in the Dry Lake Valley is not known, but is probably at least several hundred feet in most areas.

The Paleozoic rocks of the Arrow Canyon Range and Dry Lake Range comprise a thick sequence of limestone, dolomites, and quartzite. In the Arrow Canyon Range, this sequence includes, in descending order, the Birdspring Formation, Monte Cristo Limestone, Sultan Limestone, Lone Mountain Dolomite, the Ely Springs Dolomite, the Eureka Quartzite, and the Pogonip Group. These rocks outcrop in the mountainous areas and probably underlie the Muddy Creek Formation at depth under the valley floor area. The total thickness of Paleozoic rocks in the area is unknown, but is probably several thousand feet.

Two major geologic structures predominate in the Dry Lake Valley; the Arrow Canyon syncline and the Dry Lake Thrust Fault. The Arrow Canyon syncline is a structural trough that is believed to underlie the south-central part of the basin and occurs along the eastern Arrow Canyon Range in the northern part of the basin. On the eastern part of the basin, in the Dry Lake Range, the Ordovician Pogonip Group has been thrust over the uppermost Paleozoic (Kaibab, Toroweap, Coconino, and Birdspring formations).

GEOLOGIC RESOURCES—Potential mineral resources in the Dry Lake Valley include fluid minerals (oil, gas, and geothermal resources), non-energy leasable minerals (primarily sodium and potassium compounds), salable minerals (common sand, gravel, and rock), and locatable minerals (metallic and nonmetallic mineral deposits). The U.S. Bureau of Land Management (BLM, 1992) has defined the level of potential for development of these mineral types.

The potential for geothermal resources is low, and although the oil and gas potential has been categorized by the U.S. Bureau of Land Management as moderate, there are only two areas with oil leases within the valley. One area is located in the central Arrow Canyon Range and includes about 8 km^2 (3 mi^2) of Dry Lake and Hidden Valleys. The second area encompasses about 10 km^2 (4 mi^2) east of the Union Pacific Railroad's Dry Lake siding. Two oil and gas exploratory wells have been drilled in the Dry Lake Valley (United Petroleum Corporation No. 1 Apex, and Pozil, Johnson, and Krug No. 1 Apex), but no production has been reported from the basin. The U.S. Bureau of Land Management (BLM, 1992) has categorized the sodium and potassium potential of the Dry Lake Valley as low. Much of the area in the vicinity of the Dry Lake playa has a high potential for salable minerals, primarily silica sand and gravel, with the rest of the areas of alluvium classified as having moderate potential. In the consolidated rock areas of the Arrow Canyon and Dry Lake Ranges, the potential for salable minerals is low. The potential for locatable mineral resources is low over much of the valley; only in the Arrow Canyon Range and in portions of the Dry Lake Range is the potential classified as moderate.

Although hundreds of mining claims have been filed within the Dry Lake Valley, the historic mining production has been limited to the production of limestone and dolomite. Chemstar, Inc., has been actively mining and processing limestone in the Apex area for more than 40 years. No metallic mineral deposits have been developed in the valley. The Nevada Department of Transportation maintains several material site rights-of-way in the valley.

4.6.4.3 Soils. The soils in the Dry Lake Valley are typical desert soils (entisols and aridisols). The soils of the area have been categorized into four series (Nevada Power Company, 1975). The Rockland-St. Thomas series occurs on the foothills and mountains with slopes of 15 to 50 percent and includes rock and cobbly loam. These soils are generally well drained and have a moderately rapid permeability. The Colorock-Tonopah series occurs at an elevation of 396 (1,300 ft) to 914 m (3,000 ft) in areas with slopes of 2 to 8 percent. Colorock soils are gravelly to a depth of 0.3 m (1 ft) and have an underlying hardpan. The gravelly material has a moderate permeability but, because of the presence of shallow hardpan, has a low water capacity. The Tonopah soils, comprising sandy loam and gravelly loam, have high permeability and rapid drainage. Bard-Tonopah soils occur in areas of 2 to 8 percent slope between 457 m (1,500 ft) to 914 m (3,000 ft) in elevation. These soils are stony or sandy loams that exhibit moderate permeabilities and low water capacity. Bard soils are gravelly, sandy loams and gravelly sands with a hardpan occurring at a depth of 0.3 to 0.6 m (1 to 2 ft). The permeability of the Bard soils is moderate, and the water capacity is low.

The soils in the Dry Lake Valley are susceptible to erosion by wind and water (BLM, 1992). The potential for erosion is generally slight, except where the soils have been disturbed or along the banks of washes. There is also the potential for localized landslides on the steep slopes of the upland areas.

The U.S. Bureau of Land Management (BLM, 1992) indicates that the erosion susceptibility of the soils in the Dry Lake Valley is moderate to high in the northern part of the basin and low to moderate in the southern portion of the basin. The erosion condition ranges from slight to moderate.

4.6.5 Hydrology

Discussion of hydrology is divided into surface water and groundwater. Water supply in the vicinity is also discussed.

4.6.5.1 Surface Hydrology. Surface water resources in the Dry Lake Valley are meager, occurring only as ephemeral flow in the streambeds that drain the upland areas or in temporary ponding of runoff in the playa. There are no gaging stations in the Dry Lake Valley; total runoff has been estimated at 3.7 x 10^{-1} m^3/yr (300 acre-feet/year) (Scott et al., 1971). Heavy runoff events may result in short-duration flows along reaches of washes in the basin; however, most rainfall probably infiltrates and is transpired by vegetation or evaporated from the soil.

Flooding is probably a recurrent problem over most of the valley floor area in the Dry Lake Valley. Runoff estimates made by the Clark County Regional Flood Control District for the Apex area indicate that a rainfall event with a 0.01 recurrence interval will result in shallow (less than 0.3 m [1 ft]) flooding over extensive areas (Nevada Power Company, 1975). Such floods typically occur as flash floods wherein the depth of the water in the alluvial channels can exceed bankful conditions and result in sheet-flow over large areas of the alluvial fans that bound the playa.

The Alkali Flat Dry Lake in the Dry Lake Valley is roughly bisected by some of the land that could be used for a Solar Enterprise Zone facility. In this area, more frequent floods of longer duration are to be expected. Ponding in some areas of the dry lake may be present for periods of several months or more.

4.6.5.2 Groundwater. The Dry Lake Valley is situated within the California Wash Flow System, a subsystem of the regional Colorado River Flow System (Harrill et al., 1988). Groundwater that originates as precipitation over the upland areas of the valley discharges out of the regional flow system near Overton, Nevada, about 29 km (18 mi) to the east, ultimately reaching the Colorado River through a complicated pathway of groundwater and surface water flow including the Muddy River and Lake Mead.

Groundwater under the Dry Lake Valley occurs at depths ranging from about 70 m (230 ft) to 87 m (285 ft) (unpublished U.S. Geological Survey data). Groundwater is derived from two sources: recharge over the basin is 5.0 x 10^5 m^3 per year (400 acre-feet/year), and subsurface inflow on the west from Hidden Valley is 5.0 x 10^5 m^3 per year (400 acre-feet/year) (Rush, 1968). Groundwater is discharged via subsurface outflow to the California Wash at a rate of about 1.0 x 10^6 m^3 per year (800 acre-feet/year), according to (Rush, 1968).

There are no springs in the Dry Lake Valley. Groundwater is the only available water resource. There are currently only six water supply wells in the Dry Lake Valley. Well yields within the basin are low, ranging from about 76 to 303 L/min (20 to 80 gal/min). According to information on file with the Nevada Division of Water Resources, the committed groundwater resources of 1.0 x 10^6 m^3 /yr (930 acre-feet/year) are more than double the perennial yield of 5.0 x 10^5 m^3/yr (400 acre-feet/year). Current groundwater rights within the basin include

4.0×10^5 m^3 (308 acre-feet) for mining, 3.8×10^5 m^3 (308 acre-feet) for commercial use, 2.0×10^5 m^3 (168 acre-feet) for industrial use, 1.0×10^5 m^3 (75 acre-feet) for municipal and quasi-municipal, and 6.3×10^4 m^3 (51 acre-feet) for other uses. As of October 1994, there were 16 applications for water rights in the Dry Lake Valley totaling 1.1×10^6 m^3/yr (21,155 acre-feet/year).

A master plan has been established for the Apex area in southern-most Dry Lake Valley (Clark County, 1990a). A 21,000-acre industrial-use park is planned for the area with three tenants already operating. This master plan indicates that any water required for industrial purposes at the Apex site would have to be imported to the site. Further, the master plan recommends a policy that private wells be limited to low water-use industries that employ conservation measures.

According to information on file with the U.S. Geological Survey, the groundwater in the Dry Lake Valley is generally calcium-sodium-sulfate type with a total dissolved solids concentrations ranging from 700 to 1,000 mg/L (700 to 1,000 ppm), exceeding the primary drinking water standard of 500 mg/L (500 ppm). Sulfate concentrations, reported for three wells in the basin, range from 360 to 380 mg/L (360 to 380 ppm), about 40 percent more than the primary drinking water standard of 250 mg/L (250 ppm).

4.6.6 Biological Resources

The scientific names of plants and animals mentioned in this section are given in Chapter 2 of Appendix E, Biological Resources. The plant communities in the Dry Lake Valley are typical of those found in deep, sandy soils throughout this part of the Mojave Desert. The visually dominant plants are creosote bush and white bursage. Other common species include range ratany and Nevada ephedra. Areas around the playa are dominated by saltbush. Blackbrush becomes the dominant shrub on the slopes of the Las Vegas Range (Clark County, 1990a).

Animal species in the Dry Lake Valley are similar to those described for the Mojave Desert habitats of the NTS. Bighorn sheep inhabit the surrounding mountains.

The desert tortoise is the only threatened or endangered species in this area. Densities of tortoises are generally low, though some patches with higher densities may occur (Clark County, 1990a). No current candidate plant or animal species are known to occur in the Dry Lake Valley. The U.S. Fish and Wildlife Service published the latest list of candidate plants and animals on February 28, 1996 (61 FR 7596). Prior to this, six species of mammals, two species of birds, two species of reptiles, and four plant species that were identified as potentially occurring at this site were classified as candidates (Clark County, 1990a; 59 FR 219) and were addressed (Table 4-30). The updated Notice of Review has removed all of these species from candidate status. Two of these former candidates are designated as State-protected and are likely to occur in the area: the western burrowing owl and the banded gila monster (Clark County, 1990a).

The Geyer milkvetch and the golden bear poppy are two plant species that may occur at the site. These plants are designated by the state of Nevada as threatened with extinction and are classified as "fully protected." Geyer milkvetch was found in nearby areas, but has not been found within the site boundary. Three Category 2 candidate plants have been found at this site. A fourth Category 2 plant, Geyer milkvetch, was found in nearby areas, but has not been found within the site boundary.

4.6.7 Air Quality and Climate

This section includes a description of the air quality conditions at the Dry Lake Valley, including climatology, meteorology, and ambient air quality.

CLIMATOLOGY AND METEOROLOGY—Although there are no weather stations in the Dry Lake Valley, National Oceanic and Atmospheric Administration data on the climate of the area are available for stations located in the Valley of Fire, Logandale, and North Las Vegas. In general, the climate of the valley exhibits the low humidity and low annual precipitation characteristics of the climate of Clark County. The warmest month is

July, when the mean monthly maximum temperature is 40 °C (104 °F), and January is the coolest month with a mean monthly minimum of 0.5 °C (33 °F). The average monthly wind speed ranges from 12 kph (7 mph) in December to 18 kph (11 mph) in April and June. Diurnal variation in wind is common, reflecting the differential heating of the ground.

AMBIENT AIR QUALITY—The Dry Lake Valley, although in Clark County, is located outside of the Las Vegas Valley Nonattainment Area (see Section 4.1.7). This part of Clark County is designated unclassifiable/attainment for all criteria pollutants. Dry Lake Valley borders the nonattainment area on the north. The closest Class I Prevention of Significant Deterioration area is Grand Canyon National Park, 100 km (63 mi) southeast of the Dry Lake Valley. Because the Dry Lake Valley is largely undeveloped, there are few emission sources in the area. Typical sources include mining and manufacturing operations at the southern end of the basin; on-road and off-road vehicle, railroad, and aircraft traffic; and fugitive dust.

Background air quality data for Dry Lake Valley are summarized in Table 4-42. These background data are for the Kerr-McGee plant and the Georgia-Pacific gypsum board production facility in the Apex industrial area. No violations of ambient air quality standards have been reported for the pollutants monitored. Emissions from individual industrial developments should be evaluated on the basis of the emission rates, the size of the facility, seasonal variations in process emissions, and source-specific atmospheric dispersion characteristics.

4.6.8 Noise

The acoustic environment of the Dry Lake Valley can be classified as uninhabited desert or small rural communities (Section 4.1.8). However, several noise producers are adjacent to or within the 3,600-acre site. The major sources of noise would be associated with traffic on Interstate 15; which forms part of the eastern border of the site, the Union Pacific Railroad, which parallels Interstate 15, and the Apex industrial area, southeast of the site. On the site, the Nevada Power Company owns and operates an electrical substation, a phase shifter and an autotransformer, and has plans to construct four additional power plants. Meteorological conditions, such as wind, generate noise at the site.

4.6.9 Visual Resources

The landscape character of the Dry Lake Valley is typical of the Great Basin. Regional topography consists of mountain ranges arranged in a north-south orientation, separated by broad valleys. In addition to the natural surroundings, the existing viewscape includes an industrial area, U.S. Highway 93, Interstate 15, a railroad, power plant, and power transmission lines. The landscape at the Dry Lake Valley is common to the region, and because of the amount of cultural modification, the scenic quality has been designated as Class C. The average daily traffic on Interstate 15 is 12,000 to 13,000 vehicles (NDOT, 1993a). Therefore, the Dry Lake Valley would have a high visual sensitivity.

4.6.10 Cultural Resources

The Dry Lake Valley lies in southern Nevada, an area with a history that may span the past 10,000 years or more. Properties ranging from the early prehistoric period to historic transportation, mining, and ranching are known.

When Europeans first entered the area around the Dry Lake Valley, they encountered groups of Southern Paiute people. Groups that are likely to have used resources found in the project area include the Moapa, Tule Springs, and Las Vegas bands (Steward, 1938; Stoffle and Dobyns, 1982).

Geographically, the Dry Lake Valley extends from Apex to well within the Moapa River Indian Reservation. The area proposed for solar power development is within the Apex industrial area northwest of Interstate 15. It encompasses approximately 3,600 acres.

Table 4-42. Background air quality data for the Dry Lake Valley

				Average Period
Nitrogen Oxide[a] (μg/m)				Annual
1. Kerr-McGee				0.017
2. Bonneville-Nevada's Georgia Pacific Site				1.620
	Total			1.640
	Standard			25.000
	Available			23.360
Sulfur Dioxide[b] (μg/m)		3-hour	24-hour	Annual
1. Kerr-McGee		0.010	0.004	0.001
2. Great Star		100.100	30.500	5.000
	Total	100.100	30.500	5.000
	Standard	512.000	91.000	20.000
	Available	411.900	60.500	15.000
Total Suspended Particulate (μg/m)			24-hour	Annual
1. Kerr-McGee			0.125	0.001
2. United Rock and Great Star			4.600	1.480
3. Avena			0.900	0.300
4. Georgia Pacific			2.800	0.900
5. Bonneville-Nevada			0.800	0.080
	Total		9.200	2.800
	Standard		37.000	19.000
	Available		27.800	16.200

[a] United Rock and Avena emit no nitrogen oxides from stationary sources; Great Star, and Georgia Pacific were approved prior to February 8, 1988

[b] No sulfur dioxide impact from United Rock, Avena, Georgia Pacific, Bonneville-Nevada.

Source: Clark County, 1990a.

RECORDED CULTURAL RESOURCES—Eight sites have been recorded directly within the project area boundaries. Most of these are associated with the shoreline of the Dry Lake Valley. Two processing localities were recorded as part of the Overthurst Project (Bergin et al., 1980). Two other sites were recorded as part of the Kern River Gas Pipeline Survey (Kelly et al., 1990). One site is a locality with a relatively high percentage of stone tools.

Data recovery was conducted at this site and included surface collections and limited excavation of portions of the site. Another site is untyped and includes two flakes and several pieces of burned bone. There is also a temporary camp with rock circles, Southern Paiute grayware pottery, and numerous pieces of lithic fragments. Two other sites were recorded as part of a transmission line survey (Rafferty and Blair, 1986). Both of these were located along the Dry Lake Valley shoreline and both contained burned or fire-cracked rock concentrations. Several of the sites previously described have been recommended as eligible for the National Register of Historic Places. These sites may provide information about late prehistoric use of shoreline environments. A historic site that traverses The Dry Lake Valley is the Mormon Road, which is listed on the National Register of Historic Places. This route, originally part of the Spanish Trail, connected the Las Vegas Valley with cities in Utah and California. Use of the Mormon Road mainly postdates 1848 (Paher, 1971). Portions of the Old Spanish Trail/Mormon Road remain intact and have been recorded as significant historic archaeological sites (Myhrer et al.,1990).

SITES OF AMERICAN INDIAN SIGNIFICANCE—*The CGTO knows that the Dry Lake Valley area contains a wide range of important cultural resources. This knowledge derives from previous American Indian cultural resource studies of the area conducted during the Harry Allen-Warner Valley (Bean and Vane, 1979) and the Intermountain Power Project (Stoffle and Dobyns, 1982; Stoffle et al., 1983) studies of Indian concerns along various proposed power line routes. These power line study areas were located in the bottom and along the eastern edge of the Dry Lake Valley. During these studies, elders identified a wide range of plants, animals, and archaeological sites within this valley. A 1982 mail survey of American Indian people indicated an "Intensity of Concern" score of 2.5 on a 4.0 scale (Stoffle and Dobyns, 1982). A 1983 on-site visit to the Dry Lake area indicated numerous rock shelters that American Indian people considered very significant and the presence of 10 American Indian plants (Stoffle et al., 1983). The cultural assessment of the Navajo-McCullough right-of-way indicated the presence of eight plants identified elsewhere as American Indian plants, numerous archaeological sites, and artifact scatters in the Dry Lake Valley (Brooks et al., 1975). Previous studies have been geographically limited, so a complete cultural assessment of the Dry Lake Valley is not possible without visiting other portions of the valley.*

4.6.11 Occupational and Public Health and Safety

The Dry Lake Valley site proposed for siting a Solar Enterprise Zone facility is currently undeveloped desert. Baseline health and safety considerations associated with the environment include potential for heat stroke and exhaustion (primarily during summer months), dehydration, and poisonous spider and snake bites. Other physical hazards include tripping or stumbling hazards associated with the desert terrain.

4.6.12 Environmental Justice

Existing demographic conditions for Environmental Justice are discussed in Section 4.1.12. This discussion includes conditions for the Dry Lake Valley.

4.7 Coyote Spring Valley

Information concerning the physical characteristics of the Coyote Spring Valley (Figure 4-61) is available from a number of sources. The Clark County Department of Comprehensive Planning and the U.S. Bureau of Land Management have compiled data on the soils and their erosion potential, biota, and habitat. The Nevada Bureau of Mines and Geology has published information on the geology and mineral resources of the valley, and the U.S. Geological Survey has published maps of the area and maintains databases on the water resources. The Nevada Division of Water Resources maintains a database on water resource use and availability and wells within the basin. The state of Nevada has information on air and water quality. The National Oceanographic and Atmospheric Administration keeps comprehensive climate records for numerous National Weather Service Observing Sites in southern Nevada, including sites that are close to the Coyote Spring Valley.

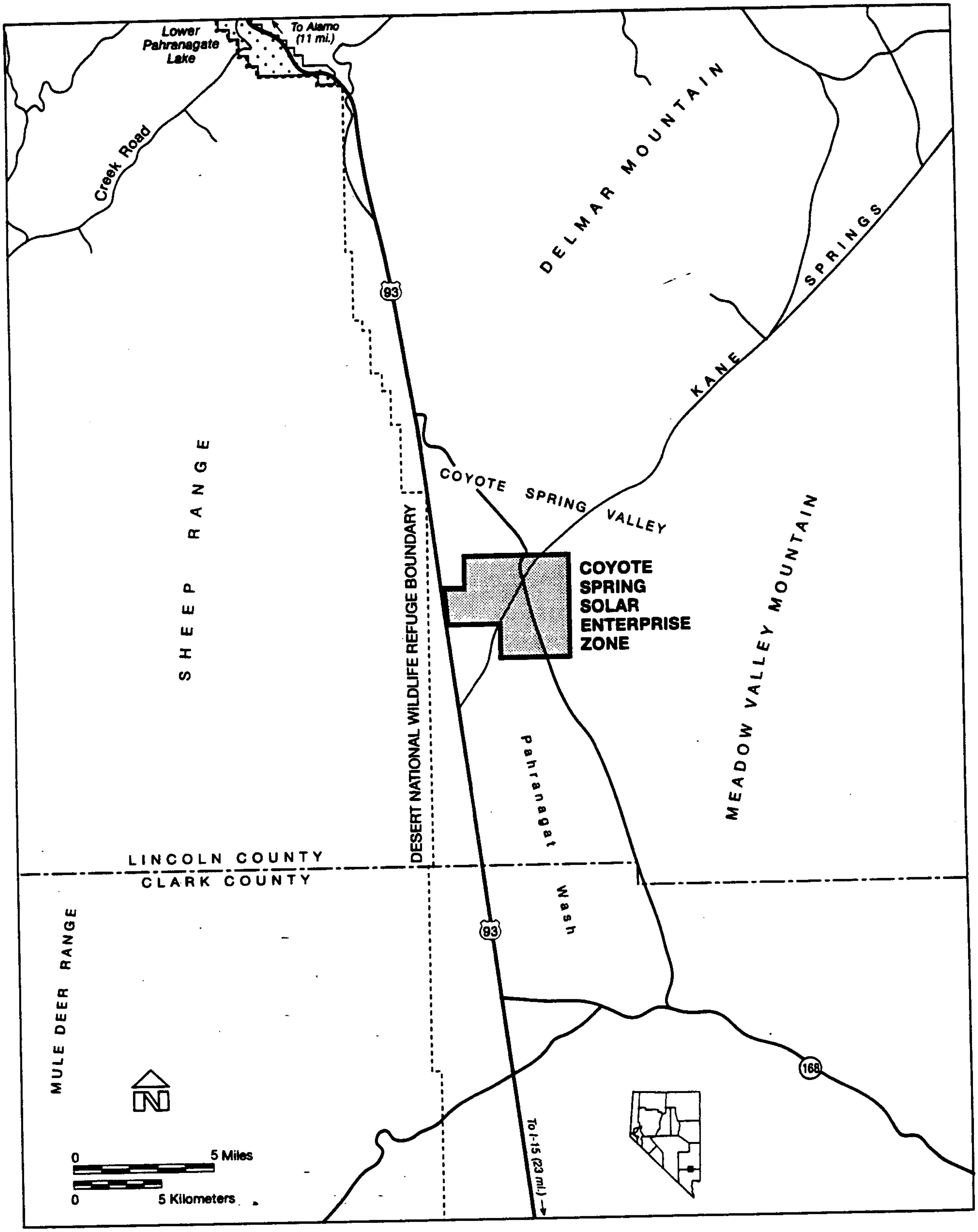


Figure 4-61. Coyote Spring Valley and surrounding area

4.7.1 Land Use

The Coyote Spring Valley includes privately owned land and land administered by the U.S. Bureau of Land Management and the U.S. Fish and Wildlife Service. Most of the area located west of U. S. Highway 93 is within the Desert National Wildlife Range. Land in the Coyote Spring Valley is used for a limited number of activities as discussed in the following Land-Use Designations section. Also discussed in this section is the infrastructure related to the Coyote Spring Valley.

4.7.1.1 Public Land Orders and Withdrawals. This section is not applicable to the Coyote Spring Valley.

4.7.1.2 Land-Use Designations. Appreciable areas of the Coyote Spring Valley have been designated by the U.S. Bureau of Land Management for special management (BLM, 1992). The U.S. Bureau of Land Management has designated a portion of east-central Coyote Spring Valley as part of the Arrow Canyon Special Recreation Management Area (BLM, 1993). This area will be managed for semiprivate recreation opportunities and the protection of cultural resources. The area between the wildlife range and U.S. Highway 93 includes portions of three Wilderness Study Areas: NV050-201, NV050-216, and NV050-217. Wilderness Study Area NV050-17 is located in northern-most Coyote Spring Valley and includes the southern Delamar Mountains.

Wilderness Study Area NV050-156 is located on the east side of the valley and encompasses most of the Meadow Valley Mountains. Wilderness Study Area NV050-215 also occurs along the east side of the basin and includes the northern portions of the Arrow Canyon Range.

The largest block of privately owned land is the Aerojet Project Area, located east of U.S. Highway 93 between the Rainbow Canyon Road on the north and U.S. Highway 168 on the south. A portion of this land was sold by Aerojet to the Wylie Corporation.

The Aerojet Project Area has been classified into four land-use types: (1) the project area of 2,760 acres; (2) a buffer area of 11,240 acres of low-density tortoise habitat; (3) a 17,885-acre conservation reserve of moderate to high tortoise density; and (4) a 10,735-acre power line corridor (Aerojet General, 1987). These areas are all located east of U.S. Highway 93, north of U.S. Highway 168, and west of the Arrow Canyon Range.

The U.S. Bureau of Land Management has also proposed a utility corridor through portions of the Coyote Spring Valley. This corridor, to be 805 m (2,640 ft) wide, would be located east of the centerline of U.S. Highway 93 from the south end of the Aerojet designated corridor. This corridor would cross the Arrow Canyon Range and into the Dry Lake Valley area substations.

Two small areas of privately owned land are located on the west side of U.S. Highway 93: the old Butler Ranch which has been abandoned, and a silica sand mining operation. These two tracts contain only about 80 acres.

4.7.1.3 Site-Support Activities. The site support of the Coyote Spring Valley is limited to two transmission lines. There are no existing facilities for water, sewage or waste disposal, or communications.

SERVICES—Services discussed for the Coyote Spring Valley include law enforcement and security, fire protection, and health care.

Law Enforcement and Security—The Coyote Spring Valley is not a secured or restricted area. Law enforcement is provided by the Lincoln County Sheriff's Department.

Fire Protection—Fire protection is provided by the U.S. Bureau of Land Management.

Health Care—No health care services are currently available on the site.

UTILITIES—One transmission line roughly parallels U.S. Highway 93 and extends the entire length of the valley. The other transmission line is located 3 to 5 km (2 to 3 mi) south of U.S. Highway 168 and extends as far west as U.S. Highway 93.

4.7.1.4 Airspace. Airspace overlying almost all of the Coyote Spring Valley is the Sally Corridor portion of the Desert Military Operating Areas. Sally Corridor is used primarily as the transition route between Nellis Air Force Base and the NAFR Complex (see Figure 4-8).

4.7.2 Transportation

This section addresses on-site traffic, off-site traffic, transportation of materials and waste, and other transportation for the Coyote Spring Valley.

4.7.2.1 On-Site Traffic. This section is not applicable to the Coyote Spring Valley.

4.7.2.2 Off-Site Traffic. U.S. Highway 93, a two-lane, two-way rural highway, is the major regional access to the Coyote Spring Valley site. In 1993, U.S. Highway 93 had an average annual daily traffic of 1,210 vehicles and operated at a level of service B. U.S. Highway 168 provides access from the central part of the basin to the Muddy Springs Area and Moapa Valley to the east. Access via unpaved roads is also limited to two main routes, the Rainbow Canyon Road on the north and the Desert Wildlife Range Road on the west. There is no rail access to the Coyote Spring Valley.

4.7.2.3 Transportation of Materials and Waste. This section is not applicable to the Coyote Spring Valley.

4.7.2.4 Other Transportation. Air or rail transportation of workers or materials to the Coyote Spring Valley has not been proposed; therefore, these facilities have not been examined in detail.

4.7.3 Socioeconomics

The Coyote Spring Valley is located in Lincoln County. What follows is a discussion of general socioeconomic conditions in Lincoln County. The county's land area is 2.7 x 10^4 km^2 (10,635 mi^2). The total civilian labor force in 1991 was 2,068; 4.5 percent or 94 civilians were unemployed. Some 6.8 percent were employed in agriculture; 1.7 percent in manufacturing; 18.7 percent in wholesale and retail trade; 2.0 percent in finance, insurance, and real estate; 5.0 percent in health services; and the largest sector, 16.0 percent in public administration. Total personal income for the county was \$62.0 million, a 103.3-percent change from 1980 personal income.

The 1992 population for Lincoln County was 3,739. It grew by 0.2 percent (less than 1 percent) between 1980 and 1992. Housing stock in the county totaled 1,800 with a vacancy rate of 26.4 percent. The number of houses increased by 6.8 percent between 1980 and 1990. The construction of four homes was authorized by building permits between 1990 and 1992.

Of the total students in Lincoln County (1,066), 97.7 percent are enrolled in public elementary or high school. From 1986 to 1987, general revenue for the county was \$7.2 million. Intergovernmental revenue was \$5.6 million, and taxes accounted for \$0.9 million, 95.8 percent of which was property taxes. Direct general expenditures were 7.6 million, a 21.5-percent change from 1982 to 1987.

4.7.4 Geology and Soils

Physiography, geology, and soils are addressed in this section. Also briefly discussed are seismic activities and geologic resources.

4.7.4.1 Physiography. The Coyote Spring Valley is a topographically open basin comprised of about 1,702 km^2 (657 mi^2). Elevations within the basin range from about 3,018 m (9,900 ft) on the west in the Sheep Range to about 650 m (2,134 ft) at the outlet for the valley along the Pahranagat Wash. The Arrow Canyon Range on the southeast rises to an elevation of only about 1,586 m (5,203 ft). On the southwest, the Coyote Spring Valley is separated from the Las Vegas Valley by the Las Vegas Range, with a maximum elevation of about 1,503 m (4,931 ft). On the valley floor, the major features are the many washes that drain the bounding upland areas and the broad alluvial fans and the Pahranagat Wash, an incised ephemeral stream. Badland topography occurs where the Muddy Creek Formation is exposed in the east-central part of the basin.

4.7.4.2 Geology. The general geologic conditions and mineral deposits of the Coyote Spring Valley have been detailed by the Nevada Bureau of Mines and Geology (Longwell et al., 1965). The general geology of the valley comprises four major geologic units: alluvium, Tertiary valley-fill deposits, Tertiary volcanics, and Paleozoic carbonate rocks. The alluvium occurs over the valley floor and comprises interbedded gravels, sand, silt, and clay. The maximum thickness of alluvium is not known, but thicknesses of 183 to 260 m (600 to 850 ft) have been penetrated by U.S. Geological Survey and U.S. Air Force test wells.

The Tertiary valley-fill deposits include the Muddy Creek Formation, which was deposited over a large area of Clark County. These deposits outcrop to the east of the Pahranagat Wash in the east-central part of the basin. The Muddy Creek Formation comprises a sequence of interbedded fine-grained and coarse-grained sediments, including claystone, siltstone, and minor sandstone. Gypsum is common in the more fine-grained deposits, and a conglomerate is common along the margins of the depositional basin. The thickness of the Muddy Creek Formation in the Coyote Spring Valley is not known, but is probably at least several hundred feet in most areas. The Tertiary volcanic rocks outcrop in the northern part of the Coyote Spring Valley and include tuffs and other volcanoclastic deposits with an unknown total thickness.

The Paleozoic rocks of the Arrow Canyon, Sheep, and Las Vegas Ranges comprise a thick sequence of limestone, dolomites, and quartzite that include, in descending order, the Birdspring Formation, Monte Cristo Limestone, Sultan Limestone, Lone Mountain Dolomite, the Ely Springs Dolomite, the Eureka Quartzite, the Pogonip Group, middle and lower Cambrian Limestones and Dolomites, and the Chisolm and Pioche Shale. These rocks outcrop in the mountainous areas and probably underlie the Muddy Creek Formation at depth under the valley floor area.

A number of major geologic structures occur in the Coyote Spring Valley. The Arrow Canyon syncline is a structural trough that occurs along the eastern Arrow Canyon Range in the northern part of the basin. On the western part of the basin, in the Sheep Range, the lower clastic aquitard (formed by the Cambrian clastics) has been thrust over younger Paleozoic rocks. The other predominant structural features are an east-west trending lineament through the Muddy Springs area, which may be related to the Pahranagat Shear System, and a northeast-southwest trending lineament that extends from northeast the Coyote Spring Valley through Kane Spring Valley.

MINERAL RESOURCES—Potential mineral resources in the Coyote Spring Valley include fluid minerals (oil, gas, and geothermal resources), non-energy leasable minerals (primarily sodium and potassium compounds), salable minerals (common sand, gravel, and rock), and locatable minerals (nonmetallic mineral deposits) (BLM, 1992). Maps presented for the other off-site Solar Enterprise Zone facility alternative locations that show the resource potential are not available for the Coyote Spring Valley.

Metallic mineral deposits are absent in the Coyote Spring Valley. The only known mineral deposits include a bentonitic clay deposit and sand and gravel. There are numerous placer claims within the basin. Oil and gas resources are considered speculative. The Nevada Department of Transportation has three material site rights-of-way within the basin. The geothermal resources are moderate. The U.S. Bureau of Land Management has categorized the sodium and potassium potential of the Coyote Spring Valley as moderate.

4.7.4.3 Soils. The soils in the Coyote Spring Valley are typical desert soils (Entisols and Aridisols). The soils of the area have been categorized into seven soil types (Aerojet General, 1987). The Arizo soils form on alluvial fans with 2 to 8 percent slopes and are deep, excessively drained gravelly and cobbly sand. The permeability is very rapid, and the available water capacity is very low. The Badland soil unit forms on the Muddy Creek Formation and is stratified sand, silt, and clay with gypsum and calcium carbonate. The Badland soils are severely eroded and are unsuitable for development because of slope and erosion limitations.

The Colorock-Tonopah Association forms on 2 to 8 percent slopes on alluvial fans and are gravelly sands or very gravelly loams. The Colorock soils are shallow loam over a caliche layer about 1 m (2 ft) thick and have a moderately rapid permeability and a very low available water capacity. The Tonopah soils are excessively drained and deep. The permeability is rapid, and the available water capacity is low.

The Glendale fine sand is limited to floodplains and terraces with 0 to 2 percent slope. The Glendale grades downward from a fine sand to brown clay loam, silty loam, and very fine sandy loam. The permeability is very low, and the available water capacity is high. The Glendale loam occurs in similar areas, but is well drained and has a moderately slow permeability and high available water capacity.

The Rockland-St. Thomas Association occurs on very steep slopes in the foothills and mountain sides. The Rockland is in areas of limestone exposures. The St. Thomas soils are cobbly loam that is well drained with a moderately rapid permeability and very low available water capacity. The Weiser cobbly sandy loam is a deep and well-drained soil that forms on steeper (15 to 30 percent slope) alluvial fans. The permeability is moderately rapid, and the available water capacity is low to very low.

SOIL EROSION—The soils in the Coyote Spring Valley are susceptible to erosion by wind and water. The potential for erosion is generally slight except where the soils have been disturbed or along the banks of washes. There is also the potential for localized landslides on the steep slopes of the upland areas.

The soils that are most susceptible to erosion include the Badland soil and the Glendale fine sand (Aerojet General, 1987). The Badland soil has a very high water-erosion hazard, and headward erosion occurs extensively in this unit. The Glendale fine sand is very susceptible to wind erosion. The erosion hazard for the Arizo soils is slight; the erosion hazard for the other soils types present is moderate.

4.7.5 Hydrology

Discussions of hydrology are divided into surface water and groundwater. Water supply in the vicinity is also discussed.

4.7.5.1 Surface Hydrology. There are no perennial surface water bodies or streams in the Coyote Spring Valley (Eakin, 1964). The surface water resources are meager, occurring only as ephemeral flow in the streambeds that drain the upland areas or in temporary ponding of runoff in the playa. Surface water flows into the basin on the north via the Pahranagat Wash (shown as White River or Muddy River on some maps). Because of the presence of surface water reservoirs in southern Pahranagat Valley, little if any runoff enters the Coyote Spring Valley from the north. To the northeast, the Kane Springs Wash discharges very infrequently to the Coyote Spring Valley.

Surface water discharges from the Coyote Spring Valley into the upper Muddy Springs area through the Pahranagat Wash. Although there are no gaging stations within the basin, the U.S. Geological Survey does maintain a gaging station in the Pahranagat Wash in Arrow Canyon, just east of the basin boundary. Flow in the wash occurs very infrequently, usually for only a few days during the winter and late summer months. In some years of record, no flow occurred at all at this gaging station. For the 5 year period of record, the average annual runoff is 668,547 m^3/yr (542 acre-feet/year). The peak instantaneous discharge rate of 95 m^3/sec (3,350 ft^3/sec) occurred on September 6, 1991.

Flooding is probably a recurrent problem over most of the valley floor area in the Coyote Spring Valley. Severe flash floods do occur infrequently in both the Pahranagat Wash and Kane Spring Wash. Such floods typically occur when the tributary alluvial channels exceed bankful conditions, resulting in sheet flow over large areas on the alluvial fans that drain to the Pahranagat Wash.

4.7.5.2 Groundwater. The Coyote Spring Valley is situated within the White River Flow System, a subsystem of the regional Colorado Flow System (Harrill et al., 1988). Groundwater that originates as precipitation over the upland areas of the valley discharges out of the regional flow system near Overton, 29 km (18 mi) to the east, ultimately reaching the Colorado River through a complicated pathway of groundwater and surface water flow.

Groundwater under the Coyote Spring Valley occurs at depths ranging from only 3 m (10 ft) below land surface in a perched aquifer in the vicinity of the Coyote Spring and the old Butler

Ranch to about 107 to 183m (350 to 600 ft) below land surface for the water table aquifer throughout the valley floor area (Buqo et al., 1992). Groundwater is derived from two sources: recharge over the basin (estimated at about 2.5 x 10^6 m^3/yr [2,000 acre-feet/year]) and subsurface inflow on the north from the Pahranagat Valley (about 4.3 x 10^7 m^3/yr [35,000 acre-feet/year]). Groundwater is discharged via subsurface outflow to the Muddy Springs area and is appreciable, estimated to be at least 4.6 x 104 m^3/yr (37,000 acre-feet/year).

There are a number of springs in the Coyote Spring Valley (Eakin, 1964). The springs are situated primarily on the eastern slopes of the Sheep Range. Of the nine springs that have been identified, discharge data are only available for two, Coyote and Mormon Well Springs. Published estimates of discharge for both of these springs is less than 4 L/min (1 gal/min); however, some seasonal variations may occur with higher discharge rates in the late spring and reduced discharges during the summer and fall. As of 1992, there were 15 surface water rights totaling only 50,573 m^3/yr (41 acre-feet/year) for springs in the basin.

Because of the limited spring discharge and the irregular nature of surface water discharge, the only reliable water resource is groundwater. There is currently only one operating water supply well in the Coyote Spring Valley. Well yields within the basin are quite variable, depending on the aquifer that is used as a water source. In general, well yields from the alluvial aquifer are quite low, approximately a few hundreds of liters (a few tens of gallons per minute), owing to the limited saturated thickness of alluvium that is present over much of the basin. In contrast, exploratory water wells drilled into the underlying regional carbonate aquifer by the U.S. Air Force were found to be quite productive, with one well capable of producing more than 11,356 L/min (3,000 gal/min).

Because of the tremendous water production potential of the regional carbonate aquifer, there has been considerable interest in developing water supplies in the Coyote Spring Valley in support of defense, municipal, and industrial applications. As of 1994, there were no groundwater rights appropriated within the basin (Buqo, 1996b). However, there are many senior applications for groundwater appropriations in the basin. In 1983, Nevada Power Company applied for 1.6 m^3/sec (55.0 ft^3sec). In 1985, Aerojet applied for 0.17 m^3/sec (6 ft^3/sec), and, later in that year, Nevada Power Company submitted applications for an additional 1.4 m^3/sec (50 ft^3/sec). In 1986, Aerojet filed 13 additional applications, bringing its total request to 747.97 m^3/sec (26,414 ft^3/sec). In 1988, a single application for 0.44 m^3/sec (15.46 ft^3/sec) was filed for ore processing and, in 1989, the Las Vegas Valley Water District filed five applications totaling 1.1 m^3/sec (38 ft^3/sec). None of these applications have been acted on, and there is considerable uncertainty regarding the potential for obtaining approval of new applications for groundwater to support a Solar Enterprise Zone facility.

WATER QUALITY—According to information published by the Las Vegas Valley Water District (Buqo et al., 1992), the groundwater in the Coyote Spring Valley is generally a calcium-sodium-sulfate type with a total dissolved solids concentrations ranging from 700 to 1,000 mg/L (700 to 1,000 ppm), exceeding the Primary Drinking Water standard of 500 mg/L (500 ppm). Samples of water from the alluvium have been found to have concentrations of iron and manganese that exceed drinking water standards, and elevated concentrations of fluoride have been reported for wells completed in the carbonate aquifer.

4.7.6 Biological Resources

Extensive inventories and assessments of the biological resources of the Coyote Spring Valley have been performed as part of the U.S. Air Force's MX Missile studies and as part of the Aerojet land withdrawal. Detailed information on the biological resources of the basin can be found in (Aerojet General, 1987), and is summarized in the following discussion. The scientific name of plants and animals mentioned in this section is given in Section E.2.6, of Appendix E, Biological Resources. If the Coyote Spring Valley is selected as the most reasonable alternative location, updated surveys would be conducted in support of a Solar Enterprise Zone-specific environmental document.

The plant communities of the Coyote Spring Valley are typical of those found in this part of the Mojave Desert. The dominant plants include creosote bush and white bursage. Mojave yucca, beaver tail cactus, and spiny menodora are subdominant on the bajada areas; shadscale, prince's plume, and wolfberry are subdominant over badland areas; desert willow and cheesebush are subdominant in wash areas. There are no known federally listed threatened, endangered, or candidate plant species within the area designated for consideration as a Solar Enterprise Zone facility.

The desert tortoise is the only threatened or endangered animal species in the Coyote Spring Valley. The Coyote Spring Valley is within critical habitat for this species. The U.S. Bureau of Land Management has designated a large area of the basin as an Area of Critical Environmental Concern to provide for management of the desert tortoise population in accordance with the U.S. Fish and Wildlife Recovery Plan for the desert tortoise (Mojave Population). The tortoise density of the Coyote Spring Valley ranges from 65 to 194 per km² (25 to 75 per mi²) with a total population of almost 18,000, according to the U.S. Bureau of Land Management. Detailed investigations by Garcia et al., 1982 indicate that the population in the vicinity of the proposed Solar Enterprise Zone facility location ranges from 26 to 233 per km² (10 to 90 per mi²). Because of the relatively high density of tortoises and the pristine habitat conditions, the Coyote Spring Valley is considered one of the most valuable tortoise habitats in Nevada (Aerojet General, 1987).

The desert bighorn sheep is a trophy big game species that has been classified as a sensitive species for management purposes by the U.S. Bureau of Land Management and Nevada Department of Wildlife. Bighorn sheep inhabit all of the mountain ranges surrounding the Coyote Spring Valley, and five intermountain migration routes have been identified. One route is 16 km (10 mi) northeast of a Solar Enterprise Zone facility site between the Delamar Mountains and northern Meadow Valley Mountains, and another route is located 10 km (6 mi) to the southeast between the Arrow Canyon Range and the southern Meadow Valley Mountains.

Although undocumented and unsighted within the Coyote Spring Valley, the banded gila monster, a State-protected reptile, may be present. This animal has been reported in the Maynard Lake area immediately north of the Coyote Spring Valley and to the east in the Moapa Valley. The most suitable gila monster habitat in the vicinity of the alternative Solar Enterprise Zone location is in the rocky areas of Pahranagat Wash and adjacent arroyos. If present within the Coyote Spring Valley, the density of this species is expected to be quite low.

4.7.7 Air Quality and Climate

This section includes a description of the air quality conditions at the Coyote Spring Valley, including climatology, meteorology, and ambient air quality.

CLIMATOLOGY AND METEOROLOGY—Although there are no weather stations in the Coyote Spring Valley, National Oceanic and Atmospheric Administration data on the climate of the area are available for stations located in the Valley of Fire, Logandale, and North Las Vegas. In general, the climate of the valley exhibits the low humidity and low annual precipitation characteristic of the climate of Clark County. The warmest month is July, when the mean monthly maximum temperature is 40 °C (104 °F); January is the coolest month, with a mean monthly minimum of 0°C (32 °F). The average monthly wind speed ranges from 11 kph (7 mph) in December to 18 kph (11 mph) in April and June. Diurnal variation in wind is common, reflecting the differential heating of the ground.

AMBIENT AIR QUALITY—The Coyote Spring Valley is located within Nevada Intrastate Air Quality Control Region 147, which is designated unclassifiable/attainment for all criteria pollutants. The closest Class I Prevention of Significant Deterioration area is the Grand Canyon National Park, approximately 121 km (75 mi) southeast of the Coyote Spring Valley. Because the Coyote Spring Valley is largely undeveloped, there are few emission sources in the area. Typical sources include a silica sand mining operation in the north-central part of the basin; on-road and off-road vehicle, railroad, and aircraft traffic; and fugitive dust.

4.7.8 Noise

The acoustic environment of the Coyote Spring Valley can be classified as uninhabited desert or small rural communities (Section 4.1.8). Noise measurements have not been made at the Coyote Spring Valley Solar Enterprise Zone site. Natural sources include wind and thunder. The major sources of noise would be associated with prevailing meteorological conditions, such as wind.

4.7.9 Visual Resources

The landscape character of the Coyote Spring Valley is typical of the Great Basin with extensive views of linear mountain ranges and valleys arranged in a north-south orientation. The valley is surrounded to the southwest and west by the Las Vegas and Sheep Ranges, Delamar Mountains to the north, Meadow Valley Mountains to the east, and Arrow Canyon Range to the south. The steep and rugged mountain slopes give way in the valley to gently sloping surfaces dissected by arroyos and washes. The visual quality of the area ranges from Class B to Class C. Because of the surrounding vista, the visual quality of the site has been designated Class B.

The proposed Solar Enterprise Zone facility in the Coyote Spring Valley is visible to the east from U.S. Highway 93. State Route 168 is 19 km (12 mi) south of the proposed site. The site would be visible from BLM Wilderness Study Areas located in the Delamar Mountains, Meadow Valley Mountains, and along the west side of U.S. Highway 93. The BLM Wilderness Study Areas range from 2 km (1 mi) to 8 km (5 mi) from the site. There are two utility corridors that roughly parallel these two routes. An abandoned ranch is located in the northern portion of the valley, and there is an active silica sand mining operation located adjacent to this ranch. The Kane Spring Wash cuts from east to west in the north part of the site.

4.7.10 Cultural Resources

The Coyote Spring Valley lies in southern Nevada, an area with a prehistory that may span the past 10,000 years or more. Properties ranging from the early prehistoric period to historic mining and ranching sites are known. A summary of cultural resources and associated impacts are described in (Aerojet General, 1987).

<u>*SITES OF AMERICAN INDIAN SIGNIFICANCE*</u>—*Coyote Spring is an area on the west flank of the Meadow Valley Mountains. The CGTO knows that this site contains a wide variety of American Indian cultural resources. The site was studied by American Indian people during the Intermountain Power Project (Stoffle and Dobyns, 1982). Nine Indian-use plants were identified during that on-site visit, including desert willow (*Chilopsis linearis*), prince's plume (*Stanleya pinnata*), and wolfberry (*Lycium andersonii*) (Stoffle and Dobyns 1982). The large desert tortoise was observed at this location. The area contains portions of an original Indian trail-wagon road from the Moapa Valley to Pahranagat Valley. Archaeological survey of the Intermountain Power Project corridor revealed 9 sites and 20 scattered finds (Tucker et al., 1982). Known American Indian cultural resources exist in the Coyote Spring area, but it is impossible to fully understand the potential impacts to cultural resources without additional systematic on-site resource studies by American Indian people.*

4.7.11 Occupational and Public Health and Safety

The Coyote Spring Valley location proposed for siting a Solar Enterprise Zone facility is currently undeveloped desert. Baseline health and safety considerations associated with the environment include potential for heat stroke and exhaustion (primarily during summer months), dehydration, and poisonous spider and snake bites. Other physical hazards include tripping or stumbling hazards associated with the desert terrain.

4.7.12 Environmental Justice

Existing demographic conditions for Environmental Justice are discussed in Section 4.1.12. This discussion includes conditions for the Coyote Spring Valley.

4.8 References

REGULATION, ORDER, LAW

10 CFR Part 1022	U.S. Department of Energy (DOE), "Energy: Compliance with Floodplain/Wetlands Environmental Review Requirements," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.
29 CFR Part 1910	U.S. Department of Labor, "Labor: Occupational Safety and Health Standards," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.
29 CFR Part 1926	U.S. Department of Labor, "Labor: Occupational Safety and Health Administration," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
40 CFR Part 52	EPA, "Protection of the Environment: Approval and Promulgation of Implementation plans," *Code of Federal Regulations*, Office of the Federal Register, national Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
40 CFR Part 81.329	Environmental Protection Agency (EPA), "Protection of the Environment: Attainment Status Designation for Nevada," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.
40 CFR Part 264	EPA, "Protection of the Environment: Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
40 CFR Part 264.18	EPA, "Protection of the Environment: Containment and Detection of Release," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.
40 CFR Part 264.193	EPA, "Protection of the Environment: Location Standards," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.
40 CFR Part 270.14	EPA, "Protection of the Environment: Contents of Part B: General Requirements," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.

40 CFR Part 270.23	EPA, "Protection of the Environment: Specific Part B Information Requirements for Miscellaneous Units," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.
40 CFR Part 1502	EPA, "Protection of the Environment: Environmental Impact Statement," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
44 CFR Part 9	Federal Emergency Management Agency (FEMA), Emergencies Management and Assistance: Floodplain Management and Protection of Wetlands," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.
44 CFR Part 65	FEMA, "Emergencies Management and Assistance: Identification and Mapping of Special Hazard Areas," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1994.
50 CFR Parts 17.11 & 17.12	U.S. Department of the Interior, "Wildlife and Fisheries: Endangered and Threatened Wildlife and Plants," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1991.
DOE Order 5400.1	DOE, "General Environmental Protection," Washington, DC, 1988.
DOE Order 5400.5	DOE, "Radiation Protection of the Public and Environment," Washington, DC, 1993.
DOE Order 5480.1B	DOE, "Environmental Safety and Health Program for Department of Energy Operations," Washington DC, 1986.
DOE Order 5480.7A	DOE, "Fire Protection," Washington, DC, 1993.
DOE Order 5480.8A	DOE, "Contractor Occupational Medical Program," Washington, DC, 1992.
DOE Order 5480.9A	DOE, "Construction Project Safety and Health Management," Washington, DC, 1994.
DOE Order 5480.10	DOE, "Contractor Industrial Hygiene Program," Washington, DC, 1985.
DOE Order 5480.13A	DOE, "Aviation Safety," Washington, DC, 1993.
DOE Order 5480.16A	DOE, "Firearms Safety," Washington, DC, 1994.
DOE Order 5480.23	DOE, "Nuclear Safety Analysis Reports," Washington, DC, 1992.
DOE Order 5480.28	DOE, "Natural Phenomena Hazards Mitigation," Washington, DC, 1993.
DOE Order 6430.1A	DOE, "General Design Criteria," Washington, DC, 1989.

DOE Order N441.1	DOE (U.S. Department of Energy), "Radiological Protection for DOE Activities," Washington, DC, 1995.
EO 8578	Executive Order, *Withdrawal of Public Land for Use of the War Department as an Aerial Bombing and Gunnery Range, Nevada*, Office of the President, Washington, DC, 1940.
EO 9019	Executive Order, *Revoking in Part and Modifying Executive Order 8578 of October 29, 1940, and Reserving Public Land for Use of the War Department as an Aerial Machine-gun Range*, Office of the President, Washington, DC, 1942.
EO 11988	Executive Order, *Floodplain Management*, Office of the President, Washington, DC, 1977.
EO 11990	Executive Order, *Protection of Wetlands*, Office of the President, Washington, DC, 1977.
EO 12898	Executive Order, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, Office of the President, Washington, DC, 1994.
PL Order 805	Public Land Order, "Withdrawing Public Lands for Use of the U.S. Atomic Energy Commission; Partial Revocation of Executive Orders 8578 and 9019," Bureau of Land Management, Department of Interior, *Federal Register*, 1952.
PL Order 1662	Public Land Order, "Withdrawing Public Lands for Use of the U.S. Atomic Energy Commission in connection with the Nevada Test Site, Additional to those withdrawn by Public Land Order No. 805 of February 12, 1952," Bureau of Land Management, Department of Interior, *Federal Register*, June 26, 1958, Vol 125.
PL Order 2568	Public Land Order, "Transferring Lands from Department of the Air Force to Atomic Energy Commission," Bureau of Land Management, Department of Interior, *Federal Register*, December 22, 1961, *Federal Register* Document 61-12179.
PL Order 2771	PL Order, "Withdrawing Lands for use of Atomic Energy Commission," *Federal Register*, Doc.62--9076, U.S. Department of the Interior, Washington, DC, 1962.
PL Order 2834	PL Order, "Alaska, Colorado, and Nevada: Correcting Certain Public Land Orders; Amending Public Land Order No. 2771 of September 6, 1962," *Federal Register*, Doc.62--12191, U.S. Department of the Interior, Washington, DC, 1992.
PL Order 3759	Public Land Order, "Withdrawal for Atomic Energy Commission," Bureau of Land Management, Department of Interior, *Federal Register*, August 27, 1965, page 9881.
58 FR 188	U.S. Fish and Wildlife Service, "Endangered and Threatened Wildlife and Plants; Review of Plant Taxa for Listing as Endangered or Threatened Species," *Federal Register*, Washington, DC, pp. 51144-51190, 1993.

| 59 F.R. 219 | U.S. Fish and Wildlife Service, "Endangered and Threatened Wildlife and Plants; Animal Candidate Review for Listing as Endangered or Threatened Species; Proposed Rule," *Federal Register*, Washington, DC, pp. 58982-59028, 1994.

61 FR 7596 U.S. Fish and Wildlife Service, "Endangered and Threatened Wildlife and Plants; Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species," *Federal Register*, Washington, DC, Vol. 61, No. 40, February 28, 1996.

DOE-STD-1020-94 DOE, "DOE Standard National Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities," Washington, DC, 1994.

16 USC 1531, 1973 16 USC 1531 et seq. (United States Code), "Endangered Species Act," Public Law, Washington, DC, 1973.

GENERAL

AEC, 1963 U.S. Atomic Energy Commission (AEC), *Case History: Project Shoal*, Nevada Operations Office, Las Vegas, NV, 1963.

AEC, 1970 AEC,*Site Disposal Report, Fallon Nuclear Test Site (Shoal), Churchill County Nevada*, NVO-73, Nevada Operations Office, Las Vegas, NV, 1970.

| AEC, 1972 | AEC, 1972, U.S. Atomic Energy Commission (AEC), *Draft Environmental Statement Underground Nuclear Testing Program Nevada Test Site*, WASH-1526, 1972.

| AEC, 1973a | AEC, 1973a, U.S. Atomic Energy Commission (AEC), *Environmental Statement Underground Nuclear Testing Program Nevada Test Site*, WASH-1526, 1973.

| AEC, 1973b AEC, *Planning Directive, Demobilization, Restoration and Monitoring Central Nevada Test Area*, NVO-90, Nevada Operations Office, Las Vegas, NV, 1973.

| AEC, 1973c AEC, *Radiation Contamination Clearance Report for Central Nevada Test Area*. NVO-294-10, Washington, DC, 1973.

Aerojet General, 1987 Aerojet-General Corporation, *Florida - Nevada. Land Exchange Environmental Report for Coyote Spring Valley*, pp. 70-75, Resource Concepts, Inc., Carson City, NV, 1987.

| Allen, 1988 | Allen, E.B., *The Reconstruction of Disturbed Arid Lands, An Ecological Approach.* AAAS Selected Symposia Series 109. Published by Westview Press, Inc. Boulder, CO for American Association for the Advancement of Science, Washington, DC, 1988.

| Angerer et al., 1994 Angerer, J.P., W.K. Ostler, W.D. Gabbert and B.W. Schultz, *Secondary Succession on Disturbed Sites at Yucca Mountain, Nevada.* EG&G Energy Measurements Topical Report, EGG 11265-1118 UC-702. Las Vegas, NV, 1994.

ANSI/ASME, 1983	American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME), "Quality Assurance Program Requirements for Nuclear Facilities," NQA-1-1983, NY, 1983.
Anderson et al., 1993	Anderson, J.G., J.N. Brune, D. dePolo, J. Gomberg, S.C. Harmsen, M.K. Savage, A.F. Sheehan, and K.D. Smith, "Preliminary Report: The Little Skull Mountain Earthquake, June 29, 1992," in *Proceedings of Symposium on Dynamic Analysis and Design Considerations for High-Level Nuclear Waste Repositories*, American Society of Civil Engineers, pp. 162-175, 1993.
Armstrong, 1968	Armstrong, R. L., "Sevier Orogenic Belt in Nevada and Utah," *Geological Society of America Bulletin*, Vol. 79, No. 4, pp. 429-458, 1968.
Avon and Durbin, 1994	Avon, L., and T.J. Durbin, *Hydrologic Evaluation of Recent Water - Level Decline at Devils Hole*, Report No. 2, Las Vegas Valley Water District, Las Vegas, NV, 1994.
BLM, 1979	Bureau of Land Management, *Final Environmental Impact Statement: Proposed Public Land Withdrawal: Nellis Air Force Bombing Range: Nye, Clark and Lincoln Counties, NV,* U.S. Department of Interior, Washington, DC, 1979.
BLM, 1980	Bureau of Land Management, *Visual Resource Management Program*, U.S. Department of Interior, Washington DC, 1980.
BLM, 1983	Bureau of Land Management, *Draft Lahontan Resource Management Plan and Environmental Impact Statement*, U.S. Department of Interior, Carson City, NV, 1983.
BLM, 1992	Bureau of Land Management, *Draft Stateline Resource Management Plan and Environmental Impact Statement,* U.S. Department of Interior, Las Vegas, NV, 1992.
BLM, 1993 BLM, 1994	Bureau of Land Management, *Draft Tonopah Resource Management Plan and Environmental Impact Statement*, U.S. Department of Interior, Las Vegas, NV, 1993.
Bard et al., 1981	Bard, J.C., C.I. Busby, and J.M. Findlay, *A Cultural Resources Overview of the Carson and Humboldt Sinks, Nevada*, Cultural Resource Series No. 2, Bureau of Land Management, Reno, NV, 1981.
Bates and Jackson, 1987	Bates, R.L., and J.A. Jackson, (eds.), *Glossary of Geology*, 3rd Edition, American Geological Institute, Alexandria, VA, 1987.
Bean and Vane, 1979	Bean, L.J., and S.B. Vane, *Allen-Warner Valley Energy System, Western Transmission System, Ethnographic and Historical Resources*, Cultural System Research, Inc., Menlo Park, CA, 1979.
Bean and Vane, 1982	Bean, L.J. and S.B. Vane, *The Ivanpah Generating Station Project Ethnographic (Native American) Resources*, Cultural Systems Research, Inc., Menlo Park, CA, 1982.

Beatley, 1974	Beatley, J.C., "Effects of Rainfall and Temperature on the Distribution and Behavior of *Larrea tridentata* (Creosote-bush) in the Mohave Desert of Nevada," *Ecology*, Vol. 55, pp. 245-261, 1974.
Beatley, 1975	Beatley, J.C.,"Climates and Vegetation Pattern Across the Mojave/Great Basin Desert Transition of Southern Nevada," *American Midland Naturalist*, Vol. 93, pp. 53-70, 1975.
Beatley, 1976	Beatley, J.C., *Vascular Plants of the Nevada Test Site and Central-Southern Nevada: Ecologic and Geographic Distributions*, TID-26881, National Technical Information Service, U.S. Department of Commerce, Springfield, VA, 1976.
Beck, 1993	Beck, C.M., *A Class III Cultural Resources Reconnaissance of Three Proposed Test Units for Soil Treatability Studies at the Project 57 Site, Area 13, Adjacent to the Nevada Test Site, Nye County, Nevada*, Cultural Resources Reconnaissance Short Report SR031493-1, Desert Research Institute, Las Vegas, NV, 1993.
Benjamin, 1995	Benjamin, T.M., 1995, Memorandum from T.M. Benjamin to M. Pankratz, "Selected NTS Underground Inventory Data," June 23, 1995.
Bergin and Roske, 1978	Bergin, K., and R. Roske, *Literature Overview Concerning Cultural Resources of the Nellis Bombing and Gunnery Ranges, Nye, Lincoln, and Clark Counties, Nevada*, Archaeological Research Center, Museum of Natural History, University of Nevada, Las Vegas, NV, 1978.
Bergin et. al. 1979	Bergin, K., C.S. Crownover, C. Stevens, R. Stockton, S. Vaughan, D. Jenkins, Dr. R. H. Brooks, D. Ferraro, A. Turner, L. Kirkberg, P. Olson, R. Maus, G. Stough, R. Scheuch, G. Tullis, T. Swearingen, K. Olson, and M. McMackin. *Final Report on the 1978 Archaeological Investigations of the Nellis Air Force Bombing and Gunnery Ranges Nye, Lincoln, and Clark Counties, Nevada or Siteseeing on the Range, A Compendium*, Archaeological Research Center, Museum of Natural History, University of Nevada, Las Vegas, NV, 1979.
Bergin et al., 1980	Bergin, K.B., E. Green, J.P. King, and R.H. Brooks, *A Stratified Random Sampling, Cultural Resource Inventory Within That Portion of the Overthrust Belt Located in the Virgin Valley Planning Unit, Clark County, Nevada*, Archaeological Research Center, Museum of Natural History, University of Nevada, Las Vegas, NV, 1980.
Blankenship, 1995	Blankenship, G., Planning Information Corporation, Memorandum from G. Blankenship to Felicia Bradfield regarding Amargosa Valley Community statistical information provided by personal communications to M. Houser from Bright, S.; Bright, R.; Copeland, B.; Fischel, J.; Jackson, B.M.; and Kyner, J.
Blomquist et al., 1992	Blomquist, K.W., C.A. Wills, W.K. Ostler, K.R. Rautenstrauch, and T.P. O'Farrell, *Distribution, Life History, Management, and Current Status of Astragalus Beatleyae on the U.S. Department of Energy's Nevada Test Site*, EGG 10617-2187, EG&G Energy Measurements, Santa Barbara Operations, Goleta, CA, 1992.

Blomquist et al., 1995	Blomquist, K.W., T. A. Lindemann, G.E. Lyon, D.C. Steen, C.A. Wills, S.A. Flick, and W. K. Ostler, *Current Distribution, Habitat, and Status of Category 2 Candidate Plant Species On and Near the U.S. Department of Energy's Nevada Test Site*, EG&G Energy Measurements, Las Vegas Area Operations, Las Vegas, NV, 1995.
Borg et al., 1976	Borg, I.Y., R. Stone, H.B. Levy, and L.D. Ramspott, *Information Pertinent to the Migration of Radionuclides in Ground Water at the Nevada Test Site, Part 1: Review and Analysis of Existing Information*, UCRL-52078 Pt. 1, Lawrence Livermore National Laboratory, Livermore, CA, 1976.
Bowen and Egami, 1983	Bowen, J.L., and R.T. Egami, *Atmospheric Overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada*, NVO-269, Nevada Operations Office, U.S. Department of Energy, Las Vegas, NV, 1983.
Bradley and Moor, 1975	Bradley, W.G., and K.S. Moor, "Ecological Studies of Small Vertebrates in Pu-Contaminated Study Areas of NTS and TTR," in *The Radioecology of Plutonium and other Transuranics in Desert Environments*, NVO-153, U.S. Energy Research and Development Administration, Nevada Operations Office, Las Vegas, NV, pp. 151-185, 1975.
Brattstrom and Bondello, 1983	Brattstrom, B.H., and M.C. Bondello,"Effects of Off-Road Vehicle Noise on Desert Vertebrates," *Environmental Effects of Off-Road Vehicles*, R.H. Webb and H.G. Wilshire, (eds.), Springer-Verlay, New York, pp. 170-171, 1983.
Brooks et al., 1975	Brooks, R. H., D. Olson, J. King, G. King, R. Leavitt, and P. Anderson, *Prehistoric and Historic Research Along the Navajo-McCullough Transmission Line Right-of-Way*, Nevada Archaeological Survey, University of Nevada, Las Vegas, NV, 1975.
Brooks et al., 1976	Brooks, R., D.O. Larson, and J. King, *An Archaeological Inventory Along Forty Miles of Proposed Fence Line Construction Along the North Boundary of the Nellis Air Force Range in Nye County, Nevada*, Archaeological Research Center, Museum of Natural History, University of Nevada, Las Vegas, NV, 1976.
Brooks et al., 1978	Brooks, R.H., R.R. Ellis, and R.D. Wilson, *An Archaeological Survey of Specified Areas Within Range 74, Nellis Air Force Base, Nevada*, Museum of Natural History, University of Nevada, Las Vegas, NV, 1978.
Bryant, 1992	Bryant, E.A., *The Cambric Migration Experiement, A Summary Report, LA-12335-MS*, Los Alamos National Laboratory, Los Alamos, NM 1992.
Bryant and Fabryka-Martin, 1991	Bryant, E. A., and J. Fabryka-Martin, *Survey of Hazardous Material Used in Nuclear Testing*, LA-12014-MS, Los Alamos National Laboratory, Los Alamos, NM, 1991.
Bunch, 1984	Bunch, J., *Three Material Pits Along SR 375 Between Rachel and Crystal Springs, Nevada*, Nevada Department of Transportation Cultural Resources Report, NDOT 041, 1984.

Buqo, 1996a	Buqo, T., Memorandum from T. Buqo to C. Stewart on USGS Water Level Data for Hydrographic Basins at the Tonopah Test Range, June 18, 1996.
Buqo, 1996b	Buqo, T., Memorandum from T. Buqo to C. Stewart on USGS Water Level Data for Coyote Spring Valley and Dry Lake Valley, June 5, 1996.
Buqo and Giampaoli, 1988	Buqo, T.S, and M.E. Giampaoli, *Hydrologic Study and Water Supply Evaluation, Searchlight, Nevada, Final Report*, Las Vegas Valley Water District, Las Vegas, NV, 1988.
Buqo et al., 1992	Buqo, T S, O. Drici, and D.B. Goings, *Hydrology and Steady State Ground-Water Model of Coyote Spring Valley, Clark and Lincoln Counties, Nevada*, Report No. 3, Las Vegas, NV, 1992.
Byers et al., 1976	Byers Jr., F.M., W.J. Carr, P.P. Orkild, W.D. Quinlivan, and K.A. Sargent, *Volcanic Suites and Related Cauldrons of the Timber Mountain-Oasis Valley Caldera Complex, Southern Nevada*, Professional Paper 919, U.S. Geological Survey, Washington, DC, 1976.
Byers et al., 1989	Byers Jr., F.M.,, W.J. Carr, and P.P. Orkild, "Volcanic Centers of Southwestern Nevada: Evolution of Understanding, 1960-1988," *Journal of Geophysical Research*, Vol. 94, No. B5, pp. 5908-5924, 1989.
Carr, 1974	Carr, W.J., *Summary of Tectonic and Structural Evidence for Stress Orientation at the Nevada Test Site*, USGS-OFR-74-176, Open-File Report, U.S. Geological Survey, Denver, CO, 1974.
Castetter and Hill, 1979	Castetter, R.C., and H.O. Hill,"Additions to the Birds of the Nevada Test Site," *Western Birds*, Vol. 10, pp. 221-223, 1979.
Chapman and Lyles, 1993	Chapman, J.B., and B.F. Lyles, *Groundwater Chemistry at the Nevada Test Site: Data and Preliminary Interpretations*, DOE/NV/10845-16, Desert Research Institute, Water Resources Center, Las Vegas, NV, 1993.
Chapman, 1994	Chapman, J.B., *Classification of Groundwater at the Nevada Test Site*, DOE/NV/10384-28, Water Resources Center, Desert Research Institute, Las Vegas, NV, 1994.
Chapman et al., 1994	Chapman, J.B., T.M. Mihevc, and B.F. Lyles, *The Application of Borehole Logging to Characterize the Hydrogeology of the Project Faultless Site, Central Nevada Test Area*, Publication #45119, DOE/NV 10845-35, Water Resources Center, Desert Research Institute, Las Vegas, NV, 1994.
Chapman et al., 1995	Chapman, J.B., K. Pohlman, and R. Andricevic, *Exposure Assessment of Groundwater Transport of Tritium from the Shoal Site*, Publication #45132, Desert Research Institute, Las Vegas, NV, 1995.
Christiansen and Lipman, 1972	Christiansen, R.L., and P.W. Lipman,"Cenozoic Volcanism and Plate-Tectonics Evolution of the Western United States; Part II, Late Cenozoic," *Philosophical Transactions of the Royal Society of London*, Ser. A, Vol. 271, pp. 249-284, 1972.

City of Las Vegas, 1993	City of Las Vegas, *Annual Budget Fiscal Year 1993-94*, Las Vegas, NV, 1993.
City of Las Vegas, 1994	City of Las Vegas, *Comprehensive Annual Financial Report for Year Ended June 30, 1994*, Las Vegas, NV, 1994.
City of North Las Vegas, 1994	*Comprehensive Annual Financial Report for Year Ended June 30, 1994*, North Las Vegas, NV, 1994.
Clark County, 1990a	Clark County, *Approved Apex Heavy Industrial Use Park Conceptual Master Plan and Environmental Assessment, Clark County*, Las Vegas, NV, 1990.
Clark County, 1990b	Clark County, *Comprehensive Annual Financial Report for Year Ended June 30, 1990*, Las Vegas, NV, 1990.
Clark County, 1994a	Clark County, *Comprehensive Annual Financial Report for Year Ended June 30, 1994*, Las Vegas, NV, 1994.
Clark County, 1994b	Clark County, *Clark County Final Budget 1994-1995*, Clark County, Las Vegas, NV, 1994.
Clark County School District, 1994a	Clark County School District, *Budget and Statistical Report, 1993-94*, Clark County, Las Vegas, NV, 1993-94.
Clark County School District, 1994b	Clark County School District, *Comprehensive Annual Financial Report for Fiscal Year Ended June 30, 1994*, Clark County, Las Vegas, NV, 1994.
Clary, et. Al., 1995	Clary, S.L., D.R. McClary, R. Whitney, and D.D. Reeves, *Water Resources Data Nevada, Water Year 1994*, U.S. Geological Survey Water-Data Report NV-94-1, 1995.
Clerico, 1978	Clerico, S., *Seismic Test Lines in Coal, Railroad, Spring, Sand Spring, Ruby, Long, and Steptoe Valley*, Archaeological Resources Short Report 4-281P, Nevada State Museum, Carson City, NV, 1978.
Cochrane, 1979	Cochrane, S., *Status of Endangered and Threatened Plant Species on Nevada Test Site—A Survey, Parts 1 and 2, Appendix C; Collection Records for the Taxa Considered*, EGG 1183-2356, EG&G Energy Measurements, Santa Barbara Operations, Goleta, CA, 1979.
Cohen and Everett, 1963	Cohen, P., and D.E. Everett, *A Brief Appraisal of the Groundwater Hydrology of the Dixie-Fairview Valley Area, Nevada*, Reconnaissance Series Report 23, Department of Conservation and Natural Resources, State of Nevada, Carson City, NV, 1963.
Cole et al., 1989	Cole, J.C., R.R. Wahl, and M.R. Hudson,"Structural Relations Within the Paleozoic Basement of the Mine Mountain Block; Implications for Interpretation of Gravity Data in Yucca Flat, Nevada Test Site," in *Proceedings from the Fifth Symposium on Containment of Underground Nuclear Explosions, held on September 19-21, 1989 at Santa Barbara, CA*, CONF-8909163, Vol. 2., pp. 431-456, 1989.

Cole et al., 1993	Cole, J.C., A.G. Harris, M.R. Lanphere, C.E. Barker, and R.G. Warren, "The Case for Pre-middle Cretaceous Extensional Faulting in Northern Yucca Flat, Southwestern Nevada," *Geological Society of America Abstracts with Programs*, Vol. 25, No. 5, p. 22, 1993.
Cooper, 1993	Cooper, K., letter dated June 2, 1993 from K. Cooper, Nevada Natural Heritage Program, Carson City, Nevada, to C. Wills, EG&G Energy Measurements, Las Vegas, NV, regarding sensitive plant and animal species in Churchill and Mineral counties and in Nye County above the 38° latitude Mark Project area, 1993.
Cooper, 1994	Cooper, K., letter dated December 8, 1994, from K. Cooper, Nevada Natural Heritage Program, Carson City, Nevada, to S. Blomquist, EG&G Energy Measurements, Las Vegas, NV, regarding sensitive plant and animal species on or near the Eldorado Valley project area, 1994.
Cox, et al., 1977	Cox, D.N., D.L. Stonemen, and T.S. Gibson, *Soil Inventory of Tonopah Management, Environmental Impact Area*, Prepared for Bureau of Land Management by Earth Environmental Consultats, Inc., Albuquerque, NM, 1977.
Crowe, 1993	Crowe, B.M., *Study Plan for Characterization of Volcanic Features*, LA-SP-8.3.1.8.5.1, Los Alamos National Laboratory, Los Alamos, NM, 1993.
Crowe et al, 1986	Crowe, B.M., K.H. Wohletz, D.T. Vaniman, E. Gladney, and N. Bower, *Status of Volcanic Hazard Studies for the Nevada Nuclear Waste Storage Investigations*, LA-9325-MS, Vol. II, Los Alamos National Laboratory, Los Alamos, NM, 1986.
Crownover, 1981	Crownover, C.S., *An Archaeological Survey of Targets and Support Facilities on the Nellis Air Force Bombing and Gunnery Ranges in Nye, Lincoln and Clark Counties, Nevada, Archaeological Research Center*, Museum of Natural History, University of Nevada, Las Vegas, NV, 1981.
D'Agnese, 1994	D'Agnese, F.A. *Using Geoscientific Information Systems for Three-Dimensional Modeling of Regional Ground-Water Flow Systems, Death Valley Region, Nevada and California.* Unpublished PhD. Dissertation, Colorado School of Mines, 1994.
DoD, 1982	U.S. Department of Defense (DoD), Memorandum of Understanding Between the Department of the Air Force Tactical Air Command Tactical Fighter Weapons Center and DOE/NV, DE-AI08-82NV10283, Las Vegas, NV, 1982.
DOE, 1986	DOE, *Environmental Assessment, Yucca Mountain Site, Nevada Research and Development Area, Nevada*, Volumes 1, 2, and 3, DOE/RW-0073, Office of Civilian Radioactive Waste Management, Washington, DC, 1986.
DOE, 1988	DOE, *Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada*, Volumes 1 and 2. DOE/RW-0199, Office of Civilian Radioactive Waste Management, Washington, DC, 1988.
DOE, 1990	DOE, "Environment and Safety Responsibility and Health Coordination," Nevada Test Site (NTS) Standard Operating Procedure (SOP) 5401, Nevada Operations Office, Las Vegas, NV, 1990.

| DOE, 1991 | DOE, "Safety and Fire Responsibilities," NTS SOP 5415, Washington, DC, 1991.

| DOE, 1992 | DOE, *Nevada Test Defense Waste Acceptance Criteria, Certification, and Transfer Requirements, NVO-325,* prepared by DOE/NV and Reynolds Electrical and Engineering Co., Inc., Waste Management Department, 1992.

DOE, 1993 DOE, "Management of Hazardous Materials and Hazardous Waste," NTS SOP 5409, Nevada Operations Office, Las Vegas, NV, 1993.

| DOE, 1994a | DOE, *Environmental Restoration Sites Inventory, 1994 Annual Status Report, Draft,* DOE/NV-UC700, Vols, I, II, III, and IV, Las Vegas, NV, 1994.

| DOE, 1994b | DOE, *Nevada Employee Survey Data Report, Executive Summary,* Yucca Mountain Site Characterization Project, Socioeconomic Monitoring Program, Washington, DC, 1994.

| DOE, 1995a DOE, *Environmental Assessment for Solid Waste Disposal,* Pre-Approval Draft, U.S. Department of Energy, Nevada Operations Office, Las Vegas, NV, 1995.

DOE, 1995b DOE, "Radiological Safety," NTS SOP 5402, Nevada Operations Office, Las Vegas, NV, 1995.

DOE, 1995c DOE, "Industrial Hygiene," NTS SOP 5410, Nevada Operations Office, Las Vegas, NV, 1995.

DOE, 1995d DOE, "Nuclear Criticality Safety," NTS SOP 5411, Nevada Operations Office, Las Vegas, NV, 1995.

DOE, 1995e DOE, "Explosive Safety," NTS SOP 5412, Nevada Operations Office, Las Vegas, NV, 1995.

DOE, 1995f | DOE, *Final Programmatic Environmental Imapact Statement for Tritium Supply and Recycling Volume I and II,* DOE/EIS-0161, U.S. Department of Energy, Office of Reconfiguration, Washington, DC, 1995.

| DOE, 1996 | DOE, *Environmental Assessment for Double Tracks Test Site Nevada Test Site, Nye County, Nevada,* DOE/EA-1136, U.S. Department of Energy, Las Vegas, NV, 1996.

DOE/AL, 1992 U.S. Department of Energy, Albuquerque Field Office (DOE/AL), *Environmental Monitoring Plan for the Tonopah Test Range, Nevada,* Albuquerque, NM, 1992.

DOE/NV, 1991 U.S. Department of Energy, Nevada Operations Office (DOE/NV), *Annual Site Environmental Report, 1990,* Vols. I and II, DOE/NV/10630-2, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1991.

DOE/NV, 1992a DOE/NV, *Environmental Assessment for the Groundwater Characterization Project, Nevada Test Site, Nye County, Nevada,* Las Vegas, NV, 1992.

DOE/NV, 1992b	U.S. Department of Energy, Nevada Field Office (DOE/NV), *Annual Site Environmental Report , 1991*, Vols. I and II, DOE/NV/10630-33, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1992.
DOE/NV, 1993	DOE/NV, *Annual Site Environmental Report - 1992, Vols. I and II*, DOE/NV/10630-66, Las Vegas, NV, 1993.
DOE/NV, 1994a	DOE/NV, *Nevada Test Site Annual Site Environmental Report*, 1993 DOE/NV/11432-123, Vols. I and II, Las Vegas, NV, 1994.
DOE/NV, 1994b	DOE/NV, *Nevada Solar Enterprise Zone Development Study*, prepared by Nevada Solar Enterprise Zone Task Force Work Group and DynCorp-Meridan, U.S. Department of Energy, Nevada Operations Office, Las Vegas, NV, 1994.
DOE/NV, 1995a	U.S. Department of Energy, Nevada Operations Office, *Underground Test Area Operable Unit Work Plan, Nevada Test Site, Nevada*, DOE/NV--389 UC-700, Las Vegas, NV, February 1995.
DOE/NV, 1995b	DOE/NV, *Nevada Test Site Annual Site Environmental Report , 1994, Vols. I and II*, DOE/NV/11432-175, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1995.
DOT, 1980	U.S. Department of Transportation, *Fundamentals and Abatement of Highway Traffic Noise Text Book and Training Course*, Document 2, Figure 10, Federal Highway Administration, Washington, DC, 1980.
DRI, 1988	Desert Research Institute (DRI), *CERCLA Preliminary Assessment of DOE's Nevada Operations Office Nuclear Weapons Testing Areas*, Volumes 1 and 2, Water Resources Center, Desert Research Institute, Las Vegas, NV, 1988.
DRI, 1990	DRI, *Branch Technical Procedures: Field Archaeology*, Desert Research Institute, Reno, NV, 1990.
Dahl, 1994	Dahl, R.S., Letter dated September 16, 1994 from R.S. Dahl, U.S. Department of Agriculture, Soil Conservation Service, Fallon, Nevada, to R. Deshler, IT Corporation, Las Vegas, NV, regarding soils information in Fallon, NV, 1994.
Dames and Moore, 1985	Dames and Moore, *Mead/McCullough Victorville/Adelanto Transmission Project*, Technical Report, Dames & Moore, San Diego, CA, 1985.
D'Azevedo, 1986	D'Azevedo, W.L., (eds), *Great Basin*, Volume II, Smithsonian Institution, Washington, DC, 1986.
Dinwiddie and Schroder, 1971	Dinwiddie, G.A., and L.J. Schroder, *Summary of Hydraulic Testing in and Chemical Analysis of Water Samples from Deep Exploratory Holes in Fish Lake, Monitor, Hot Creek, and Little Smokey Valleys, Nevada*, USGS-474-90, U.S. Geological Survey, Denver, CO, 1971.
Duckwater Shoshone Tribe, 1996	Personal Communication with Kim Townsend, 1996.

Dudley and Larson, 1976 — Dudley, W.W., Jr., and J.D. Larson, *Effect of Irrigation Pumping on Desert Pupfish Habitats in Ash Meadows, Nye County, Nevada*, U.S. Geological Survey Professional Paper 927, U.S. Government Printing Office, Washington, DC, 1976.

Duga, 1995 — Duga, S., Personal Communication from S. Duga, Pahrump Valley Volunteer Fire Department with Liz Shupp, IT Corporation, dated March 24, 1995 regarding facilities, equipment and personnel, and facsimile dated April 14, 1995 regarding additional information on facilities, equipment and personnel, Las Vegas, NV, 1995.

Dunaway and White, 1974 — Dunaway, P.B., and M.G. White (Eds), *The Dynamics of Plutonium in Desert Environments*, NVO-142, U.S. Energy Research and Development Administration, Nevada Operations Office, Las Vegas, NV, 1974.

EG&G/EM, 1991 — EG&G Energy Measurements (EG&G/EM), *The Distribution and Abundance of Desert Tortoises on the Nevada Test Site*, EGG 10617-2081, EG&G/EM, Santa Barbara Operations, Goleta, CA, 1991.

EG&G/EM, 1993a — EG&G/EM, *Reconnaissance Survey Report for Potential Ground Water Characterization Activities in Hot Creek Valley*, Survey Report LV93-GEL-7, EG&G/EM, Las Vegas, NV, 1993.

EG&G/EM, 1993b — EG&G/EM, *Reconnaissance Survey Report for Potential Ground Water Characterization Activities in Sand Springs Range*, Survey Report LV93-GEL-8, EG&G/EM, Las Vegas, NV, 1993.

EG&G/EM, 1993c — EG&G/EM, *Yucca Mountain Biological Resources Monitoring Program, Annual Report FY92*, EGG 10617-2195, EG&G/EM, Santa Barbara Operations, Goleta, CA, 1993.

EG&G/EM, 1993d — EG&G/EM, *Baseline Vegetation Contamination at Safety Test Sites on the Nevada Test Site and Tonopah Test Range,* Environmental Sciences Department Summary Report, EG&G/EM, Las Vegas, NV, 1993.

EG&G/EM, 1995 — EG&G/EM, *Preactivity and Reclamation Survey Reports for Five Tonopah Test Range Explosive Ordnance Disposal Sites*, Survey Report LV94-SRB-59, EG&G/EM, Las Vegas, NV, 1995.

EG&G/EM, 1995a — EG&G Energy Measurements, *Basic Environmental Compliance and Monitoring Program Fiscal Year 1995 Progress Report,* submitted to DOE/NV, September 21, 1995.

EG&G/EM, 1995b — EG&G Energy Measurements, *Yucca Mountain Biological Resources Monitoring Program, Progress Report January 1994-December 1994,* EG&G Topical Report EGG11265-1135 UC-808, EG&G/EM, Las Vegas, NV, 1995.

EPA, 1974 — U.S. Environmental Protection Agency (EPA), *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety,* EPA/550/9-74-004, Washington, DC, 1974.

EPA, 1992 — EPA,*Offsite Environmental Monitoring Report: Radiation Monitoring Around United States Nuclear Test Areas, Calendar Year 1991*, EPA 600/R-93/141, Environmental Monitoring Systems Laboratory, Las Vegas, NV, 1992.

ERDA, 1975 — U.S. Energy Research and Development Administration (ERDA), *Environmental Assessment, Tonopah Test Range*, Tonopah, Nevada, EIA/MA/76-2, Washington, DC, 1975.

ERDA, 1976 — Energy Research and Development administration (ERDA), *Preliminary Draft Environmental Statement, Nevada Tests Site, FY-78 and Beyond,* Department of Energy Nevada Operations Office, 1976.

ERDA, 1977 — U.S. Energy Research and Development Administration (ERDA), *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada*, ERDA-1551, Las Vegas, NV, 1977.

Eakin, 1964 — Eakin, T.E., *Ground-Water Appraisal of Coyote Spring and Kane Spring Valleys and Muddy River Springs Area, Lincoln and Clark Counties, Nevada*, Department of Conservation and Natural Resources, Ground-Water Resources-Reconnaissance Series Report 25, State of Nevada, Carson City, NV, 1964.

Edwards and Johnson, 1994 — Edwards, S. R., and W. G. Johnson, *A Status Report on the Hot Creek Archaeological Collection (Project Faultless Area, Nye County, Nevada)*, Desert Research Institute, Quaternary Sciences Center, Las Vegas, NV, 1994.

Ellis, 1979 — Ellis, R.R., *Final Report on the Archaeological Survey of Electronic Warfare Sites and Related Developments, Nellis Air Force Base Ranges*, Archaeological Research Center, Museum of Natural History, University of Nevada, Las Vegas, NV, 1979.

Engineering Science, 1990 — Engineering-Science, Inc., *Project Report of Air Quality Study at the Nevada Test Site, Mercury, Nevada*, PE192.05, Pasadena, CA, 1990.

Essington, 1987 — Essington, E.H., 1987, "Soil Radionuclide Distribution Studies for the Nevada Applied Ecology Group--1981," in: W.A. Howard and R.G. Fuller, Eds., U.S. Department of Energy, *The Dynamics of Transuranics and Other Radionuclides in natural Environments,* NVO-272, Las Vegas, NV, pp. 123-195, 1987.

Faunt, 1994 — Faunt, C.C., *Characterization of the Three-Dimensional Hydrogeologic Framework of the Death Valley Region, Nevada and California*, unpublished PhD. Dissertation, Colorado School of Mines, 1994.

Ferguson et al., 1994 — Ferguson, J.F., A.H. Cogbill, and R.G. Warren, "A Geophysical-Geological Transect of the Silent Canyon Caldera Complex, Pahute Mesa, Nevada," *Journal of Geophysical Research*, Vol. 99, No. B3, pp. 4323-4339, 1994.

Ferraro et al., 1975 — Ferraro, D., K. Bergin, and K. Olson, *Cultural Resources Located in the Proposed Seafarer Project Area, Nye County Nevada, Archaeological Research Center Report No. 5-6-1*, Archaeological Research Center, Museum of Natural History, University of Nevada, Las Vegas, NV, 1975.

Fiero and Illian 1969	Fiero, G.W., Jr. and J.R. Illian *Regional Hydrology Hot Creek Valley Flow System, Nye County, Nevada,* Report #44006. Water Resources Center, Desert Research Institute, Las Vegas, NV, 1969.
Fiero, 1968	Fiero, GW., Jr., *Regional Hydrology Hot Creek-Little Smoky Valley Flow System, Nye County, Nevada,* Report #44006, Water Resources Center, Desert Research Institute, Las Vegas, NV, 1968.
Fiero, 1986	Fiero, B., *Geology of the Great Basin, Reno,* University of Nevada Press, Reno, NV, 1986.
Fowler and Fowler, 1971	Fowler, C.S., and D.D. Fowler, "Notes on the History of the Southern Paiutes and Western Shoshones," *Utah Historical Quarterly,* Vol. 39, No. 2, pp. 95-113, Salt Lake City, UT, 1971.
Fowler and Liljeblad, 1986	Fowler, C.S., and S. Liljeblad, "Northern Paiute, In Great Basin," Warren L. D'Azevedo (ed.), *Handbook of North American Indians,* Vol. 11, Smithsonian Institution, Washington, DC, pp. 435-465, 1986.
Francis, 1973	Francis, C.W., "Plutonium Mobility in Soil and Uptake in Plants: A Review," *Journal of Environmental Quality,* pp. 67-70, 1973.
French et al., 1984	French, R.H., A. Elzeftawy, J. Bird, and B. Elliot, *Hydrology and Water Resources Overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada,* NVO-284, Desert Research Institute, Las Vegas, NV, 1984.
Frizzell and Schulters, 1990	Frizzell, Jr., V.A., and J. Schulters, *Geologic Map of the Nevada Test Site, Southern Nevada,* Miscellaneous Investigations Series Map I-2046, Scale 1:100,000, U.S. Geological Survey, Denver, CO, 1990.
Garcia et al., 1982	Garcia, J., K.H. Berry, and P.B. Schneider, "The Distribution and Relative Abundance of the Desert Tortoise (Gopherus Agassizii) in Coyote Spring Valley, Nevada, with a Discussion of Possible Impacts of the MX Project Development," *Proceedings of the Desert Tortoise Council Symposium,* 1982.
Gardner and Nork, 1970	Gardner, M.C., and W.E. Nork, *Evaluation of the Project Shoal Site, Fallon, NV, for Disposition, Including Identification of Restrictions,* NVO-1229-105, Part I, Palo Alto Laboratories, CA, 1970.
Garside et al., 1988	Garside, L.J., R.H. Hess, K.L. Fleming, and B.S. Weimer, *Oil and Gas Developments in Nevada,* Nevada Bureau of Mines and Geology Bulletin 104, University of Nevada, Reno, NV, 1988.
Giampaoli, 1986	Giampaoli, M.E., *Trip Report: Hydrologic Field Reconnaissance Led by Robert Coache, Water Resources Division,* April 24, 1986, M86-GEO-MEG-054, Science Applications International Corporation, Las Vegas, NV, 1986.

Gilbert, et al., 1988	Gilbert, R.O., J.H. Shinn, E.H. Essington, T. Tamura, E.M. Romney, K.S. Moor, and T.P. O'Farrell, "Radionuclide Transport from Soil to Air, Native Vegetation, Kangaroo Rats and Grazing Cattle on the Nevada Test Site," *Health Physics*, Vol. 55:869-887, 1988.
Giles and Cooper, 1985	Giles, K.R., and J. Cooper, *Characteristics and Migration Patterns of Mule Deer on the Nevada Test Site*, EPA/600/4-85-030, U.S. Environmental Protection Agency, Las Vegas, NV, 1985.
Glancy and Katzer, 1975	Glancy, P.A., and T.L. Katzer, *Water Resources Appraisal of the Carson River Basin, Western Nevada*, OFR-75-179, Open File Report, U.S. Geological Survey, Carson City, NV, 1975.
Glasstone, 1962	Glasstone, S. (ed.), *The Effects of Nuclear Weapons*, Revised Edition, U.S. Department of Defense, U.S. Atomic Energy Commission, Washington, DC, 1962.
Glasstone and Dolan, 1977	Glasstone, S., and P.J. Dolan, *The Effects of Nuclear* Weapons, Third Edition, U.S. Department of Defense and U.S. Department of Energy, Washington, DC, 1977.
Goishi et al., 1995	Goishi, W., B.K. Esser, J. W. Meadows, N. Naboodiri, D. K. Smith, J.F. Wild, S.M. Bowen, P.L. Baca, L.F. Olivas, C.G. Geoffrion, J. L. Thompson, C.M. Miller, *Total Radionuclide Inventory Associated with Underground Nuclear Tests Conducted at the Nevada Test Site, 1955-1992 (U)*, LA-CP-94-0222, Los Alamos National Laboratory, 1995.
Greger, 1994	Greger, P., "Status of Large Mammals and Birds on the Nevada Test Site in 1993," in *Status of the Flora and Fauna on the Nevada Test Site, 1993*, DOE/NV/11432-162, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, pp. 124-137, 1994.
Greger, 1995	Greger, P.D., "Status of Horses, Deer, and Birds on the Nevada Test Site, 1994", in *Status of the Flora and Fauna on the Nevada Test Site, 1994*, (R.B. Hunter, Compiler), DOE/NV11432-195, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1995.
Greger and Romney, 1994a	Greger, P.D., and E.M. Romney, "Status of Large Mammals and Birds on the Nevada Test Site, 1992," in *Status of the Flora and Fauna on the Nevada Test Site, 1992*, (R.B. Hunter, Compiler), DOE/NV11432-58, pp. 144-175, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV,1994.
Greger and Romney, 1994b	Greger, P.D., and E.M. Romney, "Trends in Wildlife Utilization of Water Sources and Adjacent Habitats at the Nevada Test Site 1989-91," in *Status of the Flora and Fauna on the Nevada Test Site, 1989-91*, (R.B. Hunter, Compiler), DOE/NV/11432-57, pp. 170-235, Reynolds Electrical & Engineering, Co., Inc., Las Vegas, NV, 1994.

Grow et al., 1994	Grow, J.S., C.A. Barker, and A.G. Harris, "Oil and Gas Exploration near Yucca Mountain, Southern Nevada, High-Level Radioactive Waste Management," in *Proceedings of the Fifth International Conference, Las Vegas, NV, May 11-16, 1994*, pp. 1298-1315, 1994.
Gustafson et al., 1993	Gustafson, D.L., S.E. Rawlinson, and J.J. Miller, *Summary of Natural Resources that Potentially Influence Human Intrusion at the Area 5 Radioactive Waste Management Site DOE/Nevada Test Site, Nye County, Nevada*, Raytheon Services Nevada, Las Vegas, NV, 1993.
Guth, 1981	Guth, P.L., "Tertiary Extension North of the Las Vegas Valley Shear Zone, Sheep and Desert Ranges, Clark County, Nevada," *Geological Society of America Bulletin*, Part I, Vol. 92, No. 10, pp. 763-771, 1981.
Guzowski and Newman, 1993	Guzowski, R.V., and G. Newman, *Preliminary Identification of Potentially Disruptive Scenarios at the Greater Confinement Disposal Facility, Area 5 of the Nevada Test Site*, SAND93-7100, Sandia National Laboratories, Albuquerque, NM, 1993.
Hakonson, 1975	Hakonson, T.E., "Environmental Pathways of Plutonium into Terrestrial Plants and Animals," *Health Physics*, pp. 583, 1975.
Hakonson and Nyhan, 1980	Hakonson, T.E. and J.W. Nyhan, "Ecological Relationships of Plutonium in Southwest Ecosystems," in *Transuranic Elements in the Environment*, W.C. Hanson, (ed.), U.S. Department of Energy TIC-22800, Washington, DC, pp. 403-419, 1980.
Hamilton, 1988	Hamilton, W.B., *Detachment Faulting in the Death Valley Region, California and Nevada, Geologic and Hydrologic Investigations of a Potential Nuclear Waste Disposal Site at Yucca Mountain, Southern Nevada*, M.D. Carr, and J.C. Yount (eds.), U.S. Geological Survey Bulletin 1790, U.S. Government Printing Office, Washington, DC, 1988.
Hanson, 1975	Hanson, W.C. " Ecological Considerations of the Behavior of Plutonium in the Environment," *Health Physics*, Vol 28:529-537, 1975.
Hardesty, 1982	Hardesty, D.L., "Overview of Historic Sites Research in the Carson City District," in *Cultural Resources Overview, Carson City District, West Central Nevada*, by L.S.A. Pendelton, A.R. McLane and D.H. Thomas, Cultural Resource Series No. 5, Bureau of Land Management, Reno, NV, pp. 139-193, 1982.
Harrill et al., 1988	Harrill, J.R., J.S. Gates, and J.M. Thomas, *Major Ground-Water Flow Systems in the Great Basin Region of Nevada, Utah and Adjacent States*, Hydrological Investigations Atlas HA-694-C Scale 1:1,000,000, U.S. Geological Survey, Denver, CO, 1988.
Harry Reid Center for Environmental Studies and Professional Analysis, Inc., 1994	Harry Reid Center for Environmental Studies and Progessional Analysis, Inc., *Preliminary Assessment of Geothermal Potential, Nevada Test Site, Nye County, Nevada*, Prepared for: U.S. Department of Energy, Las Vegas, NV, December 1994.

Harris et al., 1980	Harris, A.G., B.R. Wardlaw, C.C. Rust, and G.K. Merril, *Maps for Assessing Thermal Maturity Conodont Color Alteration Index Maps, in Ordovician through Triassic Rocks in Nevada, Utah and Adjacent parts of Idaho and California*, Miscellaneous Investigations Series Map I-1249, U.S. Geological Survey, Denver, CO., 1980.
Hawkins and Kunkle, 1996a	Personal communication from W.L. Hawkins and T.D. Kunkle to R. Papazian dated January 19, 1996, the subject of cavity collapse and the subsequent overburden subsidence, Los Alamos, NM, 1996.
Hawkins and Kunkle, 1996b	Memorandum from Hawkins, W.L. and T.D. Kunkle to R. Papazian on Cavity Collapse and Overburden Subsidence, January 12, 1996.
Hayward et al., 1963	Hayward, C.L., M.L. Killpack, and G.L. Richards, "Birds of the Nevada Test Site," *Brigham Young University Science Bulletin*, Biological Series, Vol. III, No. 1, Provo, UT, 1963.
Hess and Davis, 1995	Hess, R., and D. Davis, *Oil and Gas Wells Drilled in Nevada Since 1986*, Nevada Bureau of Mines, Reno, NV, 1995.
Ho et al., 1986	Ho, D.M., R.L. Sayre, C.L. Wu, *Suitability of Natural Soils for Foundations for Surface Facilities at the Prospective Yucca Mountain Nuclear Waste Repository*, Bechtel National, Inc., SAND 85-7107, San Francisco, CA, for Sandia Laboratories, Albuquerque, NM, 1986.
Hodges and Walker, 1992	Hodges, K.V., and J.D. Walker, "Extension of the Cretaceous Sevier Orogen, North America Cordillera," *Geological Society of America*, Vol. 104, pp. 560-569, 1992.
Houser, 1968	Houser, F.N., "Application of Geology to Underground Nuclear Testing, Nevada Test Site," Memoir 110, *The Geological Society of America, Inc.*, Boulder, CO, pp. 21-34, 1968.
Howard and Fuller, 1987	Howard, W.A., and R.G. Fuller (eds), *The Dynamics of Transuranics and Other Radionuclides in Natural Environments*, NVO-272, U.S. Department of Energy, Nevada Operations Office, Las Vegas, NV, 1987.
Howard, et al., 1985	Howard, W.A., P.B. Dunaway, and R.G. Fuller (eds), *The Radioecology of Transuranics and Other Radionuclides in Desert Ecosystems*, NVO-224, U.S. Department of Energy, Nevada Operations Office, Las Vegas, NV, 1985.
Humphrey, 1945	Humphrey, F.L., "Geology of the Groom District, Lincoln County, Nevada," *University of Nevada Bulletin 42*, Nevada State Bureau of Mines, Reno, NV, 1945.
Hunt, 1974	Hunt, C.B., *Natural Regions of the United States and Canada*, W. H. Freeman & Co., San Francisco, CA, 1974.

Hunter, 1992a	Hunter, R.B. (Compiler), "Status of Desert Ephemerals on the Nevada Test Site in 1988," in *Status of the Flora and Fauna on the Nevada Test Site, 1988*, DOE/NV/10630-29, Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV, Section 2, pp. 9-58, 1992.
Hunter, 1992b	Hunter, R.B. (compiler), *Status of the Flora and Fauna on the Nevada Test Site, 1988*, DOE/NV 10630-29, Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV, 1992.
Hunter, 1994a	Hunter, R.B. (compiler), "Trends in Perennial Plant Population on the Nevada Test Site, 1989-1991," in *Status of the Flora and Fauna on the Nevada Test Site, 1989-1991*, DOE/NV/11432-57, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, pp. 236-333, 1994.
Hunter, 1994b	Hunter, R.B. (compiler), *Status of the Flora and Fauna on the Nevada Test Site, 1989-1991*, DOE/NV11432-57, Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV, 1994.
Hunter, 1994c	Hunter, R.B. (compiler), *Status of the Flora and Fauna on the Nevada Test Site, 1992*, DOE/NV11432-58, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1994.
Hunter, 1995	Hunter, R.B. (compiler), *Status of the Flora and Fauna on the Nevada Test Site, 1994*, DOE/NV 11432-195, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1995.
ICBO, 1991	International Conference of Building Officials (ICBO), *Uniform Building Code*, Whittier, CA, 1991.
ICMA, 1982	International City Management Association (ICMA), Local Government Police Management, Second Edition, B.L. Garmire, (ed), Washington, DC, 1982.
Jamison, 1995	Jamison, A., Personal communication dated March 24, 1995, from A. Jamison, Tonopah Volunteer Fire Department, Tonopah, Nevada, with Liz Shupp, IT Corporation, Las Vegas, NV, regarding facilities, equipment, and personnel, 1995.
Jenkins, 1978	Jenkins, D.L., " Project 57 Cultural Resources," *UNLV Report 5-19-2*, Archaeological Research Center, Museum of Natural History, University of Nevada, Las Vegas, NV, 1978.
Kartesz, 1988	Kartesz, J.T., *Flora of Nevada*, Ph.D Dissertation, University of Michigan, Ann Arbor, MI, 1988.
Keller, 1995	Keller, J., Letter dated May 15, 1995 from J. Keller, Las Vegas Metropolitan Police Department, Las Vegas, Nevada, to Felicia Bradfield, Tetra Tech, Inc., San Bernadino, California, regarding consolidation of Clark County Sheriff's Office and Las Vegas Police Department, 1995.

Kelly and Fowler, 1986	Kelly, I.T., and C.S. Fowler, "Southern Paiute," in *Handbook of North American Indians: Great Basin*, Warren L. D'Azevedo ed., pp. 368-397, Smithsonian Institution, Washington, DC, Vol. 11, 1986.
Kelly et al., 1990	Kelly, M.S., J.H. Cleland, K.L. Hull, A.J. MacDougall, and P. Friedman, *Kern River Pipeline Cultural Resource Survey Report: Nevada*, Dames & Moore, San Diego, CA, 1990.
King, 1995	King, R. Personal communication dated April 14, 1995 from R. King, Clark County Fire Department, Las Vegas, NV, to Linda Cardenas, IT Corp., regarding information on emergency public services, 1995.
Kleinhampl and Ziony, 1984	Kleinhampl, F.J., and J.I. Ziony, *Mineral Resources of Northern Nye County, Nevada*, Nevada Bureau of Mines and Geology Bulletin 99B, University of Nevada, Reno, NV, 1984.
Knight and Smith, 1996	Knight, T. and F. Smith, *An Inventory for Rare, Threatened, Endangered, and Endemic Plants and Unique Communities on Nellis Air Force Bombing and Gunnery Range, Clark, Lincoln, and Nye Counties, Nevada, Volume III.* U.S. Department of Defense, Department of the Air Force, Nellis Air Force Bombing and Gunnery Range, Support Agreement EB4852-94200-071, 1996.
Laczniak et al., 1996	Laczniak, R.L., J.C. Cole, D.A. Sawyer, and D.A. Trudeau, *Hydrogeologic Controls on the Movement of Ground Water at the Nevada Test site, Nye County, Nevada -- A Summary Description for Environmental Restoration,* Draft USGS Open-File Report 92-4109, U.S. Geological Survey, Las Vegas, NV, 1996
Laird, 1976	Laird, C., *The Chemehuevis*, Malki Museum Press, Banning, CA, 1976.
Las Vegas Review-Journal, 1993	Las Vegas Review-Journal, *Las Vegas Perspective*, Nevada Development Authority, Las Vegas, NV, 1993.
Las Vegas Review-Journal, 1994	Las Vegas Review-Journal, *Las Vegas Perspective*, Las Vegas Review-Journal, Nevada Development Authority, First Interstate Bank of Nevada, Las Vegas, NV, 1994.
Lawson, 1995	Lawson, R., Personal communication dated April 17, 1995, from R. Lawson, Project Officer, City of Las Vegas Department of Fire Services, Las Vegas, Nevada, to Linda Cardenas, IT Corp., Las Vegas, Nevada, regarding information on facilities, equipment, and personnel, 1995.
Longwell et al., 1965	Longwell, C.R., E.H. Pampeyan, B. Bowyer, and R.J. Roberts, "Geology and Mineral Deposits of Clark County, Nevada," *Nevada Bureau of Mines & Geology Bulletin 62,* University of Nevada, Reno, NV, 1965.
Lyles, 1993	Lyles, B.F., *Tritium Activities in Selected Wells on the Nevada Test Site*, DOE/NV/10845-20, Water Resources Center, Desert Research Institute, Las Vegas, NV, 1993.

Lyons and Towler, 1995	Lyons, M. and P. Towler, Personal communication dated May 8, 1995, from M. Lyons and P. Towler, State Board of Medical Examiners, Las Vegas and Reno, NV, to Felicia Bradfield, Tetra Tech, Inc., San Bernardino, CA, regarding physicians and registered nurses in Clark and Nye counties, NV, 1995.
McArthur, 1991	McArthur, R.D., *Radionuclides in Surface Soil at the Nevada Test Site*, DOE/NV/10845-02, U.S. Department of Energy, Las Vegas, NV, 1991.
McArthur and Mead, 1989	McArthur, R.D., and S.W. Mead, *Nevada Test Site Radionuclide Inventory and Distribution Program, Report 5*, DOE/NV/10384-26, U.S. Department of Energy, Las Vegas, NV, 1989.
McLane, 1993	McLane, A.R., *An Annotated Petroglyph and Pictograph Bibliography of Nevada and the Great Basin,* Quarternary Sciences Center Occasional Paper No. 1, Social Sciences Center, Desert Research Institute, Reno, NV, 1993.
Marchand, 1995	Marchand, R., Personal communication dated March 24, 1995 from R. Marchand, Training Chief, City of North Las Vegas Fire Department, North Las Vegas, NV, to Liz Shupp, IT Corp., and letter dated April 18, 1995 to Linda Cardenas, IT Corp., Las Vegas, NV, regarding additional information on facilities, equipment, and personnel, 1995.
Medica, 1990	Medica, P.A., "Noteworthy Mammal Distribution Records for the Nevada Test Site," *Great Basin Naturalist*, Vol. 50, pp. 83-84, 1990.
Medica et al., 1990	Medica, P.A., O.L. Haworth, and M.S. Kelly, "Geographic Distribution, Eumeces gilberti rubricaudatus," *Herpetological Review*, Vol. 21, p. 40, 1990.
Mendoza, 1995a	Mendoza, C.H., Letter dated February 7, 1995 from C.H. Mendoza, U.S. Fish and Wildlife Service, Reno, NV, to Donald Elle, U.S. Department of Energy, Las Vegas, NV, regarding verification of species list for Nevada Test Site, File No. 1-5-94-SP-110, 1995.
Mendoza, 1995b	Mendoza, C.H., Letter dated February 2, 1995 from C.H. Mendoza, U.S. Fish and Wildlife Service, Reno, NV, to Don Elle, U.S. Department of Energy, Las Vegas, NV, regarding verification of species list for the Tonopah Test Range, File No. 1-5-94-SP-240, 1995.
Miller et al., 1994a	Miller, J.J., D.L. Gustafson, and S.E. Rawlinson, *Flood Assessment at the Area 5 proposed Hazardous Waste Storage Unit, DOE/Nevada Test Site, Nye County, Nevada*, Raytheon Services Nevada, Las Vegas, NV, 1994.
Miller et al., 1994b	Miller, J.J., D.L. Gustafson, and S.E. Rawlinson, *Flood Assessment at the Area 5 RWMS: 25-year and 500-year Discharges, DOE/Nevada Test Site, Nye County, Nevada*, Raytheon Services Nevada, Las Vegas, NV, 1994.
Miller et al., 1994c	Miller, J.J., D.L. Gustafson, and S.E. Rawlinson, *Flood Assessment at the Area 6 Proposed Liquid Waste Treatment System, DOE/Nevada Test Site, Nye County, Nevada*, Raytheon Services Nevada, Las Vegas, NV, 1994.

Minor et al., 1993 — Minor, S.A., D.A. Sawyer, R.R. Wahl, V.A. Frizzell, Jr., S.P. Schilling, R.G. Warren, P.P. Orkild, J.A. Coe, M.R. Hudson, R.J. Fleck, M.A. Lamphere, W. C. Swadley, and J.C. Cole, *Preliminary Geological Map of the Pahute Mesa 30' x 60' Quadrangle, Nevada*, OFR-93-299, Open File Report, U.S. Geological Survey, Denver, CO, 1993.

Moore, 1961 — Moore, J.E., *Records of Wells, Test Holes, and Springs in the Nevada Test Site and Surrounding Area*, USGS-TEI-781, Trace Elements Investigations Report, U.S. Geological Survey, 1961.

Moor and Bradley, 1974 — Moor, K.S., and W.G. Bradley, "Ecological Studies of Vertebrates in Plutonium Contaminated Areas of the Nevada Test Site," in *The Dynamics of Plutonium in Desert Environments: Nevada Applied Ecology Group Progress Report as of January 1974*, NVO-142, pp. 187-212, U.S. Atomic Energy Commission, Nevada Operations Office, Las Vegas, NV, 1974.

Myhrer, et al., 1990 — Myhrer, K., W.S. White, and S.D. Rolf, *Archaeology of the Old Spanish Trail/Mormon Road from Las Vegas, Nevada to the California Border*, Technical Report 17, Bureau of Land Management, Las Vegas, NV, 1990.

NAC, 1992 — Nevada Administrative Code (NAC), "Sanitation: Facilities for the Management of Hazardous Waste," Section 444.8456, Bureau of National Affairs, Washington, DC, 1992.

NAC, 1994 — NAC, *Classification and Taking of Wildlife and Protection and Preservation of Timbered Lands, Trees, and Flora*, Sections 503.010-503.080 and 527.010, Carson City, NV, 1994.

NAC, 1995 — NAC, "Standards of Quality for Ambient Air," Section 445B.391, Bureau of National Affairs, Carson City, NV, 1995.

NDCNR, 1988a — Nevada Department of Conservation and Natural Resources (NDCNR), "Air Quality Operating Permit, No. 1583," issued to the Department of Energy, Nevada Operations Office, Las Vegas, NV, 1988.

NDCNR, 1988b — NDCNR, "Air Quality Operating Permit, No. 1584," issued to the Department of Energy, Nevada Operations Office, Las Vegas, NV, 1988.

NDCNR, 1988c — NDCNR, "Air Quality Operating Permit, No. 1585," issued to the Department of Energy, Nevada Operations Office, Las Vegas, NV, 1988.

NDCNR, 1989a — NDCNR, "Air Quality Operation Permit, No. 1978," issued to the Department of Energy, Nevada Operations Office, Las Vegas, NV, 1989.

NDCNR, 1989b — NDCNR, "Air Quality Operating Permit, No. 1973," issued to the Department of Energy, Nevada Operations Office, Las Vegas, NV, 1989.

NDCNR, 1990 — NDCNR, "Air Quality Operation Permit, No. 2154," issued to the Department of Energy, Nevada Operations Office, Las Vegas, NV 8990.

NEEDA, 1993b	Nye/Esmeralda Economic Development Authority (NEEDA), *Draft Nye County Overall Economic Development Plan, Appendix I, Beatty Background Information, Appendix J, Pahrump Background Information, Appendix K, Tonopah Background Information*, NV-ECO-0476, Nye County, NV, 1993.
NEEDA, 1995	Nye/Esmeralda Economic Development Authority, *Nye County Overall Economic Development Plan, Draft*, Nye County, NV, July 23, 1993.
NDOT, 1987	Nevada Department of Transportation (NDOT), *Nevada Airport System Plan*, Carson City, NV, 1987.
NDOT, 1993a	NDOT, *1993 Annual Traffic Report, Planning and Program Development, Traffic Section in Cooperation with the U.S. Department of Transportation*, Federal Highway Administration, Carson City, NV, 1993.
NDOT, 1993b	NDOT, *Nevada Traffic Accidents, 1993.* Nevada Department of Transportation Safety, Engineering Division in Cooperation with the Nevada Department of Motor Vehicles and the U.S. Department of Transportation, Federal Highway Administration, Carson City, NV, 1993.
NDOT, 1995	NDOT, *Phase I and II, Nevada State Airport System Plan*, State of Nevada, Carson City, NV, 1995.
NFPA, 1986	National Fire Protection Association (NFPA), *Fire Protection Handbook Sixteenth Edition*, A.E. Cote, P.E and L.J. Linville, (eds), Quincy, MA, 1986.
NOAA, 1991	National Oceanic and Atmospheric Administration (NOAA), "Local Climatological Data-Annual," *Summaries for 1990, Part IV - Western Region*, U.S. Department of Commerce, Washington, DC, 1991.
Nevada Power Company, 1975	Nevada Power Company, *Environmental Assessment, Allen-Warner Valley Energy System, Volume III Harry Allen Station*, Nevada Power Company, Las Vegas, NV, 1975.
Nimz and Thompson, 1992	Nimz, G.J. and J.L. Thompson, *Underground Radionuclide Migration at the Nevada Test Site*, DOE/NV-346, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1992.
Nye County, 1994	Nye County, *Comprehensive Annual Financial Report for Year Ended June 30, 1994*, Tonopah, NV, 1994.
Nye County Board of Commissioners, 1993	Nye County Board of Commissioners, *Draft Baseline Economic and Demographic Projections: 1990-2010, Nye County and Nye County Communities*, Nye County, NV, 1993.
Nye County Board of Commissioners, 1994	Nye County Board of Commissioners, *Nye County Comprehensive Plan*, Nye County, NV, 1994.
Nye County School District, 1993	Nye County School District, *Final Budget, 1993-94 Budget Year*, Tonopah, NV, 1993.

Nye County School District, 1994	Nye County School District, *Report on Financial Statements and Supplemental Material for Year Ended June 30, 1994*, Tonopah, NV, 1994.
O'Farrell and Emery, 1976	O'Farrell, T.P., and L.A. Emery, *Ecology of the Nevada Test Site: A Narrative Summary and Annotated Bibliography*, DOE/NVO-167, Desert Research Institute, Boulder City, NV, 1976.
OTA, 1989	Office of Technology Assessment (OTA), *The Containment of Underground Nuclear Explosions*, OTA-ISC-414, U.S. Congress, Washington, DC, 1989.
Paher, 1971	Paher, S.W., *Las Vegas: As It Began - As It Grew*, Nevada Publications, Las Vegas, NV, 1971.
Pahrump, 1994	Pahrump, *Report on Financial Statements and Supplemental Material for Year Ended June 30, 1994*, Pahrump, NV, 1994.
PAL, 1995	PAL Consultants, Inc., A Conceptual Model of the Death Valley Ground-Water Flow System, Nevada and California: Prepared for U.S. Department of Interior, National Park Service, 1995.
Pearl, 1994	Pearl, R., Personal communication dated October 21, 1994, from R. Pearl, U.S. Department of Energy, Las Vegas, NV, to Beth Moore, GeoTrans, Inc., Las Vegas, NV, regarding summary water well information and water chemistry data for 1993, for Nevada Test Site wells, 1994.
Pippin, 1984	Pippin, L.C. (ed.), *Limited Test Excavations at Selected Archaeological Sites in the NNWSI Yucca Mountain Project Area, Southern Nye County, Nevada*, Social Sciences Technical Report No. 40, University of Nevada System, Desert Research Institute, Las Vegas, NV, 1984.
Pippin, 1986	Pippin, L.C., *An Overview of Cultural Resources on Pahute and Rainier Mesas on the Nevada Test Site, Nye County, Nevada*, University of Nevada System, Technical Report Series No. 45, University of Nevada, Reno, NV, 1986.
Pippin, 1992	Pippin, L.C., *Long Range Study Plan For Negating Potential Adverse Effects to Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site*, Quarternary Sciences Center, Desert Research Institute, Reno, NV, 1992.
Poole and Sandberg, 1991	Poole, F.G., and C.A. Sandberg, "Mississippian Paleography and Conodont Biostratigraphy of the Western United States," in *Paleozoic, Paleogeography of the Western United States-II: Pacific Section, Society of Economic Paleontologists and Mineralogists*, J.D. Cooper, and C.H. Stephens, (eds.), Vol. 67, pp. 107-136, 1991.
Price, 1973	Price, K.R. "A Review of Transuranic Elements in Soils, Plants and Animals," *Journal of Environmental Quality*, pp. 62-66, 1973.
Quade and Tingley, 1983	Quade, J., and J.V. Tingley, *A Mineral Inventory of the Nevada Test Site, and Portions of Nellis Bombing and Gunnery Range, Southern Nye County, Nevada*, DOE/NV/10295-1, U.S. Department of Energy, Nevada Operations Office, Las Vegas, NV, 1983.

Quiring, 1968	Quiring, R.F., *Climatological Data, Nevada Test Site and Nuclear Rocket Development Station*, ESSA Technical Memorandum ARL-7, Environmental Sciences Service Administration, U.S. Department of Commerce, Las Vegas, NV, 1968.
Rafferty, 1991	Rafferty, K., *A Cultural Resource Inventory of a 14 Mile Long Powerline Right-of-Way in the Eldorado Valley, Clark County, Nevada*, Archaeological Research of Southern Nevada, Las Vegas, NV, 1991.
Rafferty and Blair, 1986	Rafferty, K., and L. Blair, *A Cultural Resource Inventory of the Proposed Utah Tie Line System in Clark and Lincoln Counties, Nevada*, Division of Anthropological Studies, Environmental Research Center, University of Nevada, Las Vegas, NV, 1986.
Ramsdell and Andrews, 1986	Ramsdell, J.V., and G.L. Andrews, *Tornado Climatology of the Contiguous United States*, NUREG/CR-4461, U.S. Nuclear Regulatory Commission, Washington, DC, 1986.
Rautenstrauch et al., 1994	Rautenstrauch, K.R., G.A. Brown, and R.G. Goodwin, *The Northern Boundary of the Desert Tortoise Range on the Nevada Test Site*, EGG 11265-1103, EG&G Energy Measurements, Las Vegas, NV, 1994.
REECo, 1991	Reynolds Electrical & Engineering Co., Inc. (REECo), *Environmental Monitoring Plan Nevada Test Site and Support Facilities, Volumes I and II*, DOE/NV/10630-28, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1991.
REECo, 1992	REECo, *Contaminated Areas Report*, Reynolds Electrical & Engineering, Co.,Inc., Las Vegas, NV, 1992.
Redmond, 1995	Redmond, R., Letter dated April 28, 1995 from R. Redmond, Nye County Sheriff's Office, Pahrump Substation, Pahrump, NV, to Liz Shupp, IT Corp., Las Vegas, NV, regarding detention capacity, 1995.
Reed, 1995	Reed, D., Personal communication dated April 18, 1995 from D. Reed, Budget Management Analyst, Las Vegas Metropolitan Police Department, Las Vegas, NV, to Liz Shupp, IT Corp., Las Vegas, NV, regarding facilities, equipment, and personnel, 1995.
Reno and Pippin, 1985	Reno, R.L., and L.C. Pippin, *An Archaeological Reconnaissance of Yucca Flat, Nye County, Nevada*, Technical Report No. 35, pp. 99-110, Desert Research Institute, Las Vegas, NV, 1985.
Reno and Pippin, 1986	Reno, R.L., and L.C. Pippin, *An Archaeological Reconnaissance of the Groom Range, Lincoln County, Nevada*, Technical Report No. 46, Desert Research Institute, Reno, NV, 1986.

Rhoads, 1974	Rhoads, W.A.,"Analysis of Vegetation Cover in Certain Pu-contaminated Areas Using Aerial Photography," in *The Dynamics of Plutonium in Desert Environments: Nevada Applied Ecology Group Progress Report as of January 1974*, NVO-142, pp. 119-129, U.S. Atomic Energy Commission, Nevada Operations Office, Las Vegas, NV, 1974.
Rhoads and Williams, 1977	Rhoads, W.A., and M.P. Williams, *Status of Endangered and Threatened Plant Species on Nevada Test Site - a Survey, Part 1: Endangered Species*, EGG 1183-2356, EG&G Energy Measurements, Santa Barbara Operations, Goleta, CA, 1977.
Rhoads et al., 1978	Rhoads, W.A., S.A. Cochrane, and M.P. Williams, *Status of Endangered and Threatened Plant Species on Nevada Test Site - a Survey, Part 2: Threatened Species*, EGG 1183-2356, EG&G Energy Measurements, Santa Barbara Operations, Goleta, CA, 1978.
Rhoads et al., 1979a	Rhoads, W.A., S.A. Cochrane, and M.P. Williams, *Addendum to Status of Endangered and Threatened Plant Species on Nevada Test Site - a Survey, Parts 1 and 2*, EGG 1183-2356, EG&G Energy Measurements, Santa Barbara Operations, Goleta, CA, 1979.
Rhoads et al., 1979b	Rhoads, W.A., S.A. Cochrane, and M.P. Williams, *Status of Endangered and Threatened Plant Species on the Tonopah Test Range - a Survey*, EGG 1183-2387, EG&G Energy Measurements, Santa Barbara Operations, Goleta, CA, 1979.
Richards, 1995	Richards, D., Letter dated March 28, 1995 from D. Richards, Nye County Sheriff's Office, Pahrump, Nevada to Liz Shupp, IT Corp., Las Vegas, NV, regarding facilities, equipment and personnel, 1995.
Rogers et al., 1987	Rogers, A.M., S.C. Harmsen, and M.E. Meremonte, *Evaluation of the Seismicity of the Southern Great Basin and Its Relationship to the Tectonic Framework of the Region,* USGS-OFR-87-408, draft, Open-File Report, U.S. Geological Survey, Denver, CO, 1987.
Rogers et al., 1991	Rogers, A.R., C. Harmsen, E.J. Corbett, K. Priestly, and D. de Polo, *The Seismicity of Nevada and Some Adjacent Parts of the Great Basin*, Geological Society of America, 1991.
Rogers, 1939	Rogers, M.J., *Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas,* San Diego Museum Papers Number 3, San Diego, CA, 1939.
Romney et al., 1973	Romney, E.M., V.Q. Vale, A. Wallace, O.R. Lunt, J.D. Childress, H. Kaaz, and G.V. Alexander, *Some Characteristics of Soil and Perennial Vegetation in Northern Mojave Desert Areas of the Nevada Test Site*, U.S. Atomic Energy Commission, 1973.

| Romney et al., 1975 | Romney, W.M., A. Wallace, R.O. Gilbert, and J.E. Kinnear, "239-240 Pu and 241 Am Contamination of Vegetation in Aged Plutonium Fallout Areas," in *The Radioecology of Plutonium and Other Transuranics in Desert Environments*, NVO-153: 43-88, U.S. Department of Energy, Las Vegas, NV, 1975.

| Romney, 1977 | Romney, E.M., "Plutonium Contamination of Vegetation in Dusty Field Environments," in *Transuranics in Natural Environments*, M.G. White and P.B. Dunaway, (eds), U.S. Atomic Energy Commission, NVO-178:287-302, Washington, DC, 1977.

RSN, 1994 — Raytheon Services Nevada (RSN), *FY 1994, Nevada Test Site Technical Site Information, Vol I and II*, prepared by Raytheon Services Nevada, U.S. Department of Energy, Nevada Operations Office, Las Vegas, NV, 1994.

Ruffner, 1980 — Ruffner, J.A., *Climate of the States*, Volume 1, 2nd Edition, Gale Research Company, Detroit, MI, 1980.

Rush, 1968 — Rush, F.E., *Water - Resources Appraisal of the Lower Moapa - Lake Mead Area, Clark County, Nevada*, Water Resources - Reconnaissance Series, Report No. 50, State of Nevada, Department of Conservation and Natural Resources, Carson City, NV, 1968.

Rush, 1970 — Rush, F.E., *Regional Ground-Water Systems in the Nevada Test Site area, Nye, Lincoln, and Clark Counties, Nevada*, Water Resources - Reconnaissance Series, Report No. 54, State of Nevada, Department of Conservation and Natural Resources, Carson City, NV, 1970.

Rush and Everett, 1966 — Rush, F.E. and D.E. Everett, *Water - Resources Appraisal of the Huntington Valley Area, Elko and White Pine Counties, Nevada*, Department of Conservation and Natural Resources, Water Resources - Reconnaissance Series Report 35, State of Nevada, Carson City, NV, 1966.

Rush and Huxel, 1966 — Rush, F.E., and C.J. Huxel, Jr., *Ground-Water Appraisal of the Eldorado - Pahute Valley Area, Nevada and California*, Department of Conservation and Natural Resources, Water Resources - Reconnaissance Series Report 36, State of Nevada, Carson City, NV, 1966.

Russell, 1994 — Russell, G., Letter dated January 26, 1994 from G. Russell, U.S. Geological Survey, Las Vegas, NV, to Douglas Duncan, U.S. Department of Energy, Las Vegas, NV, regarding hydrologic data collection program, 1994.

SAIC/DRI, 1988 — Science Applications International Corporation/Desert Research Institute (SAIC/DRI), *Special Nevada Report*, U.S. Air Force, Tactical Weapons Center, Office of Public Affairs, Nellis Air Force Base, Las Vegas, NV, 1988.

SAIC/DRI, 1991 — SAIC/DRI, *Special Nevada Report*, U.S. Air Force, Tactical Weapons Center, Office of Public Affairs, Nellis Air Force Base, Las Vegas, NV, pp.3-5, 3-6, 1991.

Sawyer et al., 1990	Sawyer, D.A., R.J. Fleck, M.A. Lanphere, R.G. Warren, and D.A. Broxton, "Episodic Volcanism in the Southwest Nevada Volcanic Field: New $^{40}Ar/^{39}Ar$ Geochronologic Results," *EOS Transactions, AGU*, Vol. 71, No. 43, pp. 1290 and 1296, 1990.
Schaeffer, 1968	Schaeffer, J.R., *Climatology of the Tonopah Test Range*, SC-M-68-522, Sandia National Laboratories, Albuquerque, NM, 1968.
Schaller and Sutton, 1978	Schaller, F.W. and P. Sutton, *Reclamation of Drastically Disturbed Lands*. American Society of Agronomy, Crop Science Society of America, Soil Science Society of America, Madison, WI, 1978.
Schmeltzer et al., 1993a	Schmeltzer, J.S., J.J. Miller, and D.L. Gustafson, "Flood Assessment at Low-level Radioactive Waste Site in Southern Nevada," in *Proceedings of the 1993 ASCE International Symposium on Engineering Hydrology*, San Francisco, CA, 1993.
Schmeltzer et al., 1993b	Schmeltzer, J.S., J.J. Miller, and D.L. Gustafson, *Flood Assessment at the Area 5 Radioactive Waste Management Site and the Proposed Hazardous Waste Storage Unit, DOE/Nevada Test Site, Nye County, Nevada*, Raytheon Services Nevada, Las Vegas, NV, 1993.
Schwer, 1995	Schwer, R.K., *Economic Outlook 1995*, The Center for Business and Economic Research, University of Nevada Las Vegas, Las Vegas, NV, 1995.
Scott et al., 1971	Scott, B.R., T.J. Smales, F.E. Rush, and A.S. Van Denburgh, *Water for Nevada*, Water Planning Report 3, Nevada Department of Conservation and Natural Resources, Division of Water Resources, State of Nevada, Carson City, NV, 1971.
Sinnock, 1982	Sinnock, S., *Geology of the Nevada Test Site and Nearby Areas, Southern Nevada*, SAND82-2207, Sandia National Laboratories, Albuquerque, NM, 1982.
Smith and Black, 1984	Smith, D.D., and S.C. Black, *Animal Investigation Program for the Nevada Test Site: 1957-1981*, EPA 600/6-84-020, U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Las Vegas, NV, 1984.
State of Nevada Engineers Office, 1974	State of Nevada Engineers Office, *Static Groundwater Levels of Nevada*, Division of Water Resources, State Engineers Office, Carson City, NV, 1974.
State of Nevada, 1990	State of Nevada, *Labor Force Summary Table for the State of Nevada and for Clark County*, Employment Security Department, Las Vegas, NV, 1990.
State of Nevada, 1993a	State of Nevada, *Economic Update*, Department of Employment, Training and Rehabilitation, Research and Analysis Bureau, Carson City, NV, 1993.
State of Nevada, 1993b	State of Nevada, *Nevada's 100 Largest Firms — lst Quarter 1993*, Department of Employment, Training, and Rehabilitation, Employment Security Division, Carson City, NV, 1993.
State of Nevada, 1994	State of Nevada, *Economic Outlook*, Department of Employment, Training, and Rehabilitation, Employment Security Division, Carson City, NV, 1994.

State of Nevada, 1995a	State of Nevada, *Research Bulletin, Student Enrollment and Licensed Personnel Information*, Department of Education, Vol. 36, February, Carson City, NV, 1995.
State of Nevada, 1995b	State of Nevada, *Table of Population of Nevada's Counties and Incorporated Cities*, Nevada Department of Taxation and Nevada State Demographer, Bureau of Business and Economic Research, College of Business Administration, University of Nevada, Reno, NV, 1995.
Steinberg, 1980	Steinberg, L., *Tempiute Mine Road Overlay From Jct. SR 375 to 7.2 Miles NE 71009 SOS-17 (7)*, Nevada State Department of Transportation Cultural Resources Report NDOT-031a-80P, Bureau of Land Management CR Report 5-875 (P), Nevada State Museum, Carson City, NV, 1980.
Steward, 1938	Steward, J.H., "Basin-Plateau Aboriginal Sociopolitical Groups," *Bureau of American Ethnology, Bulletin No. 120*, Smithsonian Institution, Washington, DC, 1938.
Stewart, 1939	Stewart, O.C., "The Northern Paiute Bands," *Anthropological Records*, Vol. 2, No. 3, pp. 127-149, University of California, Berkeley, CA, 1939.
Stewart, 1980	Stewart, J.H., *Geology of Nevada*, SP-4, Nevada Bureau of Mines, Reno, NV, 1980.
Stewart and Carlson, 1977	Stewart, J.H., and J.E. Carlson, *Geologic Map of Nevada*, Map MF-930, Scale 1:500,000, U.S. Geological Survey, 1977.
Stoffle and Dobyns, 1982	Stoffle, R.W. and H. Dobyns, *Nuvagantu: Nevada Indians Comment on the Intermountain Power Project Adelanto Bipole. Transmission Line Nevada: Ethnographic (Native American) Resources*, Applied Urban Field School, University of Wisconsin-Parkside, Kenosha, WI, 1982.
Stoffle, 1987	Stoffle, R. W., *Native Americans and Nuclear Waste Storage at Yucca Mountain, Nevada: Potential Impacts of Site Characterization Activities*, Institute for Social Research, University of Michigan, Ann Arbor, MI, 1987.
Stoffle and Evans, 1988	Stoffle, R.W. and M. J. Evans, "American Indians and Nuclear Waste Storage: The Debate at Yucca Mountain, Nevada," *Policy Studies Journal*, Vol. 16, pp. 751-767, 1988.
Stoffle and Evans, 1990	Stoffle, R.W., and M.J. Evans, "Holistic Conservation and Cultural Triage: American Indian Perspectives on Cultural Resources," *Human Organization*, Vol. 49, No. 2, pp. 91-99, 1990.
Stoffle and Evans, 1992	Stoffle, R.W., and M.J. Evans, "American Indians and Nuclear Waste Storage: The Debate at Yucca Mountain, Nevada," in *Native Americans and Public Policy*, Fremont J. Layden and Lyman H. Legters (eds.), pp. 243-262. University of Pittsburgh Press, Pittsburgh, PA, 1992.

Stoffle et al., 1983 — Stoffle, R.W., H. Dobyns, and M.J. Evans, *Nungwu-Uakapi: Southern Paiute Indians Comment on the Intermountain Power Project Intermountain Adelanto Bipole I Transmission Line*, Applied Urban Field School, University of Wisconsin- Parkside, Kenosha, WI, 1983.

Stoffle et al., 1988a — Stoffle, R.W., M.J. Evans, and D.B. Halmo, *Recommended Actions for Reducing Potential Adverse Effects on Native American Cultural Resources Caused by Site Characterization Activities*, Institute for Social Research, University of Michigan, Ann Arbor, MI, 1989.

Stoffle et al., 1988b — Stoffle, R.W., D.B. Halmo, J.E. Olmsted, and M.J. Evans, *Annual Report, Native American Cultural Resource Studies, Yucca Mountain, Nevada*, Institute for Social Research, University of Michigan, Ann Arbor, MI, 1988.

Stoffle et al., 1989a — Stoffle, R.W., M.J. Evans, and C. Harshbarger, *Native American Interpretation of Cultural Resources in the Area of Yucca Mountain, Nevada*, Interim Report, Institute for Social Research, University of Michigan, Ann Harbor, MI, 1989.

Stoffle et al., 1989b — Stoffle, R.W., M. J. Evans, D.B. Halmo, W.E. Niles, and J.T. O'Farrell, *Native American Plant Resources in the Yucca Mountain Area, Nevada,* Interim Report, Institute for Social Research, University of Michigan, Ann Harbor, MI, 1989.

Stoffle et al., 1990a — Stoffle, R.W., D.B. Halmo, J.E. Olmsted, and M.J. Evans, *Native American Cultural Resource Studies at Yucca Mountain, Nevada*, Institute for Social Research, The University of Michigan, Ann Arbor, MI, 1990.

Stoffle et al., 1990b — Stoffle, R.W., D.B. Halmo, M.J. Evans, and J.E. Olmsted, "Calculating the Cultural Significance of American Indian Plants: Paiute and Shoshone Ethnobotany at Yucca Mountain," *American Anthropologist*, Vol. 92, pp. 416-432, 1990.

Stoffle et al., 1994a — Stoffle, R.W., D.B. Halmo, and M. Dufort, *NAGPRA Consultation and the Nevada Test Site, Final Report of Subgroup Activities*, BARA, University of Arizona, Tucson, AZ, 1994.

Stoffle et al., 1994b — Stoffle, R.W., M.J. Evans, D.B. Halmo, M.E. Dufort, and B.K. Fulfrost, *Native American Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site*, Desert Research Institute, Technical Report 84, BARA, University of Arizona, Tucson, AZ, 1994.

Stoffle et al., 1995 — Stoffle, R.W., L.L. Loendorf, D.E. Austin, D.B. Halmo, A.S. Bulletts, and B.K. Fulfrost, *Tumpituxwinap (Storied Rocks)*, Draft, BARA, University of Arizona, Tucson, AZ, 1995.

Stowell, 1995 — Stowell, C., personal communication dated April 11, 1995 from C. Stowell, Raytheon Services Nevada, Las Vegas, NV, to R.W. Morris, Science Application International Corporation, Las Vegas, NV, regarding NTS vehicle and transportation services, 1995.

Sullivan, B., 1995	Sullivan, B., letter dated April 25, 1995 from B. Sullivan, Beatty Volunteer Fire Department and Ambulance Service, Beatty, NV, to Liz Shupp, IT Corp., Las Vegas, NV, regarding facilities, equipment and personnel, 1995.
Sullivan, W., 1995	Sullivan, W., personal communication dated March 24 and 26, 1995 from W. Sullivan, Nye County Sheriff's Office, Beatty Substation, Beatty, NV, to Liz Shupp, IT Corp., Las Vegas, NV, regarding facilities, equipment and personnel, 1995.
Tanner and Jorgensen, 1963	Tanner, W.W., and C.D. Jorgensen, "Reptiles of the Nevada Test Site," Bulletin 3, *Brigham Young University Science*, pp. 1-31, 1963.
Tetra Tech, Inc., 1995	Tetra Tech, Inc., *Traffic Counts and Observations of Traffic Characteristics at the Mercury Gate by Tetra Tech, Inc. Personnel on March 23, 1995*, San Bernardino, CA, 1995.
Thomas, 1995	Thomas, A.R., *Bus Transportation Data,* Science Applications International Corporation, Las Vegas, NV, 1995.
Thordarson, 1983	Thordarson, W., *Geohydrologic Data and Test Results from Well J-13, Nevada Test Site, Nye County, Nevada: U.S. Geological Survey Water-Resources Investigations Report 83-4171*, p. 57, 1983.
Thordarson, 1987	Thordarson, W., *Hydrogeology of the Project Faultless Site, Nye County, Nevada*, USGS-WRI-86-4342, Water-Resources Investigations Report, U.S. Geological Survey, Denver, CO, 1987.
Tonopah, 1994	Tonopah, *Report on Financial Statements and Supplemental Material for Year Ended June 30, 1994*, Tonopah, NV, 1994.
Transportation Research Board, 1994	Transportation Research Board, *Highway Capacity Manual*, Special Report 209, National Research Council, Washington, DC, 1994.
Tucker et al., 1982	Tucker, G.C., Jr., D. Christensen, and T. McEnamy, *Results of Archaeological Investigations Along the Nevada Section of the Proposed Intermountain Power Project, Intermountain Adelanto - Bipole I Transmission Line*, Nickens and Associates, Inc., Montrose, CO, 1982.
ULI, 1994	Urban Land Institute (ULI), *ULI Market Profiles Volume II - Western North America and the Pacific Rim; Chapter II - Las Vegas Metro Area,* pp. 59 and 61, Washington, DC, 1994.
University of Nevada, 1965	University of Nevada, Reno, *Geological, Geophysical, Chemical and Hydrological Investigations of the Sand Springs Range, Fairview Valley and Fourmile Flat, Churchill County, Nevada.* Report VUF-1001, Reno, NV, 1965.
U.S. Bureau of the Census, 1990	U.S. Bureau of the Census, *Population and Housing, Summary Population and Housing Characteristics, Nevada,* U.S. Department of Commerce, Washington, DC, 1990.

U.S. Bureau of the Census, 1991	U.S. Bureau of the Census, 1990 *Census of Population and Housing Summary Population and Housing Characteristics Nevada*, U.S. Department of Commerce and Statistics Administration, U.S. Department of Commerce, Washington, DC, 1991.
U.S. Bureau of the Census, 1993	U.S Bureau of the Census, *TIGER/Line Census Files, 1992*, Technical Documentation,U.S. Department of Commerce, Washington, DC, 1993.
U.S. Bureau of the Census, 1994	*U.S.*Bureau of the Census, *County and City Data Book, 1994*, U.S. Department of Commerce, Washington, DC, 1994.
U.S. Fish and Wildlife Service, 1990	U.S. Fish and Wildlife Service, *Recovery Plan for the Endangered and Threatened Species of Ash Meadows, Nevada,* U.S. Department of Interior, Portland, OR, 1990.
U.S. Fish and Wildlife Service, 1992	U.S. Fish and Wildlife Service, *Biological Opinion on Nevada Test Site Activities*, File 1-5-91-F-225, U.S. Department of Interior, Reno, NV, 1992.
U.S. Fish and Wildlife Service, 1994	U.S. Fish and Wildlife Service, Memorandum dated May, 1994 from State Supervisor, Ecological Services, Reno, Nevada, to District Manager, Las Vegas District, Nevada, regarding biological opinion on the sale of public lands in Eldorado Valley, File No. 1-5-94-F-283, U.S. Department of Interior, 1994.
Vinson, 1995	Vinson, S., Memorandum dated May 19, 1995 from S. Vinson, Clark County Planning Department, Las Vegas, NV to Felicia Bradfield, Tetra Tech, Inc., San Bernardino, CA, regarding the areas of Clark County which are considered urban, 1995.
Vortman, 1979	Vortman, L.J., *Prediction of Ground Motion from Nuclear Weapons Tests at NTS*, SAND79-1002, Sandia National Laboratories, Albuquerque, NM, 1979.
Vortman, 1991	Vortman, L.J., *An Evaluation of the Seismicity of the Nevada Test Site and Vicinity,* SAND86-7006, Sandia National Laboratories, Albuquerque, NM, 1991.
Vortman and Long, 1982a	Vortman, L.J. and J.W. Long, *Effects of Repository Depth on Ground Motion—The Pahute Mesa Data*, SAND82-0174, Sandia National Laboratories, Albuquerque, NM, 1982.
Vortman and Long, 1982b	Vortman, LJ. and J. W. Long, 1982b. *Effects of Ground Motion on Repository Depth, The Yucca Flat Data,* SAND82-1647, Sandia National Laboratories, Albuquerque, NM., 1982.
Waddell, 1982	Waddell, R.K., *Two-Dimensional, Steady-State Model of Ground-Water Flow, Nevada Test Site and Vicinity, Nevada-California*, USGS-WRI-82-4085, Water-Resources Investigations Report, U.S. Geological Survey, 1982.
Waddell et al., 1984	Waddell, R.K., J.H. Robinson, and R.K. Blankennagel, *Hydrology of Yucca Mountain and Vicinity, Nevada - California - Investigative Results Through Mid-1983*, USGS-WRI84-4267, Water-Resources Investigations Report, U.S. Geological Survey, Denver, CO, 1984.

Wallace, 1980	Wallace, A., *Soil-Plant-Animal Relationships Bearing on Revegetation and Land Reclamation in Nevada Desert,* Great Basin Naturalist Memoirs, Brigham Young University Press, Provo, UT, 1980.
Warren et al., 1989	Warren, R.G., D.A. Sawyer, and H.R. Covington, "Revised Volcanic Stratigraphy of the Southwestern Nevada Volcanic Field," in *Proceedings from the Fifth Symposium on Containment of Underground Nuclear Explosives, held on September 19-21, 1989 in Santa Barbara, California,* CONF-8909163, Vol. 2, p. 387, Lawrence Livermore National Laboratory, Livermore, CA, 1989.
Webb and Wilshire, 1980	Webb, R.H. and H.G. Wilshire, "Recovery of Soils and Vegetation in a Mojave Desert Ghost Town, Nevada, U.S.A," *Journal of Arid Environments,* 3:291-303, 1980.
Wernicke et al., 1988	Wernicke, B., G.J. Aden, and J.K. Snow, "Basin and Range Extensional Tectonics at the Latitude of Las Vegas," *Geologic Society of America Bulletin,* Vol. 100, pp. 1738-1757, 1988.
White and Dunaway, 1975	White, M.G., and P.B. Dunaway (eds), *The Radioecology of Plutonium and Other Transuranics in Desert Environments,* NVO-153, U.S. Energy Research and Development Administration, Nevada Operations Office, Las Vegas, NV, 1975.
White and Dunaway, 1976	White, M.G., and P.B. Dunaway (eds), *Studies of Environmental Plutonium and Other Transuranics in Desert Ecosystems,* NVO-159, U.S. Energy Research and Development Administration, Nevada Operations Office, Las Vegas, NV, 1976.
White and Dunaway, 1977	White, M.G., and P.B. Dunaway (eds), *Transuranics in Natural Environments,* NVO-178, U.S. Energy Research and Development Administration, Nevada Applied Ecology Group, Las Vegas, NV, 1977.
White and Dunaway, 1978	White, M.G., and P.B. Dunaway (eds), *Selected Environmental Plutonium Research Reports of the NAEG,* NVO-192, U.S. Department of Energy, Nevada Applied Ecology Group, Las Vegas, NV, 1978.
White et al, 1977a	White, M.G., P.B. Dunaway, and D.L. Wireman (eds), *Transuranics in Desert Ecosystems,* NVO-181, U.S. Department of Energy, Nevada Operations Office, Las Vegas, NV, 1977.
White et al, 1977b	White, M.G., P.B. Dunaway, and W.A. Howard (eds), *Environmental Plutonium on the Nevada Test Site Environs,* NVO-171, U.S. Energy Research and Development Administration, Nevada Applied Ecology Group, Las Vegas, NV, 1977.
Willen, 1995	Willen, R.W., Letter dated April 28, 1995 from R.W. Willen, Nye County Sheriff's Office, Tonopah, NV, to Liz Shupp, IT Corp., Las Vegas, NV, regarding facilities and personnel, 1995.
Winograd and Thordarson, 1975	Winograd, I.J., and W. Thordarson, *Hydrogeologic and Hydrochemical Framework, South-Central Great Basin, Nevada-California, with Special Reference to the Nevada Test Site,* Professional Paper 712-C, U.S. Geological Survey, Washington, DC, 1975.

Wood, 1994	Wood, D.B., Letter dated June 8, 1994 from David B. Wood, U.S. Department of the Interior, U.S. Geological Survey to John Eberlin, IT Corp., regarding groundwater withdrawal data, Las Vegas, NV, 1994.
Woodward et al., 1995	Woodward, R., R.B. Hunter, P.D. Greger, and M.B. Saethre, *The 1993 Baseline Biological Studies and Proposed Monitoring Plan for the Device Assembly Facility at the Nevada Test Site,* DOE/NV 11432-163, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1995.
Worman, 1969	Worman, F.C.V., *Archeological Investigations at the U.S. Atomic Energy Commission's Nevada Test Site and Nuclear Rocket Development Station,* LA-4125, Los Alamos National Laboratory, Los Alamos, NM, 1969.
Young, 1972	Young, R.A., *Water Supply for Nuclear Rocket Development Station at the U.S. Atomic Energy Commission's Nevada Test Site*, U.S. Geological Survey Water-Supply Paper 1938, 1972.

This Page Intentionally Left Blank

Chapter 5

ENVIRONMENTAL CONSEQUENCES

CHAPTER 5
ENVIRONMENTAL CONSEQUENCES

This chapter provides the scientific and analytical base for the comparison of the alternatives. The discussion addresses the potential direct and indirect effects of each of the alternatives. In addition, this chapter contains discussions of unavoidable adverse effects, the relationship of short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and irreversible and irretrievable commitments of resources that would be involved in implementing an alternative.

Four alternatives are analyzed in this Environmental Impact Statement (EIS): Alternative 1 (Continue Current Operations), Alternative 2 (Discontinue Operations), Alternative 3 (Expanded Use), and Alternative 4 (Alternate Use of Withdrawn Lands). Twelve environmental resources and/or environmental resource elements are analyzed for each alternative. These are as follows:

- Land Use (includes land-use designations, site-support activities, and airspace)
- Transportation (includes on-site traffic, off-site traffic, transportation of materials and waste, and other transportation)
- Socioeconomics
- Geology and Soils
- Hydrology (surface hydrology and groundwater)
- Biological Resources
- Air Quality (includes radiological air quality)
- Noise
- Visual Resources
- Cultural Resources/American Indian
- Occupational and Public Health and Safety
- Environmental Justice.

Five programs are analyzed for each of the environmental resources and resource elements. These include the Defense Program, the Waste Management Program, the Environmental Restoration Program, the Nondefense Research and Development Program, and the Work for Others Program. In addition, site-support activities are analyzed for each of the environmental resources and resource elements.

Each program identified within an alternative was evaluated separately to identify its potential environmental impact. By evaluating each program separately, the U.S. Department of Energy (DOE) will be able to identify specific mitigation measures that may be necessary to alleviate the severity of impacts.

This EIS identifies the impacts of past, current, and potential programs of the U.S. Department of Energy, Nevada Operations Office (DOE/NV). Proposed programs are included in one or more of the four alternatives and fall into three basic levels: (1) current activities, (2) planned projects, and (3) proposed projects. Current activities are those that are presently part of the normal operations of the Nevada Test Site (NTS), the Tonopah Test Range, portions of the Nellis Air Force Range (NAFR) Complex, and other areas considered in this EIS, such as the Area 5 Radioactive Waste Management Site. Planned projects are those that are within the five-year planning cycle and are likely to be implemented, such as the Solar Enterprise Zone facility. Proposed projects are not currently considered within the five-year planning window, but have undergone sufficient conceptual development to allow a reasonable assessment. The most reliable data are clearly derived from ongoing activities. Planned projects would present slightly less reliable data. Data for proposed projects would be the least defined, but were determined to be essential to a full and open evaluation and disclosure of the potential effects of the alternatives. To provide an adequate analysis, conservative assumptions and parameter values were used to evaluate potential impacts of the less-defined activities.

Implementation of any of the alternatives could result in a permanent commitment of resources such as groundwater, soil, biota, minerals, surface area, and subsurface geology and would represent an irreversible and irretrievable commitment of such resources. In addition to the National Environmental Policy Act requirement to identify the irreversible and irretrievable commitments of resources, it is also the intent of the DOE to identify these same resources within the meaning of the Comprehensive Environmental Response, Compensation, and Liability Act, Section 107(f)(1). Though the NTS is not listed on the National Priorities List established by the U.S. Environmental Protection Agency (EPA), the requirement exists to address the natural resource damage liability as discussed in Section 107.

The impact analysis for this NTS EIS is based on the best data currently available. This EIS will serve as a baseline document for the preparation of subsequent, tiered National Environmental Policy Act documents that may be required prior to implementation of future specific projects.

5.1 Alternative 1 - Continue Current Operations (No Action)

Alternative 1, Continue Current Operations, is defined as Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. These programs would continue in the same manner and degree as they have within the past three to five years. This alternative includes programs at the NTS, the NAFR Complex, the Tonopah Test Range, the Project Shoal Area, and the Central Nevada Test Area. A more detailed description of the program projects and activities is presented in Appendix A.

Defense Program. Defense Program operations would continue under the conditions of the ongoing moratorium and the negotiations of the Comprehensive Test Ban Treaty. Stockpile stewardship and nuclear emergency response would continue to be the two main categories of activities included in the Defense Program operations under Alternative 1. Stockpile stewardship includes a program of activities to maintain confidence in the safety, reliability, and performance of the nation's nuclear weapons. Stockpile stewardship activities include nuclear test readiness, one or more underground nuclear weapons tests, if directed by the President, and hydrodynamic tests and dynamic experiments. The DOE cannot speculate on how many tests the President might direct the DOE to conduct in the unlikely event that the United States decides to renew underground nuclear testing. However, the DOE believes that this number is likely to be small and that the total environmental impact of any additional testing would be only a fraction of the impacts caused by the approximately 800 underground tests conducted prior to 1992 and documented in Chapter 4. This chapter describes the impacts each additional test would have and demonstrates that a limited testing program would result in only a few isolated areas of impact. Nuclear emergency response would continue to be composed of the Nuclear Emergency Search Team, the Federal Radiological Monitoring and Assessment Center, the Aerial Measuring System, the Accident Response Group, the Radiological Assistance Program, and the DOE/NV Internal Emergency Management Program.

Waste Management Program. The primary mission of the NTS Waste Management Program would be to continue to serve as a transuranic storage and low-level and mixed waste disposal and storage facility in support of the DOE/NV. The NTS would continue to provide disposal capability for approved waste generated on the NTS, as well as for approved off-site waste generators. The NTS will continue to implement the Waste Minimization/ Pollution Prevention Program as described in Appendix C.6. Waste management activities at the NTS would continue to be conducted in four primary areas: Areas 3, 5, 6, and 11.

The Area 3 Radioactive Waste Management Site would continue to serve the NTS and approved off-site generators as a bulk, low-level waste disposal facility. Under Alternative 1, it is anticipated that two additional cells/craters and no additional support facilities would be opened. Two disposal units in Area 3 would be closed under this alternative.

Although the Area 5 Radioactive Waste Management Site would continue to serve the NTS as a low-level and mixed waste disposal site, existing capacity would not meet the disposal needs of low-level waste expected to be generated under Alternative 1. Greater confinement disposal technology would continue to be pursued for disposal of high-specific activity waste. The pit used for disposal of mixed waste has sufficient capacity to meet the expected amount generated under this alternative. Therefore, the mixed waste disposal capacity would not be expanded. No sanitary landfill construction or disposal activities would occur in Area 5 under Alternative 1. The Transuranic Waste Storage Unit and the Hazardous Waste Storage Unit would continue to be used to store waste.

Waste management operations in Area 6 under Alternative 1 would include continued storage of polychlorinated biphenyl (PCB) waste, operation of the hydrocarbon landfill, and treatment of low-level waste at the Liquid Waste Treatment System Facility.

The Area 11 Explosive Ordnance Disposal Unit is a thermal treatment unit. Explosive ordnance wastes would continue to be detonated at the Explosive Ordnance Disposal Unit under Alternative 1.

Environmental Restoration Program. The goal of the Environmental Restoration Program is to remediate contaminated sites while complying with applicable environmental regulations and statutes and protecting the public and workers' health and safety. The Environmental Restoration Program projects that would continue under Alternative 1 are the Underground Test Area Corrective Action Unit, Soils Media Corrective Action Unit, Industrial Sites Units, decontamination and decommissioning facilities, Defense Nuclear Agency sites, Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area.

Nondefense Research and Development Program. The DOE has historically supported a variety of research and development activities at the NTS in cooperation with universities, industries, and other federal agencies. Activities that would continue under Alternative 1 include development of a variety of alternative energy resources, a spill test facility, alternative-fueled vehicles and fueling station, development of an Environmental Management and Technology Development Program, and an Environmental Research Park.

Work for Others Program. The Work for Others Program would continue to be hosted by the DOE and includes the shared use of certain NTS and Tonopah Test Range facilities and resources with other federal agencies (such as the U.S. Department of Defense [DoD]) for various military training exercises and research and development projects. Activities included in the Work for Others Program under Alternative 1 are treaty verification, nonproliferation, counter-proliferation research and development, conventional weapons demilitarization, and defense-related research and development.

Activities at the NTS and NTS support facilities throughout Nevada are and would be affected by implementation of current and future international arms control treaties. Treaties currently in effect or under negotiation that are included as part of the treaty verification activities under Alternative 1 are the Threshold Test Ban Treaty, the Peaceful Nuclear Explosion Treaty, the Chemical Weapons Convention, and the Open Skies Treaty.

Nonproliferation is defined as the use of a full range of political, economic, and military tools to prevent the spread of weapons of mass destruction or missiles, diplomatically reverse the spread, or protect the United States interest against an opponent armed with these weapons, should that prove necessary. Under Alternative 1, the NTS and Tonopah Test Range would continue to provide critical support for the United States nonproliferation goals and objectives, particularly in the areas of research and technology development.

Counterproliferation refers to DoD efforts to combat the international proliferation of weapons of mass destruction. As with nonproliferation, these efforts would continue to include the full range of political, economic, and military tools available. However, because facilities for developing, producing, and storing weapons of mass destruction would likely be located below ground, a considerable amount of counterproliferation research and development would involve the detection, monitoring, and neutralization of buried targets. Under Alternative 1, the NTS would continue current counterproliferation activities and could become the center for a national counterproliferation program.

Conventional weapons demilitarization activities would continue to include demonstration projects for the disposal or destruction of solid rocket motors and other nonnuclear energetic materials at the NTS.

Defense-related research and development activities under Alternative 1 would include tests and training exercises employing weaponry, such as small arms, artillery, guns, aircraft, armored vehicles, demolitions, rockets, bazookas, and air-dropped armaments, as well as a variety of electronic, imagery, and sensory technologies.

5.1.1 NTS

The following sections describe the potential effects the five programs and the site-support activities could have on the resources at the NTS.

5.1.1.1 Land Use. The land-use analysis includes an assessment of the availability of land; potential disturbance of prime, unique, and other important features or habitat; and compatibility with land-use plans and policies. The baseline for each site and its immediate vicinity was established based on the interpretation of aerial photographs, land-use plans and policies, maps, and other sources available through local, state, and federal agencies and through information in the DOE files. Changes to land-use resource areas associated with the alternatives are compared to baseline land use discussed in Chapter 4, and the potential impacts on these areas are assessed. No impacts to surrounding land uses have been identified under this alternative.

The NTS has been committed to weapons testing since the 1950s, and some of its land areas have undergone changes that are considered to be permanent and irreversible. As stated in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977),

> "...the addition of new underground pockets of radioactivity and the formation of subsidence craters in the test areas of the NTS will deny use of those sites for other nontest-related purposes. As a result of the test program, it will be necessary to subject those areas to rigorous control of access and limited use for an indefinite time. Such an evaluation of land-use impacts is largely qualitative and is supported by the quantitative impact analysis presented in other resource sections."

Defense Program. The entire NTS is designated as a Defense Program site. Defense Program projects, research and development, testing, and experimentation under this alternative are assumed to continue at levels equivalent to the past 3 to 5 years. Therefore, no new impacts to land use are expected. Defense Program activities are consistent with current site and land-use designation definitions. Land-use designation restrictions preclude activities that are inconsistent with current land uses.

The analysis performed for this EIS is for the conduct of one nuclear test. The impacts to the environment from the conduct of multiple tests (a series) are assumed to be incrementally additive. For example, the impacts of conducting two tests would be twice the impact of conducting a single test.

Waste Management Program. Under Alternative 1, ongoing Waste Management Program activities at the NTS would continue at current levels and are consistent with current site- and land-use designation definitions. Therefore, no new impacts to land use are expected.

Environmental Restoration Program. Under Alternative 1, the Environmental Restoration Program would continue at current levels. Therefore, no adverse impacts to land use are anticipated. After existing facilities are decontaminated, they could be used for other purposes. Removal of plutonium-contaminated soils would provide additional areas that could be used for new facility construction.

Nondefense Research and Development Program. Under Alternative 1, the DOE would continue to support ongoing program operations, but no new initiatives would be pursued. Thus, no new impacts to land use are expected.

Work for Others Program. Under Alternative 1, the DOE would continue to host projects and activities of other federal agencies (e.g., the DoD) at activity levels not exceeding those of the past 3 to 5 years. Activities are consistent with the site- and land-use designation definitions for the areas. No new impacts to land use are expected.

5.1.1.1.1 Site-Support Activities— Site-support activities are discussed in the following sections as an NTS resource that is affected by the implementation of the alternatives. The changes to the site-support activities are estimated based on changes in activities from baseline levels. Four subsections of site support are evaluated, including facilities, services, utilities, and on-site communications.

FACILITIES—Under Alternative 1, facilities would be maintained at approximately the current level. Facilities that are currently not in use would remain inactive, but be maintained to the extent possible so that they might be used at a later time.

SERVICES—Support services, such as law enforcement and security, fire protection, and health care, would remain at approximately the current level under this alternative.

UTILITIES—Water, wastewater, and electrical systems would be maintained to ensure they are defect free. Utilities currently not in use would be shut down and stabilized to the extent possible so that they might be restarted and used at a later time.

ON-SITE COMMUNICATION—Communication systems under Alternative 1 would be maintained at approximately the current capacity. Radio, telephone, and video communication systems would receive routine maintenance as deficiencies are identified. The internal and the United States mail systems would continue to operate.

5.1.1.1.2 Airspace—The effects of continued activities and aircraft operations under Alternative 1 would have a minimal effect on the NTS and NAFR Complex airspace. DOE operations (including Desert Rock Airport activities) may increase by approximately 2 percent each year and military operations may increase slightly under the Defense Program and Work for Others Program. As a result, internal NAFR Complex airspace boundaries may be modified to better accommodate range operations and facilitate movement of air traffic through the NAFR Complex. However, no significant modification to the external NTS and NAFR Complex airspace boundaries is anticipated.

The inherent constraints of the existing NTS and NAFR Complex restricted airspace would continue to require that nonparticipating civil and military aircraft be routed around the NTS and NAFR Complex, as necessary, contingent upon joint-use status, operations in progress, and air traffic considerations. The current level of air traffic control and radar/radio/navigational aid services would likely be maintained or improved under normal upgrade programs.

The possible effect on civilian aviation is keyed primarily to constraints that defense-related airspace might place on routes of flight. General aviation would continue to be diverted around the NTS and NAFR Complex. However, the current level of air traffic control and navigational aid services, as well as the same airspace structures, would most likely be maintained under this alternative. Based on the past trend and on improvements in communication, it would not appear that this alternative would cause a major change in civilian air traffic.

Under Alternative 1, the only activities that would affect airspace would be defense related. Therefore, only Defense and Work for Others Programs will be discussed and evaluated. However, with all programs, occasional flights of helicopters and fixed-wing aircraft carrying supplies and personnel are anticipated.

Defense Program. Activities at the NTS would continue at the levels of the past 3 to 5 years. No new programs or initiatives would be pursued. Activities would likely include an increase in air traffic of approximately 2 percent per year for the next 3 to 5 years.

Work for Others Program. With the Work for Others Program, the continuation of the use of the NTS airspace for various training exercises and associated defense activities is anticipated. However, no commercial air passenger, general aviation, or air cargo activities would occur except for occasional DOE-related cargo and personnel operations or for emergency operations.

Airspace requirements under Alternative 1 would be the same as those currently in effect with the Nellis Air Force Base Air Traffic Control Facility, assuming full air traffic control in the NTS and surrounding area. The continuation of operation at the NTS under the Work for Others Program would not result in changed airspace or additional air traffic impacts.

*5.1.1.2 **Transportation***. The following sections contain the discussion of the environmental impacts related to transportation activities as defined under Alternative 1. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.1.1.2.1 On-Site Traffic—The majority of NTS employees commute to the site by bus and work 4 days per week. Currently there are 54 buses serving the Las Vegas area, and 5 buses that serve the town of Pahrump, located approximately 72 km (45 mi) south of the NTS on State Route 160. These buses have dedicated routes to the following locations on the NTS: Mercury (23 routes), Area 25 (12 routes), Control Point in Area 6 (8 routes), Area 6 operations (8 routes), Area 12 operations (1 route), Area 3 Radioactive Waste Management Site (2 routes), and 1 mail route. There is a limited number of shuttle buses for on-site trips. The average number of daily trips attributable to the commuter buses would be 120 trips per day on roads within the NTS. All buses enter the site through the main gate on Mercury Highway, except for two buses from Pahrump. These buses use Gate 510 on Lathrop Wells Road (Thomas, 1995).

Traffic generated within the NTS as a result of the land use, projects, and activities associated with Alternative 1 is estimated to be 3,370 trips per day. Table 5.1-1 shows the baseline average daily trip generation for each of the programs.

Table 5.1-2 summarizes the average daily traffic volume for the key roadways on the NTS under Alternative 1. The portion of the average daily traffic volume that would be attributable to each program is also provided. All key on-site roadways have capacities exceeding 2,000 vehicles per hour for both directions combined (Transportation Research Board, 1994). A comparison of capacity to volumes assigned to each segment on Table 5.1-2 shows that no roadway would experience significant traffic congestion under Alternative 1. The segment of roadway with the highest volume would be the section of Mercury Highway from Mercury to Road 5-01, with an average daily volume of 1,215 vehicles per day.

Defense Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Defense Program is estimated to be 635 average daily trips under Alternative 1. No adverse effects on traffic-flow would occur as a result of the Defense Program.

Waste Management Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Waste Management Program is estimated to be 145 average daily trips under Alternative 1. The Radioactive Waste Management Sites in Areas 3 and 5 would continue to receive and dispose of low-level waste from approved waste generators within the DOE complex. The Area 5 Radioactive Waste Management Site would also continue to make mixed waste disposal capability available to NTS generators. Acceptance of waste quantities would continue at levels consistent with past activity (Shott el al., 1995). Inbound shipments from off-site generators are estimated to be approximately 6,800 in the next 10 years for an average of

Table 5.1-1. Average on-site daily trip generation (one-way trips) by program, Alternative 1

Program	Trips per Day
Defense	635
Waste Management	145
Environmental Restoration	390
Nondefense Research and Development	180
Work for Others	140
Site-Support Activities	1,880
Total	**3,370**

3 shipments per day. The number of waste shipments generated on the NTS is expected to be 11,615 in the next 10 years for an average of 6 shipments per day. The majority of the low-level waste would be shipped to the Radioactive Waste Management Site in Area 5. Access to this site would be provided by the Radioactive Waste Management Site access road from Mercury Highway to Road 5-01. No adverse effects on traffic flow would occur as a result of the Waste Management Program.

Environmental Restoration Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Environmental Restoration Program is estimated to be 390 average daily trips under Alternative 1. No adverse effects on traffic flow would occur as a result of the Environmental Restoration Program.

Nondefense Research and Development Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Nondefense Research and Development Program is estimated to be 180 average daily trips under Alternative 1. No adverse effects on traffic flow would occur as a result of the Nondefense Research and Development Program.

Work for Others Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Work for Others Program is estimated to be 140 average daily trips under Alternative 1. No adverse effects on traffic flow would occur as a result of the Work for Others Program.

Site-Support Activities. Traffic generated on the roads within the NTS as a result of activities associated with site-support activities is estimated to be 1,880 average daily trips under Alternative 1. No adverse effects on traffic flow would occur as a result of site-support activities.

5.1.1.2.2 Off-Site Traffic—Alternative 1 effects on roadway traffic were assessed by estimating the number of trips generated by each program-related activity and considered employees, visitors, residents, and service and delivery vehicles associated with construction and operations. These trips were then assigned to key roadway segments.

Traffic impacts were determined based on level of service changes for each of the key roads analyzed. The major traffic generators at the site under Alternative 1 would be the construction and operation employees (totaling 2,947 employees on site in 1996 through 2005) and their activities. Table 5.1-3 shows a summary of average daily vehicle trips generated by each program activity for the years 1996, 2000, and 2005. Distribution among programs is assumed to remain approximately the same as the current trip distribution. The projected peak-hour traffic on key roads and the

Table 5.1-2. Average daily traffic volumes (one-way trips) on key NTS roadway segments, Alternative 1

		Average Daily Traffic Volume						
Roadway	**Segment**	**Defense**	**Waste Management**	**Environmental Restoration**	**Nondefense Research and Development**	**Work for Others**	**Site-Support Activities**	**Total**
	North							
Buckboard Mesa Rd	Pahute Mesa Rd. to Airport Rd.	65	0	30	0	0	0	**95**
Mercury Hwy.	Tippipah Hwy. to Rainier Mesa Rd.	125	30	90	0	0	0	**245**
Pahute Mesa Rd.	Mercury Hwy. to Stockade Wash Rd.	125	0	60	0	0	0	**185**
Pahute Mesa Rd.	Stockade Wash Rd. to Buckboard Mesa Rd.	65	0	30	0	0	0	**95**
Rainier Mesa Rd.	Mercury Hwy. to Tippipah Hwy.	125	0	30	0	0	0	**155**
Tippipah Hwy.	Mercury Hwy. to Pahute Mesa Rd.	255	0	120	0	0	0	**375**
Tippipah Hwy.	Pahute Mesa Rd. to Rainier Mesa Rd.	0	0	30	0	0	0	**30**
	South							
Cane Spring Rd.	Lathrop Wells Rd. to Mercury Hwy.	0	0	30	70	30	0	**130**
Jackass Flats Rd.	Mercury Hwy. to Lathrop Wells Rd.	0	0	90	90	70	0	**250**
Lathrop Wells Rd.	U.S. Hwy. 95 to Jackass Flats Rd.	0	0	30	20	40	0	**90**
Mercury Hwy.	Mercury Hwy. to Road 5-01	510	145	270	70	30	100	**1,125**
Mercury Hwy.	Road 5-01 to Cane Spring Rd.	510	35	240	70	30	100	**985**
Mercury Hwy.	Cane Spring Rd. to Tippipah Hwy.	510	35	240	0	0	100	**885**
Road 5-01	Mercury Hwy. to Area 5 RWMS	0	95	30	0	0	0	**125**
Road 5-07	Mercury Hwy. to Area 5 RWMS	0	15	0	0	0	0	**15**

NOTE: RWMS = Radioactive Waste Management Site.

Table 5.1-3. Average off-site daily vehicle trip generation, Alternative 1

Program	1996	2000	2005
Defense	330	330	330
Waste Management	60	60	60
Environmental Restoration	90	90	90
Nondefense Research and Development	40	40	40
Work for Others	80	80	80
Site-Support Activities	880	880	880
Total	**1,480**	**1,480**	**1,480**

NOTE: All values are rounded to the nearest 10. Daily trips shown are defined as one-way vehicle trips or vehicle trip ends.

Source: AASHTO, 1990.

associated level of service that would result under Alternative 1 for 1996, 2000, and 2005 is shown on Table 5.1-4. These include the average daily vehicle trip generation, by program, listed in Table 5.1-3.

Based on American Association of State Highway Transportation Officials standards, level of service B is appropriate for freeways and arterials and rural highways (level or rolling terrain). Level of service C is appropriate for rural (mountainous), urban, and suburban highways. For local roads, level of service D is appropriate in all terrain (AASHTO, 1990). By 2005, all key roads in the immediate vicinity of the site (U.S. Highway 95; the Mercury interchange ramps; and the access highway to the site, State Route 433) would continue to operate at level of service C or better, which is acceptable according to American Association of State Highway Transportation Officials standards. However, key roads within metropolitan Las Vegas (segments of Interstate 15, U.S. Highway 95, and U.S. Highway 93) already operate at levels of service ranging from A to F, and by 2000, they would all deteriorate to an unacceptable level of service F. These conditions would prevail even without Alternative 1 because of cumulative traffic growth (recreational, regional, and commuter traffic). U.S. Highway 93 at Hoover Dam already operates at an unacceptable level of service F, and its level of service would continue to deteriorate further with or without Alternative 1 activities because of its geometry (steep grades and narrow curves) and partially because of its moderate traffic volume and truck traffic. All other key roadways would generally continue to operate at a level of service C or better throughout the period of analysis.

The off-site conditions described above would occur with or without Alternative 1 and with or without any single program activity. The following sections address the contribution of each program activity to traffic impacts.

Defense Program. The major Defense Program traffic generators in 2005 under Alternative 1 would be the approximately 660 on-site employees, generating approximately 330 vehicle trips on a typical weekday in 2005. Except for site-support, defense-related activities would have the highest number of daily vehicle trips (22 percent of the total) and the most traffic impacts.

Waste Management Program. The major traffic generators in 2005 under Alternative 1 would be the 112 on-site employees associated with the Waste Management Program, generating approximately 60 vehicle trips on a typical weekday in 2005. The Waste Management Program-related activities would contribute 4 percent of the total number of daily vehicle trips.

Table 5.1-4. Peak-hour traffic volumes and level of service on key roads, Alternative 1

Roadway Segments	Capacity VPH[a]	1996 DDHV[b]	1996 LOS[c]	2000 DDHV	2000 LOS	2005 DDHV	2005 LOS
Regional							
I-15 @ California/Nevada state line	6,800	2,980	E	3,749	F	4,711	F
I-15 north of Sahara Avenue interchange	10,200	7,321	F	9,015	F	11,133	F
I-15 north of the Downtown Expressway interchange	10,200	4,430	E	5,573	F	7,002	F
I-15 just north of the 'D' and Washington interchange	10,200	4,067	D	5,116	F	6,428	F
I-15 north of the Cheyenne interchange	6,800	1,902	C	2,689	D	3,672	F
I-15 south of the Lamb Blvd. interchange	6,800	652	A	852	A	1,103	B
I-15 north of West Mesquite interchange (Nevada/Utah state line)	6,800	636	A	887	A	1,200	B
I-80 east of Apex interchange (California/Nevada state line)	6,800	1,756	C	2,007	C	2,321	C
I-80 east of the West Wendover interchange (Nevada/Utah state line)	6,800	327	A	412	A	517	A
Local							
U.S. Hwy. 95 south of Jones Blvd. interchange (North Las Vegas Terminal)	10,200	7,325	F	9,215	F	11,578	F
U.S. Hwy. 95 north of Sunset Road interchange (East Las Vegas)	6,800	2,594	D	3,263	F	4,100	F
Tonopah Hwy. 599 east of the U.S. Hwy. 95/Rancho Road interchange	6,800	1,208	B	1,972	C	2,926	E
U.S. Hwy. 95 south of 157 north of Las Vegas	6,800	843	A	989	A	1,173	B
U.S. Hwy. 95 just east of Mercury interchange	6,800	358	A	385	A	419	A
U.S. Hwy. 95 interchange at Mercury							
Southbound off-ramp	1,300	37	B	37	B	37	B
Southbound on-ramp	1,300	242	B	242	B	242	B
Northbound off-ramp	1,300	242	B	242	B	242	B
Northbound on-ramp	1,300	37	B	37	B	37	B
SR[d] 433, 0.32 km (0.2 mi) north of the Mercury interchange (access to NTS)	2,200	291	C	291	C	291	C
U.S. Hwy. 95, 6.1 km (3.8 mi) north of Mercury interchange	2,200	283	C	323	C	374	C
U.S. Hwy. 95 @ Amargosa Valley to Beatty	2,000	62	A	69	A	78	A
U.S. Hwy. 95 north of Beatty	2,000	174	B	194	B	218	C
SR[d] 160 south of U.S. Hwy. 95	2,000	74	A	91	A	112	B
U.S. Hwy. 93 south of the Nevada/Arizona state line at Hoover Dam	1,500	820	F	987	F	1,196	F
U.S. Hwy. 93 east of westbound off-ramp of Railroad Pass interchange	6,840	2,700	E	3,250	F	3,936	F
U.S. Hwy. 93 north of I-15/U.S. Hwy. 93 interchange	2,000	134	B	168	B	211	B
U.S. Hwy. 93 south of SR 375 junction near Crystal Springs	2,000	133	B	160	B	194	B
U.S. Hwy. 93 west of SR 375 junction near Crystal Springs	2,000	47	A	55	A	65	A
SR 375 west of U.S. Hwy. 93 junction at Crystal Springs	1,500	31	A	34	A	37	A
SR 375 east of Warm Springs	1,500	14	A	15	A	16	A
U.S. Hwy. 6 east of Warm Springs at SR 375 junction	1,700	16	A	17	A	18	A
U.S. Hwy. 6 west of Warm Springs at SR 375 junction	1,700	21	A	23	A	25	A
U.S. Hwy. 6 east of Tonopah, west of SR 376	1,700	99	B	90	A	80	A

[a] Vehicles per hour
[b] Directional design hourly volume (one direction)
[c] Level of service
[d] SR=State Route.

Environmental Restoration Program. The major traffic generators in 2005 under Alternative 1 would be the 174 on-site employees associated with the Environmental Restoration Program, generating approximately 90 vehicle trips on a typical weekday in 2005. The Environmental Restoration Program-related activities would contribute approximately 6 percent to the total number of daily vehicle trips.

Nondefense Research and Development Program. The major traffic generators in 2005 under Alternative 1 would be the 86 on-site employees associated with the Nondefense Research and Development Program, generating approximately 40 vehicle trips on a typical weekday in 2005. The Nondefense Research and Development Program activities would contribute slightly less than 3 percent to the total number of daily vehicle trips.

Work for Others Program. The major traffic generators in 2005 under Alternative 1 would be the 157 on-site employees associated with the Work for Others Program, generating approximately 50 vehicle trips on a typical weekday in 2005. These activities would generate approximately 5 percent of the number of daily vehicle trips.

Site-Support Activities. Site-support activities are anticipated to generate 880 vehicle trips on a typical weekday in 2005. These trips account for operations activities related to roads, utilities, communication, and other site support. Under Alternative 1, these activities would contribute to approximately 60 percent of the total number of daily trips in 2005.

5.1.1.2.3 Transportation of Materials and Waste—The expected waste volumes and numbers of shipments for Alternative 1 are identified on Table 5.1-5. Table 5.1-5 reflects a 10-year average estimate of low-level waste volumes and shipments by generator sites for Alternative 1. The yearly average for low-level waste, ignoring NTS generated low-level waste, is approximately 700 shipments/year. Low-level waste, mixed waste, and some defense programs nuclear material would be transported under this alternative. The specific routes analyzed and their lengths are provided in Appendix I.

Defense Program. The Defense Program requires the shipment of special nuclear materials and weapons components in a safe-secure trailer. Information regarding the total number of radioactive materials shipments generated by the Defense Program is classified for reasons of national security. In addition, with the current weapons testing moratorium in place, it is uncertain at this time how many tests and what types of tests would be performed, in the event the moratorium is lifted. Under Alternative 1, a total of 140 shipments of nuclear test devices to the NTS would occur. The risk associated with Defense Programs transportation is low. The risk of radiation induced latent cancer fatality in the exposed population is 4×10^{-5}; the risk of health effects due to vehicle emissions (nonradiological risk) is 1.85×10^{-4}. The risk of a vehicle-related traffic fatality is 6×10^{-4}. The accident-initiated radiological risk of latent cancer fatality is 8×10^{-11}.

The only on-site risk is from the 32 to 40 km (20 to 25 mi) of roadway that the safe-secure trailer would travel. A group of flammable-liquid storage tanks, protected by dikes, is located near Mercury, about 31 m (100 ft) off the roadway. A transportation accident having serious consequences along this route is estimated to have a probability of less than or equal to 1 in 1,000,000.

Waste Management and Environmental Restoration Programs. Under Alternative 1, a waste volume of 350,500 cubic meters (m^3) (458,437 cubic yards [yd^3]) would be expected, of which 350,000 m^3 (457,783 yd^3) is low-level waste. Additionally, 200,000 m^3 (261,590 yd^3) of the waste would be from off-site generators. This volume of waste represents approximately 7,200 shipments for the 10-year period evaluated.

For the transportation risk analysis, health risk was estimated in terms of vehicle-related fatalities and cargo-related deaths and illness, such as latent cancer fatalities, from highway transportation of DOE-generated low-level and mixed waste. The results are given in Table 5.1-6. Traffic injuries and fatalities would be the most dominant risk, followed by the risk of radiation-induced cancer, which would be dominated by incident-free transportation.

The nonradiological accident risk along the entire route for the 10-year duration of the program is an estimated 2 vehicle-related fatalities and 27 injuries. It is estimated that 0.002 latent cancer fatalities would be induced over 10 years as a result of exposure to radiation. Inside the borders of Nevada, the risk of a traffic-related fatality is estimated to be 0.02 in 10 years, and 1 traffic-related injury is expected in 10 years. The risk of a latent cancer fatality inside Nevada during 10 years is 6×10^{-4} ($6 \times 10^{-4} = 0.0006$). The consequence and probability of the maximum foreseeable accidents were calculated based on the total number of low-level radioactive waste shipments to the NTS. The most severe consequence from a low-level waste accident would be 8.08×10^{-3} latent cancer fatalities and 1.04×10^{-3} radiation detriments. The maximum probability of occurrence of this accident is 2.25×10^{-3}. There is no off-site mixed waste received at the NTS under Alternative 1.

On-site risks include those from the transport of NTS-generated waste, as well as those from the on-site transportation of wastes generated off site. As with off-site transportation, the risk is dominated by vehicle-related fatalities and injuries; the cargo-related risks are very small.

Table 5.1-5. Low-level volumes and shipments by generator site[a], Alternative 1

Generator Site		Waste Type	10-year Volume (m³)[b]	10-year Volume (yd³)[c]	Number of Shipments[d]
Aberdeen Proving Ground		LLW[e]	790	1,033	21
Energy Technology Engineering Center		LLW	614	803	6
Fernald Environmental Management Project		LLW	84,177	110,099	2,213
Lawrence Livermore National Laboratory		LLW	1,928	2,522	51
Inhalation Toxicology Research Institute		LLW	344	450	9
Mound		LLW	60,027	78,512	1,578
Nevada Test Site	(WM)[f]	LLW	500	654	20
	(ER)[g]	LLW	115,000	150,414	8,800
Oak Ridge National Laboratory		LLW	26,607	34,801	699
Pantex Plant		LLW	769	1,006	20
RMI Extrusion Plant		LLW	5,528	7,230	146
Rocky Flats Environmental Technology Site		LLW	14,000	18,311	2,000
Tonopah to NTS		LLW	35,191	46,028	2,707
Sandia National Laboratories, CA		LLW	219	286	6
Sandia National Laboratories, NM		LLW	3,600	4,709	9
Total[h]			**349,294**	**456,858**	**18,285**

[a] All volumes are derived from the 1994 Integrated Data Base and the Waste Management Programmatic EIS inventory projections
[b] Cubic meter
[c] Cubic yard
[d] Assumes an average of 12 containers per shipment
[e] LLW = Low-level waste
[f] Waste Management Program operations
[g] Environmental Restoration Program operations
[h] Includes internally generated waste for WM and ER.

Source: 1994 Integrated Data Base (DOE, 1995a) and the Waste Management Programmatic EIS (DOE, 1995b).

Table 5.1-6. Transportation risks, Alternative 1

	Transportation Risks	Transportation Risks Inside Nevada	On-site Transportation Risks for Off-site Shipments	On-site Transportation Risks from NTS-generated Waste (One-way trips)
TRAFFIC				
Fatalities	2.04±0.01	0.0229±0.0002	3×10^{-2}	6×10^{-2}
Injuries	26.6±0.2	1.1±0.1	3×10^{-1}	7×10^{-1}
RADIATION CANCER[a]				
Incident Free[b]	0.002±0.0005	$(6\pm2) \times 10^{-4}$	3×10^{-3}	1×10^{-7}
Average Exposed Individual[c]	$(8.2\pm) \times 10^{-8}$	$(7.8\pm2.6) \times 10^{-9}$	8×10^{-8}	1×10^{-10}
Maximally Exposed Individual[d]	$(1.1\pm0.4) \times 10^{-6}$	$(1.6\pm0.7) \times 10^{-7}$	9×10^{-8}	3×10^{-9}
RADIATION DETRIMENT[e]				
Incident Free	$(1.8\pm0.4) \times 10^{-3}$	$(4.6\pm1.4) \times 10^{-4}$	0.002	1×10^{-7}
Average Exposed Individual	$(6\pm2) \times 10^{-8}$	$(6.0\pm2.2) \times 10^{-9}$	6×10^{-8}	8×10^{-11}
Maximally Exposed Individual	$(9\pm3) \times 10^{-7}$	$(1.3\pm0.5) \times 10^{-7}$	7×10^{-8}	2×10^{-9}
EARLY RADIATION FATALITIES[f]				
Average Exposed Individual	$(6.8\pm1.8) \times 10^{-7}$	$(6.5\pm2.1) \times 10^{-8}$	7×10^{-7}	9×10^{-10}
Maximally Exposed Individual	$(9.1\pm3.1) \times 10^{-6}$	$(1.3\pm0.5) \times 10^{-6}$	7×10^{-7}	2×10^{-8}
EARLY RADIATION INJURIES[g]				
Average Exposed Individual	$(1.4\pm0.4) \times 10^{-6}$	$(1.4\pm0.5) \times 10^{-7}$	1×10^{-6}	2×10^{-9}
Maximally Exposed Individual	$(1.9\pm0.7) \times 10^{-5}$	$(2.8\pm1.2) \times 10^{-6}$	1×10^{-6}	4×10^{-8}
CHEMICAL CANCER[h]				
Average Exposed Individual	$(9\pm3) \times 10^{-6}$	$(2.4\pm1.1) \times 10^{-6}$	3×10^{-7}	NA[i]
Maximally Exposed Individual	$(2.2\pm0.7) \times 10^{-4}$	$(6.2\pm2.7) \times 10^{-5}$	8×10^{-6}	NA
HAZARD INDEX[j]				
Average Exposed Individual	$(8\pm3) \times 10^{-4}$	$(2.3\pm1.2) \times 10^{-4}$	3×10^{-5}	NA
Maximally Exposed Individual	$(2.1\pm0.9) \times 10^{-2}$	$(5.8\pm3.1) \times 10^{-3}$	7×10^{-4}	NA

[a] The number of latent fatal cancers is expected because of exposure to ionizing radiation. The cancer can develop, and death can occur many years after exposure

[b] Risk resulting from routine, normal day-to-day operations without accidents or other unexpected or unusual occurrences

[c] For accident risk assessment, inhalation exposure to radioactive or chemical materials is assumed to occur under neutral atmospheric conditions (Pasquill atmospheric stability Class D). This results in most-likely or average exposure

[d] For accident risk assessment, inhalation exposure to radioactive or chemical materials is assumed to occur under stable atmospheric conditions (Pasquill atmospheric stability Class F). This results in worst-case or maximum exposure

[e] The total number of health detriment cases because of exposure to ionizing radiation minus the number of latent fatal cancers. Health detriments include genetic damage and development of nonfatal cancer

[f] The number of fatalities expected to occur a relatively short time (a few days to a few months) after acute radiation exposure. Death occurs because of loss of bone marrow function and, at higher doses, gastrointestinal damage and acute inflammation of the lungs

[g] The number of injuries expected to occur a relatively short time (a few days to a few months) after acute radiation exposure

[h] The number of latent cancers expected because of exposure to a chemical carcinogen. Cancer can develop many years after exposure

[i] Not applicable

[j] The ratio between the daily intake of a noncarcinogenic toxic chemical and acceptable reference level. A hazard index less than one indicates that exposure would not result in adverse noncarcinogenic health effects.

Source: Appendix I.

5.1.1.3 Socioeconomics. This section discusses the potential socioeconomic effects associated with Alternative 1. The purpose of this section is to identify and analyze the major socioeconomic issues related to each possible future activity at the sites.

This analysis addresses the timing of effects associated with each alternative for future reuse and covers a period extending 10 fiscal years beyond 1996. Results are usually presented for each alternative for the benchmark years 1996, 2000, and 2005. Table 5.1-7 lists the economic activity projections for Clark and Nye Counties, and Table 5.1-8 lists total housing projections.

ECONOMIC ACTIVITY, POPULATION, AND HOUSING—The baseline for this alternative was established from the total employment projected for each of the sites at the end of Fiscal Year 1995. These proposed Fiscal Year 1995 employment estimates are believed to best reflect the staffing levels needed as a result of recent stockpile requirement reductions.

The region of influence for Clark and Nye counties was identified based on the distribution of residents for current DOE and contractor personnel working at the NTS, the NAFR Complex, and the Tonopah Test Range (DOE, 1994). The region of influence was determined to be the area in which approximately 97 percent of current DOE and contractor employees reside. It was estimated that future distribution of direct workers associated with the proposed alternatives would follow the same trend. For the purpose of this analysis, county data projections are accomplished separately. Because of the difference in size, economies, and contributions to the NTS, a misleading analysis would be produced if Clark and Nye Counties were analyzed as one aggregate area of impact. In other words, the effects might be different for each county.

Under Alternative 1, it was assumed that all sites would continue their current mission with the existing facilities that could comply with environmental, safety, and health requirements and current DOE guidance. It was estimated that a 6,576-person workforce would provide the necessary support to maintain current levels of operations. Figure 5.1-1 compares direct employment among all alternatives in 2005. With the 6,576-person workforce, it is estimated that direct payroll and purchases of goods and services would generate 12,516 secondary jobs (12,235 in Clark County and 281 in Nye County).

Table 5.1-7. Economic activity projections, Clark and Nye counties, 1996, 1997, 1998, 2000, and 2005, Alternative 1

	1996	1997	1998	2000	2005
Clark County					
Population	1,077,576	1,112,348	1,148,241	1,223,541	1,380,920
Total Jobs	507,538	523,916	540,822	576,288	650,413
Unemployment Rate	5.8%	5.8%	5.8%	5.8%	5.8%
Personal income ($1,000)	21,307	22,526	23,746	26,184	32,281
Nye County					
Population	27,407	28,918	30,511	33,966	38,516
Total Jobs	10,990	11,596	12,235	13,621	15,445
Unemployment Rate	5.2%	5.2%	5.2%	5.2%	5.2%
Personal Income ($1,000)	481	516	554	637	781

Table 5.1-8. Total housing projections for the region of influence, 1996, 1997, 1998, 2000, and 2005, Alternative 1

Location and Housing Characteristics*	1996	1997	1998	2000	2005
Clark County					
Housing Stock	456,751	471,504	486,733	518,684	585,414
Housing Demand	420,928	434,511	448,532	477,946	539,422
Available Vacancy Units	35,823	36,993	38,202	40,738	45,992
Available Vacancy Rate	7.8%	7.9%	7.9%	7.9%	7.9%
City of Las Vegas					
Housing Stock	159,125	164,264	169,570	180,701	203,949
Housing Demand	147,884	152,656	157,582	167,916	189,515
Available Vacancy Units	11,240	11,608	11,988	12,785	14,434
Available Vacancy Rate	7.1%	7.1%	7.1%	7.1%	7.1%
City of North Las Vegas					
Housing Stock	28,931	31,986	35,041	38,096	46,087
Housing Demand	27,226	30,102	32,980	43,363	31,495
Available Vacancy Units	1,705	1,884	2,061	2,724	1,989
Available Vacancy Rate	5.9%	5.9%	5.9%	5.9%	5.9%
Nye County					
Housing Stock	12,252	12,927	13,639	15,184	17,221
Housing Demand	10,272	10,838	11,435	12,730	14,435
Available Vacancy Units	1,980	2,089	2,204	2,454	2,786
Available Vacancy Rate	16.2%	16.2%	16.2%	16.2%	16.2%
Town of Tonopah					
Housing Stock	1,801	1,833	1,870	1,935	1,959
Housing Demand	1,485	1,509	1,535	1,586	1,606
Available Vacancy Units	316	324	335	348	353
Available Vacancy Rate	17.6%	17.7%	17.9%	18.0%	18.0%
Town of Pahrump					
Housing Stock	6,936	7,477	8,060	9,367	11,757
Housing Demand	6,130	6,609	7,125	8,283	10,396
Available Vacancy Units	806	868	1,935	1,084	1,360
Available Vacancy Rate	11.6%	11.6%	11.6%	11.6%	11.6%
Amargosa Valley					
Housing Stock	491	512	533	579	659
Housing Demand	403	420	438	475	542
Available Vacancy Units	88	91	95	103	117
Available Vacancy Rate	17.8%	17.8%	17.8%	17.9%	17.8%

* Housing stock is the total number of units; housing demand is the total number of occupied units.

Direct earning levels are estimated at $323 million annually, and secondary earnings are estimated at more than $339 million annually. Of these earnings, $300 million in direct earnings and $330 million in secondary earnings would remain in Clark County, and $23 million direct earnings and $9 million in secondary earnings would remain in Nye County.

For all programs, because there would be no change in economic activity under Alternative 1, the unemployment rate would not be affected and would remain at 5.8 percent. Because of a lack of change in employment, no changes in population are anticipated. The demand for housing would not change under this alternative, because no in- or out-migration would be triggered with this alternative.

Defense Program. Under Alternative 1, the Defense Program would account for 1,472 direct jobs and 2,802 secondary positions, for a total of 4,274 jobs.

Waste Management Program. The Waste Management Program would result in no change in total current employment. This program would remain at approximately 726 jobs, including 250 direct and 476 secondary positions.

Environmental Restoration Program. Under Alternative 1, total employment in this program would not change from current levels. This program would account for approximately 1,129 jobs, including 389 direct and 740 secondary positions.

Nondefense Research and Development Program. Under Alternative 1, the DOE would continue to support ongoing program operations, but no new initiatives would be pursued. Total employment in this program would remain at the same levels. This program would support approximately 555 jobs, including 191 direct and 364 secondary positions.

Work for Others Program. Total employment in this program would remain at current levels. This program would contribute approximately 1,016 jobs, including 350 direct and 666 secondary positions.

Site-Support Activities. Under Alternative 1, total employment in this program would remain at the same levels. This program would contribute approximately 11,392 jobs, including 3,924 direct and 7,468 secondary positions.

PUBLIC FINANCE—The fiscal effects of Alternative 1 are presented in this section. Table 5.1-9 outlines the projected financial summary for Fiscal Years 2000 and 2005 under Alternative 1. The fiscal impact of other alternatives can be determined by subtracting their totals from the Alternative 1 future baseline. The remaining fiscal impact would be the specific impact associated with that alternative.

Clark County. The expansion and improvement of the county infrastructure would continue to be the primary focus of Clark County fiscal efforts. In addition, Clark County has undertaken the implementation of a county facilities development program as discussed in Chapter 4.

Under Alternative 1, revenues for Clark County would increase because of increases in population, personal income, and total employment in the county. Assuming continued small increases in revenues and slightly larger initial increases in expenditures, Alternative 1 would result in revenues less expenditures of a negative $2,502,000 in Fiscal Year 2000. It is expected that Clark County would achieve a positive fiscal position by Fiscal Year 2001. In Fiscal Year 2005, revenues less expenditures are expected to be $37,041,000. The fund balance (or reserves) as a percentage of current expense is expected to be 247 percent in 2000 and 379 percent in 2005.

City of Las Vegas. Under Alternative 1, revenues over expenditures for Las Vegas are expected to become positive in Fiscal Year 1995 because of increases in population, personal income, and total employment in the city. Assuming continued increases in revenues and expenditures, Alternative 1 would result in revenues less

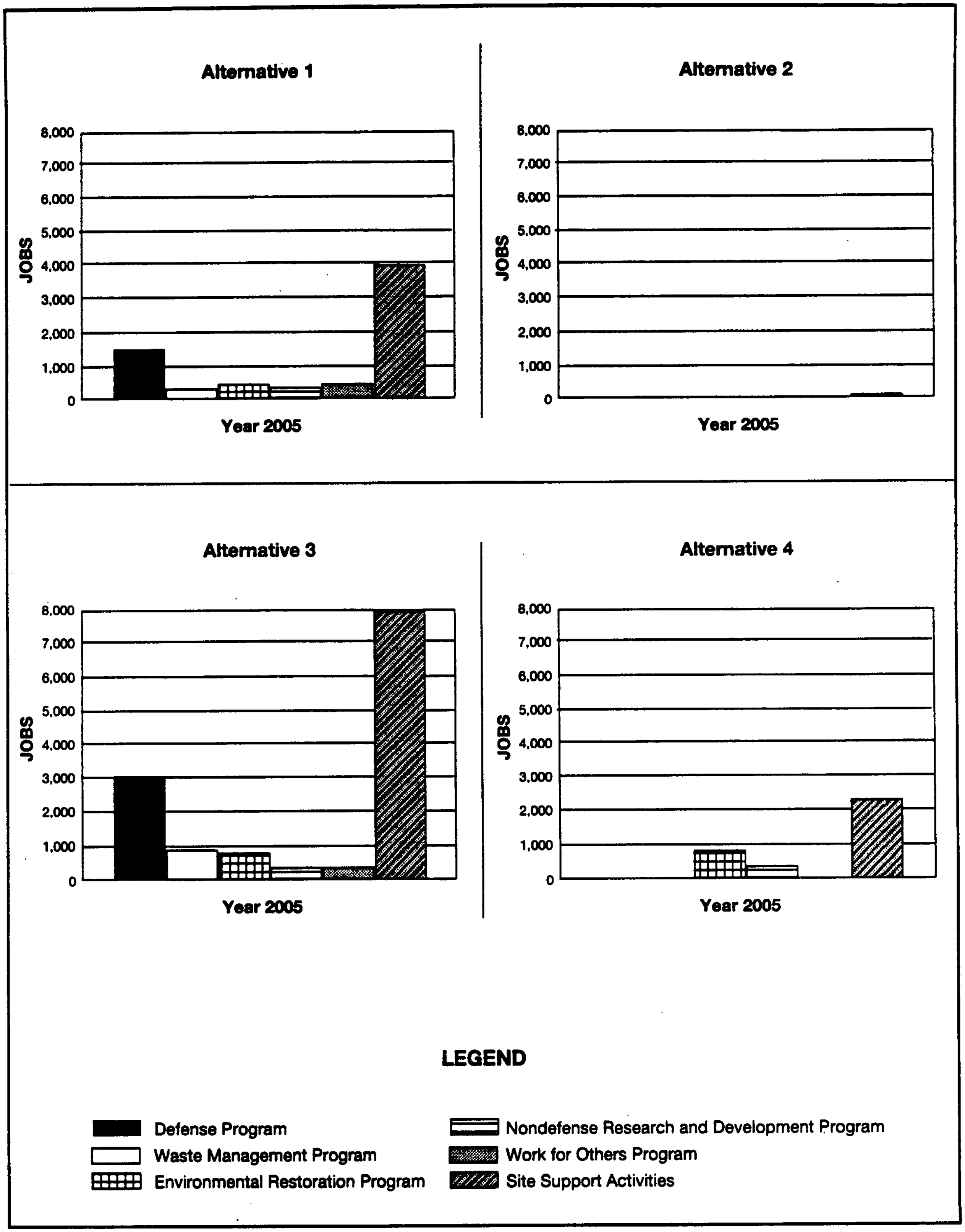


Figure 5.1-1. Total direct employment among all alternatives

Table 5.1-9. Projected financial summary for Fiscal Years 2000 and 2005, general, special revenues, debt service, and capital projects funds, Alternative 1

	Revenues Over Expenditures	Current Expense	Ending Fund Balance	Fund Balance as a Percentage of Current Expense
Fiscal Year 2000				
Clark County	($2,502,740)	$525,981,796	$1,301,552,190	247.45%
City of Las Vegas	$14,379,645	$196,970,437	$355,048,190	180.25%
City of North Las Vegas	($7,077,212)	$47,082,837	$29,965,484	63.64%
Clark County School District	($15,067,362)	$751,358,806	$124,171,528	16.53%
Nye County	$1,567,307	$25,905,977	$14,474,565	55.87%
Town of Tonopah	$78,617	$642,646	$823,356	128.12%
Town of Pahrump	$223,877	$944,592	$1,607,833	170.21%
Nye County School District	($1,402,124)	$26,698,631	($438,631)	-1.64%
Fiscal Year 2005				
Clark County	$37,041,321	$563,448,841	$2,136,031,692	379.10%
City of Las Vegas	$16,435,446	$210,832,569	$574,864,206	272.66%
City of North Las Vegas	($6,580,499)	$50,452,640	$47,652,957	94.45%
Clark County School District	($11,167,703)	$848,002,970	$190,429,375	22.46%
Nye County	$3,455,410	$27,922,658	$27,110,664	97.09%
Town of Tonopah	$75,381	$646,767	$1,206,175	186.49%
Town of Pahrump	$315,094	$1,094,844	$3,011,288	275.04%
Nye County School District	($135,592)	$30,272,304	$4,200,315	13.88%

expenditures of $14,380,000 in Fiscal Year 2000. It is predicted that Las Vegas would achieve an increasingly positive fiscal position and by Fiscal Year 2005, revenues over expenditures would be $16,435,000. The fund balance as a percentage of current expense is expected to be 180 percent in 2000 and 273 percent in 2005.

City of North Las Vegas. Expenditures for North Las Vegas are forecast to continue outpacing revenues under Alternative 1. Revenues over expenditures in Fiscal Year 2000 would be a negative $7,077,000 and a less negative $6,580,000 in Fiscal Year 2005, despite increases in population, personal income, and total employment in the city. Public safety and capital projects are anticipated to continue to be the largest expenditures. Taxes, which recently decreased (from $10,059,472 in Fiscal Year 1993 to $7,941,972 in Fiscal Year 1994), are expected to slowly grow to 1993 levels by Fiscal Year 2001. The fund balance as a percentage of current expense is expected to be 64 percent in Fiscal Year 2000 and 94 percent in Fiscal Year 2005.

Clark County School District. Under Alternative 1, revenues for the Clark County School District would expand because of increases in population and corresponding school enrollment. Regular program and undistributed expenditures would likely continue to increase at a slower rate. The school district is not predicted to achieve a positive fiscal position by Fiscal Year 2005. In Fiscal Year 2000, revenues less expenditures would be a negative $15,067,000 and in Fiscal Year 2005 a less negative $11,168,000. The fund balance as a percentage of current expense is expected to be 17 percent in Fiscal Year 2000 and 22 percent in Fiscal Year 2005.

Nye County. Under Alternative 1, revenues for Nye County would increase slightly because of small increases in population, personal income, and total employment in the county. Assuming continued small increases in expenditures as well, a positive fiscal position is expected to be reached in Fiscal Year 1996. Alternative 1 would result in revenues less expenditures of $1,567,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $3,455,000. The fund balance as a percentage of current expense is expected to be 56 percent in Fiscal Year 2000 and 97 percent in Fiscal Year 2005.

Town of Tonopah. Revenues and expenditures for Tonopah would increase slightly because of small increases in population, personal income, and total employment in the county. Assuming continued small increases, Alternative 1 would result in revenues less expenditures of $79,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $75,000. The fund balance as a percentage of current expense would be 128 percent in Fiscal Year 2000 and 186 percent in Fiscal Year 2005.

Town of Pahrump. Under Alternative 1, revenues for Pahrump would increase slightly because of small increases in population, personal income, and total employment in the county. Assuming continued small increases in revenues and slightly smaller initial increases in expenditures compared to Fiscal Year 1994, Alternative 1 would result in revenues less expenditures of $224,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $315,000. The fund balance (or reserves) as a percentage of current expense is anticipated to be 170 percent in Fiscal Year 2000 and 275 percent in the Fiscal Year 2005.

Nye County School District. Under Alternative 1, revenues for Nye County School District would increase slightly because of small increases in population. Local sources would continue to generate the most revenue. Revenues less expenditures would be a negative $1,402,000 in Fiscal Year 2000 and a less negative $136,000 in Fiscal Year 2005. The fund balance as a percentage of current expense would be a negative 2 percent in Fiscal Year 2000 and 14 percent in Fiscal Year 2005.

PUBLIC SERVICES—The public service impacts of all other alternatives can be determined by subtracting total personnel required from the Alternative 1 future baseline. The addition or reduction in personnel required would be the specific impact associated with that alternative. Table 5.1-10 summarizes the levels of service that would be required for Alternative 1. In each case, the current levels of service are assumed to continue.

The Superfund Amendments and Reauthorization Act of 1986 requires state and local jurisdiction, within the United States, to plan for and have the capability to respond to incidents involving all hazardous materials, including waste, that reside in or pass through their jurisdiction. This process is implemented through the Local Emergency Planning Committee and the State Emergency Response Commission. As part of this program, local communities and counties are required to implement an Emergency Response Plan. These plans define chain-of-command, notification procedures, and evacuation procedures for each community.

For the past 15 years, the DOE has provided training to responders in Nevada through the First-On-Scene Program. The environmental safety and health training will continue to be made available to state regulators, educators, the public, and agencies (firefighters, law enforcement, and emergency, medical personnel) within Nevada. Training courses for environmental safety and health, transportation, radioactive materials management, environmental restoration, and classes that meet or exceed federally-mandated training requirements for personnel involved with the generation or disposal of radioactive or hazardous waste can be provided by the DOE/NV. Courses conducted associated with transportation activities include: first-on-scene responder for law enforcement, firefighters, and emergency medical personnel.

Public Education. A total of 7,928 full-time equivalent licensed teachers were employed by the Clark County School District in the 1993 to 1994 school year, resulting in a student-to-teacher ratio of 18 students to 1 teacher. To continue with this ratio, the Clark County School District would

Table 5.1-10. Projected levels of public service for Fiscal Years 1996, 2000, and 2005, Alternative 1

Jurisdiction	Level of Service *	1996	2000	2005
Clark County School District Teachers	18.33	8,665	9,839	11,105
Nye County School District Teachers	16.39	273	338	384
Las Vegas Metropolitan Police Department (Las Vegas and county rural areas)	2.27	1,330	1,510	1,705
North Las Vegas Police Department	1.75	142	161	182
Nye County Sheriff's Office (Tonopah)	3.67	14	15	15
Pahrump Sheriff's Substation	1.85	30	41	51
Beatty Sheriff's Substation	2.59	5	6	5
Amargosa Valley Sheriff's Substation	2.01	2	3	3
Clark County Fire Department (urbanized unincorporated areas)	1.04	440	500	564
Las Vegas Fire Department	0.84	316	359	406
North Las Vegas Fire Department	1.15	93	106	120
Tonopah Volunteer Fire Department	7.09	27	29	30
Pahrump Volunteer Fire Department	1.98	32	44	55
Beatty Volunteer Fire Department and Ambulance Service	14.51	29	31	28
Amargosa Valley Volunteer Fire Department	23.12	26	31	36
Clark County Medical Doctors	1.37	1,481	1,681	1,897
Clark County Registered Nurses	4.84	5,220	5,927	6,689
Nye County Medical Doctors	0.34	9	12	13
Nye County Registered Nurses	1.53	42	52	59

* Level of services is per 1,000 population. The number of school teachers is based on student-to-teacher ratios, and the number of students is based on a percentage of the population.

require 11,105 teachers by the school year 2004 to 2005. This is an increase of 40 percent over this period from 1993 to 1994 to 2004 to 2005. The student-to-teacher ratio for the Nye County School District was 16.39 students to 1 teacher in the school year 1994 to 1995. Projecting this ratio to the school year 2004 to 2005, a total of 384 additional teachers would be required. This additional increase is 61 percent above the 1994 to 1995 school year's full-time teaching staff.

Police Protection. Assuming the same levels of service in the future, requirements for sworn police and deputy protection in the year 2005 can be examined. The Las Vegas Metropolitan Police Department would require 1,705 sworn officers. The North Las Vegas Police Department would require 182 sworn officers. The Nye County Sheriff's Office in Tonopah would require 15 deputy sheriffs. The Pahrump Sheriff's Substation would require 51 deputy sheriffs, the Beatty Sheriff's Substation would require 5 deputy sheriffs, and the Amargosa Valley Sheriff's Substation would require 3 deputy sheriffs.

Fire Protection. The following discussion addresses firefighter personnel expected to be required in the year 2005 under Alternative 1. The Clark County Fire Department, which handles urban fires in the county, would be expected to require 564 firefighters. Some 406 firefighters would be required in the Las Vegas Fire Department in 2005. The North Las Vegas Fire Department would require 120 firefighters. The Tonopah, Pahrump, Beatty, and Amargosa Valley Volunteer Fire Departments would require 30, 55, 28, and 36 firefighters, respectively.

Health Care. The 1995 level of service for medical doctors and registered nurses was used to determine future needs based on population growth. In 2005, a total of 1,897 medical doctors and 6,689 registered nurses would be required in Clark County. In Nye County, 13 medical doctors and 59 registered nurses would be required. However, because of the present difficulty in obtaining medical services in Nye County, it is anticipated that this level of service would increase in the future.

AMERICAN INDIAN SOCIOECONOMICS— This section describes the American Indian concerns associated with implementing Alternative 1, as summarized by the Consolidated Group of Tribes and Organizations (CGTO).

Indian people prefer to live in their traditional homelands. One reason for this preference is that Indian people have special ties to their traditional lands and a unique relationship with each other. When Indian people receive employment near their reservations, they can remain on the reservation while commuting to work. This pattern of employment tends to have positive benefits for both the Indian community and tribal enterprises like housing. The reservation Indian community has the participation of the individual and his(her) financial contribution. The individual payment for housing is tied to income level, so the more a person earns with the job, the more they pay to the tribal housing office, thus making tribally sponsored housing more economically viable.

When employment opportunities decline on reservations, however, often times Indian families must move away from their reservations to seek employment. These situations have resulted in approximately one-half to two-thirds of the tribal members in the CGTO region of influence moving away from their reservations.

As Indian people move away from reservations due to employment opportunities, Indian culture is threatened because the number of families living on reservations declines. Tribal members who choose to relocate from their reservations impact reservation economies, school, housing, and emergency services. Both schools and economies are impacted because federal funding available to tribes is based on population statistics.

With local employment opportunities such as those offered by the NTS to neighboring tribes, prices of tribal housing rise because they are based on income. If a positive balance between increased income and increased cost of living in tribal reservations is achieved, then both individual members and the tribe benefit from employment opportunities. However, continued salary raises may tip the balance toward sharp increase in cost of living, making it unable for tribal members to continue living in the reservation.

Tribal housing programs become jeopardized if vacancies occur in tribal housing projects and cannot be reoccupied. If vacancies occur, tribal revenues and federal funding will be adversely impacted and will make it more difficult to expand housing programs in future years.

Additionally, vacant units require more maintenance. If tribal members are unavailable to occupy a tribal housing unit, then tribes make units available to non-Indians, and this too potentially impacts Indian culture. The increased presence of non-Indians on a reservation or in an Indian community reduces the privacy needed for the conduct of certain ceremonies and traditional practices. When non-Indian children are in constant interaction with Indian children, it creates a situation that potentially disrupts cultural learning opportunities that occur in everyday life.

Small rural reservations must have a sufficient number of people to generate an emergency response capability. The need for emergency services will decline as people move away from the reservation. Tribal members employed in these emergency service occupations may move away because of their marketable skills. Tribal revenues for administration, school, housing, and emergency services will be reduced accordingly, due to a decline in population size.

When Indian people move away from their reservations several dilemmas occur. Typically, Indian people experience a feeling of isolation from their tribe, culture, and family. When an Indian person relocates to an off-reservation area, the individual finds that there are fewer people of their tribe and culture around them. As a result, Indian people must decide on the appropriateness of practicing traditional ceremonies in the presence of non-Indian people. Indian people are continually torn between the decision to stay in the city or return to the reservation to participate in traditional ceremonies and interact with other tribal members. This dilemma occurs on a regular basis and potentially impacts the livelihood and cultural well-being of off-reservation employees *and their families. When off-reservation individuals choose to return to their homelands to participate in traditional ceremonies, they risk their jobs or disciplinary actions against their children who attend public schools due to excessive absenteeism.*

Should an emergency situation resulting from NTS-related activities, including the transportation of hazardous and radioactive waste occur, it could result in the closure of a major reservation road. Many of the Indian reservations within the region of influence are located in remote areas with limited access by standard and substandard roads. Were a major (only) road into a reservation to be closed, numerous adverse social and economic impacts could occur. For example, Indian students who have to travel an unusually high number of miles to or from school could realize delays. Delays also could occur for regular deliveries of necessary supplies for inventories needed by tribal enterprises and personal use. Purchases by patrons of tribal enterprises and emergency medical services enroute to or from the reservation could be dramatically impeded. Potential investors interested in expanding tribal enterprises and on-going considerations by tribal governments for future tribal developments may significantly diminish because of the perceived risks associated with NTS-related activities including the transportation of hazardous waste.

Defense Program. Under Alternative 1, the Defense Program would produce a total of 4,274 jobs. It is expected that a percentage of these jobs would be filled by tribal members from reservations within the American Indian Region of Influence. Many of these Indian people will move away from their reservations to take these jobs causing the socioeconomic impacts discussed above. Increased employment can positively impact American Indian employees and their families; however, this off-reservation employment is expected to adversely impact the social structure and cultural activities on the reservation.

Waste Management Program. Under Alternative 1, the Environmental Restoration Program would create approximately 1,129 jobs. Although this is approximately one-third the number of jobs created by the Defense Program, it is anticipated that a higher percentage of American Indians would be attracted to the Environmental Restoration jobs because they are more consistent with American Indian land preservation values. American Indians have special skills that may be especially critical to Environmental Restoration activities, and the CGTO has specifically asked that Indian people be involved in these programs. American Indians have asked to be involved when soil mediation actions remove contaminated soil, and afterwards, during habitat restoration.

Nondefense Research and Development Program. *Under Alternative 1, no new jobs would be created by the Nondefense Research and Development Program. Were existing research programs, especially the National Environmental Research Park Program, to integrate American Indians into the study designs, it is possible that a few more Indian people would be employed. These shifts in employment are expected to be minor, so no American Indian socioeconomic impacts are expected.*

Work for Others Program. *Under Alternative 1, no new jobs would be created by the Work for Others Program. No American Indian socio-economic impacts are expected.*

Site-Support Activities. *Under Alternative 1, no new jobs would be created by the site-support activities. No American Indian socioeconomic impacts are expected.*

5.1.1.4 Geology and Soils. The impacts to geology and soils resulting from the five programs and site-support activities are presented in this section.

Defense Program. Under Alternative 1, two scenarios for stockpile stewardship are considered. In the first scenario, a state of readiness to conduct nuclear tests is maintained, but no tests are conducted. No impacts to geologic and soil media result from readiness activities. In the second scenario, which the DOE believes to be highly unlikely, the President directs that one or more nuclear test be conducted. These stockpile tests would be conducted on Pahute Mesa and/or

Yucca Flat; because the type of test that would be conducted cannot be identified, the impacts associated with both types of potential tests are discussed.

Approximately 12 acres of surface geologic media are disturbed in each underground nuclear test in Yucca Flat. The surface area disturbed is three times this amount for each test on Pahute Mesa. Radioisotope contamination could extend up to five cavity radii from the point of detonation. Radii of cavities at the NTS range up to 49 meters (m) (160 feet [ft]), and rubble chimneys range up to 351 m (1,150 ft) high (Borg et al., 1976).

The formation of an underground cavity, a subsurface pocket of radioactivity, and a subsidence crater, as a result of underground testing under Alternative 1, represents an unavoidable and incremental impact on the geologic media in the vicinity of the planned tests. There are, however, already hundreds of such cavities and craters on the NTS where radioactivity has been released into the geologic media, as discussed in Chapter 4, Affected Environments. The impacts associated with conducting a single underground nuclear test also are described in Chapter 4 (Sections 4.1.4.2, 4.1.4.3, 4.1.5.1, 4.1.5.2, and 4.1.11), Affected Environments. The adverse impacts on geology and soils of one to a small number of nuclear tests are a small increment when viewed against existing baseline conditions. The analysis performed for this EIS is for the conduct of one nuclear test. The impacts to the environment from the conduct of multiple tests (a series) are assumed to be incrementally additive. For example, the impacts of conducting two tests would be twice the impact of conducting a single test.

Fault reactivation and associated seismicity induced by underground testing of nuclear devices are described in Section 4.1.4. Fault reactivation from testing of nuclear devices disturbs subsurface and surface geologic media, which is potentially significant in terms of resultant limitations on land use or resultant changes in surface and subsurface water movement. The yield or size of underground nuclear explosions is controlled by the Threshold Test Ban Treaty to a maximum high-explosive equivalent of 150 kilotons (kt). For the purposes of this evaluation, any future weapons testing is assumed to occur under this limitation. Currently, underground nuclear testing can be conducted in the Pahute Mesa and Yucca Flat areas. Because geologic structure may differ considerably among the testing areas, predicting the effects of tests prior to characterizing the geologic environment in the unused areas is uncertain. Nevertheless, the geographic areas for testing and the yield limits can be used to estimate ground-motion effects from future weapons tests.

Ground-motion hazards can result from the underground nuclear explosion and secondary seismic effects. Because of the rather complete recording of ground motions emanating from NTS activities, the effects of the weapons testing program are predictable, and damage effects have been documented.

Communities within 48 kilometers (km) (30 miles [mi]) of testing areas that could be most affected by ground motion from underground nuclear explosions are Beatty, Amargosa Valley, and Indian Springs. The closest potential testing area for these communities is 31 to 40 km (19 to 25 mi) away. Table 5.1-11 is a tabulation of peak horizontal ground-motions for 150-kt tests at 31 km (19 mi), using regressions developed by Long (1986). Peak ground acceleration, velocity, and displacement were computed at the 50th and 84th percentiles of the log-normal distributions given by Long (1986) for rock and alluvium recording geology at 31 km (19 mi) for a 150-kt test. Expected peak ground accelerations (g) are well below 0.05 g, which is the acceleration where slight damage might occur in typical buildings less than several stories in height.

Several Nye County mines are located in the testing vicinity, but all are at a distance greater than 40 km (25 mi) from the closest potential testing area. Because the distances from these mines to the underground nuclear explosions are approximately the same as, or greater than, the distances for communities, damage to structures in the mines is not expected. In investigations of earthquake effects to mines (Owen, 1981), there are very few reports of damage. Surveys of mines in the vicinity of the NTS by Owen and Scholl support these findings (ERDA, 1977).

Table 5.1-11. Predicted (50th and 84th percentiles) peak ground motions at localities 30 km (19 mi) from underground testing areas

Distance		Yield	Acceleration (g)*		Velocity				Displacement			
					50%		84%		50%		84%	
km	mi	kt	50%	84%	m/sec	ft/sec	m/sec	ft/sec	cm	in.	cm	in.
Rock												
31	19	150	0.012	0.029	0.009	0.03	0.020	0.07	0.23	0.09	0.51	0.20
Alluvium												
31	19	150	0.009	0.016	0.009	0.03	0.018	0.06	0.28	0.11	0.61	0.24

* Local acceleration due to gravity.

NOTE: All peak values reported are the largest of the radial and transverse components.

In addition to direct ground motion effects of underground nuclear explosions, there is also potential hazard from secondary seismic effects. Secondary effects are associated with co-seismic strain release attributed to the release of tectonic strain, aftershocks that can be associated with tectonic strain release, and events associated with the collapse of cavities created by the underground nuclear explosions. Beyond 4.8 to 9.7 km (3 to 6 mi) of even the largest underground nuclear explosion (greater than 1 megaton), there was no evidence of significant secondary seismic effects associated with the test. In no case has the magnitude of an aftershock been larger than the magnitude of the underground nuclear explosion (URS/John A. Blume and Associates, 1986).

Underground subcritical experiments would produce some physical effects on the geologic media. Approximately 2,314 m^3 (81,700 cubic feet [ft^3]) would be disturbed each year in association with the conduct of up to four experiments. Irreversible effects would include the deposition of radiological material within the cavity mined in the subsurface. Approximately 20 acres of surface geologic media are currently disturbed in association with the Lyner Complex, where these experiments would be conducted.

In addition to the direct effect of detonating nuclear and other devices on geologic media and processes, preparation for such tests also disturbs geologic media. Disturbances include any associated infrastructure, excavated tunnels, and an existing inventory of deep boreholes up to 4 m (12 ft) in diameter for detonation of nuclear devices. Geologic media excavated in tunnels, boreholes, and burrow pits are considered to be permanently lost. Excavation of tunnels and testing conducted in those tunnels could potentially impact slope stability.

Withdrawal of the NTS would continue to exclude locatable minerals from exploration or appropriation. The presence of past production indicates a potential for future production using modern techniques. Thus, some potential impact regarding availability of these undefined resources exists. Industrial minerals and materials are widespread throughout Nevada. The unavailability of these minerals and materials from the NTS has had little effect on Nevada's mining, manufacturing, and construction industries and would probably have little effect in the future. Aggregate resources have been used in the past as part of Defense Program actions, and aggregate mining would continue under Alternative 1. The impacts of this mining are not considered significant with respect to the resource availability. The aggregate resources of the region are immense, and the demand outside metropolitan Clark County is negligible.

The NTS is considered to have a low potential for geothermal, oil, and gas resources. No impact on these resources is anticipated as a result of Defense Program activities under Alternative 1.

The impacts of soils grading and excavation in support of testing under Alternative 1 are not considered significant. Testing locations in Yucca Flat require that 12 acres be disturbed, while locations on Pahute Mesa require almost 3 times that amount. Given that one or more tests would be conducted under Alternative 1 and that an inventory of prepared sites exists, the associated soil disturbance either already exists or would be minor if a new location(s) was prepared. There is the potential for minor soil contamination as a result of drill-back operations. In the event that such a release occurs and results in soil contamination, corrective actions would be initiated, as required under the appropriate environmental regulations and DOE orders. The soil removed would be lost for the long term.

The consequences of altering the natural drainages and erosion rates are not considered significant. Short-term increases in sediment loss might occur; however, because of the overall slight precipitation over the NTS, increased soil erosion would be limited in both time and extent. Activities associated with conventional high-explosive testing, surface dynamic experiments, and hydrodynamic tests are not anticipated to significantly disturb the surface geology. No significant change in surface topography and drainage paths are anticipated, and, thus, the impacts would be negligible. Construction activities associated with these activities are mitigated to minimize impacts.

Waste Management Program. Craters resulting from underground nuclear tests in Area 3 that meet certain criteria have been excavated to dispose of bulk low-level waste. In this process, the area between adjacent crater pairs is removed, and the floors are reshaped so waste containers can be stacked for disposal. The Area 3 Radioactive Waste Management Site covers approximately 128 acres. The craters that are, and would continue to be, used at the Area 3 Radioactive Waste Management Site represent the unavoidable adverse impacts that resulted from past underground nuclear tests. Use of the craters for waste disposal is a beneficial use of lands that have been significantly and unavoidably impacted by past actions.

The underground shot cavities beneath the subsidence craters and waste cells in the Area 3 Radioactive Waste Management Site are much deeper than active hydrologic surface processes (infiltration, redistribution, and evapotranspiration) operating beneath the waste unit from the ground surface to a depth of 31 m (100 ft). Current scientific models suggest that the chimney beneath the low-level waste unit does not enhance or promote vertical groundwater flow between the waste unit (subsidence crater) and the deep shot cavity. This conceptual model was confirmed by hydrologic data obtained in 1996 from the exploratory borehole completed beneath U-3bl. Water-potential data indicate that there is no groundwater movement from a 40-m to 96-m (131-ft to 315-ft) depth within the subsurface chimney (Van Cleave, 1996). Given the proximity of Area 5 to Area 3 (23 km [14 mi]) and the very similar hydrologic conditions, the defensible hydrogeologic conceptual model for Area 5 is being tested and validated for the Area 3 Radioactive Waste Management Site. The underground shot cavities beneath the subsidence craters and waste cells in the Area 3 Radioactive Waste Management Site are located in the unsaturated zone more than 101 m (330 ft) above the water table. This substantial separation between the shot cavities and the water table provides a further basis, albeit preliminary, to conclude that there is no vertical groundwater flow between the low-level waste unit and the water table. The Environmental Restoration Program will evaluate the potential for groundwater contamination from shot cavities located in the unsaturated zone.

The trenches, pits, and boreholes in Area 5 have been excavated to dispose of containerized low-level waste and mixed waste. The Area 5 Radioactive Waste Management Site covers approximately 732 acres surrounded by a fence. The waste disposal craters and excavations are anticipated to be closed with an engineered cap. The presence of a landfill is essentially a long-term commitment of the area.

Environmental Restoration Program. Environmental Restoration Program activities on the NTS and NAFR Complex are not anticipated to significantly impact geologic media. Safety tests, venting, drill-backs, and atmospheric tests in certain areas of the NTS and NAFR Complex have resulted in radioactive soil contamination, as described in Chapter 4. Various methods of cleanup of these areas have been proposed, including removal of contaminated soil media followed by revegetation. This method of cleanup could temporarily make the surface vulnerable to erosion by water or wind processes. Chemical stabilization followed by revegetation would provide longer-term stability. Reclamation will be based on the specific circumstances of the site and will be addressed in site-specific reclamation plans. Among the variables which will be considered are size of the area, future use, nature of soils, annual precipitation, slope aspect, and site location. The range of options includes natural revegetation, gravel armoring, chemical stabilization, seeding, planting, and irrigating. When highly intensive revegetation techniques are necessary, subsoils could be amended and irrigation could be used. Soils from areas used for staging and support sites could also be salvaged and replaced at the completion of activities. Some areas would be restored to full productivity, while others would be impaired for the long term. Industrial processes have resulted in various areas of chemical or hydrocarbon soil contamination. Remediation of these areas would result in closure in place or removal to an authorized facility. The soils involved would be lost for the long term.

Nondefense Research and Development Program. Projects conducted within the NTS Environmental Research Park are not anticipated to result in significant adverse impacts to geologic media. Tests conducted at the Spill Test Facility on Frenchman Playa in Area 5 do not pose a risk of significant adverse impact to geologic media at or near the facility (DOE/OFE, 1994).

Work for Others Program. Activities under the Work for Others Program, such as defense-related research, development projects, and military training exercises, could have an adverse impact on geologic media of the NTS and NAFR Complex. One potential impact would be soil contamination resulting from weapons firing tests on the NTS and NAFR Complex. Another would be alteration of natural drainage paths, resulting in potential preferential erosion of natural or fill deposits or deposition of sediments. Weapons-firing tests conducted on the NTS, primarily in Area 25, have contaminated relatively small areas of surface and near-surface geologic media. Lead and depleted uranium are the primary contaminants. Continued tests are assumed to have similar impacts as those in the past. Assuming that contaminants are long-lived, these media would be considered permanently lost either through closure in place or removal to a disposal facility. Removal of the contaminated media would make that surface temporarily vulnerable to erosion by water or wind processes.

Site-Support Activities. Infrastructure and grading associated with disposal of bulk waste in Area 3 and containerized waste in Area 5 have further disturbed nearby surface and near-surface unconsolidated deposits, including soils. Continued aggregate use on the NTS as a result of road and facility construction would result under Alternative 1. Aggregate excavated for site-support activities is considered to be permanently lost. Other geologic resources are not anticipated to be significantly impacted by site-support activities. Site-support structures (i.e., roads and buildings) could be removed, and the disturbed geologic media could be restored.

5.1.1.5 Hydrology. The environmental impacts to surface hydrology and groundwater are described in the sections that follow.

5.1.1.5.1 Surface Hydrology—The impacts to surface hydrology for the five programs and site-support activities are presented in this section. One potential impact from all the programs would be effects to mines (Owen, 1981), and there are very few reports of damage. Surveys of mines alteration of natural drainage paths, resulted in potential preferential erosion of natural or fill deposits, deposition of sediments, ponding of water, or inundation of infrastructure. There is little surface water present on the NTS or NAFR Complex. Surface waters on the NTS consist of small areas of seepage associated with springs, small ponds associated with production wells, tritium-contaminated ponds created by tunnel drainage, and ephemeral waters caused by convective summer thunderstorms and runoff during wet winters. No surface waters are used for water supply. The ephemeral waters exist in normally dry washes for short periods of time and on the surfaces of playas for periods of days to weeks. Water quality of the ephemeral waters is poor because of naturally high sediment loads and dissolved solids. Activities could have minor effects on drainage patterns and discharge rates because of surface disturbance, existing surficial contamination, and altered infiltration rates (see Sections 4.1.3 and 4.1.5). Change to sediment loads and dissolved solids because of project activities would be minor compared to the natural conditions. No significant change in surface water quality or quantity is anticipated, and, thus, the impacts would be negligible.

Defense Program. Ground-surface disturbance and craters associated with underground nuclear tests have rerouted parts of natural drainage paths in areas of underground nuclear testing. Some craters have captured nearby drainage, and headward erosion of drainage channels is occurring. However, this is considered to be negligible. In some areas of the NTS, the natural drainage system has been all but obliterated by the craters. As noted in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977), the development of surface craters is an unavoidable adverse impact of underground nuclear testing.

Alteration of natural drainage in the areas of nuclear-device testing is considered to be irrevocable. Whether water entering these craters and subsequently infiltrating into the ground has other than a negligible effect on the unsaturated zone, or potentially the saturated zone, is unknown. However, water entering the unsaturated zones or the saturated zone would account for a negligible source component when compared to the overall baseline condition. The erosion would continue, and over extended periods of time could result in some alteration of the natural drainage system. However, the principal areas where cratering has occurred are in Frenchman Flat and Yucca Flat, which are both topographically closed basins, and no effects on drainage would occur beyond the limits of these basins.

The potential impacts of detonating additional underground nuclear device(s) on flow rates of springs on the NTS are assumed to be negligible. Springs on the NTS are located outside the testing areas or are generally upgradient.

The impacts associated with conducting a single underground nuclear test are described in Sections 4.1.4.2, 4.1.4.3, 4.1.5.1, 4.1.5.2, and 4.1.11. The adverse impacts on hydrology of a small number of additional nuclear tests are small when viewed against existing baseline conditions.

The analysis performed for this EIS is for the conduct of one nuclear test. The impacts to the environment from the conduct of multiple tests (a series) are assumed to be incrementally additive; that is, the impacts of conducting two tests would be twice the impact of conducting a single test.

Activities associated with conventional high-explosive testing, surface dynamic experiments, and hydrodynamic tests are not anticipated to contaminate the water table. No significant change in surface water quality or quantity is anticipated, and, thus, the impacts would be negligible. Construction activities associated with these activities are mitigated to minimize impacts.

Waste Management Program. Potential flood hazards on the NTS and portions of the NAFR Complex are presented in Section 4.1.5 of Chapter 4, Affected Environments. Siting of waste management facilities is a critical issue in terms of protecting the facilities from floods. Also important, however, is the impact on natural processes and media of siting such facilities in areas of potential flood hazard.

The Radioactive Waste Management Sites in Areas 3 and 5 and other waste disposal areas on the

NTS alter natural drainage paths. The craters that are, and would continue to be used, in the Area 3 Radioactive Waste Management Site resulted from underground nuclear tests. The craters have significantly altered the topography and have significantly impacted the surface drainage as discussed in Section 4.1.5. Emplacement of waste in the craters and subsequent engineered closure of the cells would return portions of the surface topography to a natural grade and help to restore drainage patterns. Similarly, engineered berms at the Area 5 Radioactive Waste Management Site constructed to prevent run-on to the site cause negligible impacts to the natural drainage of the area.

Environmental Restoration Program. Water produced from characterization and monitoring wells drilled as part of the Environmental Restoration Program can only be discharged to the surface if it is in compliance with requirements of the Clean Water Act. Because monitoring of the water would be performed and erosion would be reduced through channel protection, drilling activities would have no significant impact to drainage channels or to downstream springs or surface impoundments. Any accidental discharge of produced water that is contaminated with radionuclides or hazardous substances has the potential to contaminate surface and near-surface geologic media. However, present practice is to contain all discharged water in lined sumps until the water quality is determined.

As with Defense Program activities, the Environmental Restoration Program soil-disturbing activities might result in slight increases in sediment yield and some inorganic compounds in surface water. The only planned Environmental Restoration Program action that could result in significant adverse impacts is the cleanup of large areas of plutonium-contaminated soils on the NTS. Appropriate dust and drainage controls would be implemented to ensure that unacceptable levels of plutonium would not become available for transport via surface water flows. Because such controls would be implemented, the impacts of soil restoration actions on surface water quality would not be considered significant.

Other Environmental Restoration Program activities would not have significant impacts to surface waters on the NTS and NAFR Complex; therefore, the impact of environmental restoration actions on the quantity of surface water resources is not expected to be significant.

Nondefense Research and Development Program. The facilities for the Nondefense Research and Development Program have already been constructed, and no new soil-disturbing actions that might impact the surface water regime are included as part of Alternative 1. Tests conducted at the Spill Test Facility on Frenchman Playa in Area 5 do not pose a significant adverse impact to any surface water at or near the facility (DOE/OFE, 1994).

Work for Others Program. Surface-based testing under the Work for Others Program might have negligible impacts on the surface water regime. Slight alterations in runoff and minor contributions of inorganic compounds and increased sediment yield might occur. Any such impacts would likely be very short term and small scale. Because of the very limited surface water flows and the limited extent of disturbances, significant impacts on the surface-water regime are not anticipated.

Other activities of the Work for Others Program could have a significant impact on surface waters of the NTS and NAFR Complex. Whether these activities have a significant impact is dependent on the size and location of the activity, which are yet to be determined.

One potential impact would be contamination of surface waters resulting from weapons-firing tests on the NTS and NAFR Complex. Weapons-firing tests conducted on the NTS, primarily in Area 25, have contaminated relatively small areas of surface and near-surface geologic media. Lead and depleted uranium are the primary contaminants. Continued tests and military training activities are assumed to have similar impacts as in the past.

Site-Support Activities. As with the five programs discussed prior, a potential impact from the siting of support infrastructure in certain areas would be the alteration of natural drainage paths, resulting in potential preferential erosion of natural or fill deposits, deposition of sediments, ponding of water, or inundation of infrastructure.

Construction activities could result in some temporary impacts on surface water quality. Anticipated impacts include increases in sediment yield and perhaps in the loading of naturally occurring inorganic compounds (salts). Because of the very infrequent surface water flows, these impacts would likely be negligible and are not considered significant.

Road building associated with well drilling and soil remediation might disturb significant areas of soils. However, because of the very limited nature of surface water resources on the NTS and other DOE-administered lands in Nevada, the impact on surface water flows is expected to be minimal.

5.1.1.5.2 Groundwater—Impacts to groundwater from the five programs and site-support activities are presented in this section. In addition, because groundwater is an important resource in Nevada and the primary source of water for the NTS, the impacts to this resource are analyzed.

The consequences of Alternative 1 activities on the water resources of the NTS and adjacent areas include two broad types of effects: reductions in water resource availability and impacts on water quality. The DOE routinely withdraws groundwater at the NTS and other DOE-administered lands in Nevada. These groundwater withdrawals could result in localized impacts, including a lowering of water levels, changes in groundwater flow directions, and a reduction in the quantity of water available to other users. If large-scale groundwater withdrawals occur, the impacts could increase to include reductions in spring off-site discharge rates, water quality impairment, and reduced underflow to downgradient areas.

The potential for increased percolation of water downward through the chimney and into the groundwater system is another potential impact. However, water entering the unsaturated zones or the saturated zone would account for a negligible source component when compared to the overall baseline conditions. The Desert Research Institute (Tyler et al., 1986) has investigated the effects of craters on infiltration and soil moisture movement, and research is continuing in this area. This study was inconclusive; additional studies are planned during 1997.

Two key areas of environmental concern are located beyond the NTS boundaries to the south: Devils Hole National Monument and Ash Meadows. Devils Hole is a small pool in the limestone in the Amargosa Desert that is the habitat for the desert pupfish. This fish feeds and spawns in the shallow water on limestone ledges in the pool. An adequate water level must be maintained in the pool to provide for the continued success of this endangered species. The Ash Meadows area is a point of regional discharge for the carbonate aquifer system. An estimated 2.09×10^7 m^3/yr (17,000 acre-feet/year) discharges to the surface, creating an extensive area of spring pools, streams, and wetlands. These wetlands form a valuable habitat for a great diversity of unique species. While the results of past investigations have not found any impacts resulting from DOE operations on these key environmentally sensitive areas, additional evaluation would be performed using sophisticated numerical simulation methods to ensure the continued existence of the pupfish and the important habitat at Ash Meadows.

Another category of effects is the potential impact of a given activity on the quality of the water resources. The grading of soils and other construction actions could slightly alter the quantity and quality of runoff.

Defense Program. Historically, the total annual demand for water at the NTS since the early 1960s has varied considerably, ranging from about 1.0×10^6 m^3/yr (850 acre-feet) in 1963 to a peak of 4.2×10^6 m^3/yr (3,430 acre-feet) in 1989.

Long-term measurements of the water levels have demonstrated that historic water withdrawals have not resulted in significant impacts on water levels. It is considered unlikely that future Defense Program water withdrawals under Alternative 1 would result in significant impacts. Localized water-level declines and changes in flow direction would occur during periods of active pumping.

These effects would be limited and are thus considered to be unavoidable, but not significant, impacts.

As an unavoidable consequence of underground nuclear testing, the quality of the groundwater under some portions of the NTS has been impaired. If an underground nuclear test is conducted under or near the water table, additional impairment of water quality and further losses of groundwater resources could be expected. NTS standard operating procedures are designed to protect groundwaters from contamination by ensuring that no tests are conducted within two cavity radii (or a minimum of 100 m [328 ft]) of the groundwater table.

The effects of underground testing have been well-documented in Borg et al. (1976), and the hazardous materials associated with testing have been detailed by Bryant and Fabryka-Martin (1991). A detailed discussion of the effects of past underground testing on the groundwater is presented in Sections 4.1.5 and 4.1.11.

Yields, locations, and proximity to the water table of tests to be conducted under Alternative 1 have not been defined. Therefore, it is not possible to estimate the total potential releases to the groundwater. If tests are conducted in or near the water table, then significant releases of radionuclides and hazardous materials into the near test environment are to be expected. The estimated total release of fission and source-term radionuclides and activation products is 804,500 curies (Ci)/kt of explosive yield. Thus, the potential releases to the groundwater environment from testing of a single device far exceed releases from other actions to be included under Alternative 1. Tests conducted well above the water table would release significant quantities of radionuclides and hazardous materials into the unsaturated zone. Some downward migration of these contaminants may occur and may have the potential to contaminate the underlying groundwater.

The ancillary operations related to testing under Alternative 1 are primarily surface-based and have little potential for groundwater contamination. Minor quantities of drilling fluids or lost circulation materials might be introduced into the near-water-table environment during test hole drilling and post-shot drill-back operations. Any contamination that results from these activities would be considered inconsequential compared to the releases from the actual test.

The continuation of testing under Alternative 1 would have a significant impact on groundwater quality only if the testing is conducted in, or near, the water table. In this event, contamination of the near-test groundwater resources would occur. However, because of the conditions at the NTS (long travel paths, sorptive geologic media, slight hydraulic gradients, and the depths of the stockpiled holes), it is not considered likely that significant impacts would occur in areas downgradient of the underground testing locations.

Underground conventional high-explosive, hydrodynamic tests, and dynamic experiments would not affect the groundwater because such tests and experiments would be conducted well above the water table.

Waste Management Program. Water use in support of Waste Management Program actions under Alternative 1 would be minimal. The impact of withdrawing limited quantities of groundwater in support of the Waste Management Program would not result in significant impacts to groundwater availability.

The craters that are and would continue to be used at the Area 3 Radioactive Waste Management Site represent unavoidable adverse impacts that resulted from past underground nuclear tests. Use of the craters for waste disposal and subsequent capping with engineered covers would prevent the downward migration of precipitation into the waste.

The underground shot cavities beneath the subsidence craters and waste cells in the Area 3 Radioactive Waste Management Site are much deeper than active hydrologic surface processes (infiltration, redistribution, and evapotranspiration) operating beneath the waste unit from the ground surface to a depth of approximately 31 m (100 ft). Current scientific models suggest that the chimney beneath the low-level waste unit does not enhance or promote vertical groundwater flow between the waste unit (subsidence crater) and the deep shot cavity. This conceptual model was confirmed by hydrologic data obtained in 1996 from the exploratory borehole completed beneath U-3bl. Water potential data indicate that there is no groundwater movement from a 40-m to 96-m (131-ft to 315-ft) depth within the subsurface chimney (Van Cleave, 1996). Given the proximity of Area 5 to Area 3 (23 km [14 mi]) and the very similar hydrologic conditions, the defensible hydrogeologic conceptual model for Area 5 is being tested and validated for the Area 3 Radioactive Waste Management Site. The Environmental Restoration Program, will evaluate the potential for groundwater contamination from shot cavities located in the unsaturated zone (more than 101 m [330 ft] above the water table).

After 30 years of waste disposal operations, groundwater monitoring at the Area 5 Radioactive Waste Management Site has not detected any contamination. In addition, field studies conducted to support the Performance Assessment (Shott et al., 1995), which included monitoring of soil moisture and chloride ion concentrations, indicate that water falling on the surface (precipitation) does not reach the groundwater. These studies and the absence of contamination support the conclusion that no groundwater pathway exists beneath the Area 5 Radioactive Waste Management Site. Thus, no impact to groundwater from waste management operations at the Area 5 Radioactive Waste Management Site would occur during the timeframe covered by this EIS and long into the future. (See Volume 1: Appendix A, Section A.2; Chapter 2, Section 2.5.6; and Chapter 4, Section 4.1.5.2 for additional information.)

Environmental Restoration Program. Groundwater use during environmental restoration activities would be minimal and would be limited to that used in pad and road construction, dust control, drilling and testing of characterization wells, decontamination of sampling materials, and purging of wells prior to sampling. Annual water requirements for characterization have not been well defined, but are expected to be minimal. According to information from the Underground Test Area Corrective Action Unit project, the greatest demand for nonpotable water for drilling a characterization well was 7,401 m^3 (6 acre-feet). The total water demand for this program would probably be less than 74,009 m^3/yr (60 acre-feet/year) between 1995 and 2005. Smaller quantities of water would be required to support decontamination and well sampling. Total demand for site characterization activities would probably be 123,348 m^3/yr (100 acre-feet/year), and no significant impact is expected from the withdrawal of such a small quantity of water.

Information concerning future remediation efforts is preliminary. Water demands projected for the decommissioning of some sites (e.g., the demolition of structures at Test Cell C) have been as high as 3,785 liters (L)/day (1,000 gallons [gal]/day) of potable water (or about 1,357 m^3/yr [1.1 acre-feet/year] over a two-year period). Long-term remediation requirements have not yet been determined. If it is assumed that remediation does not include any active groundwater controls, future requirements for monitoring and well-testing would be a few thousands of cubic meters per year (tens of acre-feet per year). If active groundwater controls were implemented (e.g., hydraulic barriers or extraction wells), future water demands could be several million cubic-meters per year (thousand acre-feet per year).

Nondefense Research and Development Program. The current water demand for the Spill Test Facility has not been determined, but is expected to be slight for fire control, safety, experiments, and potable and nonpotable water. Similarly, the Environmental Management and Technology Development Program has unquantified, but minimal, water demands. Some field measurements and testing might be included in the feasibility study of a Solar Enterprise Zone facility; however, any requirements would be negligible. In total, the water demands for the Nondefense Research and Development Program activities would probably be no more than 12,335 m^3/yr (10 acre-feet/year), and no significant impact would be related to this water use.

Work for Others Program. The water demand for the Work for Others Program has not been defined, but is expected to be minimal. The defense-related research and development activities would include the development of nonintrusive detection and imaging capabilities and surface-based testing. Small quantities of water (probably less than 1,234 m^3/yr [1 acre-feet/year]) may be required to support personnel. The withdrawal of this quantity of water is not significant.

Site-Support Activities. The DOE monitored water withdrawals at the NTS for the periods between 1951 through 1990 (see Chapter 4). These records serve as the basis for predicting the demand for water for the period 1996 through 2005. Under Alternative 1, water use is expected to remain relatively stable because the activities included within the alternative are the same as those that have been conducted previously at the NTS. For the purpose of evaluating the environmental consequences of testing, the water-use rate for 1989 was assumed to be representative for active testing conditions. Water use for 1993 was assumed to be representative of the water demand to support nuclear testing readiness.

Because the water required to support the NTS is derived exclusively from groundwater, there would be some level of impacts on groundwater resources. Because the effects of groundwater withdrawals vary depending on the location, geologic conditions, and withdrawal rates, a more detailed evaluation is required.

The localized water-level declines in areas adjacent to operating water supply wells is not considered a significant impact. The impacts of water-level declines would not be considered significant unless water levels decline in areas off site from the NTS or if the quantity of groundwater discharging from the NTS to downgradient areas would be diminished. The U.S. Geological Survey maintains a water-level monitoring network downgradient of the NTS. The water level in the Devils Hole well rose more than 1 m (3 ft) between the lowest recorded measurement in 1972 and the highest recorded measurement in 1993. Similarly, in the Point of Rocks south well, static water levels rose more than 22 m (72 ft) between the lowest recorded measurement in 1970 and 1994. These data and records for other monitoring wells in the region do not show any effects that might be attributed to water withdrawals on the NTS.

*5.1.1.6 **Biological Resources.*** Little or no previously undisturbed habitat would be cleared for the Defense, Waste Management, Nondefense Research and Development, and Work for Others Programs. About 9,800 acres of land would be cleared for the Environmental Restoration Program. Most of this land has been contaminated by radioactive or hazardous materials, and some of it has been disturbed previously. Much of that land would be stabilized and/or revegetated. Infrastructure development would result in the removal of approximately 18 acres of previously undisturbed habitat. Collectively, approximately 9,900 acres, part of which has been disturbed previously, would be disturbed by the DOE or DOE-sponsored organizations under Alternative 1. This represents approximately 1 percent of undisturbed habitat present at the NTS (Hunter and Medica, 1992). Military training exercises under the Work for Others Program might impact additional sizeable habitat blocks, but these exercises are not defined well enough to allow estimation of the potential extent of disturbances. No projects in Alternative 1 are large enough that they would likely lower the viability of populations of any species, including candidate species and economically or recreationally important species.

Because Alternative 1 does not include additional atmospheric, safety, or cratering tests, the concentrations of radionuclides that the flora and fauna are exposed to will not increase. Since few deleterious effects were observed in species or populations when such activities were conducted in the past, no additional impacts are anticipated.

The desert tortoise is the only threatened or endangered species commonly found on the NTS. Individual desert tortoises might be accidentally killed or injured during military training exercises. However, because surveys are conducted and tortoises are removed prior to soil-disturbing activities on the NTS, this is unlikely. From 1989 through 1994 on average, less than one tortoise was killed per year on roads on the NTS (DOE/NV, 1991, 1993, and 1994a). Because vehicular traffic patterns are expected to be similar or lower under Alternative 1 than they were during 1989 through 1994, a similar or lower number of tortoises probably would be killed under this alternative. Groundwater withdrawals under Alternative 1 would not likely affect water flow rates at springs on and around the area. Only military training exercises located at or near springs on the NTS or NAFR Complex could significantly impact the biota associated with these springs.

In a Draft Biological Opinion issued to the DOE/NV on May 21, 1996, the U.S. Fish and Wildlife Service determined that the level of effect described in the NTS EIS would not reduce appreciably the likelihood of survival and recovery of the Mojave Desert population of the desert tortoise in the wild or diminish the value of critical habitat both for survival and recovery of the desert tortoise because:

- The proposed programmatic area does not occur within any areas recommended for recovery of the desert tortoise or areas designated as critical habitat.

- Rehabilitation and revegetation of disturbed sites or payment of off-site mitigation fees will benefit conservation and recovery of the desert tortoise as directed under Section 7(a)(1) of the Act.

- The desert tortoise is a wide-ranging species occurring over a large area. The degree of threats to the species vary in different parts of the Mojave Desert, requiring implementation of management actions tailored to the needs of specific areas (Service, 1994). The loss of habitat associated with the proposed action translates to approximately 1 percent of the total habitat on the NTS. With proper management and conservation, important desert tortoise populations both inside and outside designated recovery areas, will remain viable.

- The NTS occurs within the northeastern Recovery Unit in Nye County, Nevada. Activities on the NTS should not result in a substantial loss of the tortoises within this Recovery Unit. The potential effects on desert tortoises as a result of implementation of the proposed programs by the DOE/NV, as described in the *Description of the Proposed Action*, represents a small impact to the Mojave population of the desert tortoise when total desert tortoise population numbers and geographical extent are considered.

Because there would be few significant impacts to population viability, rare species, or rare habitats in the region, Alternative 1 should have little negative impact on biodiversity or ecosystem functions in this area.

Defense Program. No new facilities would be needed for stockpile stewardship or emergency response activities, and transportation of hazardous or radioactive materials would not likely result in significant impacts on biological resources (Appendix I). Therefore, these projects would have no significant impact on biological resources.

Counterproliferation research and development activities involve detecting underground objects related to nuclear testing or eliminating such objects. Some activities would take place in buildings or, if outside, would involve nondestructive sampling. Thus, this part of the project is unlikely to impact biological resources. Other activities might include aboveground detonations near bunkers. Some activities involve developing technologies for the safe rendering of nuclear devices. This includes aboveground detonations of conventional high explosives at the Big Explosives Experimental Facility (see Appendix F). The detonations would take place on the 20 m x 20 m (66 ft x 66 ft) gravel firing pad constructed for high-explosive detonations. The facility site consists of 8 acres of graded and cleared land surrounding the bunkers and firing pad. It is unlikely that explosions would significantly impact surrounding habitat, affect the viability of plant or animal populations, or impact springs. This facility is north of the range of the desert tortoise (Rautenstrauch et al., 1994). Transportation to study sites would be infrequent; therefore, the impact of this program on biological resources would not be significantly increased.

Under Alternative 1, one or more nuclear tests could be conducted underground on Pahute Mesa or in Yucca Flat. Because the DOE has already prepared sufficient sites to handle numerous underground tests, no new impacts on biological resources would arise from maintaining readiness for these tests. A subsidence crater could be created by the underground test of the nuclear device. Because this crater would form in the area disturbed during site preparation for the test, no new loss of habitat would occur. Drilling sumps constructed as part of post-shot drilling operations could attract waterfowl and doves. Exposure to drilling fluid additives might increase these organisms' probability of drowning (Greger, 1995).

Additional releases of tritium into the aquifer from the underground nuclear test would not likely increase the impact to threatened and endangered species located at Devils Hole National Monument or Ash Meadows National Wildlife Refuge. The short half-life of tritium and the slow rate of water exchange between the nuclear test sites and groundwater and the resulting model studies indicate that tritium would not be detected off government-controlled lands (Borg et al., 1976; GeoTrans Inc., 1995). Hydrodynamic tests and dynamic experiments conducted at the existing Big Explosives Experimental Facility in Area 4 and at the Lyner Complex in Area 1 are not expected to impact biological resources. Conventional high-explosives testing is expected to occur in areas previously cleared of vegetation, so no new wildlife or plant habitat would be lost. No other significant impact to biological resources is expected.

The analysis performed for this EIS is for the conduct of one nuclear test. The impacts to the environment from the conduct of multiple tests (a series) are assumed to be incrementally additive; that is, the impacts of conducting two tests would be twice the impact of conducting a single test.

Waste Management Program. Activities at the Area 3 Radioactive Waste Management Site would disturb very little of the previously undisturbed areas and would not have a significant impact on habitat or population viability. Closure of the two disposal cells would result in a beneficial impact because these sites would be revegetated with native plants. Area 3 is north of the range of the desert tortoise; therefore, construction and operation would have no effect on this species. This program also would have no effect on other threatened and endangered species or springs and their associated biota.

Land disturbance at the Area 5 Radioactive Waste Management Site is too localized to impact viability of plant and animal populations. Construction activity would include one new trench and closure of several pits and trenches. Because these disturbed sites would be revegetated, this activity would have a positive impact on habitat. Effects on threatened or endangered species would be unlikely given that no tortoises or tortoise sign has been seen in this area (EG&G/EM, 1994), and other threatened and endangered species would be unlikely to use this area. No springs are near this site.

At the Area 6 Waste Management Site, PCBs are temporarily stored prior to being transported off site for disposal at EPA-permitted facilities. Because this waste would be stored in a developed area with no anticipated releases to the environment, this activity would have no biological impacts. Disposal activities at the hydrocarbon landfill in Area 6 are also not expected to impact biological resources.

In Area 11, explosive ordnance would be destroyed in an 8 m x 31 m (26 ft x 102 ft) detonation pit surrounded by an earthen pad. No new land would be disturbed. Detonations occur infrequently. They would not likely impact habitat use by animals in areas around this site, because desert tortoises are rare near this facility. A 40-acre area surrounding this facility was searched in 1991; no tortoise or tortoise sign was found. It is, therefore, unlikely that tortoises would be directly injured or killed by this project.

Environmental Restoration Program. Five projects in the Environmental Restoration Program would occur on the NTS or NAFR Complex under Alternative 1. None of the environmental restoration actions would have significant impacts on population viability or habitat of plants or animals. The impacted areas are small relative to the geographic areas inhabited by affected populations, and very little undisturbed habitat would be disturbed. About 50 acres would be cleared for the Underground Test Area Corrective Action Unit project; however, much of this land is already disturbed. Burrowing owls, candidate species of bats, and economically or recreationally important species like doves or waterfowl might be exposed to drilling mud contained in drill sumps. Drilling mud, although nontoxic, might contain polymers and surfactants that could coat birds or mammals that land in or drink from the sumps. This could increase their probability of drowning (Greger, 1995). Drilling also might result in production of some hazardous and radioactive wastes; these wastes would be transferred to waste management facilities for disposal. Transport of the removed material to approved disposal sites would not likely impact biological resources (Appendix I).

The second project, the Soils Media Corrective Action Unit activities, would involve the removal and transport of radioactively contaminated soils from 3,257 acres to approved disposal locations. The habitat would be destroyed during soil removal, but may be revegetated afterward. This area is adjacent to the playa and, thus, is not desert tortoise habitat (EG&G/EM, 1991). No candidate species of plants occur on those sites (Blomquist et al., 1995). These activities would not occur near springs nor require pumping of shallow groundwater; thus, the tortoises would not be affected.

The third project, the Industrial Site Unit activities, would disturb about 2,510 acres. Almost all of this land has been disturbed previously and is not wildlife habitat. It is unlikely that desert tortoises would be killed or injured during earthmoving. Surveys would be conducted, and all tortoises would be removed prior to those activities. Removal of hazardous or radioactive materials might have positive impacts on the survival of individuals of threatened or endangered species, such as desert tortoises. Transport of the removed material to approved disposal sites would not likely impact biological resources because workers follow stringent safety protocols (Appendix I). This project is unlikely to take place near springs; thus, springs should not be affected.

During the fourth project, Decontamination and Decommissioning, eight contaminated buildings or building complexes could be torn down and transferred to appropriate disposal areas. Transport of the contaminated material to approved disposal sites would not likely impact biological resources.

There are 100 Defense Nuclear Agency sites in Area 12 of the NTS that were contaminated with radioactive or hazardous waste. This project might continue operations to contain contaminant migration, characterize and remediate contaminated muck piles and ponds, and select and implement post-contamination remediation actions. About 50,971 m^3 (1.8×10^6 ft^3) of radioactive wastes would be removed from a 500-acre area. Therefore, a substantial amount of habitat would be destroyed, but might be revegetated. Revegetation could have a positive impact on habitat in highly disturbed areas because it would advance the successional process in these areas (Call and Roundy, 1991). Cleanup might also have negative impacts on habitat in areas where mature, undisturbed natural vegetation existed prior to cleanup. Transport of the removed material to approved disposal sites would not likely impact biological resources (Appendix I). This project would not take place near springs; thus, springs would not be impacted.

Nondefense Research and Development Program. All five activities within this program would be operational under Alternative 1. The first activity, the Alternative Energy Project, and the second activity, the Environmental Management and Technology Development Project, would be in planning or design stages and would not affect biological resources.

The third activity, the Alternative Fuels Demonstration Projects would not require destruction of habitat or have other negative impacts on biological resources. Over the long term, information from this project might have significant positive ramifications for biological resources because of potential influences on fossil fuel use.

The fourth activity, the National Environmental Research Park, would have no negative effect on habitat, population viability of plants or animals, threatened or endangered species, or springs. Over the long term, research into many of these topics might have positive impacts on biological resources because the findings could result in improved management of resources.

The fifth activity, the Spill Test Facility, is not expected to result in any significant impact to vegetation or wildlife. A monitoring program was established in 1981 to evaluate impacts from chemical spill tests at various distances downwind (northeast) from the Spill Test Facility. Results of monitoring vegetation, small mammals, kit foxes, lizards, and lagomorphs showed no measurable impacts on these biological resources except for leaf burns observed on vegetation growing in patches of disturbed soil on the playa (DOE/OFE, 1994). No adverse impacts are anticipated to occur at distances greater than 5 km (3 mi) downwind of the facility, near the western boundary of the Desert National Wildlife Range. Desert tortoises are very uncommon near this facility (EG&G/EM, 1991) and probably would not be affected. Chemicals would be dispersed by the time they reach areas where tortoises are known to occur. Information from this project could have positive impacts on biological resources to the degree that it contributes to a better understanding of how to contain and clean up hazardous spills.

Work for Others Program. The Work for Others Program consists of five projects. Treaty verification and nonproliferation projects would have no significant impacts on biological resources. The Conventional Weapons Demilitarization Project would have no expected impacts on biological resources. Defense-related research and development projects have the potential to negatively impact biological resources because of habitat disturbance, either through troop or vehicle movements, ordnance detonation, or fires (Schaeffer et al., 1990). If off-road military exercises occur within tortoise habitat, tortoises might be inadvertently killed. Defense-related research activities performed in the past were essentially benign, consisting primarily of nondestructive sampling and testing, such as infrared imaging. Based on these prior projects, no significant negative impacts are anticipated on biological resources from this activity.

Similarly, defense-related research activities involving hydrodynamic tests are likely to have little or no impact on surrounding habitat, the viability of plant or animal populations, or springs or other water sources. This is because the detonations would take place on the 20 m x 20 m (66 ft x 66 ft) gravel firing pad (constructed for high-explosive detonations) surrounded by 8 acres of graded and cleared land.

Site-Support Activities. The NTS and NAFR Complex are served by existing airfields and by paved and graded roads. Most people and material are transported to these sites via roads. Road maintenance would not significantly impact biological resources because it involves redisturbance of previously disturbed habitat. The southernmost 52 km (32 mi) of Mercury Highway would be repaved, disturbing approximately 6 acres of land for staging areas. In addition, 5 km (3 mi) of the Road 5-01 reconstruction would be completed. This road would run from Mercury Highway to just south of the Area 5 Radioactive Waste Management Site, and would remove approximately 18 acres of undisturbed habitat. The fiber-optic network would continue to be expanded when extensions are added from the two central hubs. Because surveys are conducted and tortoises are found and relocated out of harm's way prior to ground disturbances, it is unlikely that tortoises would be killed during this project. Construction would be unlikely to significantly impact other biological resources. Waterline, powerline, and natural gas line developments are not likely to be extensive.

5.1.1.7 Air Quality. The impacts to air quality resulting from the five programs and site-support activities are summarized in this section. The region of influence for this air quality analysis includes Nye and Clark Counties, Nevada. The emissions from stationary, mobile, and fugitive PM_{10} sources, which are shown in Tables 5.1-12 and 5.1-13, occur within and outside of the NTS. These emissions would be dispersed over the 3,496 square kilometer (km^2) (1,350 square mile [mi^2]) area of the NTS. At the boundaries of the NTS, ambient pollutant concentrations would be well below the ambient air quality standards. Since no substantial increases in air pollution emissions

Table 5.1-12 Summary of NTS construction emissions and mobile source emissions (on site and off site), tons per year, Alternative 1

Program	Construction	Mobile Sources								
		On Site			Off Site					
					Nye County			Clark County		
	Fugitive PM_{10}[a]	CO[b]	VOC[c]	NO_x[d]	CO	VOC	NO_x	CO	VOC	NO_x
Defense	Negligible	53.63	7.29	9.55	16.69	2.52	5.90	32.40	4.89	11.44
Waste Management	0.00	9.10	1.24	1.62	2.83	0.43	1.00	5.50	0.83	1.94
Environmental Restoration	220	14.13	1.92	2.52	4.40	0.66	1.55	8.53	1.29	3.01
Nondefense Research and Development	0.00	6.94	0.94	1.24	2.16	0.33	0.76	4.20	0.64	1.48
Work for Others	0.0	12.69	1.72	2.26	3.95	0.60	1.40	7.66	1.16	2.71
Site-Support Activities	NA[e]	142.93	19.42	25.45	44.49	6.72	15.71	86.36	13.05	30.49
Total	**220**	**239.42**	**32.53**	**42.64**	**74.52**	**11.26**	**26.32**	**144.65**	**21.86**	**51.07**

[a] PM_{10} = particulate matter with a diameter equal to or less than 10 micrometers
[b] CO = carbon monoxide
[c] VOC = volatile organic compounds
[d] NO_x = nitrogen oxides
[e] NA = not applicable

Table 5.1-13. Site-support activities stationary source emissions at the NTS and Nye County, tons per year, Alternative 1

Area	TSP[a]	SO_2[b]	NO_x[c]	HC[d]	CO[e]
Area 1	34.7	3.40	2.20	0.10	0.50
Area 2	87.3	0.0	0.0	0.0	0.0
Area 3	24.37	0.0	0.0	0.0	0.0
Area 6	11.7	2.90	4.10	0.0	0.0
Area 23	1.12	10.62	9.4	0.0	2.54
U.S. DOE Portable[f]	17.68	15.24	229.32	0.0	49.68
Fuel Storage Tanker	0.0	0.0	0.0	31.95	0.0
Total NTS	**176.87**	**32.16**	**245.02**	**32.05**	**52.72**
Total Nye County	**1,685.70**	**960.68**	**933.28**	[g]	**187.68**

[a] Total suspended particulates
[b] Sulfur dioxide
[c] Nitrogen oxides
[d] Hydrocarbons
[e] Carbon monoxide
[f] Compressors
[g] No data; state hydrocarbon emission inventory is not complete.

Source: Bureau of Air Quality, State of Nevada, 1995.

are expected at the NTS by 2005, Nye County would continue its present attainment designation for all criteria pollutants. The analysis performed for this EIS is for the conduct of one nuclear test. The impacts to the environment from the conduct of multiple tests (a series) are assumed to be incrementally additive; that is, the impacts of conducting two tests would be twice the impact of conducting a single test.

Mobile source emissions in Nye County (on-site and off-site) and Clark County are presented in Table 5.1-12. These emissions would be dispersed over a wide area and would not increase ambient pollutant concentrations in Nye County above ambient standards. Therefore, Nye County would continue to maintain its attainment designation for all criteria pollutants. The NTS contribution to mobile source emissions in Clark County would continue to be very small. The carbon monoxide, volatile organic compounds, and nitrogen dioxide pollutant emissions from NTS mobile sources in Clark County contribute 0.11, 0.10, and 0.41 percent, respectively, to the Clark County pollutant burden. The small contribution to the carbon monoxide burden in Clark County would not produce additional violations of the carbon monoxide ambient air quality standard.

GENERAL CONFORMITY DETERMINATION—The EPA published the General Conformity Rule (40 CFR Parts 6, 51, and 93) to implement Section 176 (c) of the Clean Air Act as amended in 1990. This section requires that federal actions conform to the appropriate State Implementation Plan. Conformity, as defined in the Clean Air Act, is conformity to the State Implementation Plan's purpose of eliminating or reducing the severity and number of violations of National Ambient Air Quality Standards and achieving expeditious attainment of such standards. A formal conformity determination is required for federal actions occurring in nonattainment areas when the total direct and indirect emissions of nonattainment pollutant (or their precursors) exceed specified annual de minimis (threshold) values. Because ozone (O_3) is a secondary pollutant, the conformity determination for ozone uses the precursor emissions of volatile organic compounds and nitrogen dioxide (NO_2) as surrogate pollutants. The de minimis thresholds are presented in Table 5.1-14.

The mobile-source emissions for Clark County shown in Table 5.1-12 are based on commuter traffic traveling on U.S. Highway 95 between Las Vegas and the NTS. Approximately 40 percent of this highway is located in the Las Vegas Valley nonattainment area for carbon monoxide and PM_{10}.

Thus, the annual emissions of carbon monoxide (CO) in the nonattainment area would be 57.9 tons. This is well below the 100 ton per year de minimus shown for carbon monoxide in Table 5.1-14. Therefore, a general conformity analysis would not be required for this alternative.

RADIOLOGICAL AIR QUALITY—Air concentrations would have to be 14 times higher than the measured 1993 average concentrations to achieve the maximum CAP-88 air dose assessment modeled dose (see Section 4.1.7). Effluents from the five programs are estimated at concentration levels that would never approach or even begin to approach this amount; therefore, it is expected that impacts to the air quality by radioactive effluents would be minimal under Alternative 1. The analysis performed for this EIS is for the conduct of one nuclear test. The impacts to the environment from the conduct of multiple tests (a series) are assumed to be incrementally additive; that is, the impacts of conducting two tests would be twice the impact of conducting a single test.

5.1.1.8 Noise. Noise generated on the NTS does not propagate off site at audible levels. The closest sensitive receptors to the site boundary would be residences located 2 km (1.3 mi) to the south in the town of Amargosa Valley (Lathrop Wells). Therefore, NTS noise impacts under Alternative 1 would be a result of noise generated during the operation of construction equipment and from the transportation of personnel and materials to and from the site. The NTS total construction and operations workforce with this alternative would remain relatively constant through the 1996 to 2005 period.

Railroad and aircraft noise were considered. However, there are no railroads serving the NTS; therefore, a railroad noise impact analysis was not required. Based on composite noise contours developed by the U.S. Air Force in 1994 for subsonic and supersonic flight operations over the Nellis Air Force Range Complex (U.S. Air Force, 1994), the day-night average sound level (L_{dn}) in the NTS portion of the complex resulting from aircraft operations would be less than 50 decibels (dB). Flight operations at supersonic speeds are not authorized over the NTS (SAIC/DRI, 1991), and subsonic operations are not normally scheduled over

Table 5.1-14. De minimis thresholds in nonattainment areas

Criteria Pollutant	Degree of Nonattainment	Tons/Year
Ozone (VOCs and NO_2)	Serious	50
	Severe	25
	Extreme	10
	Other ozone nonattainment areas (outside of ozone transport region)	100
Volatile Organic Compounds (VOCs)	Marginal/moderate nonattainment (within ozone transport region)	50
NO_2	Marginal/moderate nonattainment (within ozone transport region)	100
Carbon monoxide (CO)	All	100
Particulate matter (PM_{10})	Moderate	100
	Serious	70
Sulfur/nitrogen dioxide (SO_2/NO_2)	All	100
Lead (Pb)	All	25

the eastern portion of restricted area R-4808, which includes most of the NTS (U.S. Air Force, 1994). Only periodic helicopter and small fixed-wing aircraft operations are conducted from Desert Rock Airport.

Defense Program. Transportation noise levels on the NTS would be minimal and would not produce any noise impacts off site, contributing less than 3 a-weighted sound level (dBA) to the overall traffic noise levels on U.S. Highway 95. Thus, noise impacts related to Defense Program activities would be considered minor and not significant. Noise levels associated with the conduct of multiple tests would be sporadic and transitory.

Waste Management Program. Waste Management Program activities under Alternative 1 would continue to include the disposal of low-level waste and mixed waste pits or trenches. The preparation of the disposal cells requires the use of some construction equipment. These construction activities would be intermittent. Noise levels would decrease with distance and would be barely distinguishable from background noise levels at the NTS boundary.

The delivery of waste to the site by large trucks would produce some on-site and off-site traffic noise. However, the number of vehicles would average only 10 to 15 per working day. This small number of vehicles would contribute only minor amounts of noise to the overall noise levels on U.S. Highway 95. Therefore, the noise levels produced by Waste Management Program activities under this alternative would produce only minor noise impacts, both on site and off site.

Environmental Restoration Program. Environmental Restoration Program activities would require the removal and disposal of contaminated soils and the drilling of characterization wells. The equipment required to perform these activities would generate noise at environmental restoration areas. The noise levels would decrease with distance. At the NTS boundary, the noise levels would be barely distinguishable from background noise levels. For example, the noise level 15 m (50 ft) from a drill rig would be about 90 dBA. At a distance of 1.6 km (1 mi), the noise level would be 50 dBA, and at a distance of 3.2 km (2 mi), the noise level would be about 44 dBA.

Removal of the contaminated material from the NTS by trucks would produce a minor contribution to on-site and off-site noise levels generated by traffic on U.S. Highway 95. Therefore, the noise levels produced by Environmental Restoration Program activities under this alternative would produce only minor noise impacts, both on site and off site.

Nondefense Research and Development Program. The only activity in the Nondefense Research and Development Program that would generate noise is the continued operation of a wind tunnel at the Spill Test Facility. The wind tunnel operation is infrequent, and local noise levels would decrease with distance. The noise from this source would be barely distinguishable from background noise levels at the NTS boundary. Transportation noises for the Nondefense Research and Development Program would be minor, both on site and off site. Therefore, noise impacts from these programs would be negligible.

Work for Others Program. Included in the Work for Others Program are activities that include periodic military training exercises. These exercises include the operation of fixed and rotary wing aircraft in the NTS airspace. Noise levels resulting from these operations would produce local noise levels of 80 to 90 dBA. However, these noise levels would decrease with distance. Because of the large size of the NTS, noise levels from these activities would be barely audible at the NTS boundaries. Noise impacts would be minor.

Site-Support Activities. Transportation noise levels on the NTS would be minimal and would not produce any on-site or off-site noise impacts.

5.1.1.9 Visual Resources. An analysis has been conducted to determine the effects of Alternative 1 on visual resources. Visual impacts were assessed on the potential of Alternative 1 to alter or conflict with the existing landscape character. An impact to visual resources would be considered adverse and potentially significant if the contrasts and sensitivity levels of the viewpoints were unacceptably high. Appendix A provides related information regarding proposed facilities and activities that would affect visual resources at the NTS. The only activities that could affect visual resources would be from the Environmental Restoration Program. The other programs would not create new ground disturbance.

The Environmental Restoration Program activities would be located in areas of scenic quality common to the region, and none would be visible from public viewpoints. Depending on pertinent reclamation factors, disturbed areas could be revegetated after remediation has been completed. Long-term impacts would be negligible. There would be some beneficial impacts to visual resources once vegetation is re-established.

5.1.1.10 Cultural Resources. There would be impacts to cultural resources as a result of ground-disturbing activities, building modifications, and change to setting through increased noise, lighting, and construction in previously undisturbed locations. Impacts to cultural resources could occur through underground testing, drilling, grading, fencing, explosives-producing subsidence craters; cleanup activities (contaminated soils, effluent ponds and inactive tanks), construction of buildings, water systems, lights, wells, upgrading power lines, natural gas lines, roads, and the decontamination of buildings. A total of 9,905 acres are expected to be disturbed, but impacts to significant cultural resources are unlikely. Continued visitation and vehicular traffic could lead to vandalism or artifact collecting that could indirectly affect recorded archaeological sites and archaeologically sensitive areas.

Although archaeological surveys have not been conducted in those areas, it is estimated that 67 sites could be impacted by projects associated with this alternative based on the results of archaeological surveys conducted in adjacent areas in 1994. The precise location and number of these resources are unknown until archaeological surveys are conducted. Surveys will be conducted prior to ground-disturbing activities, and impacts will be mitigated through the measures described in Chapter 7. At least eight structures will be decommissioned under Alternative 1. If these buildings are determined to be historically significant, they would be mitigated using measures described in Chapter 7.

Defense Program. Under Alternative 1, the DOE would maintain readiness to perform one nuclear test at the NTS. Although it is likely that this test would be performed in a disturbed area, the excavation and preparation of the test area, if in a previously undisturbed area, could adversely affect archaeological resources.

Some buildings in Area 4 may have historic significance related to the Cold War and nuclear development. Prior to any modification or destruction, these structures would be evaluated for their potential to provide historical information. No nuclear testing, stockpile management activities, or nuclear weapons storage projects are scheduled for Area 13 on the NAFR Complex. Therefore, these projects of the Defense Program would not impact cultural resources.

Waste Management Program. Under this alternative, the Area 3 Radioactive Waste Management Site facility would be sufficient to handle forecasted waste volumes for the next 10 years. With the same level of activity, this program would present no increased potential for impact on cultural resources.

At the Area 5 Radioactive Waste Management Site, existing facilities would be full before 10 years. It is estimated that one additional trench within the currently operated site would be needed.

No DOE waste management storage facilities are currently located within the NAFR Complex. All such facilities are located on the NTS, and any Waste Management Program activities pertaining to the NAFR Complex would involve removal of contaminated soils to the NTS. Therefore, the Waste Management Program would have no impact on cultural resources within the NAFR Complex.

Environmental Restoration Program. Environmental Restoration Program activities at the NTS would occur mainly on previously disturbed land. However, well construction, to monitor groundwater contamination, could impact cultural resources in undisturbed areas.

Under Alternative 1, eight structures will be decommissioned at the NTS. Two of these structures have been determined to be eligible for the National Register of Historic Places. These include the EPA Farm and the Junior Hot Cell facility. Data recovery at the Junior Hot Cell facility has been completed and the building has since been demolished. Other structures, as yet unevaluated, may be eligible. These structures will be evaluated and if eligible, they will be mitigated using the measures described in Chapter 7.

Few sites have been recorded directly within the area of potential effect for Area 13. However, much of the area has not been surveyed for cultural resources. Archaeological sites have been recorded in the general area, and indirect impacts to these sites could occur as a result of increased visitation to the site area.

Nondefense Research and Development Program. Most of the DOE's Nondefense Research and Development Program projects are located at the NTS. These projects are related to the development of solar generation facilities. If located in previously undisturbed areas, ground disturbance from construction could impact cultural resources. These programs would have no effect on the cultural resources found in the vicinity of the Area 13 site.

Work for Others Program. The DOE's Work for Others Program is focused on the NTS and would be located within existing facilities. Therefore, there would be no impact to significant cultural resources at the NTS. This program would have no effect on the cultural resources found in the vicinity of the Area 13 site.

Site-Support Activities. Site-support activities could impact cultural resources through ground disturbances associated with upgrading roads, utilities, power lines, and communication facilities.

AMERICAN INDIAN CULTURAL RESOURCES—*This section describes the American Indian concerns associated with implementing Alternative 1, as summarized by the CTGO.*

The CTGO knows that the actions considered in the NTS EIS potentially will affect American Indian cultural resources within an area roughly bounded by where these people live today in their traditional lands (Figure 4-47). The proposed NTS EIS actions will have cultural effects within this region of influence because of the cultural centrality of these lands to all three ethnic groups (Western Shoshone, Owens Valley Paiute, and Southern Paiutes). Within this region of influence, specific actions will have direct local impacts. Ultimately, however, any action that moves the NTS away from or back towards its natural state has influence on all the Indian people.

The CTGO recognizes that some of the actions proposed in the NTS EIS will have direct impacts on other Indian tribes and organizations. For example, the Project Shoal Area is located on the traditional lands of the Northern Paiute people. The Eldorado Valley actions potentially impact the Mohave people. The return of radioactive waste to the NTS has permitted and potentially will permit people like the Alaskan natives to have their lands restored to a natural state (see Project Chariot Report [DOE/NV, 1994b]). Therefore, the CTGO defines the American Indian region of influence map in an effort to focus on the cultural concerns of those people having traditional ties to the NTS itself, but, in so doing, does not intend to preclude the cultural concerns of other Indian ethnic groups.

Defense Program at the NTS—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if further underground nuclear tests occur and if natural lands are scraped for construction. Access to culturally significant places will be reduced because Indian people's perception of health and spiritual risks will increase if additional testing, storage, disassembly, or disposal of nuclear and conventional weapons occurs.

Waste Management Program at NTS—Under Alternative 1, it is expected that American Indian cultural resources will continue to be adversely impacted because the waste has not been disposed of in a culturally appropriate manner. Access to culturally significant places on the NTS will be reduced because waste isolation facilities increase Indian people's perception of health and spiritual risks.

Environmental Restoration Program at the NTS—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted by the well monitoring program and the construction of access roads, but will be positively impacted by actions that return disturbed lands to their natural condition in a culturally appropriate manner and with the participation of Indian people.

Nondefense Research and Development Program at the NTS—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted by increased visits by students and researchers who collect artifacts, visit sacred areas, and remove plants or animals. Cultural resources could be positively impacted if students and researchers receive proper guidance by Indian people regarding how to visit places and interact with the environment.

Work for Others Program at the NTS—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the NTS continued to be a place where weapons are stored, disassembled, and disposed. These actions have and will continue to pollute these lands. The presence of conventional and nuclear weapons defines the NTS as a place of destruction, which promotes an image that is inappropriate as a place for peaceful relations between Indian ethnic groups.

American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

Defense Program at Area 13—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if further nuclear safety tests occur and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests at the Area 13 site on the NAFR Complex.

Waste Management Program at Area 13—Under Alternative 1, it is expected that American Indian cultural resources will not be impacted because there is no Waste Management Program at Area 13 on the NAFR Complex and none has been identified for this alternative.

Environmental Restoration Program at Area 13—Under Alternative 1, it is expected that American Indian cultural resources at Area 13 on the NAFR Complex will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program at Area 13—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if Area 13 on the NAFR Complex continues to be a place where weapons are researched and developed. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

Work for Others Program at Area 13—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if Area 13 on the NAFR Complex continues to be a place where weapons are researched and developed. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

5.1.1.11 Occupational and Public Health and Safety. For workers at the NTS, occupational health and safety impacts could result from industrial safety hazards in the workplace (e.g., injuries or fatalities from construction and maintenance), controlled exposure to radiation or hazardous chemicals in the workplace, and accidental exposures to radiation or hazardous chemicals. Impacts to worker health could take the form of injuries or fatalities from industrial hazards and cancer fatalities, or other detrimental health effects from exposure to radiation or hazardous chemicals. Table 5.1-15 summarizes the occupational and public health and safety impacts for each NTS program area under Alternative 1.

Table 5.1-15. Health risks to workers and the public from program activities, NTS, Alternative 1

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense (with nuclear testing)	6.8	0.012	0.032 (0.034)	0.012 (0.013)	e e	e e	4.0×10^{-6} (0.0054)	1.8×10^{-6} (0.0025)	e e	e e
Waste Management	153	2.9	0.020	0.0081	5.2×10^{-7}	0.48	5.1×10^{-5}	2.3×10^{-5}	2×10^{-5}	3.8×10^{-6}
Environmental Restoration	10	0.031	0.0085	0.0034	3.0×10^{-7}	0.14	2.3×10^{-10}	1.1×10^{-10}	6×10^{-6}	2.4×10^{-6}
Nondefense Research and Development	1.9	0.0033	0.0031	0.0013	3.2×10^{-6}	0.58	f	f	1.9×10^{-4}	1.5×10^{-4}
Work for Others	11	0.019	0.0055	0.0022	6.1×10^{-8}	4.4×10^{-3}	f	f	2.9×10^{-7}	1.9×10^{-8}
Site-Support Activities	19	0.033	0.046	0.018	e	e	f	f	e	e
Total (with nuclear testing)	**202**	**3**	**0.12 (0.15)**	**0.045 (0.058)**	**4.1×10^{-6}**	**0.58**	**5.5×10^{-5} (0.0055)**	**2.5×10^{-5} (0.0025)**	**2.3×10^{-4}**	**1.5×10^{-4}**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis

b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis

c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the 10-year period of analysis

d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more

e. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified

f. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

The remote location of the NTS insulates impacts to the general public from NTS activities. To impact public health and safety, there must be a pathway or a transport mechanism to transmit the hazard to the public. For NTS activities, the principal pathways by which the public could be exposed to hazards are air, groundwater, and motorized transport. Potential impacts to the public from routine airborne emissions of radioactivity and priority pollutants are discussed in Section 5.1.1.7, Air Quality.

Transportation impacts are discussed in Section 5.1.1.2, Transportation. This section addresses potential impacts to public health and safety from subsurface contamination of groundwater and from accidental releases of radioactivity to the air. Unless otherwise noted, impacts presented in this section are the total impacts for the 10-year period evaluated in this EIS. Results are presented for each program area, although some program areas do not involve hazards from radiation or hazardous chemicals.

Defense Program. Based on occupational injury and fatality rates for construction and other industrial activities, the Defense Program at the NTS is expected to result in 3.7 injuries to workers during routine program activities and 3.1 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 0.0066 fatalities are expected from routine activities, and 0.0055 fatalities are expected to result from construction activities.

Based on previous NTS occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to NTS Defense Program workers of about 78 person-rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.031 latent cancer fatalities and 0.012 other detrimental health effects in the worker population. Risk of accidental exposure to workers increases the latent cancer fatality risk by 0.001. No Defense Program hazardous chemical accident resulting in measurable effects at the NTS has been identified.

The health and safety impact to the public from potential Defense Program accidents could result in about 4.0×10^{-6} latent cancer fatalities and 1.8×10^{-6} other detrimental health effects in the population. Should the DOE be directed by the President to conduct underground nuclear-yield testing under Alternative 1, potential accidents associated with venting of radionuclides following a test could result in a risk of about 0.0054 latent cancer fatalities and 0.0025 other detrimental health effects in the population.

Subsurface radioactivity from past underground nuclear weapons tests potentially provides an exposure pathway for both NTS workers and the public. Transport modeling of tritium-contaminated groundwater from underground test areas at Pahute Mesa and Yucca Flat was performed in support of this EIS (GeoTrans, 1995). An earlier screening study by Daniels et al. (1993) also evaluated tritium migration from Pahute Mesa to Oasis Valley. The modeling results showed that tritium concentrations in groundwater are never expected to reach concentrations that are above the EPA's maximum allowable tritium concentration in drinking water which is 20,000 picocurie per liter (pCi/L) at the boundaries of the NTS or NAFR Complex. To date, only low levels of tritium have been detected in any on-site wells.

Health effects impacts to the public from subsurface radioactivity have been estimated based on future predictions of tritium concentrations in well water, even though predicted concentrations are below current limits of detection. These impacts are not expected to occur within the 10-year time frame of this EIS. The maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 8×10^{-13} (about one in one trillion) and 1×10^{-5} (about one in 100,000). The public exposure scenario assumes that the individual consumes contaminated well water for 70 years centered around the time of peak tritium concentration in well water.

No health effects impacts to NTS workers from subsurface radioactivity are expected to occur during the 10-year time period evaluated in this EIS. Tritium is not detectable in on-site drinking water wells. Existing monitoring programs and controls preclude inadvertent consumption of contaminated well water by workers.

The maximum reasonably foreseeable radiological Defense Program accident at the NTS would be a non-nuclear explosion involving high explosives in an Area 27 nuclear weapons storage bunker, which has a probability of occurrence of 1 x 10^{-7} (1 in 10,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion
- Maximally exposed non-involved worker: 62,000 rem (2,700 rem in first year after exposure), acute radiation effects could result in fatality without immediate medical treatment
- Non-involved worker population at the nearest major facility area: 16,000 person-rem, 6.4 latent cancer fatalities, 2.6 other detrimental effects
- Maximally exposed off-site individual at the nearest point of public access: 34 rem, 3.4 x 10^{-2} chance of latent cancer fatality, 1.6 x 10^{-2} chance of other detrimental effects
- Population within 80 km (50 miles): 5,800 to 110,000 person-rem, 3 to 55 latent cancer fatalities, 1 to 25 other detrimental effects.

No Defense Program accident resulting in measurable chemically hazardous effects at the NTS has been identified.

Waste Management Program. Based on occupational injury and fatality rates for construction and other industrial activities, the Waste Management Program at the NTS is expected to result in 150 injuries to workers during routine program activities and 2.8 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 2.9 fatalities are expected from routine activities, and 0.005 fatalities are expected to result from construction activities.

Based on previous NTS occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to NTS Waste Management Program workers of about 11 person-rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0043 latent cancer fatalities and 0.0017 other detrimental health effects in the worker population.

The risk of accidental exposure increases the latent cancer fatality risk by 0.016 and the detrimental health effect risk by 0.0064. The risk of a single cancer in the worker population as a result of accidental exposure to hazardous chemicals is estimated to be 5.2 x 10^{-7}. The risk of life-threatening noncarcinogenic effects to a single worker from Waste Management Program hazardous chemical accidents has a hazard index of 0.48. A hazard index less than 1.0 indicates that no life-threatening noncarcinogenic health effects would be expected to occur.

The health and safety impact to the public from potential Waste Management Program accidents could result in about 5.1 x 10^{-5} latent cancer fatalities and 2.3 x 10^{-5} other detrimental health effects in the population. Waste Management Program accidents involving hazardous chemicals could result in about 2.0 x 10^{-5} cancers in the population. No noncancer effects from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Waste Management Program radiological accident at the NTS would be an airplane crash into the Area 5 transuranic waste storage unit, which has a probability of occurrence of 6 x 10^{-7} (1 in 1,700,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash
- Maximally exposed non-involved worker: 3,500 rem (154 rem in first year after exposure), 1.0 chance of latent cancer fatality, 1.0 chance of other detrimental effects

- Non-involved worker population at the nearest major facility area: 99 person-rem, 0.04 chance of a single latent cancer fatality, 0.016 chance of other detrimental effects

- Maximally exposed off-site individual at the nearest point of public access: 3.5 rem, 1.8×10^{-3} chance of latent cancer fatality, 8.0×10^{-4} chance of other detrimental effects

- Population within 80 km (50 mi): 1,400 to 25,000 person-rem, 1 to 13 latent cancer fatalities, 0 to 6 other detrimental effects.

For Waste Management Programs hazardous chemical effects, the maximum reasonably foreseeable accident would be an airplane crash into the Area 5 hazardous waste storage unit, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash

- Maximally exposed non-involved worker: 6.6×10^{-2} chance of cancer, 340 noncancer hazard index for potentially life-threatening one-hour concentration

- Non-involved worker population at the nearest major facility area: 1.1×10^{-3} chance of a single cancer, 0.09 noncancer hazard index for potentially life-threatening one-hour concentration

- Maximally exposed off-site individual at the nearest point of public access: 2.4×10^{-5} chance of cancer, 0.013 noncancer hazard index for potentially life-threatening one-hour concentration

- Population within 80 km (50 mi): 0.027 to 0.10 chance of a single cancer, 0.005 to 0.01 noncancer hazard index for potentially life-threatening one-hour concentration.

The long-term effects of waste disposal operations are being evaluated as a part of the performance assessment process discussed in Appendix A, Section A.2; Chapter 2, Section 2.5.6; and Chapter 4, Section 4.1.5.2. As part of the performance assessment process, scenarios have been developed to evaluate the potential for public exposure to radionuclides from the disposed waste. Considered in these scenarios are the transport of radionuclides by air, surface water, groundwater, and human intrusion pathways. Preliminary results of the Area 5 Radioactive Waste Management Site Performance Assessment (Shott et al., 1995) indicate that the potential risk/exposure from waste disposal activities through the surface water and air pathways is not significant over thousands of years. Based on the results of field studies, the groundwater pathway is not considered a credible transport mechanism. The limiting scenario identified in the Area 5 performance assessment is the intruder scenario. The intruder scenario is postulated to occur thousands of years in the future, when areas previously used for waste disposal would be mined or farmed. The significant exposure results from a person living on the former waste disposal site consuming food and water (assumed to be contaminated) for a lifetime. The results of the very conservative approach to estimating exposure is then used to establish design, operation, closure, and waste acceptance criteria for the waste management facilities. The performance assessment is a continual process that is used to improve the design and operation of DOE waste management facilities.

Environmental Restoration Program. Based on occupational injury and fatality rates for construction and other industrial activities, the Environmental Restoration Program at the NTS is expected to result in 8 injuries to workers during routine program activities and 2.2 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 0.027 fatalities are expected from routine activities, and 0.004 fatalities are expected to result from construction activities.

Based on previous NTS occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to NTS Environmental Restoration Program workers of about 21 person-rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological

Protection (1991), this dose could result in about 0.0085 latent cancer fatalities and 0.0034 other detrimental health effects in the worker population. The risk of a single cancer in the worker population as a result of accidental exposure to hazardous chemicals is estimated to be 2.8 x 10^{-7}. The risk of life-threatening noncarcinogenic effects to a single worker from Environmental Restoration Program hazardous chemical accidents has a hazard index of 0.14.

The health and safety impact to the public from potential Environmental Restoration Program accidents could result in about 2.3 x 10^{-10} latent cancer fatalities and 1.1 x 10^{-10} other detrimental health effects in the population. Environmental Restoration Program accidents involving hazardous chemicals could result in about 1.6 x 10^{-5} cancers in the population. No noncancer effects to the public from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Environmental Restoration Program radiological accident at the NTS would be an airplane crash into the Area 13 site, which has a probability of occurrence of 7 x 10^{-7} (1 in 1,400,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash
- Maximally exposed non-involved worker: 0.0011 rem, 4.4 x 10^{-7} chance of latent cancer fatality, 1.8 x 10^{-7} chance of other detrimental effects
- Non-involved worker population at the nearest major facility area: 0.0055 person-rem, 2.2 x 10^{-6} chance of a single latent cancer fatality, 8.8 x 10^{-7} chance of other detrimental effects
- Maximally exposed off-site individual at the nearest point of public access: 0.0022 rem, 1.1 x 10^{-6} chance of latent cancer fatality, 5.1 x 10^{-7} chance of other detrimental effects
- Population within 80 km (50 mi): 0.04 to 0.71 person-rem, 2.1 x 10^{-5} to 3.6 x 10^{-4} chance of a single latent cancer fatality, 9.4 x 10^{-6} to 1.6 x 10^{-4} chance of other detrimental effects.

For Environmental Restoration Program hazardous chemical effects, the maximum reasonably foreseeable accident would be an airplane crash into a hypothetical environmental restoration site consisting of a composite of hazardous sites across the NTS, which has a probability of occurrence of 7 x 10^{-7} (1 in 1,400,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash
- Maximally exposed non-involved worker: 0.008 chance of cancer, 45 noncancer hazard index for potentially life-threatening one-hour concentration
- Non-involved worker population at the nearest major facility area: 9.4 x 10^{-5} chance of a single cancer, 0.0097 noncancer hazard index for potentially life-threatening one-hour concentration
- Maximally exposed off-site individual at the nearest point of public access: 8.5 x 10^{-6} chance of cancer, 9.8 x 10^{-4} noncancer hazard index for potentially life-threatening one-hour concentration
- Population within 80 km (50 mi): 1.5 x 10^{-3} to 3.3 x 10^{-3} chance of a single cancer, 6.1 x 10^{-4} to 6.5 x 10^{-4} noncancer hazard index for potentially life-threatening one-hour concentration.

Nondefense Research and Development Program. Based on occupational injury and fatality rates for construction activities, the Nondefense Research and Development Program at the NTS is expected to result in 1.9 injuries and 0.0033 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected to result from routine program activities.

Based on previous NTS occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to NTS Nondefense Research and Development Program workers of about 8 person-rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0031 latent cancer fatalities and 0.0012 other detrimental health effects in the worker population. No Nondefense Research and Development Program accident resulting in measurable radiological effects at the NTS has been identified.

The risk of a single cancer in the worker population as a result of accidental exposure to hazardous chemicals is estimated to be 3.2×10^{-6}. The risk of life-threatening noncarcinogenic effects to a single worker from Nondefense Research and Development hazardous chemical accidents has a hazard index of 0.58.

The health and safety impact to the public from potential Nondefense Research and Development Program accidents could result in about 1.9×10^{-4} cancers in the population. No hazardous chemical noncancer effects to the public from chemical accidents would be expected to occur.

For Nondefense Research and Development Program hazardous chemical effects, the maximum reasonably foreseeable accident would be an airplane crash into the tank farm at the Spill Test Facility, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in crash
- Maximally exposed non-involved worker: 1.0 chance of cancer, 1,000 noncancer hazard index for potentially life-threatening one-hour concentration
- Non-involved worker population at the nearest major facility area: 0.054 chance of a single cancer, 0.80 noncancer hazard index for potentially life-threatening one-hour concentration
- Maximally exposed off-site individual at the nearest point of public access: 8.8×10^{-4} chance of cancer, 0.34 noncancer hazard index for potentially life-threatening one-hour concentration
- Population within 80 km (50 mi): 0 to 3 cancers, 0.01 to 0.19 noncancer hazard index for potentially life-threatening one-hour concentration.

Work for Others Program. Based on occupational injury and fatality rates for construction activities, the Work for Others Program at the NTS is expected to result in 11 injuries and 0.019 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected to result from routine program activities.

Based on previous NTS occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to NTS Work for Others Program workers of about 14 person-rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0055 latent cancer fatalities and 0.0022 other detrimental health effects in the worker population. No Work for Others Program accident resulting in measurable radiological effects at the NTS has been identified. The risk of a single cancer in the worker population as a result of accidental exposure to hazardous chemicals is estimated to be 6.1×10^{-8}. The risk of life-threatening noncarcinogenic effects to a single worker from Work for Others Program hazardous chemical accidents has a hazard index of 0.004.

The health and safety impact to the public from potential Work for Others Program accidents could result in about 2.9×10^{-7} cancers in the population. No noncancer effects to the public from chemical accidents would be expected to occur.

For Work for Others Program hazardous chemical effects, the maximum reasonably foreseeable accident would be a heavy metal release as a result of an unplanned detonation of a test assembly at the Big Explosives Experimental Facility, which has a probability of occurrence of 1 x 10^{-2} (1 in 100) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion
- Maximally exposed non-involved worker: 1.8 x 10^{-4} chance of cancer, 0.044 noncancer hazard index for potentially life-threatening one-hour concentration
- Non-involved worker population at the nearest major facility area: 6.1 x 10^{-7} chance of a single cancer, 4.0 x 10^{-6} noncancer hazard index for potentially life-threatening one-hour concentration
- Maximally exposed off-site individual at the nearest point of public access: 1.4 x 10^{-9} chance of cancer, 1.9 x 10^{-7} noncancer hazard index for potentially life-threatening one-hour concentration
- Population within 80 km (50 mi): 2.9 x 10^{-6} to 1.3 x 10^{-7} chance of a single cancer, 1.9 x 10^{-7} noncancer hazard index for potentially life-threatening one-hour concentration.

Site-Support Activities. Site-support activities are distributed among the five major program areas. Site-support activities at the NTS are expected to result in 19 injuries and 0.033 fatalities as a result of construction activities during the 10-year period evaluated in this EIS. No injuries or fatalities are projected as a result of routine site-support activities. Occupational exposure to radiation is expected to result in a collective dose to NTS site-support workers of about 115 person-rem in 10 years. This dose could result in about 0.046 latent cancer fatalities and about 0.018 other detrimental health effects in the worker population.

Perceptions of radiation effects are discussed in Section 4.1.11 and are well known among the Western Shoshone, Southern Paiute, and Owens Valley Paiute people of this region. These perceptions of risks from radiation are frightening, and remain an important part of our lives. We will always carry these thoughts with us. Today, people are afraid of many things and places in this whole area, but we still love to come out and see our land. We worry about more radiation being brought to this land.

If the DOE wants to better understand our feelings about the impacts of radiation on our cultures, they should support a study of risks from radiation designed, conducted, and produced by the CGTO. At this time there has not been a systematic study of American Indians' perceptions of risks. Therefore, it is not possible to provide action by action estimation of risk perception impacts. We believe it is a topic that urgently needs to be studied so that Indian people may better address the actual cultural impacts of proposed DOE actions. There have been recent workshops funded by the National Science Foundation to understand how to research the special issue of culturally based risk perception among American Indian communities, and at least one major project has been funded. Although this is a relatively new topic of research, it is one that can be more fully understood by research that deeply involves the people being considered. To understand our view of radiation is to begin to understand why we responded in certain ways to past, present, and why we will continue to respond to future DOE activities.

5.1.1.12 Environmental Justice. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on minority populations and low-income populations. Analysis of Environmental Justice is based on geographic distribution of low-income and minority populations in Clark, Nye, and Lincoln counties as described in Section 4.1.12.

Environmental Justice analysis involves two tiers of investigation. One is the determination of significant and adverse impacts as a result of the alternative. The other is an evaluation of whether a minority or low-income population is disproportionately affected by these significant and adverse impacts. If there are no significant and adverse impacts, there would be no significant, disproportionately high and adverse impacts experienced by minority and low-income populations.

To determine whether human health effects are adverse and disproportionately high, the following factors were considered:

- Whether the health effects, which may be measured in risks and rates, are significant, unacceptable, and above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death
- Whether the risk or rate of exposure by a minority population or low-income population to an environmental hazard is significant and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population
- Whether health effects occur in a minority population or low-income population affected by total or multiple adverse exposures from environmental hazards.

To determine whether environmental effects are adverse and disproportionately high for low-income and minority communities, the following three factors were considered to the extent practicable:

- Whether there is an impact on the natural or physical environment that significantly and adversely affects a minority community or low-income community
- Whether environmental effects are significant and are having an adverse impact on minority population or low-income populations that appreciably exceeds or is likely to exceed appreciably those in the general population or other appropriate comparison group
- Whether the environmental effects occur in a minority population or low-income population affected by total or multiple adverse exposure from environmental hazards.

To identify the need for ensuring protection of populations with differential patterns of subsistence consumption of fish and wildlife, whenever practicable and appropriate, information of the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence was analyzed. Differential patterns of consumption of natural resources relates to subsistence and differential patterns of subsistence, and means differences in rates and/or patterns of fish, water, vegetation, and/or wildlife consumption among minority populations or low-income populations, as compared to the general population. Subsistence consumption of fish and wildlife means dependence by a minority population or low-income population or subgroup of such populations on indigenous fish, vegetation, and/or wildlife, as the principal portion of its diet (CEQ, 1995). No such populations have been identified in the region of influence.

The CGTO has identified impacts to American Indian groups as a result of Alternative 1. The Yomba Shoshone tribe, the Moapa Paiute tribe, the Las Vegas Paiute tribe, the Pahrump tribe, and the Las Vegas Indian Center are all part of the CGTO and are all located in Clark, Nye, or Lincoln counties. In addition, while not physically located in Clark, Nye, or Lincoln counties, other groups have traditional ties to the NTS and surrounding areas. All American Indian groups in the American Indian region of influence (Figure 4-48) would be equally affected. Figure 4-48 does not imply that groups located closer to the NTS are more concerned about impacts than groups that live farther away. Impacts include continued reduced access to culturally significant areas, the potential for unauthorized artifact collection, and the potential for culturally inappropriate environmental restoration techniques. These impacts would be perceived only by American Indian groups and would, therefore, be a disproportionately high impact on these groups.

No other significant adverse impacts as a result of this alternative were ascertained; therefore, there would be no disproportionately high and adverse impacts to other minority and low-income populations.

The CGTO knows that the actions considered in the NTS EIS potentially will disproportionately affect American Indian people. As discussed in Section 5.1.1.10, Cultural Resources, and Section 5.1.1.11, Occupational and Public Health and Safety, the American Indian impacts include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations.

The effects of Alternative 1 on American Indian Environmental Justice issues are discussed below by program.

Defense Program at the NTS—Under Alternative 1, it is expected that all three American Indian Environmental Justice impacts would occur. Holy Land violations occur whenever a portion of traditional land and its resources are taken away from Indian people by contamination or surface disturbance. Perceived risks will occur when more radioactivity is brought to or created at the NTS. Cultural survival impacts will occur if defense activities reduce the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

Waste Management Program at the NTS—Under Alternative 1, it is expected that all three American Indian Environmental Justice impacts would occur. Holy Land violations occur whenever a portion of traditional land and its resources are taken away from Indian people by contamination or surface disturbance. Perceived risks will occur when more radioactivity is brought to or created at the NTS. Cultural survival impacts will occur if waste management activities reduce the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

Environmental Restoration Program at the NTS—Under Alternative 1, it is expected that all three American Indian Environmental Justice issues would occur. Holy Land violations can be reversed when a portion of traditional land and its resources are returned to the Indian people by eliminating contamination and restoring surface disturbance areas with traditional Indian plants and animals. Perceived risks potentially can be reduced when radioactivity is reduced by the physical and spiritual restoration of the NTS. Cultural survival impacts will reverse if environmental restoration activities increase the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

Nondefense Research and Development Program at the NTS—Under Alternative 1, it is expected that all three Environmental Justice impacts would occur. Holy Land violations occur whenever a portion of traditional land and its resources are taken away from Indian people whether this occurs by contamination or use by students and researchers. Perceived risks will not increase unless more radioactivity is brought to or created at the NTS. Cultural survival impacts will occur if research and development activities reduce the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

Work for Others Program at the NTS—Under Alternative 1, it is expected that all three Environmental Justice impacts would occur. Holy Land violations occur whenever a portion of traditional land and its resources are taken away from Indian people by contamination or surface disturbance. Perceived risks will occur when more radioactivity or hazardous waste is brought to or created at the NTS. Cultural survival impacts will occur if military training exercises and weapons tests reduce the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

5.1.2 Tonopah Test Range

Under Alternative 1, the Defense, Environmental Restoration, and Work for Others Programs at the Tonopah Test Range would continue in the same manner and degree as they have within the past three to five years. The activities associated with Alternative 1 are summarized below. A more detailed description of the activities is presented in Appendix A.

Defense Program. Under Alternative 1, Tonopah Test Range activities associated with stockpile stewardship would continue. Impact, passive, and chemical testing would also continue.

Environmental Restoration Program. Environmental Restoration Program activities would continue at current rates.

Work for Others Program. Current Work for Others Program activities would continue at the Tonopah Test Range. Activities include treaty verification, nonproliferation projects, counter-proliferation projects, conventional weapons demilitarization, and defense research and development.

Site-Support Activities. Site-support activities under Alternative 1 would remain at the existing level of approximately 150 personnel. Routine maintenance would continue to be provided to keep existing equipment and utilities functional.

5.1.2.1 Land Use. The DOE land uses under Alternative 1 would continue in the same manner and degree as in the past. This would continue the restriction on all non-federal agency uses. As a consequence, few of the traditional multiple uses for this type of land would be permitted. Undeveloped areas would continue to function as wildlife and wild horse habitat, while the industrial areas would continue in that type of land use. Past aerial bombing and gunnery activities, which have resulted in ordnance contamination of land areas, may have made it impossible to certify that decontamination is complete. The Secretary of the Interior can either accept or decline relinquished lands on the NAFR Complex.

Defense Program. Defense Program activities would continue to take place in already disturbed test beds and training areas. All ordnance or hardware would continue to be recovered following use. No new areas would be altered as a result, and land-use options would remain the same.

Environmental Restoration Program. On the Tonopah Test Range, 3 nuclear device safety test sites and 43 known industrial sites are scheduled for characterization and remediation. Presently, the safety test sites are fenced and completely restricted from use. Remediation of the safety test sites would result in their having a lessened degree of restriction on land uses. Depending on the cleanup level agreed upon between the state of Nevada and the DOE, these sites would be available for a greater unrestricted variety of other land uses. For the industrial sites that are remediated, fewer or no restrictions on alternative land uses would occur, depending on whether closure in place or clean closure is selected as the remediation measure.

Work for Others Program. Work for Others Program activities would continue to take place in already disturbed test beds and training areas. Other, noncompatible uses would be precluded, but no long-term restrictions on future land-use options would result.

5.1.2.1.1 Site-Support Activities—Under Alternative 1, the facilities associated with support functions and services at the Tonopah Test Range would continue to be maintained and used at approximately the current level. Site-support services such as law enforcement and security, fire protection, and health care would continue to operate at existing levels. The water and electrical systems would remain; general maintenance and upgrades would occur as required to ensure safe operations. The wastewater systems would remain in service with only regular maintenance and minor improvements as required to ensure adequate services to the users at the Tonopah Test Range. All solid waste disposal activities would continue to operate at current levels. Hazardous and low-level waste would continue to be transported off site for disposal. Under Alternative 1, the communication systems at the Tonopah Test Range would remain operational and be maintained for all current administrative and testing operations.

5.1.2.1.2 Airspace—It is estimated that there would be an increase of DOE sorties at a rate of 2 percent per year. As a result, the estimated sorties flown by the DOE in 2000 would exceed 18,000 per year.

The effect on civil aviation is keyed primarily to constraints on routes of flights because of defense-related airspace. The Tonopah Test Range is landlocked within the NAFR Complex, and its airspace is controlled by the surrounding airspace restrictions. Civilian aviation flights are generally restricted from crossing the surrounding airspaces, thus occurrences within Tonopah Test Range airspace would have little potential to impact civilian flights. Under Alternative 1, an increase in flying time between some commercial airports would remain. However, under this alternative, the current level of air traffic control and navigational aid services, as well as airspace structure, would be maintained. Activities under Alternative 1 are not expected to cause an increased delay in civilian air traffic. No new impacts to airspace are anticipated from the continuation of current activities.

5.1.2.2 Transportation. The following sections contain the discussion of the environmental impacts related to transportation activities as defined under Alternative 1. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.1.2.2.1 On-Site Traffic—Under Alternative 1, on-site traffic levels would remain at approximately the current levels. Therefore, no impacts to on-site traffic would occur as a result of Defense, Environmental Restoration, or Work for Others Programs. Site-support activities would not result in impacts to on-site traffic under Alternative 1.

5.1.2.2.2 Off-Site Traffic—Under Alternative 1, off-site traffic levels would remain at approximately current levels.

Defense Program. Approximately 50 employees would travel to the Tonopah Test Range to support Defense Program activities under this alternative. The main regional access to the Tonopah Test Range would continue to be U.S. Highway 6, which is currently underused. Given the number of trips associated with the Tonopah Test Range Defense Program, U.S. Highway 6 would still have a level of service A. Therefore, no significant impacts would occur.

Environmental Restoration Program. Under Alternative 1, the Environmental Restoration Program at the Tonopah Test Range would generate only an occasional, and minor, amount of vehicular traffic (less than 100 vehicle trips per day) on the local access roads and on the immediate regional highway (U.S. Highway 6 near Tonopah). Therefore, under Alternative 1, there would be no traffic impacts on off-site roadways.

Work for Others Program. The Work for Others Program is anticipated to generate less than 100 vehicle trips per day on the local access roads and U.S. Highway 6 near Tonopah. The average daily traffic on U.S. Highway 6 is far below capacity at this location. Therefore, there would be no traffic impacts on off-site roadways.

Site-Support Activities. Site-support activities and personnel would not significantly impact off-site roadways.

5.1.2.2.3 Transportation of Materials and Waste—Under Alternative 1, all materials would be delivered to the Tonopah Test Range by commercial carrier, government contractor, government vehicles, or, in the case of special nuclear material, special courier or airlift. The Tonopah Test Range would not be used for disposal of waste. Therefore, all waste would be transported off site for disposal.

Defense Program. Defense Program activities would require the transportation of special nuclear materials and weapons components in safe-secure trailers. Based on the limited testing of components from ground to air at the Tonopah Test Range, the total number of shipments is estimated to be five per year. The average transportation mileage for all safe-secure trailer shipments to the Tonopah Test Range is 24,140 km/yr (15,000 mi/yr).

The DOE evaluated and reported the risks associated with transporting Defense Program materials in a Defense Program transportation risk assessment (see Appendix I). Conclusions from the risk assessment indicated that a transportation accident having serious consequences along many identified routes is estimated to have a probability of less than or equal to one in a million. Under Alternative 1, transportation of materials and waste would remain at the current level. Therefore, no new impacts are anticipated under this alternative.

Environmental Restoration Program. Required remediation levels for contaminated soils located at the Tonopah Test Range are uncertain. As a result, the number of waste shipments to be sent from the Tonopah Test Range to the NTS is uncertain.

Work for Others Program. Under Alternative 1, no significant impacts would occur as a result of the transportation of materials and waste with this program.

Site-Support Activities. Site-support activities would not require the transport of materials and waste. Therefore, no impacts would occur.

5.1.2.2.4 Other Transportation—Approximately half of the workforce at the Tonopah Test Range would continue to be transported to the site by airlift on a daily basis. Equipment and supplies would also continue to be transported to the site by airlift.

5.1.2.3 Socioeconomics. The socioeconomic analysis has been performed for the region of influence of Clark and Nye Counties, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic issues. The analysis for this site is included in Section 5.1.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.1.2.4 Geology and Soils. The impacts to geology and soils resulting from the three programs and site-support activities are presented in this section.

Defense Program. Defense Program activities at the Tonopah Test Range would have an adverse impact to geologic media by excavation of the surface for installation of infrastructure or test activities. These projects are anticipated to impact 0.9 acres.

Several Defense Program projects have the potential to disturb and contaminate surface and subsurface geologic media. These projects are anticipated to impact approximately 640 acres, with fuel-air explosive operations accounting for greater than 99 percent of the area. Should remediation of contaminated geologic media not be implemented, and assuming that contaminants are long-lived, these media would be considered permanently lost.

Environmental Restoration Program. Environmental Restoration Program activities to restore the 964 acres of contaminated soils would make the surface vulnerable to short-term erosion by water or wind processes. Chemical stabilization and eventual revegetation would reduce erosion potential of disturbed areas.

Work for Others Program. The Work for Others Program activities would result in the same impacts as discussed for the Defense Program.

Site-Support Activities. No impacts from site-support activities would occur under this alternative.

5.1.2.5 Hydrology. The environmental impacts to surface hydrology and groundwater are described in the sections that follow.

5.1.2.5.1 Surface Hydrology—Little surface water is present on the Tonopah Test Range. Surface waters consist of small areas of seepage associated with Cactus Spring, a small sump associated with the Roller Coaster production well, a U.S. Air Force well that provides a small surface water source for wild horses, and ephemeral waters caused by summer convection storms and runoff during wet winters. No surface waters are used for water supplies. The ephemeral waters exist in normally dry washes for short periods of time and on the surfaces of usually dry lakes for periods of days to weeks. Water quality of the ephemeral waters is poor because of naturally high sediment loads and dissolved solids. Activities could have minor effects on drainage patterns and discharge rates due to surface disturbance and altered infiltration rates. Change to sediment loads and dissolved solids due to project activities would be minor in comparison to the natural baselines. No significant change in water quality or quantity is anticipated, and, thus, the impacts are negligible.

Defense Program. Defense Program activities have some potential to impact the surface hydrologic environment at the Tonopah Test Range. The nature of the impact depends on the size and location of the activity.

One potential impact is contamination of the surface hydrologic environment resulting from weapons and burn tests. Some contaminants present in geologic media could be transferred to surface waters and transported downgradient to other soil areas.

Environmental Restoration Program. The restoration areas of the Tonopah Test Range that are contaminated with radionuclides from safety tests of nuclear weapons are all on the valley bottom and, in one case, a playa. Remediation would thus clean the lower and the terminal areas of the drainages. This would remove a source of potential contamination that ephemeral standing waters could pick up. Potential sources of surface water contamination would be removed during industrial site remediation.

Work for Others Program. Under Alternative 1, Work for Others Program activities are similar to Defense Program activities; therefore, the potential impacts to surface hydrology are similar.

Site-Support Activities. Under Alternative 1, site-support activities at the Tonopah Test Range are not expected to significantly impact surface waters.

5.1.2.5.2 Groundwater—Potential impacts to the groundwater from the programs and site-support activities are presented in this section.

Under Alternative 1, the potential impact on the water resources at the Tonopah Test Range include two broad types of effects: reduction in water resource availability and impact on water quality. The DOE routinely withdraws groundwater at the Tonopah Test Range that results in localized impacts, including a lowering of water levels, changes in groundwater flow direction, and reduction in quantity of water available to other users. If large-scale groundwater withdrawals occur, the impacts could increase to include reduction in spring discharge rates, water quality damage, and a reduction in underflow to downgradient areas.

Defense Program. Under Alternative 1, defense-related activities would be similar to those of the past three to five years. Therefore, no additional impacts are anticipated to the groundwater or water resources.

Environmental Restoration Program. Existing groundwater use by the Environmental Restoration Program would continue to be minimal and would be limited to that used for dust control, equipment decontamination, sanitation, and potable water for the workforce. Annual water requirements for characterization are expected to be minimal. Because of the limited demand for water, no significant adverse impacts on groundwater resources are anticipated as the results of Environmental Restoration Program activities at the Tonopah Test Range.

Work for Others Program. Under Alternative 1, adverse impacts to groundwater at the Tonopah Test Range would not occur.

Site-Support Activities. Under Alternative 1, site-support activities at the Tonopah Test Range are not expected to significantly impact the groundwater.

5.1.2.6 Biological Resources. Collectively, approximately 50 acres of undisturbed habitat would be disturbed by DOE or DOE-sponsored organizations under Alternative 1. No projects in Alternative 1 would be large enough that they would likely lower the viability of populations of any species. Therefore, it is unlikely that activities under Alternative 1 would influence biodiversity or ecosystem functions on or around the Tonopah Test Range.

Defense Program. There are 20 projects proposed for this site under this program. Eighteen of these projects involve testing of defense-related materials in previously disturbed areas. The projects are located in disturbed areas, and governing environmental protocols are followed. No biological impacts are likely to arise from these tests. Seismic verification tests would involve disturbance of up to 20 small 0.08-acre areas. Some of these areas may be in undisturbed habitats. No impacts are envisioned for biological resources given the small size of areas to be disturbed and the lack of threatened and endangered species in these areas. The final project, Hazardous Burn Tests, would involve digging four 9-m^2 (100-ft^2) pits, lining them with plastic, and burning defense-related material in the pits. These pits could be in undisturbed habitats. This project would also be performed in compliance with relevant environmental regulations and should have no impact on biological resources.

The Defense Program at the Tonopah Test Range involves a considerable amount of ground and air transportation. It is unlikely that this travel would significantly affect population viability of plants or animals, survival of individuals of threatened or endangered species, or springs and their associated habitats. No new infrastructure development is planned at the Tonopah Test Range for the Defense Program. Hazardous waste (5,614 kg [12,376 lb]) generated from these defense projects would be transported off site for disposal. No biological impacts are likely to occur from the transport of this hazardous material. No radioactive waste would be generated from Defense Program activities.

Environmental Restoration Program. This program would involve the removal and disposal of hazardous and radioactive materials from approximately 50 acres of undisturbed habitat, and the removal and disposal of ordnance scattered across approximately 1,000 acres. Cleanup would include characterization, remediation, and closure of sites. Disturbed sites would be revegetated as necessary. Disposal would involve transport of material to several sites both on and off the NTS.

Removal of ordnance would not result in long-term disturbance of habitat or the mortality of plants or animals. Removal of contaminants would have a beneficial, long-term impact on plant and animal populations found in or near contaminated sites. However, cleanup would also have a negative impact on habitat because areas must be completely or partially cleared of vegetation during this removal process. This impact would be less significant on previously disturbed sites because habitat in these areas was already disturbed before this project began.

This program would not negatively affect population viability because the disturbances are small relative to the geographic range of affected species. Candidate species, such as burrowing owls and some bats and economically or recreationally important species such as doves or waterfowl, might be exposed to drilling mud or surfactants in drill sumps constructed for monitoring wells. This could increase their chances of drowning. Transport of the removed material to approved disposal sites would not likely impact the biological resources because stringent safety protocols are followed.

Work for Others Program. The Work for Others Program activities under Alternative 1 are similar to activities associated with the Defense Program. The level of activity is expected to remain at current levels. Therefore, no impacts to biological resources are anticipated.

Site-Support Activities. No new infrastructure would be developed under Alternative 1. Therefore, no impacts to biological resources resulting from site-support activities are expected under this alternative.

*5.1.2.7 **Air Quality**.* The Tonopah Test Range is located in Nevada Intrastate Air Quality Control Region 147. Because there are no significant sources of pollutant emissions in the region, the air quality is good. The Air Quality Control Region is designated as unclassifiable/attainment for all criteria pollutants. Fugitive dust levels generated from construction activities were calculated. Other criteria pollutants were not considered because there are no active sources on the site. In addition, mobile source emissions were not calculated because of the minimal number of mobile sources.

Defense Program. Pollutant emissions would result from rocket artillery firing, as well as missile and explosives operations. These activities would be intermittent and produce only local emissions, which would be dispersed over the relatively large target area. Therefore, air quality impacts at the boundary and off site would be minor.

Environmental Restoration Program. About 80 acres would be disturbed during the Environmental Restoration Program activities. The average annual fugitive dust emission (PM_{10}) from Alternative 1 during Environmental Restoration Program activities would be about 2.4 tons. The total fugitive dust emissions generated from Environmental Restoration projects represents about less than 0.01 percent of the total fugitive dust (PM_{10}) generated in Nye County. Calculations assume that fugitive dust would be reduced by 50 percent as a result of watering the sites. Because activities would occur only on a short-term basis, long-term air quality impacts would not be expected.

Work for Others Program. At the Tonopah Test Range, the Work for Others Program would continue to include fuel air explosives operations. A fuel air explosive device can produce a detonation yield equivalent to several thousand pounds of high explosives. Fugitive dust, as well as gaseous pollutant emissions, would result from each explosives test. Local dust clouds would result, but they would be dispersed on site and would not produce high concentrations of dust off site. Therefore, air quality impacts would be minor.

5.1.2.8 Noise. Impacts to noise as a result of the Defense, Environmental Restoration, and Work for Others Programs are presented in this section. Site-support activities under Alternative 1 are not expected to generate significant noise on site or off site.

Defense Program. Heavy equipment operation during preparation and removal of equipment for mobile testing and construction of permanent testing facilities would result in noise levels of approximately 85 to 90 dBA near the equipment (15 m [50 ft]). The noise levels would decrease to 50 dBA at distances from 878 m to 1,524 m (2,800 ft to 5,000 ft). Periodic, short-term noise would occur as a result of artillery and explosives testing operations. However, the noise levels would decrease with distance. For example, a noise level of 90 dBA at 15 m (50 ft) decreases to 50 dBA at 2 km (1 mi) and to 44 dBA at 3 km (2 mi).

Environmental Restoration Program. Noise impacts would occur during site characterization (e.g., from drilling activities) and remediation (e.g., from large truck movement and heavy equipment operations). Temporary noise impacts from construction-related noise would occur within the immediate vicinity of construction sites. Because activities would only occur on a short-term basis, long-term noise impacts would not be expected.

Work for Others Program. During fuel air explosives operations, instantaneous noise levels at the Tonopah Test Range would be very high. However, these noise levels would be intermittent and would not produce significant impacts.

5.1.2.9 Visual Resources. Under Alternative 1, the only program anticipated to have impacts on visual resources is the Environmental Restoration Program. The other programs do not have ground disturbance associated with their activities.

Some new ground disturbance would occur as a result of Environmental Restoration Program activities, and some previously disturbed sites would also be redisturbed. Potential remediation disturbances area could range from 1 or 2 acres at the artillery site, to approximately 200 acres total for the contaminated soils sites. At some of the previously disturbed areas, vegetation has completely recovered, while others, such as landfills and lagoons, remain bare and debris-laden. Many areas of the contaminated soil sites have never suffered vegetation damage. Others are playa surfaces and are either sparsely vegetated or bare. One area of approximately 10,000 acres may have ordnance contamination and an estimated 10 percent of it would be disturbed by vehicle tracks during remediation. The remaining industrial sites are in developed areas.

The Clean Slates 1, 2, and 3 site areas of disturbance would depend upon the characterization and agreed upon cleanup levels by the DOE and the state of Nevada. Resulting from 90 to 200 acres that would be disturbed, 40 acres of this area presently lie on the playa.

Summarizing, up to 200 acres comprised of increments of 1 or 2 acres up to 120 acres would be disturbed visually. Another area of approximately 10,000 acres would be altered by vehicle trailers through the vegetation. Three sites, each approximately 2 m x 2 m (6 ft x 6 ft), are associated with the Clean Slate 1, 2, and 3 tests. In addition to the Clean Slate sites, there are 43 other environmental restoration sites on the Tonopah Test Range that would disturb approximately 80 acres. The landscape character of the Tonopah Test Range is common to the region and is designated as Class C scenic quality. The affected areas would not be visible from public highways. Impacts to visual resources from Environmental Restoration Program activities would be negligible. There could be beneficial impacts to visual resources once revegetated areas have become established.

5.1.2.10 Cultural Resources. Impacts to cultural resources may occur as a result of ground disturbing activities associated with remediation, military testing, and the construction of utilities. Visitation and vehicular traffic may lead to vandalism or artifact collecting that could result in indirect impacts to cultural resources.

Defense Program. The exact nature and location of various Defense Program activities are not known at this time. These activities are expected to be conducted primarily in areas of previous operations and, thus, involve little or no surface disturbance. Another source of potential impact would be from unauthorized artifact collection by workers or visitors brought to the area by specific projects.

Environmental Restoration Program. This program has identified specific areas for characterization and potential remediation. The exact size and configurations will not be known until an agreement with the state of Nevada is reached regarding cleanup levels, and characterization has defined the boundaries involved. Some of these areas have been previously disturbed in conjunction with pre- and post-safety test activities. Previously disturbed areas will likely have little or no potential for archaeological information. Portions of some contaminated sites might present hazards to personnel that outweigh their archaeological information potential. Cultural resource surveys would not be conducted in previously disturbed areas where information potential has been destroyed and might not be implemented where personnel risk is judged as too high. If cultural resources exist in an area too highly contaminated to survey and conduct data recovery, then these resources may be lost when remediation disturbs the surface. The impact potential would likely be low because the known areas of high contamination are generally in areas of previous disturbance and are not associated with areas of high cultural resource potential.

Another potential source of impact would be from unauthorized artifact collection by workers or site visitors, although this is unlikely because site access to visitors and workers during remediation activities would be restricted.

Work for Others Program. Military research and development, such as small arms, artillery, gun, aircraft, and armored vehicle testing, and airdropped armaments, and development of associated electronic systems, might take place. If the activities occurred in an unanticipated area that had not been surveyed for cultural resources then there might be ground-disturbing impacts to cultural resources.

Site-Support Activities. Existing roadways might be used for transport, but, as part of the environmental restoration program, construction of a new road between the Tonopah Test Range and the NTS, crossing the NAFR Complex, has been proposed. Linear constructions, such as roadways that traverse large areas, would be likely to disturb the physical integrity of the cultural resources. A road would increase access and, consequently, the potential for unauthorized artifact collection. Cultural resources surveys would be performed prior to ground disturbing activities proposed under this program. Avoidance or data recovery would be implemented.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 1, as summarized by the CTGO.

The CTGO knows that the actions considered in the NTS EIS potentially will affect American Indian cultural resources within an area roughly bounded by where these people live today in their traditional lands (Figure 4-47). The proposed NTS EIS actions will have cultural effects within this region of influence because of the cultural centrality of these lands to all three ethnic groups (Western Shoshone, Owens Valley Paiute, and Southern Paiutes). Within this region of influence, specific actions will have direct local impacts. Ultimately, however, any action that moves the NTS away from or back towards its natural state has influence on all Indian people.

The CTGO recognizes that some of the actions proposed in the NTS EIS will have direct impacts on other Indian tribes and organizations. For example, the Project Shoal Area is located on the traditional lands of Northern Paiute people. The Eldorado Valley actions potentially impact the Mohave people. The return of radioactive waste to the NTS has permitted and potentially will permit people like the Alaskan natives to have their lands restored to a natural state (see Project Chariot Report [DOE/NV, 1994b]). Therefore, the CTGO defines the American Indian Region of Influence Map in an effort to focus on the cultural concerns of those people having traditional ties to the NTS, itself, but in so doing, does not intend to preclude the cultural concerns of other Indian ethnic groups.

Defense Program at the Tonopah Test Range—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if further aboveground nuclear tests occur and if natural lands are scraped for construction.

Waste Management Program at the Tonopah Test Range—Under Alternative 1, it is expected that American Indian cultural resources will not be impacted because there is no Waste Management Program on the Tonopah Test Range and none has been identified for this alternative.

Environmental Restoration Program at the Tonopah Test Range—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program at the Tonopah Test Range—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during Nondefense Research and Development Program actions. At this time, no actions are planned for the Tonopah Test Range.

Work for Others Program at the Tonopah Test Range—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the Tonopah Test Range continues to be a place where weapons are researched and developed. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

5.1.2.11 Occupational and Public Health and Safety. The Defense, Environmental Restoration, and Work for Others Programs are the only programs expected to result in health and safety impacts to workers at the Tonopah Test Range. Occupational health and safety impacts may potentially result from industrial safety hazards in the workplace (e.g., injuries or fatalities from construction and maintenance), controlled exposure to radiation or hazardous chemicals in the workplace, and accidental exposures to radiation or hazardous chemicals. Impacts to worker health might take the form of injuries or fatalities from industrial hazards, and cancer fatalities or other detrimental health effects from exposure to radiation or hazardous chemicals. Table 5.1-16 summarizes the occupational and public health and safety

Table 5.1-16. Health risks to workers and the public from program activities, Tonopah Test Range, Alternative 1

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense	2.5	0.0044	0.0025	0.001	8.4×10^{-12}	1.8×10^{-5}	9×10^{-9}	4.1×10^{-9}	1×10^{-10}	9.6×10^{-7}
Environmental Restoration	0.0049	9.7×10^{-4}	2.4×10^{-4}	1.3×10^{-4}	e	e	1.2×10^{-9}	5.7×10^{-10}	e	e
Total	**2.5**	**0.0054**	**0.0027**	**0.0011**	$\mathbf{8.4 \times 10^{-12}}$	$\mathbf{1.8 \times 10^{-5}}$	$\mathbf{1 \times 10^{-8}}$	$\mathbf{4.7 \times 10^{-9}}$	$\mathbf{1 \times 10^{-10}}$	$\mathbf{9.6 \times 10^{-7}}$

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis

b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis

c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the 10-year period of analysis

d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more

e. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified.

impacts for the applicable Tonopah Test Range program areas under Alternative 1.

The remote location of the Tonopah Test Range insulates impacts to the general public. To impact public health and safety, there must be a pathway or a transport mechanism to transmit the hazard to the public. None of the routine activities conducted at the Tonopah Test Range involves hazards that would impact public health and safety. Section 5.1.2.7, Air Quality, identifies no active sources for airborne release of radioactivity or criteria pollutants. Section 5.1.2.2.3 addresses impacts of transportation of radioactive materials and waste. Accidents associated with activities at the Tonopah Test Range could impact public health and safety and are discussed in this section.

Unless otherwise noted, impacts presented in this section are the total impacts for the 10-year period evaluated in this EIS. Results are presented for the applicable program areas, although some program areas do not involve hazards from radiation or hazardous chemicals.

Defense Program. Based on occupational injury and fatality rates for construction activities, the Defense Program at the Tonopah Test Range is expected to result in 2.5 injuries and 0.0044 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are projected as a result of routine program activities.

Based on previous occupational radiation periods, occupational exposure to radiation is not expected to exceed a collective dose to Defense Program workers of about 6-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0025 latent cancer fatalities and 0.0010 other detrimental health effects in the worker population. The risk of accidental exposure to radioactive or hazardous chemical releases contributes nearly zero increase to worker risk of latent cancer fatality or other detrimental health effects.

The health and safety impact to the public from potential Defense Program accidents at Tonopah Test Range could result in about 9.0×10^{-9} latent cancer fatalities and 4.1×10^{-9} other detrimental health effects in the population. Additional risk due to accidental exposure to hazardous chemicals would be even less.

The maximum reasonably foreseeable Defense Program radiological accident at the Tonopah Test Range would be a failure of an artillery fired test assembly, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: Not applicable; involved workers are under cover when the device is fired
- Maximally exposed non-involved worker: 71 rem, 0.037 chance of latent cancer fatality, 0.023 chance of other detrimental effects
- Non-involved worker population at the nearest major facility area: 7,100 person-rem, 5.7 latent cancer fatalities, 2.3 other detrimental effects
- Maximally exposed off-site individual at the nearest point of public access: 2.3 rem, 0.0012 chance of latent cancer fatality, 5.3×10^{-4} chance of other detrimental effects
- Population within 80 km (50 mi): 18 to 310 person-rem, 0.009 to 0.16 chance of a single latent cancer fatality, 0.004 to 0.071 chance of any other detrimental effects.

For Defense Programs hazardous chemical effects at the Tonopah Test Range, the maximum reasonably foreseeable accident would be an explosion of a rocket test assembly containing depleted uranium and beryllium, which has a probability of occurrence of 6×10^{-6} (1 in 170,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion

- Maximally exposed non-involved worker: 1.4×10^{-8} chance of cancer, 0.30 noncancer hazard index for potentially life-threatening one-hour concentration

- Non-involved worker population at the nearest major facility area: 1.4×10^{-7} chance of a single cancer, 0.30 noncancer hazard index for potentially life-threatening one-hour concentration

- Maximally exposed off-site individual at the nearest point of public access: 4.1×10^{-7} chance of cancer, 1.0 noncancer hazard index for potentially life-threatening one-hour concentration

- Population within 80 km (50 mi): 1.7×10^{-6} to 1.1×10^{-7} chance of a single cancer, 0.016 to 0.03 noncancer hazard index for potentially life-threatening one-hour concentration.

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, the Environmental Restoration Program is expected to result in 0.0049 injuries and 0.001 fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected to result from construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Tonopah Test Range Environmental Restoration Program workers of about 0.6-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 2.4×10^{-4} latent cancer fatalities and 9.6×10^{-5} other detrimental health effects in the worker population. The risk of accidental exposure to radioactive releases contributes nearly zero increase to worker risk of latent cancer fatality or other detrimental health effects. No Environmental Restoration Program hazardous chemical accident resulting in measurable effects at the Tonopah Test Range has been identified.

The health and safety impact to the public from potential Environmental Restoration Program accidents at Tonopah Test Range could result in about 1.2×10^{-9} latent cancer fatalities and 5.7×10^{-10} other detrimental health effects in the population.

The maximum reasonably foreseeable Environmental Restoration Program radiological accident at the Tonopah Test Range would be an airplane crash into the Project Roller Coaster site, which has a probability of occurrence of 1×10^{-6} (1 in 1,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash

- Maximally exposed non-involved worker: 0.012 rem, 4.8×10^{-6} chance of latent cancer fatality, 1.9×10^{-6} chance of other detrimental effects

- Non-involved worker population at the nearest major facility area: 1.2 person-rem, 4.8×10^{-4} chance of a single latent cancer fatality, 1.9×10^{-4} chance of any other detrimental effects

- Maximally exposed off-site individual at the nearest point of public access: 0.0034 rem, 1.7×10^{-6} chance of latent cancer fatality, 7.8×10^{-7} chance of other detrimental effects

- Population within 80 km (50 mi): 0.2 to 3.3 person-rem, 9.5×10^{-5} to 1.7×10^{-3} chance of a single latent cancer fatality, 4.4×10^{-5} to 7.6×10^{-4} chance of other detrimental effects.

Work for Others Program. The impacts would be the same as those described for the Defense Program.

5.1.2.12 Environmental Justice. Environmental Justice impacts for the region of influence are discussed in Section 5.1.1.12.

5.1.3 Project Shoal Area

The only program that will occur at the Project Shoal Area is the Environmental Restoration Program. Therefore, environmental restoration is the only program discussed for this site. Under Alternative 1, characterization and remediation activities at the Project Shoal Area would continue.

5.1.3.1 Land Use. Hazardous waste or other waste generated during environmental restoration actions would be disposed of off site at a permitted waste disposal facility. For the purposes of this evaluation, it has been assumed that radioactive waste would be disposed of at NTS facilities.

Some site characterization activities might have minor impacts on surrounding land use. There might be some impact on the use of restricted airspace or the use of the site by the U.S. Navy for strike rescue training. However, such impacts likely would be of short duration during active site characterization. The nearest population center is the community of Fallon, and it is not likely that any of the Alternative 1 actions would result in significant impacts on surrounding land use at the Project Shoal Area. Remediation activity would have the effect of negating any requirement restricting surface land uses near surface ground zero.

Under Alternative 1, continued site characterization and long-term hydrologic monitoring of the site could result in the disturbance of 10 acres of land. The Project Shoal Area, which is periodically used by the U.S. Navy for military maneuvers, consists of approximately 2,560 acres. The 10 acres identified for Environmental Restoration Program activities would represent less than 0.4 percent of the Project Shoal land area. Conflict between Environmental Restoration Program activities and other land uses would be temporary and negligible.

5.1.3.1.1 Site-Support Activities—Road traffic associated with Environmental Restoration Program actions would result in some short-term increases in road use. Water supplies for drilling and other activities would be trucked from off site, and short-term requirements for power would be met through generators.

5.1.3.1.2 Airspace—Under Alternative 1, the Environmental Restoration Program activities anticipated at the Project Shoal Area would not require direct air access other than for intermittent aerial radiological monitoring. Therefore, there would be minimal effects on airspace at the Project Shoal Area.

5.1.3.2 Transportation. The following sections address the environmental impacts related to transportation activities as defined under Alternative 1. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.1.3.2.1 On-Site Traffic—Environmental Restoration Program activities would be short-term and would require relatively few personnel (less than 10 people at any given time). No public roads currently exist on the site. Minor vehicular traffic is anticipated; therefore, there would be no traffic impacts.

5.1.3.2.2 Off-Site Traffic—Environmental Restoration Program activities would generate only an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day) on the local access roads and on the immediate regional highway (U.S. Highway 50). In 1993, the average daily traffic on U.S. Highway 50 near the site amounted to 1,340 vehicles (NDOT, 1993); this traffic volume is far below the capacity of U.S. Highway 50 at this location (capacity ranges from 10,000 to 20,000 vehicles per day). Therefore, there would be no traffic impacts on off-site roadways.

5.1.3.2.3 Transportation of Materials and Waste—The highest risk resulting from environmental restoration activities would be in traffic fatalities and injuries. Both were calculated as less than one (person) being affected.

5.1.3.2.4 Other Transportation—Alternative 1 does not assume direct use of local railroads or other modes of transportation; therefore, direct effects on rail and other modes of transportation would be minimal. Furthermore, the anticipated activities at the site do not call for a measurable transportation demand.

5.1.3.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic issues. The analysis for this site is included in Section 5.1.1.3.

5.1.3.4 Geology and Soils. Environmental restoration at the Project Shoal Area site would consist of locating and characterizing the mud pit by collecting shallow soil samples from the pit for chemical and radiological analysis, reentering wells that were drilled during the original activities on the site to convert them into groundwater monitoring wells, and monitoring the groundwater to detect any contaminant migration that might occur. Because these wells already exist and drill pads have been prepared, this work would not affect additional geologic media. The only preparation that is expected is clearing of the vegetation around the abandoned wells. The disturbed areas did not cause excessive erosion. They have revegetated naturally, so it is not expected that they would pose an erosional problem for the future.

No known geologic resources (aggregates, clay, coal, minerals, or fossils) would be adversely impacted at the Project Shoal Area from Alternative 1 activities. The site is not located on or near any known or exploitable mineral resources, fossil beds, unique geologic outcrops, or other unique geologic features. The closest mine is an intermittently operated gold mine located approximately 8 km (5 mi) north of the site, but this is not close enough to be affected by any activities that have been or would be conducted on the site under this alternative.

5.1.3.5 Hydrology. The environmental impacts to surface hydrology and groundwater are described in the sections that follow. Discussions of impacts to water quality and water quantity are also presented.

5.1.3.5.1 Surface Hydrology—The impact of Environmental Restoration Program actions on the quality of surface water resources of the Project Shoal Area is not expected to be significant. Road building associated with well drilling might disturb small areas of soils. However, because of the very limited nature of surface water resources at the Project Shoal Area, the impact on surface water flows is expected to be minimal.

The soil-disturbing actions might result in slight increases in sediment yield and some inorganic compounds in the surface water. Given the limited amount of soil disturbance and the scant surface water resources, no significant adverse impacts on surface water quality are anticipated.

5.1.3.5.2 Groundwater—Planned groundwater use by the Environmental Restoration Program at the Project Shoal Area would be minimal and would be limited to that used in the drilling and testing of characterization wells, decontamination of sampling materials, and purging of wells prior to sampling. Annual water requirements for characterization have not been well defined, but are expected to be minimal. Because of the low demand for water, no significant impacts on water resource availability are anticipated. Similarly, because of the limited nature of Environmental Restoration Program activities, no significant adverse impacts on groundwater quality are anticipated.

5.1.3.6 Biological Resources. The only activities planned for this site consist of continued hydrological monitoring at existing wells. In addition, more wells might be drilled at this site, which may result in minor land disturbance. All 10 acres to be disturbed during environmental restoration have been disturbed previously; therefore, there are no likely biological impacts on habitat, population viability of plants or animals, threatened or endangered species, or regionally rare habitats (EG&G/EM, 1993).

5.1.3.7 Air Quality. The Project Shoal Area is located in Nevada Intrastate Air Quality Control Region 147. There are no air quality monitoring stations in the region. Because there are no significant sources of pollutant emissions in the region, the air quality is good. The Air Quality Control Region is designated as unclassifiable/attainment for all pollutants. The quantity of fugitive dust that could be generated from the construction activities was calculated. Other criteria pollutants were not considered because there are no active sources on the site. In addition, mobile source emissions were not calculated because of the minimal number of mobile sources. Emissions from the operation of naval aircraft over the Project Shoal Area would have little impact on surface ambient pollutant concentrations. Studies have shown that resulting concentrations would be about 0.05 percent of the allowable concentration (SAIC/DRI, 1991).

Under the Environmental Restoration Program, about 10 acres of land would be disturbed. The average annual fugitive dust emission (PM_{10}) from Alternative 1 drilling activity would be about 3 tons. Calculations assume that fugitive dust would be reduced by 50 percent as a result of watering the sites. Calculations assume activities are only expected to occur on a short-term basis; therefore, long-term air-quality impacts are not expected.

5.1.3.8 Noise. Most of the noise at the Project Shoal Area would be generated during well drilling operations associated with the Environmental Restoration Program. All drilling operations occur on site, and there are no sensitive noise receptors. Noise impacts associated with increased traffic on access routes were not analyzed because the increase in traffic volume would be negligible.

Noise impacts would occur during site characterization (e.g., drilling) and remediation (e.g., large truck movement and front-end loaders). Temporary impacts resulting from construction-related noise would occur within the immediate vicinity of construction sites. Noise impacts from construction activities in the Project Shoal Area would be negligible because the closest private residence is 8 km (5 mi) west of the Project Shoal Area. Potential construction-related noise levels of 80 to 85 dBA at 15 m (50 ft) from the sources within the Project Shoal Area construction would be reduced to 30 dBA at 8 km (5 mi), which would be lower than ambient noise levels. Activities would only occur on a short-term basis; therefore, long-term noise impacts would not be expected.

5.1.3.9 Visual Resources. The scenic quality for the Project Shoal Area has been designated Class C, and the sensitivity level is low. The Project Shoal Area is approximately 2,560 acres; the affected area (10 acres) would represent less than 0.4 percent of the total area. Impacts from Environmental Restoration Program activities to visual resources would be negligible. Depending on pertinent reclamation factors, disturbed areas could be revegatated after cleanup has been completed. There would be some beneficial impacts to visual resources once revegated areas become established.

5.1.3.10 Cultural Resources. Ground-disturbing activities associated with remediation may effect the physical integrity of cultural resources. Indirect impacts to cultural resources might result from increased visitation and vehicular traffic in archaeologically sensitive areas.

AMERICAN INDIAN CULTURAL RESOURCES—
This study area is not within the traditional lands of the Indian people represented by the CTGO. It is recommended by the CTGO that the DOE EIS team directly contact Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, and Pyramid Lake and Lovelock Paiute Tribes.

NOTE: The Fallon Paiute, Walker River Paiute, and Lovelock Paiute Tribes were contacted by the DOE in letters dated May 12, 1995.

5.1.3.11 Occupational and Public Health and Safety. The Environmental Restoration Program is the only active program expected to result in health and safety impacts to workers at the Project Shoal Area. No contamination has been detected in surficial soils at this site, and no surface soil remedial actions are proposed. Activities at this site would consist of characterization and hydrologic monitoring. Impacts to worker health might take the form of injuries or fatalities from industrial hazards and cancer fatalities or other detrimental health effects from exposure to radiation or hazardous chemicals.

Table 5.1-17 summarizes the occupational and public health and safety impacts for Environmental Restoration Program activities under Alternative 1.

Table 5.1-17. Health risks to workers and the public from program activities, Project Shoal Area, Alternative 1

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index
Environmental Restoration	1.6×10^{-4}	3.1×10^{-5}	1.7×10^{-5}	9×10^{-6}	c	c	d	d	c	c
Total	$\mathbf{1.6 \times 10^{-4}}$	$\mathbf{3.1 \times 10^{-5}}$	$\mathbf{1.7 \times 10^{-5}}$	$\mathbf{9 \times 10^{-6}}$	**c**	**c**	**d**	**d**	**c**	**c**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis

b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis

c. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified

d. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

Because of the remote location of the Project Shoal Area and the nature of planned Environmental Restoration Program activities, no impacts to public health and safety are reasonably foreseeable from either routine activities or accidents. Radioactive contamination is known to exist in the subsurface as a result of past underground nuclear weapons testing. Potential impacts to public health and safety from subsurface contamination of groundwater are discussed in this section.

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities at the Project Shoal Area are expected to result in 1.6×10^{-4} injuries and 3.1×10^{5} fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Project Shoal Area Environmental Restoration Program workers of about 0.04 person-rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 1.7×10^{-5} latent cancer fatalities and 6.8×10^{-6} other detrimental health effects in the worker population. No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Project Shoal Area have been identified.

Subsurface radioactivity from past underground nuclear weapons testing at the Project Shoal Area could provide an exposure pathway for the general public. Transport modeling of tritium-contaminated groundwater at the Project Shoal Area was performed in support of this EIS (Chapman et al., 1995). The modeling results showed that peak tritium concentrations in groundwater could vary from nondetectable to about 20,000 pCi/L (depending on uncertainties in modeling parameters) at the nearest existing public wells. For comparison, EPA's maximum allowable tritium concentration in drinking water is 20,000 pCi/L. At the eastern boundary of the Project Shoal Area, where no well currently exists, peak tritium concentrations could be between 280 pCi/L, arriving 200 years after the test, and 720,000 pCi/L, arriving about 70 years after the test.

Health effects to the public from Project Shoal subsurface radioactivity estimated by Chapman et al. (1995) were based on future predictions of tritium concentrations in well water and on the assumption that a public well could be installed at the boundary of the Project Shoal Area. These impacts are not expected to occur within the 10-year timeframe evaluated in this EIS. The public exposure scenarios assume that a hypothetical individual would consume contaminated well water for 70 years centered around the time of peak tritium concentration in well water. At the eastern boundary of the Project Shoal Area, the maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 2×10^{-10} (about one in five billion) and 2×10^{-3} (about one in 500). At the nearest existing public well, a hypothetical maximally exposed individual is estimated to have a lifetime probability of contracting fatal cancer between 4×10^{-24} (essentially zero) and 2×10^{-7} (about one in five million).

5.1.3.12 Environmental Justice. Environmental Justice impacts for the region of influence are discussed in Section 5.1.1.12.

5.1.4 Central Nevada Test Area

The only program that would occur at the Central Nevada Test Area is the Environmental Restoration Program. Therefore, this program is the only one discussed for this site. Characterization and remediation activities at the Central Nevada Test Area would continue.

5.1.4.1 Land Use. Present use of the site is primarily for grazing, wildlife habitat, hunting, and scattered outdoor recreation. The DOE continues long-term monitoring and characterization and would complete needed remediation under this alternative. Sites that might require work include sewage lagoons, trash dumps, four emplacement holes, an uncovered hole, a runoff ditch, and drilling mud pits. Approximately 44 acres would be disturbed by characterization and remediation at the three industrial sites. This would comprise less than 2 percent of the total site, which totals approximately 2,470 acres.

Wastes generated during Environmental Restoration Program activities would be disposed of at off-site permitted disposal facilities. For the purpose of this evaluation, it has been assumed that all radioactive wastes would be disposed of at NTS facilities. Closure in place would be an option evaluated for some sites.

Remediation would permit fewer to no restrictions on surface land uses. Closure in place would result in restricted surface use of the closure to protect the cap. The opportunity for a variety of land-use options would be improved under Alternative 1.

Surrounding land uses are similar to the site land uses with grazing, wildlife habitat, hunting, recreation, public land ranching, and widely scattered private ranch lands but there are no nearby population centers in the region. Environmental Restoration Program activities would have no effect on surrounding land uses.

5.1.4.1.1 Site-Support Activities—Road traffic associated with Environmental Restoration Program activities would result in some short-term increases in road use. Water supplies for drilling and other activities would be trucked from off site, and short-term requirements for power would be met through generators.

5.1.4.1.2 Airspace—There would be no effect on airspace at the Central Nevada Test Area as a result of Alternative 1 Environmental Restoration Program activities.

5.1.4.2 Transportation. The following sections contain the discussion of the environmental impacts related to transportation activities as defined under Alternative 1. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.1.4.2.1 On-Site Traffic—The site is accessed by U.S. Highway 6, and there are no public access roads on site. Traffic generated by Environmental Restoration Program activities would be minimal and not significant.

5.1.4.2.2 Off-Site Traffic—Environmental Restoration Program activities would generate only an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day). Traffic volume is far below the capacity of U.S. Highway 6 at this location (capacity ranges from 10,000 to 20,000 vehicles per day). Therefore, under Alternative 1, there would be minor vehicular traffic generated. If remediation waste is removed from the site, then traffic on on-site roads would increase, but would be well within their capacity.

5.1.4.2.3 Transportation of Materials and Waste—The highest risk from Environmental Restoration Program activities would be in traffic fatalities and injuries. Both were calculated to be less than one person being affected.

5.1.4.2.4 Other Transportation—Alternative 1 activities do not include direct use of local railroads, air transportation, or other modes of transportation to this site; therefore, direct effects on rail, air, and other modes of transportation would be minimal.

5.1.4.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work; therefore, the place of employment would not change the effects in any of the socioeconomic issues. The analysis for this site is included in Section 5.1.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.1.4.4 Geology and Soils. Environmental Restoration Program activities at the Central Nevada Test Area would consist of characterizing the mud pits at each of the three emplacement holes and remediating them if needed, cleaning up the debris that has been left on the sites, and monitoring the groundwater to detect any contaminant migration that might occur.

No known geologic resources (aggregates, clay, coal, minerals, or fossils) would be adversely impacted at the Central Nevada Test Area from Alternative 1 activities. The site is not located on or near any known or exploitable mineral resources, fossil beds, unique geologic outcrops, or other unique geologic features.

5.1.4.5 ***Hydrology.*** Environmental impacts to surface hydrology and groundwater are described in the sections that follow.

5.1.4.5.1 ***Surface Hydrology***—The impact of Environmental Restoration Program actions on the quantity of surface water resources of the Central Nevada Test Area is not expected to be significant. Road building associated with well drilling might disturb small areas of soils. However, because of the very limited nature of surface water resources at the Central Nevada Test Area, the impact on surface-water flows is expected to be minimal.

The soil-disturbing actions might result in slight increases in sediment yield and some inorganic compounds in the surface water. Given the limited amount of soil disturbance and the scant surface water resources, no significant adverse impacts on surface water quality are anticipated.

5.1.4.5.2 ***Groundwater***—Planned groundwater use by Environmental Restoration Program activities at the Central Nevada Test Area would be limited to that used in the drilling and testing of characterization wells, decontamination of sampling materials, and purging of wells prior to sampling. Annual water requirements for characterization are expected to be minimal. Because of the low demand for water, no significant impacts on water resources availability are anticipated. Similarly, because of the limited nature of Environmental Restoration Program activities, no significant adverse impacts on groundwater quality are anticipated.

5.1.4.6 ***Biological Resources.*** Remediation would likely include the removal of drill pond mud, sewage lagoons, and the transfer of hazardous materials to appropriate disposal sites. Transport of the removed material to approved disposal sites is not likely to impact biological resources because of the stringent safety protocols in place (Appendix I). About 44 acres would be disturbed by Environmental Restoration Program activities. Some of this land has been disturbed previously. Removal of contaminants would have a beneficial, long-term impact on plants and animal populations found on or near the contaminated sites. However, it would also have a negative impact on habitat because areas must be completely or partially cleared of vegetation during this removal process. This program would not negatively affect population viability. Disturbances do not occur where candidate plant species are likely to occur. Candidate species, such as State protected birds and some bats; and economically or recreationally important species, like doves or waterfowl, might be exposed to drilling mud or surfactant in drill sumps constructed for monitoring wells. This could increase their chances of drowning. No threatened or endangered species would likely be affected by these activities.

5.1.4.7 ***Air Quality.*** Ambient air quality has not been monitored for criteria pollutants at the Central Nevada Test Area. However, because the area lacks significant pollution emission sources, the air quality is good. The amount of fugitive dust generated from the construction activities was calculated. Other criteria pollutants were not considered because there are no active sources on the site. In addition, mobile source emissions were not calculated because of the minimal number of mobile sources.

A total of 44 acres of land would be disturbed at the Central Nevada Test Area during environmental restoration activities. The average annual fugitive dust emissions (PM_{10}) from Alternative 1 construction activities would be about 13.2 tons. Fugitive dust emissions assume a 50-percent reduction as a result of watering the construction sites. Air quality impacts would occur during site characterization and remediation (e.g., large truck movement and front-end loaders). Activities are only expected to occur on a short-term basis; therefore, long-term air quality impacts are not expected.

5.1.4.8 ***Noise.*** Noise impacts would occur during site characterization and remediation (e.g., large truck movement and front-end loaders). Temporary impacts resulting from construction-related noise would occur within the immediate vicinity of the construction sites. Noise impacts from construction activities in the Central Nevada Test Area would be negligible because there are no sensitive receptors. Potential construction-related noise levels of 80 dBA to 85 dBA at 15 m (50 ft) from the sources within the Central Nevada Test Area construction would be reduced as the distance increases. Activities are only expected to occur on a short-term basis; therefore, long-term noise impacts are not expected.

5.1.4.9 ***Visual Resources***. The scenic quality for the Central Nevada Test Area has been designated Class B, and the sensitivity level is low. The affected areas would be revegetated after cleanup has been completed. The Central Nevada Test Area is approximately 2,470 acres; the affected areas (44 acres) would represent less than 2 percent of the total area. Impacts to visual resources from Environmental Restoration Program activities would be negligible. Depending on pertinent reclamation facts, disturbed areas would be revegatated after cleanup has been completed. Beneficial impacts would occur when vegetation becomes established.

5.1.4.10 Cultural Resources. The exact location of all characterization and remediation activities is not known at this time. These activities are expected to be conducted largely in areas of previous operations and thus involve minor new surface disturbance. Other potential sources of impact would be from unauthorized artifact collection by workers or site visitors, although this is unlikely because of the tight control of visitors and workers at a remediation site.

<u>AMERICAN INDIAN CULTURAL RESOURCES</u>— This section describes the American Indian concerns associated with implementing Alternative 1, as summarized by the CTGO.

This study area is not within the traditional lands of the American Indian people represented by the CGTO. It is recommended by the CGTO that the DOE EIS team directly contact Indian tribes and organizations having traditional lands in the Central Nevada Test Area. The following tribes were suggested: Fallon, Paiute, Walker River Paiute, and Pyramid Lake and Lovelock Paiute tribes.

<u>Defense Program</u>—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if further nuclear tests occur and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests or construction at the Central Nevada Test Area.

<u>Waste Management Program</u>—Under Alternative 1, it is expected that American Indian cultural resources will not be impacted because there is no Waste Management Program on the Central Nevada Test Area and none has been identified for this alternative.

<u>Environmental Restoration Program</u>—Under Alternative 1, it is expected that American Indian cultural resources on the Central Nevada Test Area will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

<u>Nondefense Research and Development Program</u>— Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the Central Nevada Test Area becomes a place where weapons are researched and developed. No such actions are planned for this alternative, so American Indian cultural resources will not be adversely impacted.

<u>Work for Others Program</u>—Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the Central Nevada Test Area becomes a place where weapons are researched and developed. No such actions are considered in this alternative, so American Indian cultural resources will not be adversely impacted.

5.1.4.11 Occupational and Public Health and Safety. The Environmental Restoration Program is the only active program expected to result in health and safety impacts to workers at the Central Nevada Test Area. Activities at this site would consist of site characterization and remediation with removal of contaminated mud and sludge. Impacts to worker health might take the form of injuries or fatalities from industrial hazards and cancer fatalities or other detrimental health effects from exposure to radiation or hazardous chemicals. Table 5.1-18 summarizes the occupational and public health and safety impacts for Environmental Restoration Program activities under Alternative 1.

Because of the remote location of the Central Nevada Test Area and the nature of planned Environmental Restoration Program activities, no impacts to public health and safety are reasonably foreseeable from either routine activities or accidents. Radioactive contamination is known to exist in the subsurface as a result of past underground nuclear weapons testing. Potential impacts to public health and safety from subsurface contamination of groundwater are discussed in this section.

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities at the Central Nevada Test Area are expected to result in 1.6×10^{-4} injuries and 3.1×10^{-5} fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Central Nevada Test Area environmental restoration workers of about 0.04-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 1.7×10^{-5} latent cancer fatalities and 6.8×10^{-6} other detrimental health effects in the worker population. No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Central Nevada Test Area have been identified.

Subsurface radioactivity from past underground nuclear weapons testing at the Central Nevada Test Area potentially provides an exposure pathway for the general public. Transport modeling of tritium-contaminated groundwater at the Central Nevada Test Area was performed in support of this EIS (Pohlmann et al., 1995). The modeling results show that tritium concentrations in groundwater are never expected to reach concentrations that are detectable (about 1 pCi/L) at any existing public wells. For comparison, the EPA's maximum allowable tritium concentration in drinking water is 20,000 pCi/L. At the southern boundary of the Central Nevada Test Area, where no wells currently exist, tritium concentrations are predicted to have reached a peak of 1.23×10^{8} pCi/L about 8 to 15 years after the test (between 1976 and 1983).

Health effects impacts to the public from the Central Nevada Test Area subsurface radioactivity have been estimated by Pohlmann et al. (1995) based on predictions of future tritium concentrations in well water and on the assumption that a public well could be installed at the southern boundary of the Central Nevada Test Area. The public exposure scenarios assume that a hypothetical individual would consume contaminated well water for 70 years centered around the time of peak tritium concentration in well water. At the existing public well nearest to the Central Nevada Test Area, the peak tritium concentration does not reach the well until about 117 years after the test date (about the year 2085). The maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 1.7×10^{-24} (essentially zero) and 3.2×10^{-10} (about one in three billion). If a public well were to be drilled at a location near the southern boundary of the Central Nevada Test Area, with a peak tritium concentration of about 1.2×10^{8} pCi/L, Pohlmann et al. (1995) estimated that the maximally exposed public individual would have a lifetime probability of contracting a fatal cancer between 1.4×10^{-5} (about one in 70,000) and 5.5×10^{-3} (about one in 200). However, by the year 1996, radioactive decay would result in a 50-percent reduction of the peak

Table 5.1-18. Health risks to workers and the public from program activities, Central Nevada Test Area, Alternative 1

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index
Environmental Restoration	1.6×10^{-4}	3.1×10^{-5}	1.7×10^{-5}	9×10^{-6}	c	c	d	d	c	c
Total	$\mathbf{1.6 \times 10^{-4}}$	$\mathbf{3.1 \times 10^{-5}}$	$\mathbf{1.7 \times 10^{-5}}$	$\mathbf{9 \times 10^{-6}}$	**c**	**c**	**d**	**d**	**c**	**c**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis

b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis

c. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified

d. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

concentration, and additional reduction would result from diffusion in the aquifer. Groundwater sampling and analysis results near the southern boundary of the Central Nevada Test Area have not confirmed these predicted tritium concentrations.

5.1.4.12 Environmental Justice. The Environmental Justice impacts for the region of influence are discussed in Section 5.1.1.12.

5.2 Alternative 2 - Discontinue Operations

Alternative 2, Discontinue Operations, is defined as the discontinuation of DOE/NV and interagency programs and operations at the NTS, the Tonopah Test Range, the Project Shoal Area, and the Central Nevada Test Area. Only those environmental monitoring and security functions necessary for human health and security would be maintained. The DOE would maintain control of the NTS and the Tonopah Test Range, but no activities would take place. All facilities, after operations have ceased, would be placed in cold standby.

Defense Program. Defense Program operations would not be maintained in a state of readiness for nuclear testing, and there would be an overall discontinuation of DOE/NV defense-related activities at the NTS and the Tonopah Test Range.

Waste Management Program. The DOE would maintain only a minimum low-level and mixed waste disposal capability until NTS waste-generating activities completely shut down. After shutdown, on-site monitoring and security functions would be reduced and become part of the sitewide monitoring activity. Transuranic and transuranic mixed waste would be shipped to other DOE facilities for certification, handling, and disposal.

Environmental Restoration Program. All DOE/NV Environmental Restoration Program activities would cease.

Nondefense Research and Development Program. The DOE/NV would discontinue support of ongoing program operations.

Work for Others Program. The DOE/NV would not host projects and activities of other federal agencies. This would include a discontinuation of the use of the NTS airspace and certain lands by the DoD for various training exercises and defense-related research and development projects. However, the DOE would be required to provide for overflights and inspection of the NTS in accordance with international arms control treaties, such as the Open Skies Treaty.

5.2.1 Nevada Test Site

The impacts associated with the discontinuation of Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs are presented in this section. The impacts associated with site-support activities are also presented.

5.2.1.1 Land Use. Alternative 2 would result in no new ground disturbance. No activities would occur for the Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs. Therefore, no impacts to land use would occur. No impacts to surrounding land use have been identified under this alternative.

5.2.1.1.1 Site-Support Activities—The site-support activities at the NTS would be almost entirely discontinued. Only minimal resources would be provided for those monitoring and security functions that would continue at the NTS. A minimal number of facilities would be maintained to support security and monitoring activities and personnel. Services would be effectively eliminated with the exception of minimal security services.

UTILITIES—Electrical, water, and wastewater systems under Alternative 2 would be limited primarily to Mercury. Mercury would be the central location for the security and monitoring personnel who would continue to perform duties at the NTS. The main 34.5-kilovolt (kV) powerline extending into the Yucca Flat area of the NTS would be maintained to provide power for monitoring equipment and services to the north.

The main components of power would remain largely as they exist under Alternative 1. Most of the 427 km (265 mi) of primary and secondary power supply lines on the NTS would remain in place and would be used to power monitoring equipment, security stations, and a few administrative offices.

Most of the water supply lines would be abandoned and either left in place or removed and salvaged; however, water in this system must maintain a constant flow to prevent freezing in extreme temperatures. Water wells would be capped except for those that can be used for monitoring purposes. Water storage sumps and tanks would be drained and removed or filled in and graded over.

The NTS sewage-handling systems would be shut down and remediated. Sewage would be handled locally with septic tanks and leachfields. The number of personnel and the sewage generated in any single location would be too small to support the use of sewage lagoons as they currently exist.

COMMUNICATIONS—The telephone and radio portions of the communication system would be maintained to the extent necessary to support monitoring and security personnel on the NTS. The primary telephone communication link between Las Vegas and the NTS would remain. Radio communications would be the least affected on-site communication under this alternative. Radio communications would be required over much of the NTS to maintain contact capabilities for security personnel.

- Mobile radio communications would be reduced from around 30 nets to approximately 2 nets, and the digital microwave system would be reduced from 3 units to 1 unit. Central monitoring of NTS radio nets would be limited, but would be maintained at Station 900. The station would continue to function as an emergency reporting point for radio and telephone communications. The public safety network would be eliminated because of the lack of need for off-site DOE locations.

- Only minimal telephone communications would be maintained for communication to the Las Vegas area. Because the cost of maintenance would be so high, the functions provided by the DOE/NV central hub and switching network would be turned over to the local commercial telephone system. The Octel Maximum Voice Mail System would be eliminated.

- All video capabilities would be eliminated. Data communications capabilities would be removed except for the portion of the system that would be needed for monitoring purposes.

- There would be no NTS mail systems. The U.S. Post Office in Mercury would shut down.

5.2.1.1.2 Airspace—Under Alternative 2, the only activities that would affect airspace would be defense related; therefore, only Defense and Work for Others Programs are discussed. Occasional flights of helicopter and fixed-wing aircraft carrying supplies and personnel are anticipated, but these flights would not cause significant increases in air traffic.

Defense Program. The overall discontinuation of Defense Program activities would result in fewer traffic operations within NTS airspace relative to the baseline and a possible decrease of congestion in the overlapping airspace. Therefore, there would be no airspace or air traffic impacts from Defense Program activities.

Work for Others Program. With the Work for Others Program, there would be a discontinuation of the use of the NTS airspace by the DoD for various training exercises and defense-related research and development projects. No commercial air passenger, general aviation, or air-cargo activities would occur except for emergency operations or occasional aircraft operations carrying supplies and personnel.

Airspace restrictions under Alternative 2 would be the same as those currently in effect with the Nellis Air Traffic Control Facility. The overflights and inspections required for compliance with international arms control treaties that would be conducted under the Work for Others Program would not result in any airspace or air traffic impacts.

*5.2.1.2 **Transportation.*** The environmental impacts related to transportation activities as defined under Alternative 2 are discussed in the following sections. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.2.1.2.1 On-Site Traffic—Under Alternative 2, access to the NTS would remain strictly controlled for security purposes, and minimal support would be provided to maintain access to those roads and to the infrastructure necessary to support decommissioning operations and long-term environmental monitoring efforts. Traffic generated within the NTS as a result of this alternative is estimated to be 60 trips per day.

Table 5.2-1 summarizes the average daily trip generation that would be attributed to each program. A minimal number of trips would be experienced on Mercury Highway. All key on-site roadways have capacities exceeding 2,000 vehicles per hour for both directions combined (Transportation Research Board, 1994). A comparison of capacity to volumes assigned to each segment shows that no roadway would experience significant traffic congestion under Alternative 2.

Under Alternative 2, there would be no traffic generated on the roads within the NTS as a result of activities associated with Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs. Under Alternative 2, traffic generated on the roads within the NTS as a result of work associated with site-support activities is estimated to be 60 average daily trips. The majority of these trips would be confined to Mercury Highway; however, approximately 10 percent would involve travel to Area 5. There would be no adverse effects on traffic flow as a result of site-support activities.

5.2.1.2.2 Off-Site Traffic—Under Alternative 2, NTS employment on site would be reduced when compared to employment under Alternative 1. Correspondingly, a decrease in daily vehicle trips and traffic volumes on key roadway segments is anticipated, resulting in changes in the level of service. The decrease in vehicle trips during the peak hour was estimated for each roadway segment and subtracted from the baseline to obtain the future project traffic volumes on key roadways.

Traffic impacts were determined based on level of service changes for each of the key roads analyzed. The major traffic generators at the site would be

Table 5.2-1. Average on-site daily trip generation (one-way trips) by program, under Alternative 2

Program	Trips per Day	Difference from Alternative 1
Defense	0	-635
Waste Management	0	-145
Environmental Restoration	0	-390
Nondefense Research and Development	0	-180
Work for Others	0	-190
Site-Support Activities	60	-1820
Total	**60**	**-3310**

from personnel involved with environmental monitoring, security functions, and maintenance of the associated facilities. Table 5.2-2 shows the changes in daily vehicle trips resulting from the loss of employees for each program activity for the years 1996, 2000, and 2005. These changes are all reductions relative to the baseline. After an initial reduction in employment in 1997, employment would remain constant. Under Alternative 2, the access highway to the NTS would experience the greatest reduction in vehicular traffic of an estimated 280 vehicles (in one direction) during the peak hour. Two roadway ramps on the Mercury interchange would experience a similar reduction of 235 vehicles. U.S. Highway 95 between the Mercury interchange and Las Vegas would experience a decrease of 235 vehicles. All other key roads would be likely to experience a reduction of less than 160 vehicles. The projected peak-hour traffic on key roads and the associated levels of service that would result under Alternative 2 for 1996, 2000, and 2005 are shown in Table 5.2-3.

Based on standards of the American Association of State Highway and Traffic Engineers, level of service B is appropriate for freeways and arterials and for rural highways in level or rolling terrain. Level of service C is appropriate for rural, mountainous, urban, and suburban areas. For local roads, level of service D is appropriate in all terrain (AASHTO, 1990). By 2005, all key roads in the immediate vicinity of the site (U.S. Highway 95, the Mercury interchange ramps, and the access highway to the site State Route 433) would continue to operate at level of service C or better, an acceptable level according to the standards of the American Association of State Highway and Traffic Engineers. Under Alternative 2, it is likely that the current bus service to the NTS would be discontinued, resulting in a little less reduction in vehicular traffic than reported above. However, this scenario would not change any level of service on key roadways. Key roads within metropolitan Las Vegas (segments of Interstate 15, U.S. Highway 95, and U.S. Highway 93) currently operate at levels of service ranging from A to F; shortly after 2000, these key roads would all deteriorate to unacceptable level of service F.

These conditions would prevail without Alternative 2 because of cumulative traffic growth (recreational, regional, and commuter traffic). U.S. Highway 93 at Hoover Dam already operates at an unacceptable level of service F, and its level of service would continue to deteriorate further, with

Table 5.2-2. Average off-site daily vehicle trip reduction from Alternative 1, under Alternative 2

Program	1996	2000	2005
Defense	-200	-330	-330
Waste Management	-30	-60	-60
Environmental Restoration	-50	-90	-90
Nondefense Research and Development	-30	-40	-40
Work for Others	-50	-80	-80
Site-Support Activities	-400	-840	-840
Total	**-760**	**-1440**	**-1440**

NOTE: All values are rounded to the nearest 10 and represent a net decrease relative to Alternative 1. Daily trips shown are defined as one-way vehicle trips or vehicle trip ends.

Table 5.2-3. Peak-hour traffic and level of service on key roads, under Alternative 2[a]

Roadway Segments	Capacity VPH[b]	1996 DDHV[c]	1996 LOS[d]	2000 DDHV	2000 LOS	2005 DDHV	2005 LOS
Regional							
I-15 @ California/Nevada state line	6,800	2,968	E	3,726	F	4,687	F
I-15 north of Sahara Avenue interchange	10,200	7,234	F	8,851	F	10,968	F
I-15 north of the downtown expressway interchange	10,200	4,392	E	5,502	F	6,931	F
I-15 just north of the 'D' and Washington interchange	10,200	4,029	D	5,046	F	6,357	F
I-15 north of the Cheyenne interchange	6,800	1,864	C	2,618	D	3,602	F
I-15 south of the Lamb Blvd. interchange	6,800	627	A	805	A	1,056	A
I-15 north of West Mesquite interchange (Nevada/Utah state line)	6,800	630	A	875	A	1,188	B
I-80 east of Apex interchange (California/Nevada state line)	6,800	1,750	C	1,995	C	2,309	C
I-80 east of West Wendover interchange (Nevada/Utah state line)	6,800	321	A	400	A	506	A
Local							
U.S. Hwy. 95 south of Jones Blvd. interchange	10,200	7,263	F	9,098	F	11,461	F
U.S. Hwy. 95 north of Sunset Road interchange (East Las Vegas)	6,800	2,581	D	3,240	F	4,076	F
Rancho Road (SR 599) east of the northern U.S. 95/Rancho Road interchange	6,800	1,109	B	1,784	C	2,738	E
U.S. Hwy. 95 south of SR 157 north of Las Vegas	6,800	725	A	766	A	949	A
U.S. Hwy. 95 just east of Mercury interchange	6,800	234	A	150	A	184	A
U.S. Hwy. 95 interchange at Mercury							
Southbound off-ramp	1,300	18	B	10	B	10	B
Southbound on-ramp	1,300	118	B	10	B	10	B
Northbound off-ramp	1,300	118	B	10	B	10	B
Northbound on-ramp	1,300	18	B	10	B	10	B
SR 433, 0.32 km (0.2 mi) north of the Mercury interchange (access to NTS)	2,000	142	B	10	A	10	A
U.S. Hwy. 95 6.1 km (3.8 mi) north of Mercury interchange	2,000	270	C	300	C	350	C
U.S. Hwy. 95 @ Amargosa Valley to Beatty	2,000	56	A	57	A	66	A
U.S. Hwy. 95 north of Beatty	2,000	168	B	182	B	206	B
SR 160 south of U.S. 95	2,000	68	A	79	A	100	A
U.S. Hwy. 93 south of the Nevada/Arizona state line at Hoover Dam	1,500	808	F	964	F	1,172	F
U.S. Hwy. 93 east of westbound off-ramp of Railroad Pass interchange	6,840	2,663	E	3,179	F	3,866	F
U.S. Hwy. 93 north of I-15/U.S. 93 interchange	2,000	121	B	145	B	188	B
U.S. Hwy. 93 south of SR 375 junction near Crystal Springs	2,000	127	B	148	B	182	B
U.S. Hwy. 93 west of SR 375 junction near Crystal Springs	2,000	41	A	44	A	54	A
SR 375 west of U.S. 93 junction at Crystal Springs	1,500	25	A	22	A	25	A
SR 375 east of Warm Springs	1,500	10	A	10	A	10	A
U.S. Hwy. 6 east of Warm Springs at SR 375 junction	1,700	10	A	10	A	10	A
U.S. Hwy. 6 west of Warm Springs at SR 375 junction	1,700	15	A	11	A	13	A
U.S. Hwy. 6 east of Tonopah, west of SR 376	1,700	92	A	78	A	68	A

[a] Traffic volumes, reported as 10 vehicles, should be interpreted as very low volumes
[b] Vehicles per hour
[c] Directional design hourly volume (one direction)
[d] Level of service.

NOTE: SR = State Routes

or without this alternative, mainly because of its geometry (steep grades and narrow curves) and partially because of its moderate traffic volume and truck traffic. All other key roadways would generally continue to operate at level of service C or better.

The following sections address the contribution of environmental monitoring, security, and associated site-support activities to traffic impacts generated by the site and occurring at the access road off U.S. Highway 95.

Defense Program. Under Alternative 2, the loss in the number of employees associated with Defense Program activities would result in approximately 330 daily vehicle trip reductions with respect to Alternative 1 on a typical weekday in 2005. Except for site-support activities, defense-related activities would contribute the most to the reduction in the number of daily vehicle trips and peak-hour vehicles (approximately 23 percent of the total).

Waste Management Program. Under Alternative 2, the loss in the number of employees associated with Waste Management Program activities would result in approximately 60 daily vehicle trip reductions with respect to Alternative 1 on a typical weekday in 2005. The Waste Management Program activities would contribute to an approximate 4-percent reduction in the total number of daily vehicle trips.

Environmental Restoration Program. Under Alternative 2, the loss in the number of employees associated with the Environmental Restoration Program would result in approximately 90 daily vehicle trip reductions with respect to Alternative 1. The Environmental Restoration Program activities would contribute to an approximate 6-percent reduction in the total number of daily vehicle trips.

Nondefense Research and Development Program. Under Alternative 2, the loss in the number of employees associated with the Nondefense Research and Development Program activities would result in approximately 40 daily vehicle trip reductions with respect to Alternative 1. The Nondefense Research and Development activities would contribute slightly less than a 5-percent reduction in the total number of daily vehicle trips.

Work for Others Program. Under Alternative 2, the loss in the number of employees associated with Work for Others Program activities would result in approximately 80 daily vehicle trip reductions with respect to Alternative 1 on a typical weekday in 2005. These activities would contribute to a reduction in the number of daily vehicle trips of slightly less than 6 percent.

Site-Support Activities. Site-support activities are anticipated to cause a reduction of 840 vehicle trips in 2005. The reduction in trips is a result of fewer site-support employees who would be required with the discontinuation of site support activities at the NTS.

5.2.1.2.3 Transportation of Materials and Waste—The Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs would be eliminated, so no hazardous and/or radioactive shipments to the NTS would occur. Therefore, transportation risk under this alternative would decrease.

5.2.1.2.4 Other Transportation—No other modes of transportation would be used; therefore, no transportation impacts would be realized.

5.2.1.3 Socioeconomics. This section addresses the potential socioeconomic effects associated with Alternative 2. The description of socioeconomic conditions includes indicators (population, civilian labor force, employment, unemployment rate, and income) that provide a basis for comparing regional socioeconomic conditions of the site with Alternative 1. In addition, public finance and public services (public education, police and fire protection, and health) are described. The loss of employment and personal income and the increase in unemployment associated with Alternative 2 would result in substantial short-term adverse effects to the regional economy; however, economic and natural growth in the region of influence is expected to compensate for these reductions over time.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

<u>ECONOMIC ACTIVITY, POPULATION, AND HOUSING</u>. Under Alternative 2, it was assumed that an 86-person workforce would provide the necessary support to maintain minimum environmental monitoring and security functions. With the 86-person workforce, it is estimated that direct payroll and purchases of goods and services

would generate 164 secondary jobs (160 in Clark County and 4 in Nye County). Direct earnings are estimated at $4.2 million annually, and secondary earnings are estimated at more than $4.4 million annually. Of these earnings, $3.9 million in direct earnings and $4.3 million in secondary earnings would remain in Clark County; $0.3 million direct earnings and $0.1 million secondary earnings would remain in Nye County.

The major losses to the region of influence would include contractors and employees of the DOE, who are generally technicians and engineers, and the loss of other employment opportunities associated with the DOE. The region of influence would lose some diversification, thus increasing the influence and dependence on the service industry. The NTS is one of the major employers for technical positions that are usually filled by graduates of Nevada's universities and community colleges (State of Nevada Plan of Action for the Future of the NTS and its Work Force, 1994). In addition to the loss of employment diversification, the local universities would lose grants and other applicable funding. The loss of employment in Nye County would decrease per capita income from an average of $18,144 to $17,008, a decrease of 6.3 percent in 1998. However, economic activity and natural growth would compensate for this reduction.

Although it cannot be quantified, the region of influence and the state of Nevada would experience the loss of the Financial Assistance Award, an award that is negotiated every year between the state of Nevada and the DOE/NV. The Financial Assistance Award is provided to facilitate the accomplishment of activities in environmental safety and health oversight, monitoring, access, and emergency response initiatives to ensure compliance with applicable regulations. The award would be terminated within a year if this alternative were to be implemented. This impact has not been included in this analysis. The amounts change from year to year and cannot be accurately calculated.

Operational employment levels began to decline in 1987. Under Alternative 2, the decrease in employment is assumed to continue until all operations have been discontinued. It has been assumed that the first full year of closure would be 1997; Table 5.2-4 reflects the effects of this alternative to the economic indicators for Clark and Nye Counties. These are the total changes to the region of influence for all programs. Table 5.2-5 lists the housing projections for the region of influence. Figure 5.1-1 illustrates direct employment levels for all alternatives.

Defense Program. In the region of influence, in addition to the loss of 1,472 direct positions, an additional 2,802 secondary positions would be lost for a total of 4,274 jobs. In Clark County, the reduction in civilian employment (4,060 jobs) would contribute to the total increase in the unemployment rate from 5.8 percent under Alternative 1 to 9.0 percent under Alternative 2 in 1997. In Nye County, this decrease would result in a loss of 170 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 11.3 percent in 1997.

Because of work stoppage in this program, it is expected that 1,700 persons would relocate from Clark County, contributing to a total decrease in population of 0.7 percent in 1998. In Nye County, 132 persons would relocate, contributing to the total 1.9 percent decrease in population in 1998.

After discontinuing operations, an estimated 664 households that support the Defense Program would relocate out of Clark County in 1998, contributing to the increase in the housing vacancy rate from an average of 7.9 percent to 8.5 percent in 1998. In Nye County, an estimated 49 households would relocate out of the county, contributing to the increase in the housing vacancy rate in 1998 from an average 16.2 percent to 17.8 percent.

Waste Management Program. In the region of influence, in addition to the loss of 250 direct positions, an additional 476 secondary positions would be lost for a total of 726 jobs. In Clark County, the reduction in civilian employment of 689 jobs would contribute to the total increase in the unemployment rate from 5.8 percent to 9.0 percent in 1996. In Nye County, this decrease would mean a loss of 29 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 11.3 percent in 1997.

Table 5.2-4. Economic activity effects for Clark and Nye counties in 1996, 1997, 1998, 2000, and 2005 totals for all programs, under Alternative 2

Total Alternative 2	1996	1997	1998	2000	2005
Clark County					
Population	1,077,576	1,112,348	1,140,745	1,216,045	1,373,424
Total Jobs	498,230	506,017	522,923	558,389	632,514
Unemployment Rate	7.5	9.0	8.0	7.9	7.7
Personal Income ($Millions)	20,840.0	21,641.8	22,861.1	25,299.7	31,396.2
Nye County					
Population	27,407	28,918	29,928	33,383	37,933
Total Jobs	10,601	10,848	11,487	12,873	14,697
Unemployment Rate	8.6	11.3	8.4	8.0	7.7
Personal Income ($Millions)	57.1	471.3	509.0	592.3	736.1
Changes from Alternative 1 (Alternative 2 effects)					
Clark County					
Population	0	0	-7,496	-7,496	-7,496
Total Jobs	-9,308	-17,899	-17,899	-17,899	-17,899
Unemployment Rate	+ 1.7	+3.2	+ 2.2	+ 2.1	+1.9
Personal Income ($Millions)	- 467.1	-884.7	- 884.7	- 884.7	-884.7
Nye County					
Population	0	0	- 583	- 583	- 583
Total Jobs	- 389	- 748	- 748	- 748	- 748
Unemployment Rate	+ 3.4	+ 6.1	+ 3.2	+ 2.8	+ 2.5
Personal Income ($1,000)	- 23.6	- 44.6	- 44.6	- 44.6	- 44.6

Because of work stoppage in the Waste Management Program, it is expected that 289 persons would relocate from Clark County, which would contribute to the total decrease in population of 0.7 percent in 1998. In Nye County, 22 persons would relocate, which would contribute to the total decrease of 1.9 percent in 1998.

After site closure in 1997, an estimated 1,113 households that support the Waste Management Program would relocate out of Clark County, contributing to the increase in the housing vacancy rate in 1998 from an average of 7.9 percent to 8.5 percent. In Nye County, an estimated eight households would relocate out of the area,

Table 5.2-5. Total housing projections for the region of influence, 1996, 1997, 1998, 2000, and 2005

	Alternative 1 Vacancy Rate (%)	Alternative 2, Housing Demand Decrease	Vacancy Rate (%)	Change in Vacancy Rate
Clark County				
1996	7.8	0	7.8	0.0
1997	7.9	0	7.9	0.0
1998	7.9	2,928	8.5	0.6
2000	7.9	2,928	8.4	0.5
2005	7.9	2,928	8.4	0.5
City of Las Vegas				
1996	7.1	0	7.1	0.0
1997	7.1	0	7.1	0.0
1998	7.1	1,029	7.7	0.6
2000	7.1	1,029	7.6	0.5
2005	7.1	1,029	7.6	0.5
City of North Las Vegas				
1996	5.9	0	5.9	0.0
1997	5.9	0	5.9	0.0
1998	5.9	171	6.4	0.5
2000	5.9	171	6.3	0.4
2005	5.9	171	6.3	0.4
Nye County				
1996	16.2	0	16.2	0.0
1997	16.2	0	16.2	0.0
1998	16.2	218	17.8	1.6
2000	16.2	218	17.5	1.4
2005	16.2	218	17.5	1.3
Town of Tonopah				
1996	17.6	0	17.6	0.0
1997	17.7	0	17.7	0.0
1998	17.9	24	19.2	1.3
2000	18.0	24	19.2	1.2
2005	18.0	24	19.3	1.3
Town of Pahrump				
1996	11.6	0	11.6	0.0
1997	11.6	0	11.6	0.0
1998	11.6	157	13.6	2.0
2000	11.6	157	13.3	1.7
2005	11.6	157	12.9	1.3
Amargosa Valley				
1996	17.8	0	17.8	0.0
1997	17.8	0	17.8	0.0
1998	17.8	8	19.4	1.6
2000	17.9	8	19.3	1.4
2005	17.8	8	19.0	1.2

which would cause the housing vacancy rate to increase in 1998 from an average 16.2 percent to 17.8 percent.

Environmental Restoration Program. In the region of influence, in addition to the loss of 389 direct positions, an additional 740 secondary positions would be lost for a total of 1,129 jobs. In Clark County, the reduction in 1,073 civilian jobs would contribute to the total increase in the unemployment rate from 5.8 percent to 9.0 percent in 1997. In Nye County, the decrease would mean a loss of 45 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 11.3 percent in 1997.

Because of work stoppage in this program, 449 persons would relocate from Clark County, which would contribute to the total decrease in population of 0.7 percent in 1998. In Nye County, a total of 35 persons would relocate, which would contribute to the total decrease of 1.9 percent in 1998.

After site closure in 1997, an estimated 175 households that support the Environmental Restoration Program would relocate out of Clark County, contributing to the increase in the housing vacancy rate in 1998 from an average of 7.9 percent to 8.5. In Nye County, an estimated 13 households would relocate out of the county, contributing to the increase in the housing vacancy rate in 1998 from an average 16.2 percent to 17.8 percent.

Nondefense Research and Development Program. In the region of influence, in addition to the loss of 191 direct positions, an additional 364 secondary positions would be lost for a total of 555 jobs. In Clark County, the reduction of 527 civilian jobs would contribute to the total increase in the unemployment rate from 5.8 percent to 9.0 percent in 1997. In Nye County, the decrease would result in a loss of 22 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 11.3 percent in 1997.

Because of work stoppage in this program, 221 persons would relocate from Clark County, which would contribute to the total decrease in population of 0.7 percent in 1998. In Nye County, a total of 17 persons would relocate, which would also contribute to the total decrease of 1.9 percent in 1998.

After site closure in 1997, an estimated 86 households that support the Nondefense Research and Development Program would relocate from Clark County, contributing to the increase in the housing vacancy rate in 1998 from an average of 7.9 percent to 8.5 percent.

Work for Others Program. In the region of influence, in addition to the loss of 350 direct positions, an additional 666 secondary positions would be lost for a total of 1,016 jobs. In Clark County, the reduction in civilian employment of 965 jobs would contribute to the total increase in the unemployment rate from 5.8 percent to 9.0 percent in 1997. In Nye County, the decrease would translate to a loss of 40 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 11.3 percent in 1997.

Because of work stoppage in the Work for Others Program, 404 persons would relocate from Clark County, which would contribute to the total decrease in population of 0.7 percent in 1998. In Nye County, a total of 31 persons would relocate, which would contribute to the total decrease of 1.9 percent in 1998.

After site closure in 1997, an estimated 158 households that support this program would relocate from Clark County, contributing to the increase in the housing vacancy rate in 1998 from an average of 7.9 percent to 8.5 percent. In Nye County, an estimated 12 households would relocate out of the county, contributing to the increase in the housing vacancy rate in 1998 from an average 16.2 percent to 17.8 percent.

Site-Support Activities. It is estimated that an 86-person workforce would perform these activities. In the region of influence, in addition to the loss of 3,838 direct positions, an additional 7,305 secondary positions would be lost for a total of 11,143 jobs. In Clark County, the reduction of 10,587 civilian jobs would contribute to the total increase in the unemployment rate from 5.8 percent to 9.0 percent in 1997. In Nye County, the decrease would result in a loss of 442 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 11.3 percent in 1997.

Because of work stoppage for site-support activities, 4,433 persons would relocate from Clark County, which would contribute to the total decrease in population of 0.7 percent in 1998. In Nye County, a total of 345 persons would relocate, which would contribute to the total decrease of 1.9 percent in 1998.

After site closure in 1997, an estimated 1,732 households that support this program would relocate out of Clark County, contributing to the increase in the housing vacancy rate in 1998 from an average of 7.9 percent to 8.5 percent. In Nye County, an estimated 129 households would relocate out of the county, contributing to the increase in the housing vacancy rate in 1998 from an average 16.2 percent to 17.8 percent.

PUBLIC FINANCE. The fiscal effects of Alternative 2 are presented in this section. Table 5.2-6 outlines the projected financial summary for Fiscal Years 2000 and 2005 under Alternative 2. The fiscal impact of all alternatives can be determined by subtracting their income statement totals from the Alternative 1 future baseline. The remaining fiscal impact is the specific impact associated with each alternative.

Clark County. The expansion and improvement of the county infrastructure would continue to be the primary focus of Clark County fiscal efforts. In addition, Clark County has undertaken the implementation of a county facilities development program as discussed under Public Finance, Section 4.1.3.

Under Alternative 2, revenues for Clark County would increase because of increases in population, personal income, and total employment in the county. Assuming continued small increases in revenues and slightly larger initial increases in expenditures (see discussion on capital projects under Public Finance, Section 4.1.3), Alternative 2 would result in revenues less expenditures of a negative $5,916,000 in Fiscal Year 2000. It is expected that Clark County would achieve a positive fiscal position by Fiscal Year 2001. In Fiscal Year 2005, revenues less expenditures are expected to be $33,627,000. The fund balance (or reserves) as a percentage of current expense is expected to be 245 percent in 2000 and 374 percent in 2005. To compare with Alternative 1, Clark County revenues over expenditures would be $3,414,000 less in 2000 and in 2005.

City of Las Vegas. Under Alternative 2, revenues over expenditures for the City of Las Vegas are expected to become positive in Fiscal Year 1996 because of increases in population, personal income, and total employment in the city.

Assuming continued increases in revenues and expenditures, this alternative would result in revenues less expenditures of $12,928,000 in Fiscal Year 2000. It is predicted that the city would achieve an increasingly positive fiscal position and by Fiscal Year 2005, revenues over expenditures would be $14,984,000. The fund balance as a percentage of current expense is expected to be 177 percent in 2000 and 267 percent in 2005. To compare with Alternative 1, revenues over expenditures would be $1,452,000 less in 2000 and $1,451,000 less in 2005.

City of North Las Vegas. Expenditures for North Las Vegas are forecast to continue to outpace revenues. Revenues over expenditures in Fiscal Year 2000 would be a negative $7,342,000 and a negative $6,845,000 in Fiscal Year 2005, despite small increases in population, personal income, and total employment in the city. Public safety and capital projects are anticipated to continue to be the largest expenditures. Taxes, which recently decreased (from $10,059,472 in Fiscal Year 1993 to $7,941,972 in Fiscal Year 1994), are expected to grow slowly to 1993 levels by Fiscal Year 2002. The fund balance as a percentage of current expense is expected to be 61 percent in Fiscal Year 2000 and 89 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $265,000 less in 2000 and 2005.

Table 5.2-6. Projected financial summary for Fiscal Years 2000 and 2005, general, special revenues, debt service, and capital projects funds, under Alternative 2

	Revenues Over Expenditures	Current Expense	Ending Fund Balance	Fund Balance as a Percentage of Current Expense
Fiscal Year 2000				
Clark County	($5,915,892)	$524,197,231	$1,284,861,518	245.11%
City of Las Vegas	$12,928,147	$196,311,179	$348,069,068	177.30%
City of North Las Vegas	($7,341,672)	$46,922,327	$28,626,284	61.01%
Clark County School District	($15,288,842)	$746,755,621	$123,507,085	16.54%
Nye County	$1,284,015	$25,646,743	$13,557,544	52.86%
Town of Tonopah	$73,867	$636,796	$804,554	126.34%
Town of Pahrump	$210,030	$934,496	$1,551,442	166.02%
Nye County School District	($1,529,444)	$26,240,727	($820,589)	-3.13%
Fiscal Year 2005				
Clark County	$33,627,168	$561,664,276	$2,102,270,259	374.29%
City of Las Vegas	$14,983,943	$210,173,311	$560,627,597	266.75%
City of North Las Vegas	($6,844,959)	$50,292,130	$44,991,457	89.46%
Clark County School District	($11,389,185)	$843,399,785	$188,657,527	22.37%
Nye County	$3,172,118	$27,663,424	$24,777,199	89.57%
Town of Tonopah	$71,158	$641,576	$1,165,212	181.62%
Town of Pahrump	$299,760	$1,083,655	$2,881,282	265.89%
Nye County School District	($262,911)	$29,814,400	$3,181,761	10.67%

Clark County School District. Under Alternative 2, revenues for Clark County School District would expand because of increases in population and corresponding school enrollment, although the level of increase would be less than that experienced under Alternative 1. Regular program and undistributed expenditures would likely continue to increase. The school district is not predicted to achieve a positive fiscal position by Fiscal Year 2005. In Fiscal Year 2000, revenues less expenditures would be a negative $15,289,000, and in Fiscal Year 2005, a less negative $11,389,000. The fund balance as a percentage of current expense is expected to be 17 percent in Fiscal Year 2000 and 22 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $222,000 more in 2000 and $221,000 more in 2005 because of the decreased expenses associated with smaller enrollments.

Nye County. Under Alternative 2, revenues for Nye County would increase slightly because of small increases in population, personal income, and total employment in the county. Assuming continued small increases in expenditures as well, a positive fiscal position is expected to be reached in Fiscal Year 1999. This alternative would result in revenues less expenditures of $1,284,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $3,172,000. The fund balance as a percentage of current expense is expected to be 53 percent in Fiscal Year 2000 and 90 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $283,000 less in 2000 and 2005.

Town of Tonopah. Revenues and expenditures for the town of Tonopah would increase slightly because of small increases in population, personal income, and total employment in the county.

Assuming continued small increases, Alternative 2 would result in revenues less expenditures of $74,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $71,000. The fund balance as a percentage of current expense would be 126 percent in Fiscal Year 2000 and 182 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $5,000 less in 2000 and $4,000 less in 2005.

Town of Pahrump. Under Alternative 2, revenues for the town of Pahrump would increase slightly because of small increases in population, personal income, and total employment in the county. Assuming continued small increases in revenues and slightly smaller initial increases in expenditures compared to Fiscal Year 1994, this alternative would result in revenues less expenditures of $210,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $300,000. The fund balance (or reserves) as a percentage of current expense is anticipated to be 166 percent in Fiscal Year 2000 and 266 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $24,000 less in 2000 and $15,000 less in 2005.

Nye County School District. Under Alternative 2, revenues for Nye County School District would increase slightly because of small increases in population. Local sources would continue to generate the most revenue. Revenues less expenditures are expected to reach a negative $1,529,000 in Fiscal Year 2000 and negative $263,000 in Fiscal Year 2005. The fund balance as a percentage of current expense is expected to be a negative 3 percent in Fiscal Year 2000 and 11 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $127,000 more in 2000 and 2005.

PUBLIC SERVICES. Table 5.2-7 summarizes the levels of service that would be required under Alternative 2, and the text compares these levels to Alternative 1. In each case, the current levels of service per 1,000 population are assumed to continue.

Public Education. A total of 7,928 full-time equivalent licensed teachers were employed by the Clark County School District in the 1993-94 school year, resulting in a student-to-teacher ratio of 18.33. To continue with this ratio, the Clark County School District would require 11,044 teachers by the school year 2004 to 2005, or 61 less than under Alternative 1. The student-to-teacher ratio for Nye County School District was 16.39 in the school year 1994-95. Assuming this ratio were to be projected in the school year 2004 to 2005, 378 teachers or 6 less than under Alternative 1 would be required.

Police Protection. Assuming the same levels of service in the future, requirements for sworn police and deputy protection in the year 2005 can be examined. The Las Vegas Metropolitan Police Department would require 1,695 sworn police officers or 10 less than under Alternative 1. The North Las Vegas Police Department would require 181 sworn officers or 1 less. The Nye County Sheriff's Office in Tonopah would require 15 sheriff's deputies or no change in the number of sworn officers over Alternative 1. The town of Pahrump Sheriff's Substation would require 51, the Beatty Sheriff's Substation would require 5, and the Amargosa Valley Sheriff's Substation would require 3 or no changes over Alternative 1.

Fire Protection. The following is a discussion of firefighter personnel expected to be required in the year 2005 under Alternative 2. The Clark County Fire Department, which handles urban-area fires in the unincorporated county, would be expected to require 561 firefighters in 2005, or 3 less than under Alternative 1. Some 403 firefighters, or 3 less than under Alternative 1, would be required in the Las Vegas Fire Department in the year 2005. The North Las Vegas Fire Department would require 119 firefighters, or one less than under Alternative 1. The Tonopah, Pahrump, Beatty, and Amargosa Valley Volunteer Fire Departments would require 29, 54, 28, and 35 firefighters, respectively, which is 1 less than under Alternative 1 except for Beatty, which would remain the same.

Health Care. The 1995 levels of service for medical doctors and registered nurses was used to determine future needs based on population growth. In the year 2005, a total of 1,887 (or 10 less than under Alternative 1) medical doctors and 6,653 (36 less) registered nurses would be required in Clark County.

Table 5.2-7. Projected levels of public service for 1996, 2000, and 2005, under Alternative 2

Jurisdiction	Level of Service*	1996	2000	2005
Clark County School District Teachers	18.33	8,665	9,779	11,044
Nye County School District Teachers	16.39	273	333	378
Las Vegas Metropolitan Police Department (Las Vegas and county rural areas)	2.27	1,330	1,501	1,695
North Las Vegas Police Department	1.75	142	160	181
Nye County Sheriff's Office (Tonopah)	3.67	14	15	15
Pahrump Sheriff's Substation	1.85	30	40	51
Beatty Sheriff's Substation	2.59	5	6	5
Amargosa Valley Sheriff's Substation	2.01	2	3	3
Clark County Fire Department (urbanized unincorporated areas)	1.04	440	497	561
Las Vegas Fire Department	0.84	316	357	403
North Las Vegas Fire Department	1.15	93	105	119
Tonopah Volunteer Fire Department	7.09	27	29	29
Pahrump Volunteer Fire Department	1.98	32	43	54
Beatty Volunteer Fire Department and Ambulance Service	14.51	29	31	28
Amargosa Valley Volunteer Fire Department	23.12	26	31	35
Clark County Medical Doctors	1.37	1,481	1,671	1,887
Clark County Registered Nurses	4.84	5,220	5,891	6,653
Nye County Medical Doctors	0.34	9	11	13
Nye County Registered Nurses	1.53	42	51	58

* Level of service is per 1,000 population. The number of school teachers is based on student-to-teacher ratios, and the number of students is based on a percentage of the population.

In Nye County, 13 medical doctors and 58 registered nurses would be required, which is the same number of medical doctors and 1 less registered nurse than Alternative 1.

5.2.1.4 ***Geology and Soils.*** No adverse impacts to geology and soils would occur under Alternative 2 for Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs and for site-support activities. However, geologic media disturbed or contaminated by past activities would not be restored, and would continue to be monitored.

5.2.1.5 ***Hydrology.*** The environmental impacts to surface hydrology and groundwater are described in the following sections. Discussions of impacts to water quality and water quantity are also presented.

5.2.1.5.1 ***Surface Hydrology***—The surface hydrologic environment adversely impacted by past Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs would not be restored. Therefore, contaminated surface geologic media would continue to be a threat to any surface water present. The minimal site-support activities under Alternative 2 would not impact surface hydrology.

5.2.1.5.2 ***Groundwater***—Under Alternative 2, the demand for water resources would be significantly decreased to levels required for environmental monitoring and potable water supplies for a caretaker workforce. Water quality might be adversely impacted because of the cessation of waste management and restoration activities that protect the groundwater quality. This, in turn, might limit the availability of water for other uses.

5.2.1.6 Biological Resources. Discontinuation of some site-support activities would lead to the shutdown of manmade water sources in several areas on the NTS. This, in turn, would likely influence the distribution of several wildlife species, including horses, deer, and chukar, and could result in loss of some local populations of these species.

A decrease in traffic on the NTS could result in fewer desert tortoises being accidentally killed on roads. However, because so few tortoises have been killed on NTS roads in the past (less than one per year), this decrease would have little positive effect on the tortoise population. At a sitewide level of analysis, there are no anticipated ecosystem-level impacts.

5.2.1.7 Air Quality. This alternative would not adversely affect air quality. Pollutant emissions associated with stationary sources would be essentially eliminated following closure, and mobile source emissions would be substantially reduced. There would be some level of air quality benefit associated with maintaining the site at a reduced level of activity compared with the levels of activity associated with the other alternatives.

Site-support activities could contribute a small portion to total emissions. Under Alternative 2, only environmental monitoring and security functions would be maintained. Stationary source emissions would be eliminated. Mobile source emissions would consist of exhaust emissions from workers' vehicles used to commute to and from the site. Assuming a worst-case scenario of about 100 vehicles traveling to the site, pollutant emissions would be as follows:

- Volatile organic compounds: 5.11 tons per year
- Carbon monoxide: 34.61 tons per year
- Nitrogen oxides: -7.60 tons per year.

These emission rates would be about 14 percent of the off-site mobile emission rates that would occur under Alternative 1. These emissions would be dispersed over a wide area and would not sufficiently increase ambient pollutant concentrations in Nye and Clark Counties to cause or increase violations of the Ambient Air Quality Standards. Thus, the ambient -air quality designations in these counties would not change. The air quality impacts of this alternative would be small, but beneficial. A general conformity analysis would not be required (see Section 5.1.1.7).

RADIOLOGICAL AIR QUALITY. Under Alternative 2, effluents would be minimal because of resuspension of soils contaminated in the past. Impacts to the air quality would, therefore, be negligible.

5.2.1.8 Noise. Under this alternative, most noise sources, such as construction and material-handling equipment, boilers, pumps, engines, and wind tunnels, would be eliminated. A minor amount of noise would result from the operation of security and environmental monitoring vehicles on site.

Noise levels would become those typically found in uninhabited desert areas. The major sources of noise would be physical phenomena such as wind, rain, wildlife activities, and an occasional airplane (the wind is the predominant noise source.) Desert noise levels as a result of wind have been measured at an upper limit of 22 dBA for a still desert and 40 dBA for a windy desert.

With site-support activities, ambient noise levels of 30 to 35 dBA would probably be a reasonable estimate for the NTS. A minor amount of noise would result from vehicles used by workers commuting between NTS and Las Vegas on U.S. Highway 95. However, the noise levels generated by the worker's vehicles (about 100 vehicles) would not be detectable in the noise levels generated by the total traffic (buses, trucks, and automobiles) on U.S. Highway 95.

5.2.1.9 Visual Resources. Under Alternative 2, all facilities associated with each program would be abandoned in place. Only maintenance necessary for safety would occur. There could be a slow deterioration of facilities; however, there would be little change in the overall appearance of the existing landscape. Facilities would not be located in areas of high scenic value and would generally not be visible from any public viewpoints. Therefore, under Alternative 2, impacts to visual resources would be negligible.

5.2.1.10 Cultural Resources. Discontinuance of activities would eliminate many impacts to cultural resources. However, some ground-disturbing activities, such as landfill capping, and construction of fencing, may alter the physical integrity of cultural resources. Some sites may be affected by vandalism and artifact collecting. Historic structures may be indirectly impacted by deterioration and neglect. Facilities would be evaluated for their potential to provide historical information, and appropriate consultation with the State Historic Preservation Office (SHPO) would be completed.

Waste Management Program. Direct impacts to cultural resources may result from capping of landfills and security fencing. Capping aggregate will be native soil which may be obtained from areas containing cultural resources. Indirect impacts such as unauthorized artifact collection may occur.

Environmental Restoration Program. Under Alternative 2, work on Environmental Restoration Program projects would be halted by 1996. Inactive sites would be abandoned. At some sites, decommissioning may involve activities designed to make facilities safe.

Nondefense Research and Development Program: Under this alternative there would be no Nondefense Research and Development Programs on the NTS.

Work for Others Program. This program is hosted by the DOE/NV and includes the shared use of certain NTS facilities and resources with other federal agencies such as the DoD. Activities include military training exercises and research and development projects such as weaponry tests. These kinds of activities would be discontinued under Alternative 2. Decommissioning activities might affect cultural resources.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 2, as summarized by the CGTO.

Defense Program at NTS—Under Alternative 2, there will be no further defense testing and storage activities. American Indian cultural resources will no longer be impacted by defense activities; American Indian people require further information before completely evaluating the cultural impacts of this Defense Program alternative.

Waste Management Program at NTS—Under Alternative 2, it is expected that American Indian cultural resources will continue to be adversely impacted because the waste has not been disposed of in a culturally appropriate manner. Access to culturally significant places on the NTS will be reduced because waste isolation facilities increase Indian people's perception of health and spiritual risks.

Environmental Restoration Program at NTS—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted by the monitoring well and access road program, but will be positively impacted by actions that return disturbed lands to its natural condition in a culturally appropriate manner and with the participation of Indian people.

Nondefense Research and Development Program at NTS—Under Alternative 2, it is expected that American Indian cultural resources will not be adversely impacted by visits of students and researchers.

Work for Others Program at NTS—Under Alternative 2, overflights and monitoring required in keeping with International Arms Control treaties have the potential for impacting American Indian cultural resources.

Defense Program at Area 13—Under Alternative 2, American Indian cultural resources will not be adversely impacted because there are no plans for additional tests at the Area 13 site on the NAFR Complex.

Waste Management Program at Area 13—Under Alternative 2, American Indian cultural resources will not be adversely impacted because there are no waste facilities at the Area 13 site on the NAFR Complex.

Environmental Restoration Program at Area 13—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during *environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.*

Nondefense Research and Development Program at Area 13—*Under Alternative 2, it is expected that American Indian cultural resources will not be adversely impacted by discontinuing research and development actions.*

Work for Others Program at Area 13—*Under Alternative 2, it is expected that American Indian cultural resources will not be adversely impacted because no Work for Others Program actions are being planned.*

5.2.1.11 Occupational and Public Health and Safety. Table 5.2-8 summarizes the occupational and public health and safety impacts for applicable program areas under Alternative 2. Site-support activities are estimated to result in a collective dose to workers that would not exceed about 6-person rem in 10 years. This dose could result in about 0.0025 latent cancer fatalities and 0.0010 other detrimental health effects in the worker population. Removal of transuranic and hazardous waste from the NTS under Alternative 2 was assumed to require some period of time to fully implement, and accidents could occur during the implementation period. The risk of accidental exposure to radioactive releases could result in a latent cancer fatality risk to workers of 0.016 and detrimental health effect risk of 0.0064. The risk of a single cancer in the worker population as a result of exposure to hazardous chemicals is estimated to be 5.2×10^{-7}. The risk of life-threatening noncarcinogenic effects to a single worker from accidents during implementation of Alternative 2 is estimated to be 0.48. A hazard index less than 1.0 indicates that no life-threatening noncarcinogenic health effects would be expected to occur.

The health and safety impact to the public from potential Waste Management Program accidents during implementation of Alternative 2 could result in about 4.7×10^{-5} latent cancer fatalities and 2.1×10^{-5} other detrimental health effects in the population. The risk of a single cancer in the population due to accidental exposure to hazardous chemicals would be 2.0×10^{-5}. No noncancer effects to the public from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Waste Management Program radiological accident at the NTS would be a multi-container fire at the Area 5 transuranic waste storage unit, which has a probability of occurrence of 1×10^{-6} (1 in 1,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: plume rise from the fire carries the plume over close-in workers
- Maximally exposed non-involved worker: 3.7 rem, 0.0015 chance of latent cancer fatality, 5.9×10^{-4} chance of other detrimental effects
- Non-involved worker population at the nearest major facility area: 0.10 person-rem, 4.0×10^{-5} chance of a single latent cancer fatality, 1.6×10^{-5} chance of other detrimental effects
- Maximally exposed off-site individual at the nearest point of public access: 0.0036 person-rem, 1.8×10^{-6} chance of latent cancer fatality, 8.3×10^{-7} chance of other detrimental effects
- Population within 80 km (50 mi): 1.5 to 26 person-rem, 7.5×10^{-4} to 0.013 chance of a single latent cancer fatality, 3.5×10^{-4} to 0.006 chance of other detrimental effects.

For Waste Management Programs hazardous chemical effects, the maximum reasonably foreseeable accident would be a multi-container fire at the Area 5 hazardous waste storage unit, which has a probability of occurrence of 8×10^{-5} (1 in 13,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: plume rise from the fire carries the plume over close-in workers

Table 5.2-8. Health risks to workers and the public from program activities, Nevada Test Site, Alternative 2

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Waste Management	h	h	0.016	0.0064	5.2×10^{-7}	0.48	4.7×10^{-5}	2.1×10^{-5}	2×10^{-5}	3.8×10^{-6}
Site-Support Activities	e	e	0.0025	0.001	f	f	g	g	f	f
Total	**0.0**	**0.0**	**0.019**	**0.0074**	**5.2×10^{-7}**	**0.48**	**4.7×10^{-5}**	**2.1×10^{-5}**	**2×10^{-5}**	**3.8×10^{-6}**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the 10-year period of analysis
d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more
e. No activities
f. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified
g. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified
h. No routine operations anticipated, only shipment and disposal of current waste inventory.

- Maximally exposed non-involved worker: 8.8×10^{-3} chance of cancer, 51 noncancer hazard index for potentially life-threatening one-hour concentration

- Non-involved worker population at the nearest major facility area: 1.0×10^{-4} chance of a single cancer, 0.013 noncancer hazard index for potentially life-threatening one-hour concentration

- Maximally exposed off-site individual at the nearest point of public access: 1.2×10^{-6} chance of cancer, 0.0019 noncancer hazard index for potentially life-threatening one-hour concentration

- Population within 80 km (50 mi): 0.002 to 0.004 chance of a single cancer, 0.0019 noncancer hazard index for potentially life-threatening one-hour concentration.

Subsurface radioactivity from past underground nuclear weapons tests would continue to provide a potential exposure pathway for the public.

Potential health impacts from this exposure scenario are the same as those described in Section 5.1.1.11 under Alternative 1.

Perceptions of radiation effects are discussed in Section 4.1.11 and are well known among the Western Shoshone, Southern Paiute, and Owens Valley Paiute people of this region. These perceptions of risks from radiation are frightening, and remain an important part of our lives. We will always carry these thoughts with us. Today, people are afraid of many things and places in this whole area, but we still love to come out and see our land. We worry about more radiation being brought to this land.

If the DOE wants to better understand our feelings about the impacts of radiation on our cultures, they should support a study of risks from radiation designed, conducted, and produced by the CGTO. At this time there has not been a systematic study of American Indians perceptions of risk. Therefore, it is not possible to provide action by action estimation of risk perception impacts. We believe it is a topic that urgently needs to be studied so that Indian people may better address the actual cultural impacts of proposed DOE actions. There has been recent workshop funded by the National Science Foundation to understand how to research the special issue of culturally based risk perception among American Indian communities, and at least one major project has been funded. Although this is a relatively new topic of restack, it is one that can be more fully understood by research that deeply involves the people being considered. To understand our view of radiation is to begin to understand why we responded in certain ways to past, present, and why we will continue to respond to future DOE activities.

5.2.1.12 Environmental Justice. Environmental Justice analysis involves two tiers of investigation. One is the determination of significant and adverse impacts as a result of the alternative. The other is an evaluation of whether a minority or low-income population is disproportionately affected by these significant and adverse impacts. If there are no significant and adverse impacts, then there would be no significant, disproportionately high and adverse impacts experienced by minority and low-income populations. The location of minority or low-income populations is shown on the figures in Section 4.1.12.

The CGTO has identified impacts to American Indian groups as a result of Alternative 2. While not physically located in Clark, Nye, or Lincoln counties, these groups have traditional ties to the NTS and surrounding areas. Impacts include continued reduced access to environmental restoration sites that would not be remediated. However, the degree of impact to American Indian cultural sites would be less than that associated with Alternative 1. These impacts would be perceived only by American Indian groups and would, therefore, be a disproportionately high impact on these groups.

No other significant adverse impacts as a result of this alternative were ascertained; therefore, there would be no disproportionately high and adverse impacts to other minority and low-income populations.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These concerns for all sites are discussed in Section 5.2.1.10, Cultural Resources, and Section 5.2.1.11, Occupational and Public Health and Safety. These would only be felt by American Indian people. Therefore, a disproportionate impact would occur. There has not been a systematic study of these issues for the NTS. The CGTO maintains that past, present, and future activities on the NTS have, are, or will impact these American Indian Environmental Justice issues. Although Alternative 2 involves no new activities, it contains the possibility of adversely impacting American Indian Justice issues. For example, if road maintenance is discontinued, it may be difficult for American Indian people to return to the area. Also if DOE/NV Environmental Protection personnel are not available, there may be a difficulty in maintaining consultation with American Indian tribes through the CGTO. Therefore, it is essential to maintain both the physical access to places and the agreement that facilitates access to these places. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Program-by-program impacts are assessed in Section 5.1.1.12

5.2.2 Tonopah Test Range

This alternative is defined as the discontinuation of DOE/NV activities at the Tonopah Test Range. All U.S. Air Force and the DOE, Albuquerque activities would remain at planned mission levels and requirements. DOE/NV's discontinued programs include the Defense, Environmental Restoration, and Work for Others Programs. Therefore, only impacts resulting from the discontinuation of these programs are discussed for this site.

5.2.2.1 Land Use. Under Alternative 2, there would be no impacts on land use. Current restrictions governing access to areas of plutonium-contaminated soils would continue to be in effect. There would be no impact on surrounding land use as a result of the discontinuation of the DOE/NV Defense, Environmental Restoration, and Work for Others Program actions under Alternative 2.

Under Alternative 2, facilities would be secured, and overall monitoring at the Tonopah Test Range environmental restoration sites would take place. This could result in the closure of 1,616 km^2 (624 mi^2) of land at the Tonopah Test Range. Because activities are presently limited at the Tonopah Test Range, this would have a minor effect on users. To the extent that cessation of activities would reduce impacts on future land uses, this alternative would have a beneficial impact.

5.2.2.1.1 Site-Support Activities—DOE/NV site-support activities at the Tonopah Test Range under Alternative 2 would be discontinued. All site support activities associated with DOE, Albuquerque would continue. The impact from these activities would not exceed those impacts identified under Alternative 1.

FACILITIES - Facilities used by the DOE/NV would be closed and placed in cold standby. All facility support services performed by the DOE, Albuquerque would continue. Operational activities would be the same as those identified under Alternative 1. Joint-use infrastructure would remain the responsibility of the U.S. Air Force.

UTILITIES - Utilities would be maintained to ensure they are free of defects. Utilities not currently used would be shut down and stabilized to the extent possible so that they might be restarted and used at a later time. Water supply systems for DOE activities would remain operational to support DOE activities. The DOE wastewater flow to the sewage system would remain operational. The facultative lagoon would remain in operation and be maintained by the U.S. Air Force. Flows to remote location septic systems would cease as the facilities occupied by the DOE/NV are closed. All solid waste generated at the Tonopah Test Range would be contained in one solid waste disposal unit operated by the U.S. Air Force. This unit would not receive waste from the DOE/NV, but would continue to support all other operations at the Tonopah Test Range.

COMMUNICATIONS - The Tonopah Test Range has fully integrated communication systems of ground-to-ground and ground-to-air links using both radio frequency and land line equipment that ensures full support to test projects, administration, and emergencies. These site-support activities would remain open to support DOE, Albuquerque mission activities.

5.2.2.1.2 Airspace—The airspace over the Tonopah Test Range is Restricted Area R-4809. This airspace is managed by the DOE and is seldom authorized for joint use by civilian aircraft, with the exception of critical in-flight emergencies. Currently, limited flying operations occur over the range by the DOE and U.S. Air Force.

Defense Program. Under Alternative 2, the airspace would continue to be used by the U.S. Air Force and DOE, Albuquerque. Under this alternative, Defense Program activities would most likely be maintained at the current level of air traffic control and navigational aid service and airspace structure. Therefore, with the Defense Program, there would be no airspace or air traffic impacts.

Environmental Restoration Program. The discontinuation of Environmental Restoration Program activities would have no impact to airspace.

Work for Others Program. The Work for Others Program that is managed by DOE/NV and associated with defense-related programs would discontinue the use of the Tonopah Test Range airspace. Other DOE, Albuquerque Work for Others Program activities would continue at levels not to exceed those identified under Alternative 1. Airspace availability would continue to be coordinated between the U.S. Air Force and DOE, Albuquerque to ensure mission requirements are successful.

5.2.2.2 Transportation. The environmental impacts related to transportation activities as defined under Alternative 2 are discussed in the following sections. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.2.2.2.1 On-Site Traffic—The on-site activities would not produce a significant level (or amount) of traffic demand. Therefore, the traffic congestion impacts on the on-site roadways would be minimal.

5.2.2.2.2 Off-Site Traffic—Under Alternative 2, DOE/NV activities at the Tonopah Test Range would be restricted to site monitoring and security, which would generate only an occasional and minor amount of vehicular traffic (less than 25 vehicle trips per day) on the local access roads and on the immediate regional highway (U.S. Highway 6 near Tonopah). In 1993, the average daily traffic on U.S. Highway 6 near Tonopah amounted to 1,095 vehicles. This traffic volume would be far below the capacity of U.S. Highway 6 at this location (in the range of 10,000 to 20,000 vehicles per day). DOE, Albuquerque activities would not exceed levels discussed under Alternative 1. Therefore, there would be no traffic impacts on off-site roadways under Alternative 2.

5.2.2.2.3 Transportation of Materials and Waste—Transportation of materials and waste by DOE/NV from the Tonopah Test Range to authorized facilities, including the NTS, would not occur under Alternative 2. Transportation of materials and waste by the DOE, Albuquerque would be minimal and would not exceed those levels identified under Alternative 1; therefore, no impacts would result.

5.2.2.2.4 Other Transportation—The nature of anticipated activities on this site would not require a measurable transportation demand, direct use of local railroads, nor other modes of transportation. Therefore, direct or indirect effects on rail and other modes of transportation would be minimal.

5.2.2.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.2.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for *tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.*

5.2.2.4 ***Geology and Soils.*** Under Alternative 2, impacts to geologic media, processes, or resources would be the same as those described for the NTS in Section 5.2.1.4.

5.2.2.5 ***Hydrology.*** The environmental impacts to surface hydrology and groundwater are described in the following sections.

5.2.2.5.1 ***Surface Hydrology***—Under Alternative 2, impacts to surface hydrology would be the same as those described for the NTS in Section 5.2.1.5.

5.2.2.5.2 ***Groundwater***—Under Alternative 2, the demand for water resources would remain at the same levels discussed for the NTS in Section 5.2.1.5. No significant adverse impacts to either groundwater supply or groundwater quality are anticipated.

5.2.2.6 ***Biological Resources.*** All scheduled activities would occur in previously disturbed areas. No habitat would be disturbed on the Tonopah Test Range under Alternative 2. The continued presence of radionuclides on 55 acres of land that would occur under this alternative should have no significant impact on biological resources unless those contaminants enter the regional groundwater.

Defense Program. No significant impacts on biological resources are anticipated.

Environmental Restoration Program. Under Alternative 2, contaminated sites on the Tonopah Test Range, including 55 acres contaminated with radionuclides, would be closed, without removal of contaminants. This might have a negative, but currently unquantifiable, impact on plant and animal populations living on or near that site that would be affected by those contaminants. However, it should not cause a decrease in the viability of populations. Those populations are widespread throughout the region, and the contaminants are limited to relatively small areas. The presence of contaminants in the environment should not affect threatened or endangered species or springs unless those contaminants enter the groundwater and are released at off-site springs.

Work for Others Program. No impacts to biological resources are anticipated as a result of Alternative 2.

Site-Support Activities. Under Alternative 2, the decrease in site-support activities would have no impact on biological resources.

5.2.2.7 ***Air Quality.*** Because none of the DOE/NV programs would occur at the Tonopah Test Range, no air quality impacts are expected. DOE, Albuquerque programs would continue at present levels; however, no significant air quality impacts would be expected.

5.2.2.8 ***Noise.*** Because none of the DOE/NV programs would occur at the Tonopah Test Range, no noise impacts are expected. DOE, Albuquerque programs would continue at levels not to exceed those identified under Alternative 1; no noise impacts are anticipated.

5.2.2.9 ***Visual Resources.*** Under Alternative 2, there would be little change in the overall appearance of the existing landscape. Therefore, impacts to visual resources would be negligible.

5.2.2.10 ***Cultural Resources.*** None of the DOE/NV programs would occur at the Tonopah Test Range; therefore, no impacts to cultural resources are anticipated.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 2, as summarized by the CGTO.

Defense Program—Under Alternative 2, there will be no belowground nuclear testing so American Indian cultural resources will not be adversely impacted.

Waste Management Program—Under Alternative 2, there will be no Waste Management Program on the Tonopah Test Range and none has been identified for this alternative, so it is expected that

American Indian cultural resources will not be adversely impacted.

Environmental Restoration Program—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during nondefense research and development actions. At this time, no actions are planned for the Tonopah Test Range.

Work for Others Program—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if the Tonopah Test Range continues to be a place where weapons are researched and developed. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

5.2.2.11 Occupational and Public Health and Safety. Under Alternative 2, Defense Program activities at the Tonopah Test Range would continue as under Alternative 1. Table 5.2-9 summarizes the health and safety impacts to workers and the public for applicable Tonopah Test Range program areas under Alternative 2. Based on occupational injury and fatality rates for construction activities, the Defense Program at the Tonopah Test Range is expected to result in 2.5 injuries and 0.0044 fatalities to workers during construction activities over the 10-year period evaluated in the NTS EIS. During the same period, no injuries or fatalities are projected as a result of routine program activities.

Based on previous occupational radiation periods, occupational exposure to radiation is not expected to exceed a collective dose to Defense Program workers of about 6 person-rem in 10-years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0025 latent cancer fatalities and 0.0010 other detrimental health effects in the worker population.

The risk of accidental exposure to radioactive or hazardous chemical releases contributes nearly zero increase to worker risk of latent cancer fatality or other detrimental health effects.

The health and safety impact to the public from potential Defense Program accidents at Tonopah Test Range could result in about 9.0×10^{-9} latent cancer fatalities and 4.1×10^{-9} other detrimental health effects in the population. The risk of a single cancer in the population due to accidental exposure to hazardous chemicals is estimated to be 1.0×10^{-10}. No noncancer effects to the public from chemical accidents would be expected to occur.

The maximum reasonably foreseeable radiological Defense Program accident at the Tonopah Test Range would be the same as described in Section 5.1.2.11 for Alternative 1 (a failure of an artillery fired test assembly, which has a probability of occurrence of 1×10^{-7} [(1 in 10,000,000)] per year).

For Defense Programs hazardous chemical effects at the Tonopah Test Range, the maximum reasonably foreseeable accident also would be the same as described in Section 5.1.2.11 for Alternative 1 (an explosion of a rocket test assembly containing depleted uranium and beryllium, which has a probability of occurrence of 6×10^{-6} [1 in 170,000] per year).

5.2.2.12 Environmental Justice. Environmental Justice impacts for the region of influence are discussed in Section 5.2.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations.

Table 5.2-9. Health risks to workers and the public from program activities, Tonopah Test Range, Alternative 2

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense	2.5	0.0044	0.0025	0.0010	8.4×10^{-12}	1.8×10^{-5}	9×10^{-9}	4.1×10^{-9}	1×10^{-10}	9.6×10^{-7}
Total	**2.5**	**0.0044**	**0.0025**	**0.0010**	$\mathbf{8.4 \times 10^{-12}}$	$\mathbf{1.8 \times 10^{-5}}$	$\mathbf{9 \times 10^{-9}}$	$\mathbf{4.1 \times 10^{-9}}$	$\mathbf{1 \times 10^{-10}}$	$\mathbf{9.6 \times 10^{-7}}$

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population
d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more.

These impacts are discussed in Section 5.2.3.10, Cultural Resources, and Section 5.2.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Tonopah Test Range. The CGTO maintains that past, present, and future activities on the Tonopah Test Range have, do, or will have a disproportionate impact on these American Indian Environment Justice issues. Although Alternative 2 involves no new activities, it contains the possibility of adversely impacting American Indian Environmental issues. If DOE/NV Environmental Protection personnel are not available, there may be a difficulty establishing future consultation with the American Indian tribes through the CGTO. Therefore, it is essential to establish both the physical access to places and agreements that will facilitate access to these places. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

5.2.3 Project Shoal Area

Under Alternative 2, all activities at the Project Shoal Area would be discontinued. The only program that is planned for the Project Shoal Area is the Environmental Restoration Program. Therefore, discontinuation of environmental restoration activities is the only program discussed for this site.

5.2.3.1 ***Land Use***. Under Alternative 2, no significant impacts on surrounding land use as a result of Alternative 2 have been identified. The negligible existing baseline impacts of the DOE monitoring would continue under this alternative.

5.2.3.1.1 ***Site-Support Activities***—No impacts as a result of site-support activities would occur under Alternative 2. Existing DOE monitoring activities would continue under this alternative.

5.2.3.1.2 ***Airspace***—Under Alternative 2, the monitoring activities anticipated at the Project Shoal Area would not include direct use of air transportation. Therefore, there would be minimal effects on use of R-4812 airspace at the Project Shoal Area as a result of this alternative.

5.2.3.2 ***Transportation***. The environmental impacts related to transportation activities as defined under Alternative 2 are discussed in the following sections. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.2.3.2.1 ***On-Site Traffic***—Monitoring activities would require relatively few personnel (less than 10 people at any given time). There are no public roads on site. Minor vehicular traffic is anticipated; therefore, there would be no traffic impacts.

5.2.3.2.2 ***Off-Site Traffic***—Monitoring activities would generate an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day) on the local access roads and on the immediate regional highway (U.S. Highway 50). Therefore, no traffic impacts would occur on off-site roadways under Alternative 2.

5.2.3.2.3 ***Transportation of Materials and Waste***—No transportation of materials and waste would occur under Alternative 2. Therefore, no impacts would result from transport of waste.

5.2.3.2.4 ***Other Transportation***—Under Alternative 2, monitoring activities at the site would result in minimal direct effects on rail and other modes of air transportation.

5.2.3.3 ***Socioeconomics***. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.2.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.2.3.4 ***Geology and Soils***. No known geologic resources (aggregates, clay, coal, minerals, or fossils) would be adversely impacted at the Project Shoal Area if operations were discontinued. The site is not located on or near any known exploitable mineral resources, fossil beds, unique geologic outcrops, or other unique geologic features.

5.2.3.5 ***Hydrology***. Under Alternative 2, the demand for water resources would be significantly decreased to levels required for environmental monitoring. No significant adverse impacts, either to water supply or water quality, are anticipated.

5.2.3.6 ***Biological Resources***. Under Alternative 2, no habitat would be disturbed, and no other activities would be conducted that might impact plants or animals.

5.2.3.7 ***Air Quality***. Because none of the programs occur at the Project Shoal Area, no air quality impacts are expected.

5.2.3.8 ***Noise***. Because none of the programs occur at the Project Shoal Area, no noise impacts are expected.

5.2.3.9 ***Visual Resources***. Under Alternative 2, none of the programs occur at the Shoal Test Area. Therefore, impacts to visual resources would not be expected.

5.2.3.10 ***Cultural Resources***. Because none of the programs occur at the Project Shoal Area, no impacts to Cultural Resources are expected.

AMERICAN INDIAN CULTURAL RESOURCES—*This section describes the American Indian concerns associated with implementing Alternative 2, as summarized by the CGTO.*

This study area is not within the traditional lands of the Indian people represented by the CGTO. It is recommended by the CGTO that the DOE EIS team directly contact Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake, and Lovelock Paiute Tribes.

NOTE: The Fallon Paiute, Walker River Paiute, and Lovelock Paiute Tribes were contacted by the DOE in letters dated May 12, 1995.

5.2.3.11 ***Occupational and Public Health and Safety***. Under Alternative 2, all operations at the Project Shoal Area would cease, except for security and environmental monitoring functions necessary for human health and safety, and security. No human health impacts are estimated for the major program areas because all projects and activities would be discontinued. Subsurface radioactivity from past underground nuclear weapons tests would continue to provide a potential exposure pathway for the public. Potential health impacts from this exposure scenario are the same as those described in Section 5.1.3.11 under Alternative 1.

5.2.3.12 ***Environmental Justice***. Environmental Justice impacts for the region of influence are discussed in Section 5.2.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.2.3.10, Cultural Resources, and Section 5.2.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues from the Project Shoal Area site.

This study area is not within the traditional lands of the American Indian people represented by the CGTO. It is recommended by the CGTO that the DOE EIS team directly contact American Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake, and Lovelock Paiute Tribes.

5.2.4 Central Nevada Test Area

The only program that would occur at the Central Nevada Test Area would be the Environmental Restoration Program. Therefore, the discontinuation of environmental restoration activities for this site are the only impacts discussed. Under Alternative 2, all activities at the Central Nevada Test Area would be discontinued.

5.2.4.1 ***Land Use***. Under Alternative 2, all actions planned for the Central Nevada Test Area would be discontinued. No significant impacts on surrounding land use as a result of Alternative 2 have been identified. The negligible existing baseline impacts of the DOE monitoring would continue under this alternative.

5.2.4.1.1 Site-Support Activities—No impacts as a result of site-support activities would occur under Alternative 2. The existing impacts of the DOE monitoring activities would continue under this alternative.

5.2.4.1.2 Airspace—Fallon Naval Air Station intends to create military operating areas in three of Nye County's rural regions; they would be designated Smoky, Duckwater, and Diamond. The Central Nevada Test Area falls under the Duckwater military operating area. This airspace expansion has not yet been filed, but is not expected to impact monitoring activities at the Central Nevada Test Area. In addition, monitoring activities under Alternative 2 would not include direct use of air transportation. Therefore, there would be minimal effects on airspace at the Central Nevada Test Area as a result of Alternative 2.

*5.2.4.2 **Transportation***. The environmental impacts related to transportation activities as defined under Alternative 2 are discussed in the following sections. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.2.4.2.1 On-Site Traffic—Under Alternative 2, monitoring activities would require relatively few personnel (less than 10 at any given time). There are no public roads currently on site, and the low level of personnel anticipated would generate only a minor amount of traffic.

5.2.4.2.2 Off-Site Traffic—Under Alternative 2, environmental monitoring would generate only an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day). In 1993, U.S. Highway 6 near Warm Springs carried 145 to 210 vehicles average daily traffic. This traffic volume is far below the capacity of U.S. Highway 6 at this location (ranging from 10,000 to 20,000 vehicles per day). Therefore, there would be no adverse traffic impacts on off-site roadways under Alternative 2; thus, no mitigation measures would be required.

5.2.4.2.3 Transportation of Materials and Waste—No transportation of materials and waste would occur at the Central Nevada Test Area under Alternative 2. Therefore, no impacts would result from the transport of waste.

5.2.4.2.4 Other Transportation—Because Alternative 2 does not assume direct use of local railroads, air transportation, or other modes of transportation to this site, direct effects on rail, air, and other modes of transportation would be minimal.

*5.2.4.3 **Socioeconomics***. The socioeconomic analysis is being prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.2.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

*5.2.4.4 **Geology and Soils***. No known geologic resources (aggregates, clay, coal, minerals, or fossils) would be adversely impacted at the Central Nevada Test Area if operations were discontinued. The site is not located on or near any known exploitable mineral resources, fossil beds, unique geologic outcrops, or other unique geologic features.

*5.2.4.5 **Hydrology***. Under Alternative 2, the demand for water resources would be significantly decreased to levels required for environmental monitoring. No significant adverse impacts, either to water supply or water quality, are anticipated.

*5.2.4.6 **Biological Resources***. Under Alternative 2, no impacts to plants or animals are anticipated.

*5.2.4.7 **Air Quality***. Because none of the programs occur at the Central Nevada Test Area, no air quality impacts are expected.

*5.2.4.8 **Noise***. Because none of the programs occur at the Central Nevada Test Area, no noise impacts are expected.

*5.2.4.9 **Visual Resources***. Under Alternative 2, none of the programs occur at the Central Nevada Test Area. Therefore, impacts to visual resources would not be expected.

5.2.4.10 ***Cultural Resources.*** Under Alternative 2 none of the programs occur at the central Nevada Test Area. Therefore, no impacts to cultural resources are expected.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 2, as summarized by the CGTO.

Defense Program—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if further nuclear tests occur and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests or construction at the Central Nevada Test Area.

Waste Management Program—Under Alternative 2, it is expected that American Indian cultural resources will not be impacted because there is no Waste Management Program on the Central Nevada Test Area and none has been identified for this alternative.

Environmental Restoration Program—Under Alternative 2, it is expected that American Indian cultural resources at the Central Nevada Test Area will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if the Central Nevada Test Area becomes a place where weapons are researched and developed. No such actions are planned for this alternative, so cultural resources will not be adversely impacted.

Work for Others Program—Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if the Central Nevada Test Area becomes a place where weapons are researched and developed. No such actions are considered in this alternative, so American Indian cultural resources will not be adversely impacted.

5.2.4.11 Occupational and Public Health and Safety. Under Alternative 2, all operations at the Central Nevada Test Area would cease except for security and environmental monitoring functions necessary for human health and safety and security. No human health impacts are estimated for the major program areas because all projects and activities would be discontinued. Subsurface radioactivity from past underground nuclear weapons test would continue to provide a potential exposure pathway for the public. Potential health impacts from this exposure scenario are the same as those described in Section 5.1.4.11 under Alternative 1.

5.2.4.12 Environmental Justice. Environmental Justice impacts for the region of influence are discussed in Section 5.2.1.12.

The American Indian responses regarding Environmental Justice are discussed in Section 4.1.12. American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.2.4.10, Cultural Resources, and 5.2.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Central Nevada Test Area. The CGTO maintains that past, present and future activities on the Central Nevada Test Area have, are, or will impact these American Indian Environmental Justice issues. Alternative 2 contains no new activities, it contains the possibility of adversely impacting these issues. Even though the CGTO has not been permitted to visit the area, the area is especially important due to the concentration of cultural resources. Therefore, this area provides a special opportunity for the DOE to undue past Environmental Justice impacts. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice Study, before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

5.3 Alternative 3 - Expanded Use

Alternative 3, Expanded Use of the NTS, is defined as the increased support of both defense and nondefense programs. This alternative includes support for the ongoing DOE/NV missions, as described under Alternative 1, with the addition of many new activities within each program. Alternative 3 includes programs at the NTS, portions of the NAFR Complex, the Tonopah Test Range, the Project Shoal Area, the Central Nevada Test Area, and three Solar Enterprise Zone locations: Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley. The description of Alternative 1 activities is presented in Section 5.1. Therefore, this section summarizes only the additional activities that would be included under Alternative 3. A detailed description of the activities is presented in Appendix A.

Defense Program. Stockpile stewardship, stockpile management, nuclear emergency response, and storage and disposition of weapons-usable fissile material would be the four categories of activities included in the Defense Program under Alternative 3. Stockpile stewardship would consist of the same activities as under Alternative 1 with the addition of more complex hydrodynamic tests and dynamic experiments, advanced nuclear weapons simulators, the National Ignition Facility, and a new large, heavy industrial facility. Stockpile management would be made up of interim storage of nuclear weapons and construction of a stockpile management complex. Nuclear emergency response activities would be the same as those described under Alternative 1. The DOE would be responsible for the management, storage, and disposition of weapons-usable fissile materials from the nation's nuclear weapons dismantlement and weapons production processes.

Waste Management Program. As with Alternative 1, waste management activities at the NTS would continue to be conducted in four primary areas: Areas 3, 5, 6, and 11. The additional waste management activities that would be implemented under Alternative 3 for each area are described below.

The Area 3 Radioactive Waste Management Site activities would be increased to levels consistent with the centralized alternative in the Waste Management Draft Programmatic EIS. Three additional low-level waste disposal craters, one support building, and a truck decontamination facility would be constructed. All new waste disposal facilities will be designed and constructed to meet all applicable regulations. Closure of the additional disposal units would occur when they become full.

The radioactive and mixed waste disposal activities at the Area 5 Radioactive Waste Management Site would be increased to meet the need of additional DOE generators identified to ship waste to the NTS. Two additional low-level waste disposal pits would be opened (pending the approval of a modification to the Resource Conservation and Recovery Act Part B permit) and 20 mixed waste disposal cells would be prepared. Other construction would include a Class I sanitary landfill, a mixed waste storage unit, a low-level storage unit, a Waste Examination Facility, a real-time radiography building, a cotter concentrate treatment facility, and a new access building.

Waste management operations in Area 6 under Alternative 3 would be the same as those described under Alternative 1.

The Area 11 Explosive Ordnance Disposal Unit activities under Alternative 3 would be the same as those described under Alternative 1, except that treatment operations would be increased to a level near maximum capacity.

Environmental Restoration Program. Environmental Restoration Program activities would continue as described under Alternative 1, but would be accelerated. Expanded uses may require cleanup level adjustment in accordance with the applicable environmental requirements.

Nondefense Research and Development Program. Under Alternative 3, the changes in Nondefense Research and Development Program activities include the construction and operation of a Solar Enterprise Zone facility, increased activities at the Spill Test Facility, and increased technology development activities.

Work for Others Program. Activities would be the same as those described under Alternative 1.

5.3.1 Nevada Test Site

The impacts that would occur at the NTS as a result of Alternative 3 are presented in this section.

5.3.1.1 Land Use. Alternative 3 would result in 5,809 acres of new ground disturbance resulting in a total of 64,500 acres compared to 58,729 acres of existing ground disturbance. Most of the new disturbance would be for new facility construction, especially a Solar Enterprise Zone facility (2,402 acres). The Defense Program would contribute 1,000 acres of new disturbance; the Waste Management Program, 209 acres; the Environmental Restoration Program, 51 acres; the Nondefense Research and Development Program, 4,582 acres; the Work for Others Program, 10 acres; and the site-support activities would contribute 30 acres.

Defense Program. Under Alternative 3, the High-Explosive Test Zone acreage would increase from 176 km^2 (68 mi^2) to 422 km^2 (163 mi^2) of land area. All 130 km2 (50 mi^2) of the former Critical Assembly Zone in Area 27 would become part of the Reserved Zone and would become available for diverse short-term testing and experimentation or short-duration exercises and training, such as those associated with Nuclear Emergency Search Team, Federal Radiological Monitoring and Assessment Center, and DoD land navigation. Alternative 3 also includes the creation of a 49-km^2 (19-mi^2) Defense Industrial Zone for stockpile management of weapons, including production; assembly; disassembly or modification; staging, repair, retrofit, and surveillance; and construction of a large, heavy industrial facility. Also included in this zone would be permanent facilities for stockpile stewardship operations involving equipment and activities such as radiography, lasers, special nuclear materials processing, and explosive-pulsed power.

In North Las Vegas the principal impact of the proposed National Ignition Facility project on land use at the North Las Vegas Facility would be the conversion of limited vacant land, which would not be available for other uses. The proposed National Ignition Facility would require about 8 acres, which represents approximately 10 percent of the total land area at the North Las Vegas Facility and 56 percent of land available for development at the North Las Vegas Facility. The impact of this conversion would be reduced somewhat by the existence of other areas on the site that would remain open for future development. Potential onsite impacts to land use could also result from required waste and water system upgrades, but the presence of the National Ignition Facility should not preclude future land uses for development in the city of North Las Vegas or Clark County.

Waste Management Program. Alternative 3 would not involve the expansion of the Radioactive Waste Management Zones in Areas 3 or 5. The land-use areas for solid waste landfills could be expanded to accommodate increased on-site municipal wastes and solid wastes from surrounding rural counties.

Environmental Restoration Program. Characterization and cleanup activities would be commensurate with the designated land uses at the site. Environmental restoration is not considered a land-use designation, but it is an activity required for characterization and re-use of lands and facilities.

Nondefense Research and Development Program. Under Alternative 3, the Nondefense Research and Development Program would designate approximately 62 km^2 (24 mi^2) of land area as a Solar Enterprise Zone. All other activities proposed for this program would be conducted in areas appropriately zoned for the activity.

Work for Others Program. Under Alternative 3, the Research Test Experiment Zone would be designated for defense-related small-scale research and development projects, demonstrations, pilot projects, and outdoor tests and experiments for the development, quality assurance, or reliability of materials and equipment under controlled conditions. This zone area would increase from 36 $km2^2$ to 298 km^2 (14 mi^2 to 115 mi^2).

5.3.1.1.1 Site-Support Activities—Under Alternative 3, the NTS site-support activities would be modernized and expanded to the extent necessary to provide support for existing activities, as well as new projects and activities not previously conducted at the NTS.

FACILITIES—It is anticipated that the Control Point 1 and Mercury cafeterias would undergo minor renovation. In Area 23, Buildings 117 (offices) and 650 (the medical facilities and laboratory) would be expanded and renovated or modified. A new records management building would be constructed in Area 23, and the existing bulk fuel storage facility in Area 23 would be upgraded.

Current maintenance levels of existing off-site government-owned facilities would continue. The DOE and contractor personnel currently in leased facilities would relocate to the North Las Vegas facility. The North Las Vegas and Remote Sensing Laboratory Facility would be expanded to accommodate additional employees.

SERVICES—Law enforcement, security, fire protection, and health services would be expanded as required with this alternative.

UTILITIES—Power utilities at the NTS would be modified and expanded. The main electrical power substation on the line from Las Vegas would be replaced with a modern substation. A new switching center would be installed, and significant sections of the power grid would be upgraded. Water wells and supply lines would be installed, as necessary, depending on the location of future projects. Waste-handling systems would be built, as necessary, with environmental acceptability as a primary concern.

The NTS substation for the main 138-kV supply line from Las Vegas would be replaced with a modern substation. Along with this modernization, a new switching center and a switching station would be built. The existing 34.5-kV loop that extends primary supply into the forward areas of the NTS would be upgraded at the Area 2 substation. This upgrade would provide a backup feed line to the Rainier substation. There would be no significant increase to the approximately 427 km (265 mi) of primary and secondary power supply lines used on the NTS.

COMMUNICATIONS—Communications systems would be upgraded, mobile radio systems would be replaced with modern digital systems, and monitoring systems would be consolidated. Telephone communications would be enhanced with a modern microwave system and a paging terminal and controller. Fiber-optic links would be extended to facilities requiring extensive data communication capabilities.

The approximately 60 radio systems and 3,500 mobile units would be replaced with a digitally trunked mobile radio system. Administrative issues associated with the change, such as procedures and training, would be modified accordingly. Central monitoring of NTS radio nets maintained at Station 900 would be consolidated and enlarged to provide greater access for equipment and maintenance. This station would function primarily as an emergency reporting point for both radio and telephone. The public safety network, which provides coverage to most of Nevada and portions of nearby states, would be upgraded.

The central hub for telephone communications would be relocated to the Nevada Support Facility in North Las Vegas. The microwave portion of the system would be replaced with state-of-the-art microwave equipment, and the paging terminal and controller would be replaced to provide the highest level of flexibility. Additional Aspen voice mail systems would be added, as necessary, to the Octel maximum system that currently services the DOE/NV community.

The NTS would continue to operate the two existing mail systems. Little or no expansion is anticipated for either of the mail systems as a result of this alternative.

5.3.1.1.2 Airspace—Under Alternative 3, there could be an increase in flying time between commercial airports within and outside Nevada. An increase in the number of operations is also projected. However, this alternative would most likely maintain the current level of air traffic control and navigational aid services, as well as the same airspace structure. Based on past trends and on improvements in communication, this alternative might cause modification and extended flight times for civilian aircraft.

The only activities that would affect airspace would be defense related. Therefore, only Defense and Work for Others Programs will be discussed and evaluated. However, occasional helicopters and fixed-wing aircraft carrying supplies and personnel are anticipated for all programs.

Defense Program. Under Alternative 3, there would be an increase in the support for ongoing defense-related activities located at the NTS, possibly resulting in the increase of air traffic operations. Assuming a 2-percent annual increase, operations would increase by approximately 20 percent over the 10-year study period. This would require additional coordination with other federal agencies to ensure all missions are accommodated.

Work for Others Program. Under Alternative 3, the Work for Others Program activities would cause an increase in the use of the NTS airspace by the DoD for training and defense-related research and development. No commercial air passenger, general aviation, or air cargo activities would occur within the NTS airspace. (Occasional DOE-related aircraft operations carrying supplies and personnel or for emergency operations might take place.) The continuation of operations at the NTS under the Work for Others Program within this alternative would require additional coordination with other military operations and activities to ensure both missions are accommodated.

5.3.1.2 ***Transportation.*** The following sections contain the discussion of the environmental impacts related to transportation activities as defined under Alternative 3. The analysis of transportation impacts is presented with respect to on-site traffic, off-site traffic, transportation of materials and waste, and other transportation.

5.3.1.2.1 On-Site Traffic—Traffic generated within the NTS as a result of land uses, projects, and activities associated with Alternative 3 is estimated to be 16,310 vehicle trips per day. Table 5.3-1 shows the average daily trip generation for each program. The daily trips were distributed on site based on existing travel patterns for commuters and the current NTS areas affected by each program.

Table 5.3-2 summarizes the average daily traffic volume for the key roadways on the NTS for Alternative 3. The portion of the average daily traffic volume that would be attributable to each program is also provided. All key on-site roadways have capacities exceeding 2,000 vehicles per hour for both directions combined (Transportation Research Board, 1994). A comparison of capacity to the volumes assigned to each segment on Table 5.3-2 shows that no roadway would experience significant traffic congestion under Alternative 3.

Defense Program—Traffic generated on the roads within the NTS as a result of projects and activities associated with the Defense Program is estimated to be 2,450 average daily trips under Alternative 3. There would be no adverse effects on traffic flow as a result of the Defense Program.

Waste Management Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Waste Management Program is estimated to be 1,215 average daily trips under Alternative 3. The Radioactive Waste Management Sites in Areas 3 and 5 would continue operations as described in Alternative 1, with an increase in the scope of service to the entire DOE complex (DOE, 1995b). Projections indicate that the number of inbound shipments from off-site generators would be approximately 4,000 shipments per year, during the next 10 years, for an average of 20 shipments per day. The number of on-site generated waste shipments would remain at six shipments per day, as described under Alternative 1.

Road 5-01, the access to the Radioactive Waste Management Site in Area 5, is scheduled for improvement by the second quarter Fiscal Year 1997. The improvement project is described under Alternative 1 in Section 5.1.1.2.1. No adverse effects on traffic flow would occur as a result of the Waste Management Program.

Table 5.3-1. Average on-site daily trip generator (one-way trips) by program, Alternative 3

Program	Trips per Day On site	Difference from Alternative 1
Defense	2,450	+ 1,815
Waste Management	1,215	+ 1,070
Environmental Restoration	1,400	+ 1,010
Nondefense Research and Development	6,080	+ 5,900
Work for Others	1,130	+ 990
Site-Support Activities	4,035	+ 2,155
Total	**16,310**	**+12,940**

Environmental Restoration Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Environmental Restoration Program is estimated to be 1,400 average daily trips under Alternative 3. No adverse effects on traffic flow would occur as a result of the Environmental Restoration Program.

Nondefense Research and Development Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Nondefense Research and Development Program is estimated to be 6,080 average daily trips under Alternative 3. Traffic volumes on Jackass Flats Road, Cane Spring Road, and that portion of Mercury Highway that is south of Cane Spring Road would be approximately 3,000 vehicles per day for each segment, representing a substantial increase over Alternative 1. These volumes, however, represent on-site trips that were assumed to be uniformly distributed throughout the day. This, together with the fact that all on-site trips were also assumed to have an endpoint in Mercury, shows that no adverse effects on traffic flow would occur as a result of the Nondefense Research and Development Program.

Work for Others Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Work for Others Program is estimated to be 1,130 average daily trips under Alternative 3. No adverse effects on traffic flow would occur as a result of the Work for Others Program.

Site-Support Activities. Traffic generated on the roads within the NTS as a result of site-support activities is estimated to be 4,035 average daily trips under Alternative 3. No adverse effects on traffic flow would occur as a result of site-support activities.

5.3.1.2.2 Off-Site Traffic—Under Alternative 3, on-site NTS employment would be increased relative to the future baseline (Alternative 1). Correspondingly, an increase in daily vehicle trips and traffic volume on key roadways is anticipated.

This increase in vehicle trips was estimated for each roadway segment and added to the baseline to obtain the overall vehicle trips for the project.

Traffic impacts were determined based on level of service changes for each of the key roads analyzed. The major traffic generators at the site resulting from various programs under Alternative 3 are the additional construction and operation employees (totaling 389 employees in 1996; 3,011 employees in 2000; and 2,051 employees in 2005) and their associated activities. Note that the employment figures represent the increment above the baseline

Table 5.3-2. Average daily traffic volumes on key NTS roadway segments under Alternative 3

Roadway	Segment	Average Daily Traffic Volume						
		Defense	Waste Management	Environmental Restoration	Nondefense Research and Development	Work for Others	Site Support	Total
North								
Buckboard Mesa Rd.	Pahute Mesa Rd. to Airport Rd.	245	0	110	0	0	0	**355**
Mercury Hwy.	Tippipah Hwy. to Ranier Mesa Rd.	490	245	325	0	0	0	**1,060**
Pahute Mesa Rd.	Mercury Hwy. to Stockade Wash Rd.	490	0	215	0	0	0	**705**
Pahute Mesa Rd.	Stockade Wash Rd. to Buckboard Mesa Rd.	245	0	110	0	0	0	**355**
Ranier Mesa Rd.	Mercury Hwy. to Tippipah Hwy.	490	0	110	0	0	0	**600**
Tippipah Hwy.	Mercury Hwy. to Pahute Mesa Rd.	980	0	430	0	0	0	**1,410**
Tippipah Hwy.	Pahute Mesa Rd. to Ranier Mesa Rd.	0	0	110	0	0	0	**110**
South								
Cane Spring Rd.	Lathrop Wells Rd. to Mercury Hwy.	0	0	110	3,000	520	0	**3,630**
Jackass Flats Rd.	Mercury Hwy. to Lathrop Wells Rd.	0	0	325	3,040	565	0	**3,930**
Lathrop Wells Rd.	U.S. Highway 95 to Jackass Flats Rd.	0	0	110	40	45	0	**195**
Mercury Hwy.	Mercury Hwy. to Road 5-01	1,960	1,215	970	3,000	520	405	**8,070**
Mercury Hwy.	Road 5-01 to Cane Spring Rd.	1,960	305	860	3,000	520	405	**7,050**
Mercury Hwy.	Cane Spring Rd. to Tippipah Hwy.	1,960	305	860	0	0	405	**3,530**
Road 5-01	Mercury Hwy. to Area 5 RWMS	0	790	110	0	0	0	**900**
Road 5-07	Mercury Hwy. to Area 5 RWMS	0	120	0	0	0	0	**120**

NOTE: RWMS= Radioactive Waste Management Site.

figures (Alternative 1). Table 5.3-3 shows a summary of average daily vehicle trips increase by each program activity for the years 1996, 2000, and 2005. The year 2000 represents a peak in the increased number of trips.

Under Alternative 3, the NTS access road (State Route 433) would experience the greatest increase in traffic during the peak hour (in one direction). This increase would be 40 vehicles in 1996, 300 in 2000, and 200 in 2005. Similarly, 30 vehicles would be added in 1996 to the Mercury interchange ramps serving Las Vegas, 250 vehicles in 2000, and 135 in 2005. Approximately 100 to 250 vehicles would be added to U.S. Highway 95 between Mercury and Las Vegas in 2000. Most other roadway segments would generally experience less than 100 additional vehicles during the peak hour. This figure would be less by 20 for segments in remote areas. The projected peak-hour traffic on key roads and the associated level of service that would result under Alternative 3 for 1996, 2000, and 2005 are shown in Table 5.3-4.

Based on Association of American State Highway and Transportation Officials standards, level of service B is appropriate for freeways; arterials; and rural, level, or rolling terrain. Level of service C is appropriate for rural (mountainous), urban, and suburban highways. For local roads, level of service D is appropriate in all terrain (AASHTO, 1990).

Under Alternative 3, the access highway to the site (State Route 433) would operate at level of service C in 1996 and level of service D in 2000 and 2005. According to Association of American State Highway and Transportation Officials standards and considering this access to be a local highway, level of service D is acceptable. Roadway ramps at the Mercury interchange would continue to operate at level of service B. U.S. Highway 95 east of Mercury would continue to have excess capacity and would operate at level of service A. However, U.S. Highway 95 north of the Mercury interchange would likely operate at level of service D by 2005.

On the other hand, key roads within metropolitan Las Vegas (segments of Interstate 15, U.S. Highway 95, and U.S. Highway 93) already operate at levels of service ranging from A to F, and by 2000, they would all deteriorate to unacceptable level of service F. These conditions would prevail even without Alternative 3 because of cumulative traffic growth (recreational, regional, and commuter traffic). U.S. Highway 93 at Hoover Dam (rural and mountainous) already operates at unacceptable level of service F, and its level of service would continue to deteriorate further with or without this alternative, owing to its geometry (steep grades and narrow curves) and partially to its moderate traffic volume and truck traffic. All other key roadways would continue to operate at level of service C or better. These conditions would prevail with or without Alternative 3 and with or without any single program activity. The following sections address the contribution of each program activity to traffic impacts. The trips discussed for each program account for construction and operations activities generated by the site and occurring at the access road off U.S. Highway 95.

Defense Program. With the Defense Program, 40 additional daily vehicle trips in 1996, 350 in 2000, and 350 in 2005 would be generated. Except for site support, the defense-related activities would have the highest number of daily vehicle trips, peak-hour vehicles, and the most traffic impacts. The defense activities would contribute 34 percent to total trips added under Alternative 3 in 2005.

Waste Management Program. Under Alternative 3, the Waste Management Program would add 130 vehicle trips on a typical weekday in 2005. The number of daily vehicle trips added would amount to less than 13 percent of trips added by all programs.

Environmental Restoration Program. Under Alternative 3, Environmental Restoration Program activities are expected to be accelerated relative to Alternative 1. The largest number of trips added is expected to be approximately 90, or 9 percent of the total in 2005.

Nondefense Research and Development Program. Under Alternative 3, approximately 40 vehicle trips would be added with this program on a typical weekday. In 2005, the Nondefense activities would contribute less than 4 percent to the total number of daily vehicle trips.

Table 5.3-3. Average daily vehicle trip increase off site under Alternative 3

Program	1996	2000	2005
Defense	40	350	350
Waste Management	20	130	130
Environmental Restoration	30	90	90
Nondefense Research and Development	10	40	40
Work for Others	10	10	10
Site-Support Activities	100	900	410
Total (all programs)	**210**	**1,520**	**1,030**

NOTE: All values are rounded to the nearest 10. Daily trips shown are defined as one-way vehicle trips or vehicle trip ends. Trips shown are the increase from Alternative 1.

Table 5.3-4. Peak-hour traffic volumes and level of service on key off-site roads under Alternative 3 (Page 1 of 2)

Roadway Segments	Capacity VPH[a]	1996 DDHV[b]	1996 LOS[c]	2000 DDHV	2000 LOS	2005 DDHV	2005 LOS
Regional							
I-15 at California/Nevada state line	6,800	2,984	E	3,774	F	4,724	F
I-15 north of Sahara Avenue interchange	10,200	7,343	F	9,188	F	11,226	F
I-15 north of the Downtown Expressway interchange	10,200	4,439	E	5,647	F	7,042	F
I-15 just north of the 'D' and Washington interchange	10,200	4,076	D	5,190	F	6,468	F
I-15 north of the Cheyenne interchange	6,800	1,911	C	2,763	D	3,712	F
I-15 south of the Lamb Blvd. interchange	6,800	658	A	901	A	1,129	B
I-15 north of West Mesquite interchange (Nevada/Utah state line)	6,800	637	A	899	A	1,207	B
I-80 east of Apex interchange (California/Nevada state line)	6,800	1,758	C	2,019	C	2,327	C
I-80 east of the West Wendover interchange (Nevada/Utah state line)	6,800	329	A	424	A	524	A
Local							
U.S. Hwy. 95 south of Jones Blvd. interchange	10,200	7,341	F	9,339	F	12,645	F
U.S. Hwy. 95 north of Sunset Road interchange (East Las Vegas)	6,800	2,597	D	3,288	F	4,113	F
Rancho Road (SR 599) east of the northern U.S. Hwy. 95/Rancho Road interchange	6,800	1,234	B	2,169	D	3,033	E
U.S. Hwy. 95 south of SR 157 north of Las Vegas	6,800	873	A	1,224	B	1,300	B
U.S. Hwy. 95 just east of Mercury interchange	6,800	390	A	633	A	553	A
U.S. Hwy. 95 just south of Boulder City	2,220	599	C	633	C	680	C
U.S. Hwy. 95 interchange at Mercury							
Southbound off-ramp	1,300	42	B	75	B	57	B
Southbound on-ramp	1,300	274	B	489	B	409	B
Northbound off-ramp	1,300	274	B	489	B	409	B
Northbound on-ramp	1,300	42	B	75	B	37	B
SR 433, 0.32 km (0.2 mi) north of the Mercury interchange (access to NTS)	2,200	329	C	588	D	291	D

Table 5.3-4. Peak-hour traffic volumes and level of service on key off-site roads under Alternative 3 (Page 2 of 2)

Roadway Segments	Capacity VPH[a]	1996 DDHV[b]	1996 LOS[c]	2000 DDHV	2000 LOS	2005 DDHV	2005 LOS
U.S. Hwy. 95, 6.1 km (3.8 mi) north of Mercury interchange	2,200	286	C	348	C	390	D
U.S. Hwy. 95 at Amargosa Valley to Beatty	2,000	64	A	82	A	86	A
U.S. Hwy. 95 north of Beatty	2,000	176	B	206	B	226	C
SR160 south of U.S. Hwy. 95	2,000	75	A	103	B	120	B
U.S. Hwy. 93 south of the Nevada/Arizona state line at Hoover Dam	1,500	824	F	1,012	F	1,209	F
U.S. Hwy. 93 east of Westbound off-ramp of Railroad Pass interchange	6,840	2,710	E	3,324	F	3,976	F
U.S. Hwy. 93 north of I-15/U.S. Hwy. 93 interchange	2,000	137	B	193	B	225	C
U.S. Hwy. 93 south of SR 375 junction near Crystal Springs	2,000	134	B	172	B	200	B
U.S. Hwy. 93 west of SR 375 junction near Crystal Springs	2,000	49	A	68	A	72	A
SR 375 west of U.S. Hwy. 93 junction at Crystal Springs	1,500	33	A	46	A	43	A
SR 375 east of Warm Springs	1,500	15	A	27	A	23	A
U.S. Hwy. 6 east of Warm Springs at SR 375 junction	1,700	17	A	29	A	25	A
U.S. Hwy. 6 west of Warm Springs at SR 375 junction	1,700	23	A	35	A	32	A
U.S. Hwy. 6 east of Tonopah, west of SR 376	1,700	100	B	103	B	86	A

[a] Vehicles per hour
[b] Directional design hourly volume (one direction)
[c] Level of service
Note: SR = State Route.

Work for Others Program. Under Alternative 3, employees of the Work for Others Program would add 10 vehicle trips per day.

Site-Support Activities. Site-support activities are expected to add 900 additional vehicle trips in 2000 and 410 in 2005. These trips account for operations activities related to roads, utilities, communications, and other site support. Under Alternative 3, these activities would contribute to approximately 60 percent of the total number of increased daily trips in 2000.

5.3.1.2.3 Transportation of Materials and Waste—Alternative 3 represents a significant increase in the mission of the NTS. The majority of the activities under this alternative are associated with Defense and Waste Management Program activities.

Activities identified for the Defense Program include added responsibilities for the stockpile stewardship mission. Besides the NTS's primary mission of readiness to test nuclear weapons other activities include relocation of assembly/disassembly activities and management of special nuclear materials (plutonium pits) and other highly explosive materials. The transportation of nuclear explosive materials are required for the following reasons for this alternative:

- Weapons currently stored at classified DoD facilities are returned to the NTS for dismantlement.
- Weapons are returned to the identified assembly area for testing, modification upgrades, and certain component replacement.
- Weapons are returned to DoD facilities upon completion of modification or test of the unit.
- Weapons are shipped between the DOE and DoD facilities for field testing of subsystems.

Under Alternative 3, the Waste Management Program activities also increase based on the DOE mission. The projected generators, waste types, volumes, and shipments are given in Tables 5.3-5 and 5.3-6. Table 5.3.-5 reflects a 10-year average estimate of LLW volumes and shipments by generator sites for Alternative 3. The yearly average for LLW, ignoring NTS generated LLW, is approximately 2,460 shipments/year. The estimates were derived from current waste storage volumes provided by Waste management Draft Programmatic EIS and the projected generated rate for the next 10 years. These volumes and sources are based on the best available information and volumes may change based on the final Waste Management Programmatic EIS or updated waste load inventories or projections from the respective sites. Table 5.3-6 reflects a ten-year average estimate_ of MW volumes and shipments by generator sites for Alternative 3. The yearly average for MW, ignoring NTS generated MW, is approximately 1,540 shipments/year. Specific detail about DOE-related transportation activities, including associated risk and routes, is provided in Appendix I.

Defense Program. For this EIS, it was assumed that there would be a maximum number of special nuclear material and other high-explosive materials shipments of 2,100 to the NTS. This includes approximately 140 test devices shipments, 1,590 nuclear and high explosives, and 360 plutonium pit shipments. These activities support projected activities associated with underground nuclear testing, assembly/disassembly activities and storage of special nuclear material, and other associated high explosives. On site at the NTS the only hazard would be from the 32 to 40 km (20 to 25 mi) of roadway that the safe-secure trailer would travel; a group of flammable-liquid storage tanks, protected by dikes, is located near Mercury, about 31 m (100 ft) off the roadway.

The health risk estimates from the transportation of Defense Program special nuclear materials were calculated using the model, ADROIT. This model calculates the risk from both incident-free transport and vehicular accidents. The incident-free radiological risk of Latent Cancer Fatalities is 2.14×10^{-3}, the nonradiological risk of health effects from vehicle emissions is 4.01×10^{-3}. The expected number of traffic fatalities is 1.06×10^{-2}. The accident-initiated radiological risk is 1×10^{-6}.

Waste Management and Environmental Restoration Programs. The health risks of transporting low-level waste and mixed waste on the highway were calculated. The results of the transportation risks along the entire route for the 10-year duration of this alternative are shown in Table 5.3-7. Eight vehicle-related fatalities and 108 injuries are estimated. Less than one (0.077) latent cancer fatality is expected. The risks associated under Alternative 3 are higher than the other alternatives because of the large volumes of waste and the greater number of shipments and miles traveled.

Inside Nevada, the vehicle-related fatalities are less than one (0.07), and four injuries are estimated. It is estimated that 0.01 latent cancer fatality would occur in 10 years. Approximately two fatalities and two injuries are expected from on-site transportation of NTS-generated waste and on-site transportation of waste generated off site and shipped to the NTS.

The consequence and probability of the maximum foreseeable accident were calculated for both low-level and mixed waste shipments to the NTS. The most severe consequence from a low-level waste accident would be 2.25×10^{-3} latent cancer fatalities, and 1.04×10^{-3} radiation detriments. The incident free nonradiological risk for waste shipments is 1.20×10^{-2}. The maximum probability of occurrence of this accident would be 8.08×10^{-3}.

For an accident involving mixed waste the radiological consequence would be the same as the low-level waste. For the hazardous chemical portion of the mixed waste, the most severe chemical-induced cancer consequence is 1.1×10^{-6} and the hazard index for the most severe chemical-induced non-cancer is 0.38. The maximum probability of this accident occurring is 3.23×10^{-3}.

5.3.1.3 Socioeconomics. The potential socioeconomic effects under Alternative 3 are discussed in this section. The description of socioeconomic

Table 5.3-5 Low-level waste volumes and shipments by generator site[a] under Alternative 3

Generator Site	10-year Volume Projection (m³)[b]	(yd³)[c]	Number of Shipments[d]
Aberdeen Proving Ground	790	1,033	21
Ames Laboratory	1,232	1,611	32
Argonne National Laboratory-East	11,265	14,734	296
Bettis Atomic Power Laboratory	9,775	12,788	257
Brookhaven National Laboratory	3,264	4,269	86
Energy Technology Engineering Center	614	803	16
Fermi Laboratory	2,165	2,832	57
Fernald Environmental Management Project	84,177	110,099	2,213
Hanford	170,891	223,517	4,492
Idaho National Engineering Laboratory and Argonne National Laboratory-West	106,934	139,864	2,811
Knolls Atomic Power Laboratory-Kesselring	15,554	20,344	409
Lawrence Berkeley Laboratory	5,099	6,669	134
Lawrence Livermore National Laboratory	1,928	2,522	51
Los Alamos National Laboratory	41,773	54,637	1,098
Inhalation Toxicology Research Institute	344	450	9
Mound	60,027	78,512	1,578
Nevada Test Site	150,000	654	14,000
Oak Ridge National Reservation	26,607	34,801	699
Paducah Gaseous Diffusion Plant	16,996	22,230	447
Pantex Plant	769	1,006	20
Portsmouth Gaseous Diffusion Plant	63,512	83,071	1,670
Princeton Plasma Physics Laboratory	187	245	5
RMI Extrusion Plant	5,528	7,230	146
Rocky Flats Environmental Technology Site	13,759	17,996	2,012
Sandia National Laboratories, CA	219	286	6
Savannah River Site	243,901	319,011	6,411
Stanford Linear Accelerator	3,694	4,832	97
Sandia National Laboratories, NM	351	459	9
West Valley Demonstration Project	67	88	2
Total[g]	**1,041, 422**	**1,362,129**	**39,084**

[a] All volumes are derived from the 1994 Integrated Data Base (DOE, 1995a) and the Waste Management Programmatic EIS (DOE, 1995b) projections. The sites and volumes may change based on the final WMP EIS or updated waste load inventories or projections from the respective DOE sites.
[b] Cubic meters
[c] Cubic yards
[d] Assumes the majority of containers are 1-m x 1-m x 2m (4-ft x 4-ft x 7-ft) boxes
[e] Assumes an average of 12 containers per shipment
[f] Low-level waste
[g] Including internally generated waste.

Table 5.3-6 Mixed waste volumes and shipments by generator site[a], Alternative 3

Generator Site	10-year Volume Projection (m^3)[b]	(yd^3)[c]	Number of Shipments[d,e]
Ames Laboratory	1	1	1
Argonne National Laboratory-East	6,700	8,763	181
Bettis Atomic Power Laboratory	40	52	1
Hanford	120,000	156,954	3,243
Idaho National Engineering Laboratory and Argonne National Laboratory-West	47,390	61,984	1,281
Knolls Atomic Power Laboratory-Kesselring	150	196	4
Lawrence Berkeley Laboratory	4,300	5,624	116
Los Alamos national Laboratory	2,700	3,532	73
Nevada Test Site (ER)[f]	500	196,193	9
Paducah Gaseous Diffusion Plant	600	785	16
Portsmouth Gaseous Diffusion Plant	33,754	44,149	912
RMI Extrusion Plant	25	33	1
Rocky flats Environmental Technology Site	63,000	82,401	9,000
Savannah River site	21, 300	27,859	576
West Valley Demonstration Project	40	52	1
Total[g]	**300,500**	**393,039**	**15,415**

[a] All volumes are derived from the 1994 Integrated Data Base (DOE, 1995a) and the Waste Management Programmatic EIS (DOE, 1995b) inventory projections
[b] Cubic meters
[c] Cubic yards
[d] Assumes the majority of containers are 1-m x 1-m x 2-m (4-ft x 4-ft x 7-ft) boxes
[e] Assumes an average of 12 containers per shipment
[f] Environmental Restroation Program
[g] Includes internally generated waste.

conditions includes indicators (population, civilian labor force, employment, unemployment rate, and income) that provide a basis for comparing regional socioeconomic conditions of the site with the three other alternatives. Public finance and public services (public education, police and fire protection, and health) are described. Alternative 1 was considered equivalent to future baseline conditions without new activities. Table 5.3-8 reflects the effects of economic indicators for this alternative, and Table 5.3-9 describes housing projections.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

ECONOMIC ACTIVITY, POPULATION, AND HOUSING—Under Alternative 3, it was assumed that direct employment would increase by 867 jobs in 1996, with a maximum increase of 6,718 jobs in 2000, and 4,531 jobs in 2005. It is estimated that direct payroll and purchases of goods and services would generate 2,017 additional secondary jobs in 1996; 12,744 in 2000; and 8,977 in 2005. Of the total employment increase of 13,508 workers, a vast majority (over 97 percent) is expected to live in Clark and Nye counties. Hence, the discussion below concentrates on these two counties.

Table 5.3-7. Transportation risks under Alternative 3

	Transportation Risks	Transportation Risks Inside Nevada	On-site Transportation Risks
Traffic			
Fatalities	8	7×10^{-2}	1
Injuries	108	4	2
Radiation Cancer[a]			
Incident Free[b]	0.077	0.010 ± 0.002	5×10^{-3}
Radiation Detriment[c]			
Incident Free	3.9×10^{-2}	7.9×10^{-3}	4×10^{-3}
Chemical Cancer[d]			
Maximally Exposed Individual[e]	7.5×10^{-5}	9.8×10^{-6}	2×10^{-6}
Chemical Non-cancer (Hazard Index)[f]			
Maximally Exposed Individual	7.9×10^{-3}	1.1×10^{-3}	5×10^{-3}

[a] The number of latent fatal cancers expected due to exposure to ionizing radiation. The cancer can develop and death can occur many years after exposure

[b] Risk due to routine, normal day-to-day operations without accidents or other unexpected or unusual occurrences

[c] The total number of health detriment cases due to exposure to ionizing radiation minus the number of latent fatal cancers. Health detriments includes genetic damage and development of nonfatal cancer

[d] The number of latent cancers expected due to exposure to a chemical carcinogen. Cancer can develop many years after exposure

[e] For accident risk assessment, inhalation exposure to radioactive or chemical materials is assumed to occur under stable atmospheric conditions (Pasquill atmospheric stability Class F). This results in worst-case of maximum exposure

[f] The ratio between the daily intake of a noncarcinogenic toxic chemical and acceptable reference level. A hazard index less than one indicates that exposure will not result in adverse noncarcinogenic health effects.

Within Clark County, a total of 2,756 new jobs in 1996; 18,534 jobs in 2000; and 12,857 jobs in 2005 would be generated under Alternative 3. Within Nye County, this alternative would generate 101 new jobs in 1996; 758 in 2000; and 516 in 2005. An increase of 12,857 in Clark County in 2005 would result in a decrease in the County's unemployment rate from 5.8 percent to 4.7 percent. Similarly, in Nye County, an increase of 516 jobs in 2005 would result in a decrease in the County's unemployment rate from 5.2 percent to 4.7 percent.

Because of an increase in employment opportunities, population in-migration is anticipated. It is estimated that 10,020 persons could relocate to Clark County in 2005 resulting in a population increase of 0.7 percent over the Alternative 1 level of 1,380,920 persons. As many as 656 persons may in-migrate to Nye County in 2005. This would result in a population increase of 1.7 percent over the Alternative 1 level of 38,516 persons.

In 2005, an estimated 3,914 households could relocate to Clark County and 246 households to Nye County under Alternative 3. This would result in a reduction of housing vacancy rates from 7.9 percent to 7.2 percent in Clark County and from 16.2 percent to 14.8 percent in Nye County.

Direct earning levels are estimated at $41.2 million in 1996, $330.7 million in 2000, and $224.6 million in 2005. Secondary earnings are estimated at $53.9 million in 1996, $346.1 million in 2000, and $243.0 million in 2005 in the region of influence. Of these earnings, Clark County would gain a

Table 5.3-8. Economic activity effects for Clark and Nye counties 1996, 1997, 1998, 2000, and 2005, totals for all programs under Alternative 3

	1996	1997	1998	2000	2005
Alternative 3					
Clark County					
Population	4	9	1,159,879	1,244,186	1,390,940
	1,078,21	1,115,69			
Total Jobs	510,294	531,649	553,762	594,822	663,270
Unemployment Rate	5.4	4.8	4.8	4.7	4.7
Personal Income ($Millions)	21,436.5	22,903.5	24,381.9	27,099.4	32,913.5
Nye County					
Population	27,497	29,292	31,216	35,014	39,172
Total Jobs	11,091	11,907	12,765	14,379	15,961
Unemployment Rate	4.9	4.7	4.7	4.7	4.7
Personal Income ($Millions)	486.5	534.6	585.7	683.1	812.2
Changes from Alternative 1 (Alternative 3 effects)					
Clark County					
Population	638	3,351	11,638	20,645	10,020
Total Jobs	2,756	7,733	12,940	18,534	12,857
Unemployment Rate	-0.4	-1.0	-1.0	-1.1	-1.1
Personal Income ($1,000)	129.3	377.0	636.2	915.0	632.6
Nye County					
Population	90	374	705	1,048	656
Total Jobs	101	311	530	758	516
Unemployment Rate	-0.3	-0.5	-0.5	-0.5	-.05
Personal Income ($1,000)	5.8	18.7	32.0	46.2	31.5

total of $90.9 million in 1996, $643.2 million in 2000, and $444.7 million in 2005. For Nye County, this economic activity would generate a total of $4.2 million in 1996, $33.6 million in 2000, and $22.9 million in 2005.

Defense Program. In the region of influence, this program would create 532 new jobs, including 160 direct and 372 secondary positions, in 1996. In 2000, employment in the region of influence would increase by 4,584 jobs. By the end of 2005, total employment increase in the region of influence would remain at 4,584. In Clark County, this program would contribute to 4,359 jobs (1,383 direct and 2,976 secondary) in 2005. For Nye County, this program would contribute 178 jobs (109 direct and 69 secondary) in 2005. In 2005, an estimated 1,897 households that support the Defense Program would relocate to Clark County, and 92 households to Nye County, contributing to a decrease in housing vacancy rates. In North Las Vegas, construction of the proposed National Ignition Facility at the North Las Vegas Facility would require 280 workers during the peak year of construction (1998). Operation of the facility would require 330 direct workers in the peak year of 2003 and continue through the duration of National Ignition Facility operations. These activities would generate too few jobs to affect the socioeconomic region of influence.

Waste Management Program. In the region of influence, this program would create 226 new jobs, including 68 direct and 158 secondary jobs, in 1996. In 2000, employment in the region of influence would increase by 1,634 jobs (563 direct and 1,071 secondary). By the end of 2005, total employment would remain at 1,634. In Clark County, the Waste Management Program would contribute 1,553 jobs (493 direct and

Table 5.3-9. Housing projections for the Nevada Test Site region of influence, 1996, 2000, and 2005, under Alternative 3

	Alternative 1 Vacancy Rate (%)	Alternative 3 Housing Demand Increase	Vacancy Rate (%)	Change in Vacancy Rate
Clark County				
1996	7.8	249	7.8	0.0
2000	7.9	8,064	6.3	-1.6
2005	7.9	3,914	7.2	-0.7
City of Las Vegas				
1996	7.1	88	7.0	-0.1
2000	7.1	2,833	5.5	-1.6
2005	7.1	1,375	6.4	-0.7
City of North Las Vegas				
1996	5.9	31	5.8	-0.1
2000	5.9	489	4.6	-1.3
2005	5.9	237	5.4	-0.05
Nye County				
1996	16.2	34	15.9	-0.3
2000	16.2	393	13.6	-2.6
2005	16.2	246	14.8	-1.4
Town of Tonopah				
1996	17.6	5	17.3	-0.3
2000	18.0	51	15.4	-2.6
2005	18.0	27	16.6	-1.4
Town of Pahrump				
1996	11.6	120	11.3	-0.3
2000	11.6	256	8.8	-2.8
2005	11.6	177	10.1	-1.5
Amargosa Valley				
1996	17.8	1	17.5	-0.3
2000	17.9	15	15.3	-2.6
2005	17.8	9	16.4	-1.4

1,060 secondary) in 2005. In Nye County, the Waste Management Program would contribute 64 jobs (39 direct and 25 secondary) in 2005.

With the workload increase in this program, 1,730 persons would relocate to Clark County, and 88 persons to Nye County. In 2005, an estimated 676 households that support this program would relocate to Clark County, and 33 households to Nye County contributing to a decrease in housing vacancy rates.

Environmental Restoration Program. In the region of influence, this program would create 432 new jobs, including 130 direct and 302 secondary positions, in 1996. In 2000, employment in the region of influence would increase by 1,152 jobs. By the end of 2005, total employment would remain at 1,152. In Clark County, this program would add 1,095 jobs (348 direct and 747 secondary) in 2005. For Nye County, this program would add 45 jobs (27 direct and 18 secondary) in 2005.

Because of the workload increase in the Environmental Restoration Program, 1,220 persons would relocate to Clark County, and 62 persons to Nye County in 2005.

An estimated 477 households that support this program would relocate to Clark County and 23 households to Nye County contributing to a decrease in housing vacancy rates.

Nondefense Research and Development Program. In the region of influence, this program would create a total of 170 jobs, including 51 direct and 119 secondary positions, in 1996. In 2000, employment in the region of influence would increase by 467 jobs. By the end of 2005, total employment would remain at 467. Within Clark County, this program would add 444 jobs (140 direct and 304 secondary) in 2005. For Nye County, this program would add 18 jobs (11 direct and 7 secondary) in 2005. With workload increases in the Nondefense Research and Development Program, 495 persons would relocate to Clark County and 25 persons to Nye County.

The demand for housing in the region of influence would increase as a result of the relocation of households associated with the NTS. In 2005, an estimated 193 households that support this program would relocate to Clark County and an estimated 9 households would relocate to Nye County, contributing to a decrease in housing vacancy rates.

Work for Others Program. In the region of influence, this program would create 27 jobs, including 8 direct and 19 secondary positions, in 1996. In 2000, employment in the region of influence would increase by 23 jobs (8 direct and 15 secondary). By the end of 2005, total employment would remain at 23 jobs. In Clark County, this program would contribute 22 jobs (7 direct and 15 secondary) in 2005. In Nye County, the Work for Others Program would contribute at least one job in 2005. Because of the workload increase in this program, 25 persons are anticipated to relocate in Clark County and one person in Nye County.

In 2005, an estimated 10 households that support the Work for Others Program would relocate to Clark County, and one household to Nye County, contributing to a decrease of housing vacancy rates.

Site-Support Activities. Under Alternative 3, additional employment would be required to support increased construction requirements under other programs. In the region of influence, site-support activities would create 1,497 jobs, including 450 direct and 1,047 secondary positions, in 1996. In 2000, employment in the region of influence would increase by 11,632 jobs (4,009 direct and 7,623 secondary). By the end of 2005, total employment would reach 5,648 (1,822 direct and 3,826 secondary). In Clark County, this program would contribute 5,384 jobs (1,708 direct and 3,676 secondary) in 2005. For Nye County, this program would contribute 210 jobs (129 direct and 81 secondary) jobs in 2005.

Because of workload increases in site-support activities, 1,695 persons would relocate to Clark County, and 234 persons to Nye County.

In 2005, an estimated 661 households that support this program would relocate to Clark County, and 89 households to Nye County, contributing to a decrease in housing vacancy rates.

PUBLIC FINANCE—The fiscal impact of all alternatives can be determined by subtracting their income statement totals from the Alternative 1 future baseline. The remaining fiscal impact is the specific impact associated with each alternative. Projected financial summaries are present in Table 5.3-10, and the text makes comparisons to Alternative 1.

Clark County. The expansion and improvement of the county infrastructure would continue to be the primary focus of Clark County fiscal efforts. In addition, Clark County has undertaken the implementation of a county facilities development program as discussed under Public Finance, Section 4.1.3.

Under Alternative 3, revenues for Clark County would increase because of increases in population, personal income, and total employment in the county. Assuming continued small increases in revenues and slightly larger initial increases in expenditures (see discussion on capital projects under Public Finance, Section 4.1.3), Alternative 3 would result in revenues less expenditures of a

Table 5.3-10. Projected financial summary for fiscal years 2000 and 2005, general, special revenues, debt service, and capital projects funds under Alternative 3

	Revenues Over Expenditures	Current Expense	Ending Fund Balance	Fund Balance as a Percentage of Current Expense
Fiscal Year 2000				
Clark County	($358,416)	$530,896,729	$1,309,506,535	246.66%
City of Las Vegas	$15,421,723	$198,785,755	$358,736,590	180.46%
City of North Las Vegas	($6,963,735)	$47,524,966	$30,459,795	64.09%
Clark County School District	($14,457,373)	$764,036,602	$125,786,513	16.46%
Nye County	$2,042,525	$26,371,978	$15,921,125	60.37%
Town of Tonopah	$85,400	$653,194	$845,107	129.38%
Town of Pahrump	$240,271	$962,762	$1,657,509	172.16%
Nye County School District	($1,173,255)	$27,521,758	$255,400	0.93%
Fiscal Year 2005				
Clark County	$38,981,856	$565,834,291	$2,154,436,001	380.75%
City of Las Vegas	$17,307,927	$211,713,581	$583,469,805	275.59%
City of North Las Vegas	($6,448,959)	$50,667,058	$48,766,937	96.25%
Clark County School District	($10,871,647)	$854,156,107	$194,428,324	22.76%
Nye County	$3,755,368	$28,214,353	$30,575,821	108.37%
Town of Tonopah	$79,266	$652,617	$1,255,095	192.32%
Town of Pahrump	$327,144	$1,107,419	$3,135,982	283.18%
Nye County School District	$7,669	$30,787,544	$5,863,763	19.05%

negative $358,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures are expected to be $38,982,000. The fund balance (or reserves) as a percentage of current expense is expected to be 247 percent in 2000 and 381 percent in 2005. To compare with Alternative 1, Clark County revenues over expenditures would be $2,144,000 more in 2000 and $1,941,000 more in 2005.

City of Las Vegas. Under Alternative 3, revenues over expenditures for the City of Las Vegas are expected to become positive in Fiscal Year 1995 because of increases in population, personal income, and total employment in the city. Assuming continued increases in revenues and expenditures, this alternative would result in revenues less expenditures of $15,422,000 in Fiscal Year 2000. It is predicted that by Fiscal Year 2005, revenues over expenditures would be $17,308,000. The fund balance as a percentage of current expense is expected to be 180 percent in 2000 and 275 percent in 2005. To compare with Alternative 1, revenues over expenditures would be $1,042,000 more in 2000 and $873,000 more in 2005.

City of North Las Vegas. Expenditures for North Las Vegas are forecast to continue to outpace revenues. Revenues over expenditures in Fiscal Year 2000 would be a negative $6,964,000 and a less negative $6,449,000 in Fiscal Year 2005. This is despite anticipated increases in population, personal income, and total employment in the city. Public safety and capital projects are anticipated to continue to be the largest expenditures. Taxes, which recently decreased (from $10,059,472 in Fiscal Year 1993 to $7,941,972 in Fiscal Year 1994), are expected to slowly grow to 1993 levels by Fiscal Year 2000. The fund balance as a percentage of current expense is expected to be 64 percent in Fiscal Year 2000 and 96 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $113,000 more in 2000 and $132,000 more in 2005.

Clark County School District. Under Alternative 3, revenues for the Clark County School District would expand because of increases in population and corresponding school enrollment. Regular program and undistributed expenditures would likely continue to increase. The school district is not predicted to achieve a positive fiscal position by Fiscal Year 2005, even with Alternative 3. With more students and no corresponding increases in revenue by Fiscal Year 2000, revenues less expenditures would be a negative $14,457,000 and, in Fiscal Year 2005, a less negative $10,872,000. The fund balance as a percentage of current expense is expected to be 16 percent in Fiscal Year 2000 and a 0.23 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $610,000 less in 2000 and $296,000 less in 2005.

Nye County. Under Alternative 3, revenues for Nye County would increase slightly because of increases in population, personal income, and total employment in the county. Assuming continued small increases in expenditures as well, a positive fiscal position is expected to be reached in Fiscal Year 1996. This alternative would result in revenues less expenditures of $2,043,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $3,755,000. The fund balance as a percentage of current expense is expected to be 60 percent in Fiscal Year 2000 and 108 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $476,000 more in 2000 and $300,000 more in 2005.

Town of Tonopah. Revenues and expenditures for the town of Tonopah would increase slightly because of increases in population, personal income, and total employment in the county. Assuming continued increases, Alternative 3 would result in revenues less expenditures of $85,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $79,000. The fund balance as a percentage of current expense would be 129 percent in Fiscal Year 2000 and 192 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $6,000 more in 2000 and $4,000 more in 2005.

Town of Pahrump. Under Alternative 3, revenues for the town of Pahrump would increase slightly because of increases in population, personal income, and total employment in the county. Assuming continued increases in revenues and slightly smaller initial increases in expenditures compared to Fiscal Year 1994, this alternative would result in revenues less expenditures of $240,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $327,000. The fund balance (or reserves) as a percentage of current expense is anticipated to be 172 percent in Fiscal Year 2000 and 283 percent in the Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $16,000 more in 2000 and $12,000 more in 2005.

Nye County School District. Under Alternative 3, revenues for the Nye County School District would increase slightly because of increases in population. Local sources would continue to generate the most revenue. Assuming small increases in revenues and expenditures, the school district would see a positive level of revenues over expenditures in Fiscal Year 2005. Revenues less expenditures are expected to be a negative $1,173,000 in Fiscal Year 2000 and $8,000 in Fiscal Year 2005. The fund balance as a percentage of current expense is expected to be 0.93 percent in Fiscal Year 2000 and 19 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $229,000 more in 2000 and $128,000 more in 2005.

PUBLIC SERVICES —Table 5.3-11 summarizes the level of service that would be required for Alternative 3, and the following text compares them to Alternative 1. In each case, the current level of service per 1,000 population is assumed to continue.

Public Education. A total of 7,928 full-time equivalent licensed teachers were employed by the Clark County School District in the 1993 to 1994 school year, resulting in a student-to-teacher ratio of 18:33. To continue with this ratio, the Clark County School District would require 11,185 teachers by the school year 2004 to 2005, or 80 more than under Alternative 1. The student-to-teacher ratio for Nye County School District was 16:39 in the 1994 to 1995 school year. Assuming this ratio were to be projected in the school year 2004 to 2005, 390 teachers or 6 more than with Alternative 1 would be required.

Police Protection. Assuming the same level of service in the future, requirements for sworn police and deputy protection in the year 2005 can be examined.

Table 5.3-11. Projected levels of public service for the years of 1996, 2000, and 2005 under Alternative 3

		Year		
Jurisdiction	Level of Service *	1996	2000	2005
Clark County School District Teachers	18.33	8,670	10,005	11,185
Nye County School District Teachers	16.39	274	349	390
Las Vegas Metropolitan Police Department (Las Vegas and county rural areas)	2.27	1,331	1,536	1,717
North Las Vegas Police Department	1.75	142	164	183
Nye County Sheriff's Office (Tonopah)	3.67	14	16	16
Pahrump Sheriff's Substation	1.85	30	42	52
Beatty Sheriff's Substation	2.59	5	6	5
Amargosa Valley Sheriff's Substation	2.01	2	3	3
Clark County Fire Department (urbanized unincorporated areas)	1.04	441	508	568
Las Vegas Fire Department	0.84	317	365	409
North Las Vegas Fire Department	1.15	93	108	121
Tonopah Volunteer Fire Department	7.09	28	30	30
Pahrump Volunteer Fire Department	1.98	32	45	56
Beatty Volunteer Fire Department and Ambulance Service	14.51	29	32	29
Amargosa Valley Volunteer Fire Department	23.12	27	32	36
Clark County Medical Doctors	1.37	1,481	1,710	1,911
Clark County Registered Nurses	4.84	5,223	6,027	6,738
Nye County Medical Doctors	0.34	9	12	13
Nye County Registered Nurses	1.53	42	54	60

* Level of service is per 1,000 population. The number of school teachers is based on student-to-student ratios, and the number of students is based on a percentage of the population.

The Las Vegas Metropolitan Police Department would require 1,717 sworn police officers or 12 more officers than under Alternative 1. The North Las Vegas Police Department would require 183 sworn officers or 1 more sworn police officer over Alternative 1. The Nye County Sheriff's Office in Tonopah would require 16 sheriff deputies or 1 more deputy sheriff over Alternative 1. The town of Pahrump Sheriff's Substation would require 52, the Beatty Sheriff's Substation would require 5, and the Amargosa Valley Sheriff's substation would require 3. This would lead to the requirement for one more deputy sheriff for the town of Pahrump and none for the Beatty and Amargosa Valley Sheriff's substations.

Fire Protection. It can be assumed that the present level of service based on current population can be projected into the future. The Clark County Fire Department, which handles fires in the urbanized unincorporated county, would be expected to require 568 firefighters in 2005, or 4 more than under Alternative 1. Some 409, or 3 more firefighters, would be required in the Las Vegas Fire Department in the year 2005. The North Las Vegas Fire Department would require 113 or 1 more firefighter. The Tonopah, Pahrump, Beatty and Amargosa Valley Volunteer Fire Departments would require 30, 56, 29 and 36 firefighters, respectively. There are changes of zero, one, one, and zero, respectively, in comparison with Alternative 1.

Health Care. The 1995 level of service for medical doctors and registered nurses was used to determine future needs based on population growth. By 2005, a total of 1,911 (14 more than under Alternative 1) medical doctors and 6,738 (49 more) registered nurses would be required in Clark County. In Nye County, 13 medical doctors and 60 registered nurses would be required, which is the same number of medical doctors and one more registered nurse from Alternative 1.

5.3.1.4 Geology and Soils. The following is a discussion of geologic and soils impacts.

Defense Program. Under Alternative 3, adverse impacts to geology and soils media are the same as those discussed under Defense Program in Alternative 1 (Section 5.1.1.4). Storage of weapons or components of weapons in the Device Assembly Facility and in the P-Tunnel has been proposed and, if implemented, could disturb geologic media. New stockpile management activities at the Device Assembly Facility would disturb approximately 29 acres of surface geologic media. Any additional excavation for this purpose would result in permanent loss of the excavated geologic media and could impact slope stability.

The construction and operation of the proposed National Ignition Facility at the North Las Vegas Facility would have no adverse impact on geological resources. The National Ignition Facility would require about 8 of vacant land. The soils at the North Las Vegas Facility are considered acceptable for standard construction techniques. Soil impacts during construction would be short-term and minor with appropriate standard construction erosion and sediment control measures. The site has been disturbed in the past; therefore, construction impacts would be minor. Net soil disturbance during operation would be less than for construction because areas temporarily used for laydown would be restored. Seismic risks would be taken into consideration during design, construction, and operation activities.

Waste Management Program. Adverse impacts to geologic media discussed for the Waste Management Program under Alternative 1 also apply under Alternative 3. Specific other facilities or actions that could adversely impact geologic media include those listed in Appendix A.

Environmental Restoration Program. Under Alternative 3, the adverse impacts to geologic media discussed under the Environmental Restoration Program in Section 5.1.1.4 apply.

Nondefense Research and Development Program. Under Alternative 3, the adverse impacts to geologic media discussed under the Nondefense Research and Development Program in Section 5.1.1.4 apply. Other facilities that could adversely impact geologic media are the Treatability Test Facility and the Area 6 decontamination pad.

Work for Others Program. Under Alternative 3, the adverse impacts to geologic media discussed under the Work for Others Program in Section 5.1.1.4 apply. Other specific actions that could adversely impact geologic media are associated with the demilitarization of conventional weapons.

Site-Support Activities. The impacts associated with site-support activities under Alternative 3 would be the same as those discussed under Alternative 1. Construction of new facilities could adversely impact the geologic media. Impact to geologic media is primarily from clearing of the site, construction of infrastructure, and excavation of aggregate.

5.3.1.5 Hydrology. The environmental impacts to surface hydrology and groundwater are described in the sections that follow . Discussions of impacts to water quality and water quantity are also presented.

5.3.1.5.1 Surface Hydrology—The impacts to surface hydrology for the five programs and site-support activities are presented in this section. One potential impact from all the programs would be alteration of natural drainage paths, resulting in potential preferential erosion of natural or fill deposits, deposition of sediments, ponding of water, or inundation of infrastructure. Activities could have minor effects on drainage patterns and discharge rates because of surface disturbance and altered infiltration rates.

No surface waters are used for water supplies. The ephemeral waters exist in normally dry washes for short periods of time and on the surface of usually dry lakes for periods of days to weeks. Water quality of the ephemeral waters is poor because of naturally high sediment loads and dissolved solids. Change to sediment loads and dissolved solids due to project activities would be minor compared to the natural baselines. No significant change in water quality or quantity is anticipated, and thus the impacts would be negligible.

Defense Program. Under Alternative 3, the adverse impacts to the surface hydrologic environment discussed under the Defense Program in Alternative 1 apply. The additional facilities and activities included under Alternative 3 could increase the adverse impacts to the surface hydrologic environment that are presented under Alternative 1. Information regarding these facilities is presented in Appendix A.

The proposed National Ignition Facility location at the North Las Vegas Facility is outside the 500-year floodplain of the local drainage. Construction of the National Ignition Facility at the North Las Vegas Facility would be expected to have minor to negligible effects on water quality with the implementation of a stormwater pollution and prevention plan to minimize soil erosion, sedimentation, and contamination of stormwater. Measures would be taken to comply with stormwater discharge regulations associated with construction activities.

Waste Management Program. Under Alternative 3, the adverse impacts to the surface hydrologic environment discussed under the Waste Management Program in Section 5.1.1.5 apply. The additional facilities and activities included under Alternative 3 could increase the adverse impacts to the surface hydrologic environment that are presented under Alternative 1.

Environmental Restoration Program. Under Alternative 3, the adverse impacts to the surface hydrologic environment discussed under the Environmental Restoration Program in Section 5.1.1.5 apply.

Nondefense Research and Development Program. Under Alternative 3, the adverse impacts to the surface hydrologic environment discussed under the Nondefense Research and Development Program in Section 5.1.1.5 apply. Specific other facilities that could adversely impact the surface hydrologic environment are the Treatability Test Facility and the Area 6 decontamination pad. The impacts would be the same as those described under Alternative 1.

Work for Others Program. Under Alternative 3, the adverse impacts to the surface hydrologic environment discussed under the Work for Others Program in Section 5.1.1.5 apply.

Site-Support Activities. Under Alternative 3, the impacts to the surface hydrologic environment discussed under site-support activities in Section 5.1.1.5 apply.

5.3.1.5.2 Groundwater—The demand for water resources under Alternative 3 would increase for all programs on the NTS. The major demands would be the Defense Program and a Solar Enterprise Zone facility under the Nondefense Research and Development Program. As a result of the increased demand for water, the impacts for Alternative 3 would be the same as Alternative 1, plus the added effects of the new actions that would be included under Alternative 3.

Defense Program. The impacts of Alternative 3 on the water resources of the NTS include all of the impacts considered under Alternative 1, plus the added impacts of the additional activities. The additional activities would result in a slight increase in water demand relative to Alternative 1, which are reflective of the historical NTS water demand. The additional activities are not expected to affect groundwater quality.

Groundwater would not be used for construction or operation of the proposed National Ignition Facility at the North Las Vegas Facility; all water would be purchased from public suppliers.

Waste Management Program. Under Alternative 3, additional waste disposal capacity would be developed, and minor added water demands would result. It is estimated that 9.251 m^3/yr (7.5 acre-feet per year) of groundwater will be needed for increased waste disposal. No significant adverse impacts are associated with this minor added demand for additional water. It is expected that the additional waste management activities would be similar to ongoing activities and that they would not have an additional impact on the groundwater. The craters that are and would continue to be used at the Area 3 Radioactive Waste Management Site represent the unavoidable adverse impacts that have resulted from past underground nuclear tests. Use of the craters for waste disposal and subsequent capping with engineered covers would prevent the downward migration of precipitation into the waste.

The underground shot cavities beneath the subsidence craters and waste cells in the Area 3 Radioactive Waste Management Site are much deeper than active hydrologic surface processes (infiltration, redistribution, and evapotranspiration) operating beneath the waste unit from the ground surface to a depth of approximately 31 m (100 ft). Current scientific models suggest that the chimney beneath the low-level waste water unit does not enhance or promote vertical groundwater flow between the waste water unit (subsidence crater) and the deep shot cavity. This conceptual model was confirmed by hydrologic data obtained in 1996 from the exploratory borehole completed beneath U-3bl. Water potential data indicate that there is no groundwater movement from 40 m to 96 m (131 ft to 315 ft) depth within the subsurface chimney (Van Cleave, 1996). Given the proximity of Area 5 to Area 3 (22 km [14 mi]) and the very similar hydrologic conditions, the defensible hydrogeologic conceptual model for Area 5 is being tested and validated for the Area 3 Radioactive Waste Management Site. The Environmental Restoration Program will evaluate the potential for groundwater contamination from shot cavities located in the unsaturated zone (more than 100 m [330 ft] above the water table).

After 30 years of waste disposal operation, groundwater monitoring at the Area 5 Radioactive Waste Management Site has not detected any contamination. In addition, field studies conducted to support the performance assessment, which include monitoring of soil moisture and chloride ion concentrations, indicate that water falling on the surface (precipitation) does not reach the groundwater. These studies and the absence of contamination support the conclusion that no groundwater pathway exists beneath the Area 5 Radioactive Waste Management Site. Thus, no impact to groundwater from waste management operations would occur during the timeframe covered in this EIS and long into the future (see Appendix A, Section A.2; Chapter 2, Section 2.5.6; and Chapter 4, Section 4.1.5.2 for additional information).

Environmental Restoration Program. For the Environmental Restoration Program, the impacts would be the same as for Alternative 1, but on an accelerated schedule. Additional restoration actions would be taken, and characterization wells would be drilled at a faster rate.

Acceleration of the Environmental Restoration Program schedule could result in a doubling of characterization water demands to about 246,696 m^3/yr (200 acre-feet per year). The impacts of this increase would not be significant, as the increase represents only a small portion of the available water in all but Yucca Flat.

Because no significant impacts on the water resources were identified and because of constraints on the length of time that would be required for remediation, no significant added impacts are anticipated as a result of accelerated remedial actions under Alternative 3. Small quantities of water would be needed for remedial actions unless active groundwater controls were implemented. In the unlikely event that such controls would be necessary, large-scale groundwater withdrawals (millions of cubic-meter per year [thousands of acre-feet per year]) could be required.

Nondefense Research and Development Program. The water demand for the Nondefense Research and Development Program is likely to be large and would have a significant impact on the availability of the groundwater in the basin in which actions are taken. The peak demand for a Solar Enterprise Zone facility has been estimated at between 4.0 x 10^6 m^3 and 6.8 x 10^6 m^3 (3,250 and 5,550 acre-ft/yr), depending on the final array of power-generating options that would be constructed. The alternate fuel vehicle and other demonstration projects would not have appreciable water demands unless large-volume aquifer testing were conducted. Any such occurrences would be evaluated on a case-by-case basis, and National Environmental Policy Act requirements would be met, as needed. Use of water for a Solar Enterprise Zone facility would more than triple the annual water use at the NTS. The impacts of a Solar Enterprise Zone facility on the water resources of the NTS would depend on the location, aquifer, perennial yield, and other water uses in the area. The two candidate sites for the facility are in Area 25 in Fortymile Canyon and Area 22 in Mercury Valley. The perennial yield of Fortymile Canyon is 9.4 x 10^6 m^3 (7,600 acre-feet per year). The peak historic demand was only 419,384 m^3 (340 acre-ft), leaving as much as 8.9 x 10^6 m^3 (7,260 acre-ft) of water available. Mercury Valley has a perennial yield of 9.9 x 10^6 m^3/yr (8,000 acre-ft/yr) and a peak historic demand of only 527,930 m^3 (428 acre-ft), leaving as much as 9.3 x 10^6 m^3 (7,570 acre-ft) of unappropriated water available.

The perennial yields of the two areas are based on the limited recharge from precipitation and the appreciable underflow from upgradient basins. In Fortymile Canyon, the naturally occurring recharge has been estimated by Scott et al. (1971) to be about 2.8 x 10^6 m^3/yr (2,300 acre-feet per year), with underflow estimated at 7.2 x 10^6 m^3/yr (5,800 acre-feet per year). The location of a Solar Enterprise Zone facility in Fortymile Canyon would increase total groundwater withdrawals from 1.2 x 10^6 to 3.7 x 10^6 m^3 (1,000 to 3,100 acre-ft) above the recharge from precipitation and would thus capture some of the underflow out of the basin. There may not be a one-to-one correspondence between the quantity of water withdrawn in excess of the perennial yield and the reduction in underflow to downgradient basins. The results of preliminary modeling of the groundwater withdrawals indicates that the groundwater level impacts will be localized within the vicinity of the well and most impacts will be upgradient. It is likely that some groundwater will be removed from storage, a process referred to as groundwater mining and there will be a corresponding decrease in the impact on downgradient discharge rates. The results presented herein are preliminary and are adequate for the purposes of this sitewide EIS. More detailed evaluations will be performed as more detailed information on water use by the facility becomes available and will be presented in lower-tiered National Environmental Policy Act documents prior to the development of the water.

The recharge from precipitation over Mercury Valley is slight, estimated at only 3.1 x 10^5 m^3/yr (250 acre-ft/yr) by Scott et al. (1971). Existing historic demands for water have exceeded this amount; thus, the development of water supplies for a Solar Enterprise Zone facility in Mercury Valley would likely capture some portion of the underflow out of the basin into Amargosa Desert (an estimated 2.09×10^7 m^3/yr [17,000 acre-ft/yr]).

Sensitive environmental areas downgradient of the NTS include Ash Meadows, Devils Hole, and Death Valley. A recent evaluation of water-level declines in Devils Hole was performed by the Las Vegas Valley Water District (Avon and Durbin, 1994). A statistical analysis of precipitation, water withdrawals in Pahrump Valley, water withdrawals on the NTS, and water levels in Devils Hole was performed as part of this evaluation. The results indicated that there was no relationship between water withdrawals on the NTS to lowering of water levels at Devils Hole. It is considered very unlikely that the withdrawal of the groundwater from the NTS for a Solar Enterprise Zone facility would have any significant adverse impact on downgradient water levels or spring discharge rates.

Site Support Activities. The additional water demand under Alternative 3 includes 3.8×10^4 m^3/yr (31 acre-ft/yr) of potable water and 6.5×10^5 m^3/yr (525 acrè-ft/yr) of nonpotable water. In total, the increase of 6.9×10^5 m^3/yr (556 acre-ft) is not a large quantity of water, and added impacts are not considered unless a large portion of that total is withdrawn from Yucca Flat. For Yucca Flat, any increases in groundwater withdrawals would add to the overdraft of groundwater (withdrawals in excess of the perennial yield) of that basin. In Yucca Flat, the total quantity of water needed would be quite small, a few thousands of cubic-meter (tens of acre-feet) at most.

5.3.1.6 ***Biological Resources***. Impacts are as discussed under Alternative 1, except that four major sources of impacts are added: expansion of the Device Assembly Facility for the Stockpile Management project; construction of the large, heavy industrial facilities near the Device Assembly Facility; construction of new facilities for Area 5 Waste Management projects; and implementation of the alternative energy project at one site on the NTS. A total of approximately 15,600 acres could be disturbed under Alternative 3. This represents an increase of 5,700 acres over Alternative 1. A portion of this area (3,000 acres) could be in tortoise habitat on the NTS. Alternative 3 projects could increase the risk of crushing tortoises at construction sites and along roads leading to construction sites. The alternative energy project is sufficiently large that it could negatively affect the viability of some small, local populations of some species if it were sited in an area where those species are found. Given these potential impacts of the alternative energy project, Alternative 3 might reduce biodiversity in the region.

Defense Program. Six defense-related activities would be conducted under Alternative 3. The nuclear emergency response activity would have the same potential impacts described under Alternative 1. The stockpile stewardship activity under Alternative 3 would increase the number of tests to be conducted, which would slightly increase the impact that is described in the introductory paragraph in this section. The hydrodynamic tests and dynamic experiments would be conducted at several appropriate places on the NTS, including two existing facilities in Yucca Flat (the Lyner Complex and the Big Explosives Experimental Facility) and two proposed new facilities. The existing facilities in Yucca Flat are north of the range of the desert tortoise (Rautenstrauch et al., 1994), and operations there are not expected to significantly impact surrounding habitat, the viability of plant or animal populations, or springs.

About 3 acres of habitat would be cleared for each proposed new facility, which would not be enough to influence population viability of plants and animals in these areas. A potential location for the next generator radiographic facility is north of the desert tortoise range. This facility should have no effect on springs. Transportation during construction might be a significant impact on desert tortoises because of the increased risk of crushing individuals along the road.

The stockpile management project includes assembly, disassembly, maintenance, and storage of nuclear devices. Under Alternative 3, a large facility could be built near the Device Assembly Facility in Area 6 to perform all stockpile management functions, including modifying nuclear weapons, quality assurance, testing, and interim storage of pits and components. About 8 acres would be cleared for this facility. Some or all of this land is currently undisturbed habitat. Densities of desert tortoises are relatively high around this site compared to other sites on the NTS (Blomquist et al., 1995). These tortoises might be crushed during construction and transportation activities for the project (U.S. Fish and Wildlife Service, 1992; DOE/NV, 1993). There are no other endangered, threatened, or candidate species at this site (Blomquist et al., 1995). The loss of habitat and associated mortality of individual plants and animals are not expected to significantly affect the viability of their population.

The new large, heavy industrial facilities under Alternative 3 would involve the disturbance of approximately 600 acres on the NTS in Area 6. No rare plants are known to occur at the site. Construction of these facilities should not affect the viability of the more common plant or animal populations because the disturbances are very small relative to the range of those populations. Desert tortoises might be killed during ground-clearing activities if these facilities were located within the range of desert tortoises. Tortoises also might be killed along roads during transportation activities. All surface-disturbing activities may kill or displace other wildlife such as small mammals, reptiles, and soil-dwelling invertebrates. If ground clearing for construction occurs during the breeding season, the eggs of birds in nests on the ground within a project area may be destroyed. Most birds that breed on the NTS are protected under the Migratory Bird Treaty Act.

Because construction of the large, heavy industrial facilities is the only likely activity to occur during the timeframe covered in this EIS, water demands would be low. Because groundwater used for construction would not be taken from the perched aquifers that supply springs on the NTS (Section 4.1.5.2), this action should have little or no impact on those springs. Given the small quantities of groundwater required, there would be no likely impacts on springs off the NTS during the construction phase. However, pumping the large quantities of groundwater needed during the operation phase of this project could impact off-site springs.

The storage and disposition of weapons-usable fissile materials project could occur within the Defense Industrial Zone in Areas 5 and 6 and in existing tunnels in Area 12. Biological resources could be affected by this activity during transportation of construction and waste material and during operation if there were an accidental release of radionuclides. Neither of these is likely to cause important impacts on biological resources because of the relatively small quantities of waste to be transported and because of the safety protocols in place (See Appendix I of this EIS).

Accidents associated with transport of nuclear devices and components, tritium, and associated radioactive waste for the Defense Program would be unlikely. Impacts on biological resources are unlikely to occur for this reason and because of the small quantities that would be released and the small areas impacted should an accident occur.

No original undisturbed native vegetation remains on the site of the North Las Vegas Facility. Few wildlife species exist at the North Las Vegas Facility because it is located in an urbanized area and contains little vegetation. The only species that exist are those adapted to urban habitats. No biological resource impacts are expected. The North Las Vegas Facility is located within urban Las Vegas on previously disturbed land within a fenced site. It is not expected that any threatened, endangered, or rare species exist. No impacts to threatened and endangered species are expected.

Waste Management Program. At the Area 3 Radioactive Waste Management Site, low-level waste would be buried in existing subsidence craters; four filled disposal cells would be closed. In addition, three additional craters would be used for a total of seven craters. Building 3-302 would be expanded, and a truck decontamination station would be constructed. Impacts of these activities were described for Alternative 1. The amount of undisturbed habitat that would be removed is about the same under Alternatives 1 and 3 because most of the project area is already disturbed.

Approximately 145 acres of previously undisturbed land would be disturbed at the Area 5 Radioactive Waste Management Site because of new construction projects. This would result in the loss of plant and wildlife habitat. Disturbances are not expected to impact viability of plant or animal populations. Threatened and endangered species are not likely to be impacted by construction given that no desert tortoises have been seen in the area (EG&G/EM, 1994). Several storage pits and disposal units would be closed. Because these disturbed sites would be revegetated, this activity would have a positive impact on habitat. There would be no effects on springs or their associated biota because there are no springs near this site.

Area 6 Waste Management Program activities and impacts would include all that are described for Alternative 1. In addition, a 14 acres Liquid Waste Treatment System would be constructed in Area 6 in 1996 or 1997. Impacts resulting from the construction and operation of the Liquid Waste Treatment System are presented in the Liquid Waste Treatment System Environmental Assessment, issued in 1995. Bird and bat candidate species and economically and recreationally important species like doves and waterfowl (Greger, 1995) could be exposed to hazardous materials or drown in open evaporative tanks constructed for this facility. Off the site, these doves and waterfowl could be harvested, thereby exposing hunters to contaminants. This site is located outside desert tortoise habitat (EG&G/EM, 1991; Rautenstrauch et al., 1994). There would be no effects on springs or their associated biota. Transportation of wastes to Area 6 would be unlikely to have significant impacts on biological resources because of the low probability of an accidental release during transport, the small quantity likely to be released, and the small area impacted should an accident occur. Area 11 Waste Management Program activities would be similar to those under Alternative 1; thus, impacts would be the same.

Environmental Restoration Program. Activities proposed under Alternative 3 are similar to those described under Alternative 1, with the exception that the rate at which these activities would be initiated and completed is likely to be accelerated. This is not likely to change the nature of the impacts; they should remain as described under Alternative 1.

Nondefense Research and Development Program. Five projects within this program would be conducted under this alternative. For four of these projects (Spill Test Facility, Alternate Fuel Demonstration Project, Environmental Management and Technology Development Project, and National Environmental Research Park), the impacts would not be substantially different from those described under Alternative 1. The fifth project within this program, alternative energy, would result in the destruction of large areas of undisturbed habitat and might use massive quantities of water. The Alternative Energy Solar Power Generating Project would involve the development of one of four technologies or subprojects in Areas 22 or 25 capable of generating electricity from solar energy. For this analysis, it was assumed that one of the four technologies would be developed there and that about 2,400 acres of previously undisturbed habitat would be cleared. This loss of habitat and associated mortality of individuals, disruption of movement patterns and gene flow, and other effects should not have a negative impact on the viability of most species found in that area because those species are common throughout a large region. The DOE/NV will consult with the U.S. Fish and Wildlife Service to evaluate the effects, if any, of the Alternative Energy Project on species listed as endangered, threatened, or candidates under the Endangered Species Act. Nests of birds, protected under the Migratory Bird Treaty Act, may also be destroyed if ground clearing for construction of the project occurred during the breeding season.

The abundance of desert tortoises is very low in the vicinity of proposed sites (EG&G/EM, 1991). If tortoises are within or near the chosen site, they might be killed, injured, or displaced during construction and operation of the facilities. Tortoises also are likely to be killed on roads during transportation activities for this project. Up to 6.8 x 10^6 m^3 (5,500 acre-ft) of water might be pumped annually from the underground aquifer for this project. Because this groundwater would not be taken from the perched aquifers that supply springs on the NTS (Section 4.1.5.2), this action should have little or no impact on those springs. Although the groundwater under the NTS is connected to springs in Devils Hole National Monument and Ash Meadows National Wildlife Refuge, water use at the NTS should affect neither water quality nor quantity in these springs (Section 5.3.1.5). Finally, construction of site-support facilities, such as a 97 km (60 mi) power line from Las Vegas, local water lines, and a 97 km (60 mi) natural gas pipe line, could adversely affect desert tortoises.

Work for Others Program. The Work for Others Program consists of five projects. The treaty verification, nonproliferation, and counterproliferation research and redevelopment projects would consist of the same activities and would have the same impacts under Alternative 3 as are described under Alternative 1. The joint Demilitarization Technology Program involves demonstration projects designed to explore the feasibility of resource and recycling technologies and destruction technologies that could be used to dispose of conventional munitions and solid rocket motors. Some activities would occur in existing underground facilities. Given the location and methods proposed for minimizing and monitoring vented hazardous gases, there are no expected impacts on biological resources. Activities for the second project, defense-related research and development, are similar to those described under Alternative 1. Therefore, the impacts on biological resources would be the same as those described in Section 5.1.1.6.

Site-Support Activities. Under Alternative 3, the NTS site-support activities would be expanded to the extent necessary to provide support for existing activities, as well as new projects and activities not previously performed at the NTS. Scheduled site support activities could remove at least 62 acres of undisturbed habitat. Potential impacts to biological resources are larger under this alternative relative to the other three alternatives. Given the development of several new projects under Alternative 3, it is likely that development to service these new projects would be sizeable. An example would be the construction of a natural gas pipe line from Las Vegas to service some subprojects within the alternative energy project. Projects of this size could have significant impacts on habitat removal and might lead to the death of desert tortoises because of crushing during construction. Based on historic levels of less than or equal to one tortoise killed on NTS roads per year, this increase in traffic might result in the mortality of two to three tortoises per year. This loss should not affect the viability of the tortoise population on the NTS. Given the number of new projects proposed for the Control Point or Device Assembly Facility areas or for areas along the southern boundary of the NTS, it is also likely traffic would become disproportionately common in areas inhabited by tortoises.

5.3.1.7 Air Quality. This section addresses the potential effects that the five programs and the site-support activities on the NTS might have on regional air quality. Emissions from stationary, mobile, and fugitive dust sources, shown in Tables 5.3-12 and 5.3-13, occur within and outside of the NTS. These emissions would be dispersed over the 3,496-km^2 (1,350-mi^2) area of the test site. At the boundaries of the site, ambient pollutant concentrations would be well below the ambient air standards. Carbon monoxide emissions from mobile sources in the Las Vegas Valley nonattainment area would be approximately 90-tons per year (40 percent of 224 tons, see Table 5.3-12 and Section 5.1.1.7). This value is below the 100-ton carbon monoxide de minimus value shown in Table 5.1-14. Therefore, a general conformity analysis would not be required for this alternative.

Defense Program. The air quality of the NTS is subject to periodic disturbance brought about by routine operations and test detonations. About 521 acres of land would be disturbed during Defense Program construction activities under this alternative. The average annual fugitive dust (PM_{10}) emission rate, including various drilling and construction activities, would be about 15.6 tons. These emissions represent 0.002 percent of the total Nye County fugitive emissions (864,600 tons). These calculations assume that fugitive dust would be reduced by 50 percent as a result of watering the sites. Because construction activities are expected to occur only on a short-term basis, long-term air quality impacts are not expected. Nevada Administrative Code 445, Sections 704 to 7165 regulates surface disturbance of 5 acres or more. The Nevada Division of Environmental Protection, Bureau of Air Quality, issued Operating Permit 2743 to the DOE for variable disturbance of land at the NTS. The permit expires in March 1998. There could be gaseous releases associated with new large, heavy industrial facilities. Pollutant concentrations combined with Alternative 1 concentrations would be in compliance with national and state standards. The transfer of Pantex stockpile management operations to the NTS would increase pollutant emissions. The amount of criteria and hazardous air-pollutant-emission increases at the NTS are shown in Tables 5.3-14 and 5.3-15, respectively.

Table 5.3-12. Summary of NTS construction emissions and mobile source emissions (on site and off site) tons per year, Alternative 3

	Construction	Mobile Sources								
		On Site			Off Site					
					Nye County			Clark County		
Program	Fugitive PM_{10}[a]	CO[b]	VOC[c]	NO_X[d]	CO	VOC	NO_X	CO	VOC	NO_X
Defense	15.6	87.21	11.85	15.53	27.14	4.10	9.59	52.69	7.96	18.60
Waste Management	2.3	31.17	4.24	5.55	9.20	1.47	3.43	18.83	2.85	6.65
Environmental Restoration	220.5	21.89	2.97	3.89	6.81	1.03	2.41	13.23	2.00	4.67
Nondefense Research and Development	360	8.91	1.21	1.59	2.77	0.42	0.98	5.38	0.81	1.90
Work for Others	3.0	0.37	0.05	0.07	0.12	0.02	0.04	0.22	0.03	0.08
Site Support Activities	1.8	221.55	31.10	39.46	68.96	10.42	24.36	133.85	20.23	47.26
Total	**603.2**	**371.10**	**50.42**	**66.09**	**115.50**	**17.46**	**40.81**	**224.20**	**33.88**	**79.16**

a PM_{10} = Particulate matter with a diameter equal to or less than 10 micrometers
b CO = carbon monoxide
c VOC = volatile organic compounds
d NO_X = nitrogen oxides

Table 5.3-13. Site-support activities stationary emissions at the NTS and Nye County, tons

Area	TSP[a]	SO_2[b]	NO_X[c]	HC[d]	CO[e]
Area 1	34.70	3.40	2.20	0.10	0.50
Area 2	87.30	0.00	0.00	0.00	0.00
Area 3	24.37	0.00	0.00	0.00	0.00
Area 6	12.33	3.16	59.60	0.94	39.00
Area 23	1.12	10.62	9.40	0.00	2.54
U.S. DOE Portable[f]	17.68	15.24	229.32	0.00	49.68
Fuel Storage Tanks	0.00	0.00	0.00	31.95	0.00
Total NTS	**177.50**	**32.42**	**300.52**	**32.99**	**91.72**
Total Nye County	**1,685.70**	**960.68**	**933.28**	[g]	**187.68**

[a] Total suspended particulates
[b] Sulfur dioxide
[c] Nitrogen oxides
[d] Hydrocarbon
[e] Carbon monoxide
[f] Compressors
[g] No data; State hydrocarbon emission inventory is not complete.

Source: Bureau of Air Quality, State of Nevada, 1995.

Table 5.3-14. Stockpile management facilities criteria pollutant summary

Pollutant	Pounds per Year	Tons Per Year
CO[a]	49,589.01	24.79
NO_x[b]	119,173.42	59.59
PM[c]	18,604.74	9.30
SO_2[d]	0.22	0.00
Total	**187,367.39**	**93.68**

[a] Carbon monoxide
[b] Nitrogen oxides
[c] Particulate matter
[d] Sulfur dioxide.

Source: Pantex Plant Environmental Information Document, 1995.

Table 5.3-15. Stockpile management facilities hazardous air pollutants emissions summary[*] under Alternative 3 (Page 1 of 2)

Pollutant	Chemical Abstracts Service (CAS #)	Pounds per Year	Tons per Year
1,1,1-chloroethane	75003	50.14	0.03
1,1,2-trichloroethane	79005	8.34	0.00
2-nitropropane	79469	3.76	0.00
Benzene	71432	201.49	0.10
Carbon Disulfide	75150	59.64	0.03
Carbon Tetrachloride	56235	34.36	0.02
Chlorobenzene	108907	3.94	0.00
Chromium	7440473	4.71	0.00
Cresol	1319773	0.11	0.00
Cresylio Acid	1319773	0.11	0.00
Dibenzofuran	132649	0.16	0.00
Ester Glycol Ethers	Not Applicable	1.89	0.00
Ethene, tricholor	79016	3.48	0.00
Ethyl Benzene	100414	3.34	0.00
Ethylene Dichloride	107062	2.93	0.00
Formaldeyde	50000	127.62	0.06
HCL	7647010	2,438.56	1.22
HF	7664393	2,592.76	1.30
Ketones	Not Applicable	0.061	0.00
Lead	7439921	408.37	0.20
Mercury	Not Applicable	0.00	0.00
Methane Dichloro	75092	12.35	0.01
Methanol	67561	2,411.40	1.21
Methyl Ethyl Ketone	78933	15,581.44	7.79
Methyl Isobutyl Ketone	108101	1.36	0.00
Methylene Chloride	75092	401.39	0.20
Naphthalene	91203	0.90	0.00

Table 5.3-15. Stockpile management facilities hazardous air pollutants emissions summary[*] under Alternative 3 (Page 2 of 2)

Pollutant	Chemical Abstracts Service (CAS #)	Pounds per Year	Tons per Year
Nickel	7440020	0.36	0.00
Nitrobenzene	98953	0.11	0.00
Phenol	108952	4.92	0.00
Tetrachloroethylene	127184	14.19	0.01
Toluene	10883	1,027.29	0.51
Trichloroethylene	79016	43.00	0.02
Triethylamine	121448	0.00	0.00
Xylene	1330207	489.75	0.25
Total		**25,933.72**	**12.96**

[*] Amounts less than 0.01 lb/yr or less than 0.01 tons/yr are listed as 0.00.

Source: Pantex Plant Environmental Information Document, 1995.

These emissions are based on the 1993 Pantex emission inventory (Pantex, 1995). The stationary-source criteria pollutant emissions would increase 20 to 30 percent above those shown in Table 5.3-13. If the emissions from the large, heavy industrial facilities were included, emission increases could require a Prevention of Significant Deterioration permit application. The NTS would be considered a major source under Prevention of Significant Deterioration requirements (potential to emit 250 tons per year or more of any air pollutant subject to regulation under the Clean Air Act).

Military aircraft conduct training exercises in the airspace over the NTS, and the pollutant emissions released from these aircraft are distributed over a large area. A study has shown that pollutant ambient air standards. Carbon monoxide emissions from mobile sources in the Las Vegas Valley nonattainment area would be approximately 90-tons per year (40 percent of 224 tons, see Table 5.3-12 and Section 5.1.1.7). This value is below the 100-ton carbon monoxide de minimus value shown in Table 5.1-14. Therefore, a general conformity analysis would not be required for this alternative.

Defense Program. The air quality of the NTS is subject to periodic disturbance brought about by routine operations and test detonations. About 521 acres of land would be disturbed during Defense Program construction activities under this alternative. The average annual fugitive dust (PM_{10}) emission rate, including various drilling and construction activities, would be about emissions from operations contribute no more than 0.05 percent of the allowable ambient concentrations (SAIC/DRI, 1991). Thus, these military aircraft operations have a negligible impact on air quality over the NTS. Aircraft operations at Desert Rock Airport (Mercury) are relatively low (3,500 to 4,000 operations per year); therefore, the emissions resulting from related air and ground activities would be negligible (SAIC/DRI, 1991).

Operation of the proposed National Ignition Facility in North Las Vegas would generate criteria and toxic/hazard pollutants resulting from the combustion of boiler fuel for heating, operation of diesel generators, and solvent cleaning processes. The emissions consist of particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and volatile organic compounds. Boiler fuel is assumed to be liquefied petroleum gas. Concentrations of pollutants resulting from operation of the proposed National Ignition Facility added to existing concentrations are expected to be within federal and state regulation levels. For additional information, consult the *Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (DOE,1996).

Waste Management Program. The NTS Waste Management Program activities are conducted in four primary areas: Areas 3, 5, 6, and 11. About 75 acres of land would be disturbed over a 10-year period. The average annual fugitive dust emissions (PM_{10}) would be about 2.3 tons. Most of the fugitive dust would be generated during the construction of a new waste storage site.

Calculations assume that fugitive dust would be reduced 50 percent as a result of watering the sites. Because construction activities are expected to occur only on a short-term basis, long-term air quality impacts are not expected.

Environmental Restoration Program. The total fugitive dust emissions (PM_{10}) generated from environmental restoration projects would be about 221 tons per year, compared with the total fugitive dust (PM_{10}) emissions generated in Nye County, which would be about 866,400 tons per year. The total Environmental Restoration Program emissions represent about 0.03 percent of the county's PM_{10} burden.

Nondefense Research and Development Program. One Nondefense Research and Development Program at the NTS with Alternative 3 could impact air quality. The Solar Enterprise Zone facility would be the site of a 100-megawatt (MW) solar generation facility, which would be located in either Area 22 or Area 25. It was assumed that the maximum disturbed area for the facility would be 2,402 acres, and the construction period would be two years. Annual fugitive dust (PM_{10}) emissions would be approximately 360 tons.

Work for Others Program. Under Alternative 3, the use of NTS airspace and certain land by the DoD for training, research, and development would continue and possibly increase. The approximately 10 acres of land disturbance with this program would cause 3 tons of PM_{10} emissions.

Site-Support Activities. Stationary sources at the NTS for emissions include the shaker plant, boilers, aggregate crushing and processing, a concrete batch plant, and fuel storage tanks. Portable compressor emissions are also included. The construction of a large, heavy industrial facility in Area 6, would contribute to the emissions. About 30 acres of land would be disturbed for new facility construction, generating 1.8 tons of PM_{10}.

RADIOACTIVE AIR QUALITY—Air concentrations would have to be 14 times higher than the measured 1993 average concentrations to achieve the maximum CAP-88 air dose assessment modeled dose (see Section 4.1.7). Average concentrations from the five programs and site- support activities are estimated never to equal or exceed this amount. Impact to air quality by radioactive effluents under Alternative 3 would be minimal.

5.3.1.8 Noise. Because of its large size (3,496 km^2 [1,350 mi^2]), noise generated on the NTS does not propagate off site at audible levels. The closest sensitive receptors to the site boundary are residences located 2 km (1.3 mi) to the south in the town of Amargosa Valley. Therefore, NTS noise impacts for this alternative are a result of noise generated during the operation of construction equipment and from the transportation of personnel and materials to and from the site. The NTS total construction and operations workforce under this alternative would increase from 1996 to 2005.

Railroad and aircraft noise was considered. No railroads serve the NTS; therefore, railroad noise impact analyses were not required. Based on composite noise contours developed by the U.S. Air Force in 1994 for subsonic and supersonic flight operations over the NAFR Complex (U.S. Air Force, 1994), the day-night average sound level (L_{dn}) on the NTS portion of the complex resulting from aircraft operations would be less than 50 db. Flight operations at supersonic speeds are not authorized over the NTS (SAIC/DRI, 1991), and subsonic operations are not normally scheduled over the eastern portion of restricted area R-4808, which includes most of the NTS (U.S. Air Force, 1994). Only periodic helicopter and small fixed-wing aircraft operations are conducted from Desert Rock Airport. All noise impacts under Alternative 3 would be the same as those under Alternative 1, with additional impacts resulting from an increase in training exercises.

At the North Las Vegas Facility, the noise background levels are those that would be expected in an urbanized industrial area. No anticipated impacts from additional noise are anticipated for operations activities. Construction activities would contribute a small portion of noise temporarily.

*5.3.1.9 **Visual Resources**.* An analysis has been conducted to determine the effects of Alternative 3 activities on visual resources. Visual impacts were assessed on the potential of activities to alter or conflict with the existing landscape character.

Defense Program. Under Alternative 3, a total of 1,000 acres of new ground disturbance is anticipated to occur for projects related to the Defense Program. The projects would be located in areas of scenic quality common to the area. Most of this ground disturbance would be associated with new construction at the Device Assembly Facility in Area 6, and the large, heavy-industrial facilities, which have not been sited. Area 6 is currently used for large, heavy industrial activities. It is not anticipated that these facilities would be seen from public viewpoints. Therefore, impacts to visual resources resulting from facility construction and operation on visual resources would be negligible.

Under Alternative 3, a nuclear test would be conducted if directed by the President. Underground testing likely would be conducted in existing drill holes. The test would occur in the existing testing areas that do not have high scenic value and are not visible from public viewpoints. Therefore, impacts to visual resources caused by testing would be negligible.

The North Las Vegas Facility occupies approximately 80 acres in the city of North Las Vegas, Nevada. The area can be described as an urbanized industrial area, and visual resources are typical for such an area. No additional impacts are expected to visual resources.

Waste Management Program. The Waste Management Program would generate approximately 209 acres of new ground disturbance under Alternative 3. The new facilities would be located in areas of scenic quality common to the region, near similar facilities in areas that are already disturbed. None of the Waste Management Program projects would be visible from any public viewpoints. Therefore, impacts to visual resources from waste management operations would be negligible.

Environmental Restoration Program. Under Alternative 3, the Environmental Restoration Program would generate approximately 50 acres of new ground disturbance. Environmental Restoration Program activities would be located in areas of scenic quality common to the region, and none would be visible from any public viewpoints. Depending on pertinent reclamation factors, disturbed areas would be revegetated after remediation is completed. Adverse impacts would be negligible. There would be some beneficial impacts to visual resources once vegetation is reestablished.

Nondefense Research and Development Program. The Nondefense Research and Development Program would cause approximately 2,400 acres of new ground disturbance for the construction of a Solar Enterprise Zone facility. A Solar Enterprise Zone facility is proposed to be located on the southern NTS boundary (Area 22) and would be visible from U.S. Highway 95. However, the scenic quality is classified as Class C. The landscape character of the area is common to the region, and there is a minor amount of existing manmade modification in the highway viewshed. Because of the size of the area affected and the visibility from Highway 95 (a view corridor with a high sensitivity level) there would be adverse impacts to visual resources.

Work for Others Program. Only 10 acres of new ground disturbance would occur for this program under Alternative 3. Although most Work for Others Program activities are proposed for existing facilities, some new construction would occur. Most of the ground disturbance would be related to construction of the facilities. The new facilities would be constructed near existing facilities, which are located in areas with common scenic quality and are not visible from public viewpoints. Therefore, impacts would be negligible.

Site-Support Activities. Approximately 30 acres of new ground disturbance would occur for site-support activities under Alternative 3. Most of the ground disturbance would be related to new road and utility corridor construction to support expanded programs. Ground disturbance would be scattered throughout the NTS. Impacts to visual resources would be negligible.

5.3.1.10 Cultural Resources. The amount of acreage disturbed as a result of activities described for Alternative 3 would increase substantially as compared to Alternative 1. All activities as proposed under Alternative 1 are proposed under Alternative 3 with the addition of construction of fifteen buildings, expansion of waste management and disposal areas, increased road construction, expansion of communications, water control systems and flood protection, increased cleanup activities, and an expansion of power lines and gas lines. A total of 15,600 acres are expected to be disturbed under Alternative 3. Continued visitation and vehicular traffic could lead to vandalism or artifact collecting that could directly affect recorded archaeological sites and archaeologically sensitive areas.

Although archaeological surveys have not been conducted in these areas, it is estimated that more than 67 sites could be impacted by projects associated with this alternative based on surveys conducted in adjacent areas in 1994. The precise location and number of these resources are unknown until archaeological surveys are conducted. Surveys will be conducted prior to any ground-disturbing activities, and impacts would be mitigated through the measures described in Chapter 7. At least eight structures will be decommissioned under Alternative 3. If these buildings are determined to be historically significant, they would be mitigated using measures described in Chapter 7.

Defense Program. Additional impacts are expected from ground disturbances associated with the construction of facilities, upgrading utilities, and construction of a waste management complex. Increased visitation and vehicular traffic in archaeologically sensitive areas could have indirect impacts. All surveys will be performed prior to any ground-disturbing activities or expansion of existing facilities.

At North Las Vegas, the construction and operation of the proposed National Ignition Facility would have no effect on archaeological sites or historic structures that are listed on or eligible to be listed on the National Register of Historical Places or Native American cultural resources.

Waste Management Program. Under Alternative 3, waste management would expand and additional facilities would be constructed in Area 3 and Area 5 at the NTS. An increase in ground disturbance, and an increase in visitation could have an impact on cultural resources.

Environmental Restoration Program. Impacts to cultural resources are the same as those contained in Alternative 1.

Nondefense Research and Development Program. Additional impacts may occur through construction of the Natural Gas facility.

Work for Others Program. Impacts are the same as contained in Alternative 1.

<u>AMERICAN INDIAN CULTURAL RESOURCES</u>—*This section contains the description of the American Indian concerns associated with implementing Alternative 3, as summarized by the CGTO.*

<u>Defense Program at the NTS</u>—*Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if new Defense Program operations are undertaken or if current underground nuclear tests are expanded into previously unused areas. Access to culturally significant places will be reduced because Indian peoples' perception of health and spiritual risk will increase if additional testing, storage, disassembly,*

or disposal of nuclear and conventional weapons occur.

Waste Management Program at the NTS—Under Alternative 3, it is expected that American Indian cultural resources will continue to be adversely impacted, in particular, if waste storage facilities are expanded because the waste has not been disposed of in a culturally appropriate manner. Access to culturally significant places on the NTS will be reduced because waste isolation facilities increase Indian people's perception of health and spiritual risks.

Environmental Restoration Program at the NTS—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted by an expansion of the monitoring well program and access road activities, but will be positively impacted by actions that return disturbed land to its natural condition in a culturally appropriate manner and with the participation of Indian people.

Nondefense Research and Development Program at the NTS—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted by increased visits by students and researchers who collect artifacts, visit sacred areas, and remove plants or animals. Cultural resources will be positively impacted if students and researchers receive proper guidance by Indian people regarding how to visit places and interact with the environment.

Work for Others Program at the NTS—Under Alternative 3, it is expected that American Indian cultural resources will be impacted if the NTS continues to be a place where weapons are stored, disassembled, and disposed. These actions have and will continue to pollute these lands. The presence of conventional and nuclear weapons defines the NTS as a place of destruction which promotes an image that is inappropriate for a place for peaceful relations between Indian ethnic groups. American Indian cultural resources will continue to be impacted by military training exercises and weapons tests.

Defense Program at Area 13—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if nuclear safety tests continue or increase and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests at the Area 13 site on the NAFR Complex.

Waste Management Program at Area 13—Under Alternative 3, it is expected that American Indian cultural resources will not be adversely impacted because there is no Waste Management Program on the Area 13 site on the NAFR complex and none has been identified for this alternative.

Environmental Restoration Program at Area 13—Under Alternative 3, it is expected that American Indian cultural resources of the Area 13 site on the NAFR Complex be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will increase if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program at Area 13—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during research and development. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

Work for Others Program at Area 13—Under Alternative 3, it is expected that American Indian cultural resources will be impacted if weapon research and development programs continue or are expanded at the Area 13 site. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

5.3.1.11 Occupational and Public Health and Safety. Alternative 3 includes all program activities described under Alternative 1, plus additional activities. For NTS workers, the increased activities are expected to result in a corresponding increase in human health and safety impacts compared with Alternative 1. Table 5.3-16 summarizes the occupational and public health and safety impacts to construction and operations and maintenance personnel for each NTS program area under Alternative 3. Increased impacts to public health and safety can also be anticipated under Alternative 3. For routine activities, these impacts are primarily related to routine air emissions and transportation activities. Potential impacts to the public from routine air emissions of radioactivity and priority pollutants are discussed in Section 5.3.1.7, Air Quality. Transportation impacts are discussed in Section 5.3.1.2. This section contains the discussion of potential impacts to public health and safety from subsurface contamination of groundwater and from accidental releases of radioactivity to the air.

Unless otherwise noted, impacts presented in this section are the total impacts for the 10-year period evaluated in this EIS. Results are presented for each program area although some program areas do not involve hazards from radiation or hazardous chemicals.

Defense Program. Based on occupational injury and fatality rates for construction and other industrial activities and on projected increases in the worker population under Alternative 3, Defense Program activities at the NTS are expected to result in 3.7 injuries to workers during routine program activities and in 61 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 0.0066 fatalities are expected because of routine activities, and 0.11 fatalities are expected from construction activities. Based on previous NTS occupational radiation records and on projected increases in the worker population under Alternative 3, occupational exposure to radiation is estimated to result in a collective dose to NTS Defense Program workers of about 115-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.046 latent cancer fatalities and 0.018 other detrimental health effects in the worker population. Risk of accidental exposure to workers increases the latent cancer fatality risk by 0.005 and the risk of other detrimental health effects by 0.002. No Defense Program hazardous chemical accident resulting in measurable effects at the NTS has been identified.

The health and safety impact to the public from potential Defense Program accidents could result in about 4.4×10^{-6} latent cancer fatalities and 2.0×10^{6} other detrimental health effects in the population. Should the DOE be directed by the President to conduct underground nuclear-yield testing under Alternative 3, potential accidents associated with venting of radionuclides following a test could result in a risk of about 0.0054 latent cancer fatalities and 0.0025 other detrimental health effects in the population.

The maximum reasonably foreseeable Defense Program radiological accident at the NTS would be the same as described in Section 5.1.1.11 for Alternative 1 (an explosion of high explosives associated with interim stored nuclear weapons at the Area 27 storage bunkers, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year.

No Defense Program accident resulting in measurable chemically hazardous effects at the NTS has been identified.

Subsurface radioactivity from past underground nuclear weapons tests would continue to be a potential exposure pathway for the public under Alternative 3. Potential impacts to the public would be identical to those described under Alternative 1. The maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 8×10^{-13} (about one in one trillion) and 1×10^{-5} (about one in 100,000). The public exposure scenario assumes that the individual consumes contaminated well water for 70 years centered around the time of peak tritium concentration in well water. These impacts are not expected to occur within the 10-year timeframe of this EIS.

Table 5.3-16. Health risks to workers and the public from program activities, Nevada Test Site, Alternative 3

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense (with nuclear testing)	65	0.12	0.051 (0.053)	0.020 (0.021)	e	e	4.4×10^{-6} (0.0054)	2×10^{-6} (0.0025)	e	e
Waste Management	467	8.7	0.0025	0.010	5.2×10^{-7}	0.48	5.1×10^{-5}	2.3×10^{-5}	2×10^{-5}	3.8×10^{-6}
Environmental Restoration	11	0.035	0.0096	0.0036	3×10^{-7}	0.14	2.3×10^{-10}	1.1×10^{-10}	6×10^{-6}	2.4×10^{-6}
Nondefense Research and Development	8.6	0.015	0.0042	0.0017	3.2×10^{-6}	0.58	f	f	1.9×10^{-4}	1.5×10^{-4}
Work for Others	11	0.019	0.0055	0.0023	8.9×10^{-8}	2.4	2×10^{-7}	9.2×10^{-8}	4.2×10^{-7}	6.4×10^{-7}
Site Support Activities	210	0.37	0.054	0.021	e	e	f	f	e	e
Total (with nuclear testing)	**773**	**9**	**0.13 (0.18)**	**0.059 (0.08)**	**4.1×10^{-6}**	**2.4**	**5.6×10^{-5} (0.0055)**	**2.5×10^{-5} (0.0025)**	**2.3×10^{-4}**	**1.5×10^{-4}**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis

b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis

c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the10-year period of analysis

d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more

e. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified

f. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

For the North Las Vegas Facility, the occupational and public health and safety impacts described in this section are based on analyses documented in the Draft Programmatic EIS for Stockpile and Managmement (DOE, 1996). Potential radiation exposures to workers inside the proposed National Ignition Facility would be kept as low as reasonably achievable through facility design and administrative controls. The average worker inside the facility is estimated to receive about 30 millirem per year, and the worker population inside the facility is estimated to receive a collective dose of 10 person-rem per year. Over the 10-year period of activities considered by the NTS EIS, workers could receive a total dose of 100 person-rem which would result in a risk of 0.04 (about 1 in 25) of a single latent cancer fatality in the worker population. Other workers at the North Las Vegas Facility outside the National Ignition Facility are estimated to receive a collective dose of 0.07 person-rem per year, or a maximum of 0.7 person-rem over 10 years with a corresponding cancer fatality risk of 2.8×10^{-4} (about 1 in 4,000).

Potential radiation exposures to the public within 80 kilometers (50 miles) of the proposed National Ignition Facility would be well within regulatory limits. The maximally exposed public individual is estimated to receive an annual dose of 0.6 millirem per year, which is much less than the limit of 100 millirem per year from all DOE sources. Over the 10-year period of activities considered by the NTS EIS, this individual could receive a total dose of 6 millirem resulting in a risk of 3×10^{-6} (about 1 in 300,000) of contracting a fatal cancer. The entire population within 80 kilometers is estimated to receive a collective dose of 0.6 person-rem per year, or 6 person-rem over 10 years with a corresponding risk of 0.003 (about 1 in 300) of a single latent cancer fatality in the exposed population.

No routine impacts from hazardous chemicals would be expected to occur because only minute quantities of volatile organic compounds are expected to be emitted during routine operations.

The maximum reasonably foreseeable radiological accident associated with the proposed National Ignition Facility involves a severe earthquake that occurs during a maximum-credible-yield fusion experiment. The collapse of beamlines and building structures would potentially result in atmospheric releases of tritium in the tritium processing system, activitated gases in the air, and activated material in the target chamber. The joint frequency of a severe earthquake during a maximum-credible-yield fusion experiment would be less than 2×10^{-8} per year. If this accident occurred, workers at the North Las Vegas Facility could receive a collective dose of 47 person-rem resulting in a risk of 0.019 (about 1 in 50) of a single latent cancer fatality among the worker population. The maximally exposed public individual could receive a dose of 68 millirem resulting in a latent cancer fatality risk of 3.4×10^{-5} (about 1 in 30,000). The population within 80 kilometers could receive a collective dose of 4,900 person-rem per year, potentially resulting in two to three latent cancer fatalities among the exposed population.

The maximum reasonably foreseeable chemical accident associated with the proposed National Ignition Facility involves an accidental release of mercury. People within 239 m (784 feet) of the release could experience adverse health effects from mercury inhalation if not protected (i.e., sheltering inside building, breathing protection). The nearest members of the public would be 210 m (689 ft) west of the facility. The personnel in nearby buildings would likely be protected because the release (typically lasting 15 minutes) would pass by the buildings with little infiltration. Personnel in the NIF Laser and Target Area Building and those outside in the immediate vicinity might be affected.

Waste Management Program. Based on occupational injury and fatality rates for construction and other industrial activities and on projected increases in the worker population under Alternative 3, the Waste Management Program at the NTS is expected to result in 440 injuries to workers during routine program activities and 27 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 8.7 fatalities are expected because of routine activities, and 0.048 fatalities are expected from construction activities.

Based on previous NTS occupational radiation records and on projected increases in the worker population under Alternative 3, occupational exposure to radiation is estimated to result in a collective dose to NTS Waste Management Program workers of about 23-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0092 latent cancer fatalities and 0.0037 other detrimental health effects in the worker population. The risk of accidental exposure increases the latent cancer fatality risk by 0.016 and detrimental health effect risk by 0.0064. The risk of a single cancer in the worker population as a result of accidental exposure to hazardous chemicals is estimated to be 5.2×10^{-7}. The risk of life-threatening noncarcinogenic effects to a single worker from Waste Management Program hazardous chemical accidents has a hazard index of 0.48. A hazard index less than 1.0 indicates that no life-threatening noncarcinogenic health effects would be expected to occur.

The health and safety impact to the public from potential Waste Management Program accidents could result in about 5.1×10^{-5} latent cancer fatalities and 2.3×10^{-5} other detrimental health effects in the population. Waste Management Program accidents involving hazardous chemicals could result in about 2.0×10^{-5} cancers in the population. No noncancer effects from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Waste Management Program radiological accident at the NTS would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Area 5 transuranic waste storage unit, which has a probability of occurrence of 6×10^{-7} (1 in 1,700,000) per year.

For Waste Management Programs hazardous chemical effects, the maximum reasonably foreseeable accident would also be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Area 5 hazardous waste storage unit, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year.

Environmental Restoration Program. Based on occupational injury and fatality rates for construction and other industrial activities and on projected increases in the worker population under Alternative 3, Environmental Restoration Program activities at the NTS are expected to result in 8.8 injuries to workers during routine program activities and 2.5 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 0.03 fatalities are expected from routine activities, and 0.0044 fatalities are expected from construction activities.

Based on previous NTS occupational radiation records and on projected increases in the worker population under Alternative 3, occupational exposure to radiation is estimated to result in a collective dose to NTS Environmental Restoration Program workers of about 23-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0093 latent cancer fatalities and 0.0037 other detrimental health effects in the worker population. The risk of accidental worker exposure to hazardous chemicals increases the risk of fatal or nonfatal cancer in the worker population by 2.8×10^{-7}. The risk of life-threatening noncarcinogenic effects to workers from Environmental Restoration Program hazardous chemical accidents has a hazard index of 0.14.

The health and safety impact to the public from potential Environmental Restoration Program radiological accidents could result in about 2.3×10^{-10} latent cancer fatalities and 1.1×10^{-10} other detrimental health effects in the population. Environmental Restoration Program accidents involving hazardous chemicals could result in about 1.6×10^{-5} cancers in the population. No noncancer effects to the public from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Environmental Restoration Program radiological accident at the NTS would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Area 13 site, which has a probability of occurrence of 7×10^{-7} [1 in 1,400,000]) per year.

For Environmental Restoration Program hazardous chemical effects, the maximum reasonably foreseeable accident would also be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into a hypothetical environmental restoration site consisting of a composite of hazardous sites across the NTS, which has a probability of occurrence of 7×10^{-7} (1 in 1,400,000) per year.

Nondefense Research and Development Program. Based on occupational injury and fatality rates for construction activities and on projected increases in the worker population under Alternative 3, Nondefense Research and Development Program activities at the NTS are expected to result in 8.6 injuries and 0.015 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of routine activities.

Based on previous NTS occupational radiation records and on projected increases in the worker population under Alternative 3, occupational exposure to radiation is estimated to result in a collective dose to NTS Nondefense Research and Development Program workers of about 11-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0042 latent cancer fatalities and 0.0017 other detrimental health effects in the worker population. No Nondefense Research and Development Program accident resulting in measurable radiological effects at the NTS has been identified.

The risk of accidental worker exposure to hazardous chemicals increases the risk of a single cancer in the worker population by 3.2×10^{-6}. The risk of life-threatening noncarcinogenic effects to workers from Nondefense Research and Development hazardous chemical accidents has a hazard index of 0.58.

The health and safety impact to the public from potential Nondefense Research and Development Program accidents could result in about 1.9×10^{-4} cancers in the population. No hazardous chemical noncancer effects to the public from chemical accidents would be expected to occur.

For Nondefense Research and Development Program hazardous chemical effects, the maximum reasonably foreseeable accident would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the tank farm at the Fuel Spill Test Facility, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year.

Work for Others Program. Based on occupational injury and fatality rates for construction activities and on projected increases in the worker population under Alternative 3, Work for Others Program activities at the NTS are expected to result in 11 injuries and 0.019 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of routine activities.

Based on previous NTS occupational radiation records and on projected increases in the worker population under Alternative 3, occupational exposure to radiation is estimated to result in a collective dose to NTS Work for Others Program workers of about 14-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0055 latent cancer fatalities and 0.0022 other detrimental health effects in the worker population. The risk of accidental exposure increases the latent cancer fatality risk by 0.002 and detrimental health effect risk by 0.001. The risk of accidental worker exposure to hazardous chemicals increases the risk of a single cancer in the worker population by 8.9×10^{-8}. The risk of life-threatening noncarcinogenic effects to workers from Work for Others Program hazardous chemical accidents has a hazard index of 2.4.

The health and safety impact to the public from potential Work for Others Program radiological accidents could result in about 2.0×10^{-7} latent cancer fatalities and 9.2×10^{-8} other detrimental health effects in the population. Work for Others Program accidents involving hazardous chemicals could result in about 4.2×10^{-7} cancers in the population. No noncancer effects to the public from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Work for Others Program radiological accident at the NTS would be an inadvertent detonation of a test assembly at the Big Explosives Experimental Facility and release of 1,000 ci of tritium, which has a probability of occurrence of 3×10^{-5} (1 in 33,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion
- Maximally exposed non-involved worker: 0.35 rem, 1.4×10^{-4} chance of latent cancer fatality, 5.6×10^{-5} chance of other detrimental effects
- Non-involved worker population at the nearest major facility area: 0.006 person-rem, 2.4×10^{-6} chance of a single latent cancer fatality, 9.6×10^{-7} chance of any other detrimental effects
- Maximally exposed off-site individual at the nearest point of public access: 4.7×10^{-5} rem, 2.4×10^{-8} chance of latent cancer fatality, 1.1×10^{-8} chance of other detrimental effects
- Population within 80 km (50 mi), 0.02 to 0.35 person-rem, 1.0×10^{-5} to 1.8×10^{-4} chance of latent cancer fatality, 4.6×10^{-6} to 8.1×10^{-5} chance of other detrimental effects.

For Work for Others Program hazardous chemical effects, the maximum reasonably foreseeable accident would be a depleted uranium and beryllium release as a result of an unplanned detonation of a test assembly at the Big Explosives Experimental Facility, which has a probability of occurrence of 1×10^{-3} (1 in 1,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured -in the explosion
- Maximally exposed non-involved worker: 8.0×10^{-4} chance of fatal or nonfatal cancer, 240 noncancer hazard index for potentially life-threatening one-hour concentration
- Non-involved worker population at the nearest major facility area: 2.8×10^{-6} chance of a single cancer, 0.023 noncancer hazard index for potentially life-threatening one-hour concentration
- Maximally exposed off-site individual at the nearest point of public access: 6.3×10^{-9} chance of cancer, 6.4×10^{-5} noncancer hazard index for potentially life-threatening one-hour concentration
- Population within 80 km (50 mi): 1.3×10^{-5} to 5.6×10^{-7} chance of a single cancer, 6.4×10^{-5} noncancer hazard index for potentially life-threatening one-hour concentration.

Site-Support Activities. Under Alternative 3, site-support activities at the NTS are expected to result in 210 injuries and 0.37 fatalities as result of construction activities during the 10-year period evaluated in this EIS. No injuries or fatalities are projected as a result of routine site-support activities.

Occupational exposure to radiation is expected to result in a collective dose to NTS site-support workers of about 135-person rem in 10 years. This dose could result in about 0.054 latent cancer fatalities and about 0.022 other detrimental health effects in the worker population.

Perceptions of radiation effects are discussed in Section 5.1.1.11 and are well known among the Western Shoshone, Southern Paiute, and Owens Valley Paiute people of this region. These perceptions of risks from radiation are frightening, and remain an important part of our lives. We will always carry these thoughts with us. Today, people are afraid of many things and places in this whole area, but we still love to come out and see out land. We worry about more radiation being brought to this land.

If the DOE wants to better understand our feelings about the impacts of radiation on our cultures, they should support a study of risks from radiation designed, conducted, and produced by the CGTO.

At this time there has not been a systematic study of American Indian's perception of risk. Therefore, it is not possible to provide action-by-action estimation of risk perception impacts. We believe it is a topic that urgently needs to be studied so that Indian people may better address the actual cultural impacts of proposed DOE actions. There have been recent workshops funded by the National Science Foundation to understand how to research the special issue of culturally based risk perception among American Indian communities, and at least one major project has been funded. Although this is a relatively new topic of research, it is one that can be more fully understood by research that deeply involves the people being considered. To understand our view of radiation is to begin to understand why we responded in certain ways to past, present, and why we will continue to respond to future DOE activities.

5.3.1.12 Environmental Justice. Environmental Justice analysis is conducted in two steps. One is the determination of significant and adverse impacts as a result of the alternative. The other is an evaluation of whether a minority or low-income population is disproportionately affected by these significant and adverse impacts. If there are no significant and adverse impacts, there would be no significant, disproportionately high and adverse impacts experienced by minority and low-income populations. The location of minority or low-income populations is shown on the figures in Section 4.1.12.

The CGTO has identified impacts to American Indian groups as a result of Alternative 3. While not physically located in Clark, Nye, or Lincoln Counties, these groups have traditional ties to the NTS and surrounding areas. Impacts would include continued reduced access to culturally significant areas, the potential for unauthorized artifact collection, and the potential for culturally inappropriate environmental restoration techniques. Because of the expansion of activities under Alternative 3, potential impacts would be greater than those listed under Alternative 1. These impacts would be perceived only by American Indian groups and would, therefore, be a disproportionately high impact on these groups.

No other significant adverse impacts as a result of this alternative were ascertained; therefore, there would be no disproportionately high and adverse impacts to other minority and low-income populations.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.2.1.10, Cultural Resources, and 5.2.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the NTS. The CGTO maintains that past, present and future activities on the NTS have, are, or will disproportionately impact these American Indian people. Under the Expanded Use Alternative 3, there is a high potential of adverse impacts to these issues. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Action-by-action responses are accessed in Section 5.1.1.12 and are not repeated here.

5.3.2 Tonopah Test Range

Under Alternative 3, the Defense, Environmental Restoration, and Work for Others Programs at the Tonopah Test Range would continue. In addition, a variety of proposed tests would be conducted at the Tonopah Test Range. The activities associated with Alternative 3 are summarized below. A detailed description of the activities is presented in Appendix A.

Defense Program. Under Alternative 3, Tonopah Test Range activities would include the same activities as under Alternative 1, with the addition of a variety of proposed tests. The proposed tests would include robotics, smart transportation, a variety of burn tests, smoke obscuration operations, thermal test operation facility, climatic test operation facility, armor/antiarmor tests, and infrared tests.

Environmental Restoration Program. Environmental Restoration Program activities would continue at current or accelerated rates.

Work for Others Program. Current Work for Others Program activities would continue at the Tonopah Test Range. Activities would be the same as those described for Alternative 1 in Section 5.1.2.

Site-Support Activities. Site-support activities under Alternative 3 would be increased as a result of increased activities at the Tonopah Test Site.

5.3.2.1 Land Use. Under Alternative 3, the actions taken at the Tonopah Test Range would be the same as for Alternative 1, including the addition of Nondefense Research and Development and Work for Others Programs. The Environmental Restoration Program would accelerate its schedule.

Defense Program. Alternative 3 would include all activities identified under Alternative 1 and any increase of defense-related missions not evaluated in the baseline, resulting in more demands on the airspace by the DOE. This would require additional coordination with the U.S. Air Force to ensure both missions are accommodated.

Environmental Restoration Program. Two Environmental Restoration Program projects at the Tonopah Test Range could result in land disturbance under Alternative 3. One project would consist of the restoration of approximately 200 acres for the Soils Media Corrective Action Unit. The second project would consist of 43 Environmental Restoration Program sites identified at the Tonopah Test Range.

Impacts to land-use resources from Environmental Restoration Program activities would be mostly beneficial, making contaminated lands usable subject to restrictions and tenant uses. Adverse impacts would be negligible. The 1,025 acres identified for Environmental Restoration Program projects would represent less than 0.3 percent of the Tonopah Test Range land area.

Work for Others Program. Under Alternative 3, the activities conducted would be similar to those activities identified under Alternative 1 and other Defense Program activities. Therefore, the impact would be similar.

5.3.2.1.1 Site-Support Activities—Site-support activities under Alternative 3 would include those identified under Alternative 1, as well as any expansions needed. This could require additional facilities, services, utilities, and communications, depending on growth in certain testing activities.

Maintenance support of all facilities would continue at present levels. New facilities could be built as required for expansion of activities. Law enforcement, security, fire protection, and health services would expand to match increased activities. Off-site administrative support would be primarily located in Las Vegas, Nevada, and Albuquerque, New Mexico, and their number would increase as needed to serve the Tonopah Test Range.

All utilities would be maintained to ensure they are free of defects. Utilities that are currently not in use might be required to be powered up. Additional support lines could be established. It is anticipated that the present water system would provide sufficient support for an increase in activities, and the present wastewater system would be sufficient to support all growth within Areas 3 and 9. No additional expansion of solid waste units or support construction would be required to support an increase in solid waste. The communication systems described in Section 4.2.1.3 would have the capability of being expanded as needed to support all increased activities at the Tonopah Test Range.

5.3.2.1.2 Airspace—Airspace actions associated with Alternative 3 would most likely be similar to those discussed under Alternative 1. Current levels of air traffic control and navigational air service, as well as airspace structure, would be maintained.

Under this alternative, the only activities that would affect airspace would be defense-related. Therefore, only the Defense and Work for Others Programs are discussed.

Defense Program. Alternative 3 includes all activities identified in Alternative 1 and any increase of defense-related missions not evaluated in the baseline, resulting in more demands on the airspace by the DOE. This would require additional coordination with the U.S. Air Force to ensure both missions are accommodated.

Work for Others Program. With the Work for Others Program, the continuation of the use of the Tonopah Test Range airspace for various military training exercises and for defense-related activities is anticipated. No commercial air passenger or general aviation activities are anticipated. Occasional air cargo, fixed-wing, and helicopter transit are expected.

Airspace requirements under Alternative 3 would be the same as those currently in effect with Nellis Air Force Base Air Traffic Control Facility, assuming coordination of air traffic control at the Tonopah Test Range and its surrounding areas. The continuation of operations at the Tonopah Test Range under the Work for Others Program under Alternative 3 would require additional coordination with the U.S. Air Force to ensure both missions are accommodated.

5.3.2.2 Transportation. The following sections contain the discussion of the environmental impacts related to transportation activities, as defined under Alternative 3. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.3.2.2.1 On-Site Traffic—Traffic volumes on the Tonopah Test Range are below 1,000 vehicles per day on any roadway. Activities associated with the Tonopah Test Range would add minimal traffic to the already underused roadways. Federal agencies that use the Tonopah Test Range would continue to maintain some of the transportation infrastructure.

5.3.2.2.2 Off-Site Traffic—Under Alternative 3, activities at the Tonopah Test Range as a result of the Defense, Environmental Restoration, and Work for Others Programs would generate only an occasional and minor amount of vehicular traffic on the local access roads and on the immediate regional highway (U.S. Highway 6 near Tonopah). There would be no traffic impacts on off-site roadways under Alternative 3 .

5.3.2.2.3 Transportation of Materials and Waste—The impacts resulting from the transportation of materials and waste under Alternative 3 would be the same as those described under Alternative 1 in Section 5.1.2.2.3.

5.3.2.2.4 Other Transportation—Under Alternative 3, the impacts related to other transportation would be the same as those described under Alternative 1 in Section 5.1.2.2.4. In addition, the increase in personnel under Alternative 3 might require multiple airplane trips.

5.3.2.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.3.1.3.

5.3.2.4 Geology and Soils. The impacts to geology and soils resulting from three programs and site-support activities are presented in this section.

Defense Program. Under Alternative 3 for the Tonopah Test Range, the adverse impacts to geologic media discussed under the Defense Program in Section 5.1.2.4 apply. An additional 2.8 acres are anticipated to be impacted by excavation of the surface for installation of infrastructure or test facilities. Weapons tests are anticipated to impact an additional 9 m^2 (100 ft^2) of surface geologic media.

Environmental Restoration Program. Under Alternative 3, the adverse impacts to geologic media discussed under the Environmental Restoration Program in Section 5.1.2.4 apply.

Work for Others Program. Under Alternative 3, the adverse impacts to geology and soils are similar to the impacts discussed for the Defense Program under this alternative.

Site-Support Activities. Impacts are not expected as a result of site-support activities.

5.3.2.5 Hydrology. The environmental impacts to surface hydrology and groundwater are described. Discussions of impacts to water quality and water quantity are also presented.

5.3.2.5.1 Surface Hydrology—The impacts to surface hydrology for the programs and site- support activities are presented in this section. One potential impact from all programs would be the alteration of natural drainage paths, resulting in potential preferential erosion of natural or fill deposits, deposition of sediments, ponding of water, or inundation of infrastructure.

Some negligible increase in surface water flows may occur if appreciable areas were paved or the natural runoff characteristics were otherwise altered. The impact would not be considered significant.

Defense Program. Adverse impacts to the surface hydrologic environment discussed under the Defense Program in Section 5.1.2.5 apply under Alternative 3 of the Tonopah Test Range. An additional 2.8 acres are anticipated to be impacted by excavation of the surface for installation of infrastructure or test facilities. Weapons tests are anticipated to impact an additional 9 m^2 (100 ft^2) of surface geologic media.

Environmental Restoration Program. Under Alternative 3, the adverse impacts to the surface hydrologic environment discussed under the Environmental Restoration Program in Section 5.1.2.5 apply under Alternative 3.

Work for Others Program. Under Alternative 3, Work for Others Program activities are similar to Defense Program activities; therefore, the potential impacts to surface hydrology would be similar.

Site-Support Activities. Site-support activities at the Tonopah Test Range are not expected to significantly impact surface waters.

5.3.2.5.2 Groundwater—For the Tonopah Test Range, the impacts are the same as discussed under Alternative 1. The increase of defense-related activities or acceleration of Environmental Restoration Program activities is not expected to have significant impacts on water demand under Alternative 3.

5.3.2.6 Biological Resources. Only three programs, Defense, Environmental Restoration, and Work for Others, would occur on the Tonopah Test Range under Alternative 3. The discussion for these three programs follows.

Defense Program. The projects under Alternative 3 are similar to those proposed under Alternative 1, except that more tests would be performed in previously disturbed areas. As was concluded for Alternative 1, there would be no impacts on biological resources.

Environmental Restoration Program. The activities under Alternative 3 for this program are similar to those described under Alternative 1 with the exception of the acceleration of scheduled activities associated with this program. This is not likely to change the nature of the impacts as described under Alternative 1.

Work for Others. The activities associated with this program are similar to activities associated with Defense Program activities. Therefore, there would be no impacts to biological resources.

Site-Support Activities. The impacts to biological resources would be the same as those described under Alternative 1 in Section 5.1.2.6.

5.3.2.7 Air Quality. Under Alternative 3, impacts to air quality would be the same as those described under Alternative 1 in Section 5.1.2.7. Increased defense-related programs and the acceleration of the environmental restoration activities would not significantly impact the air quality of the area.

5.3.2.8 Noise. Under Alternative 3, noise impacts would be the same as those described under Alternative 1 in Section 5.1.2.8.

5.3.2.9 Visual Resources. The impacts to visual resources under Alternative 3 would be similar to those described under Alternative 1 in Section 5.1.2.9.

5.3.2.10 Cultural Resources. The impacts to cultural resources on the Tonopah Test Range as a result of activities included under Alternative 3 are presented in this section.

Defense Program. Additional impacts are expected from increased testing, which may result in ground disturbances or a modification of existing structures. Archaeological sites have been recorded in the area, and indirect impacts to these sites could occur as a result of increased visitation to the site.

Environmental Restoration Program. Impacts to cultural resources are the same as those contained in Alternative 1.

Waste Management Program. Under Alternative 3, waste management would expand and additional facilities would be constructed at Areas 3 and 5 at the NTS. An increase in ground disturbances and an increase in visitation could have an impact on cultural resources.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 3, as summarized by the CGTO.

Defense Program—Under Alternative 3, it is expected that American Indian cultural resources would be adversely impacted if additional underground nuclear tests occur or if new areas are used for expanded testing programs.

Waste Management Program—Under Alternative 3, it is expected that American Indian cultural resources would not be adversely impacted. There is no Waste Management Program on the Tonopah Test Range, and none has been identified for this alternative.

Environmental Restoration Program—Under Alternative 3, it is expected that American Indian cultural resources would be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places would be increased if environmental restoration were successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Additional impacts may occur through construction of the Natural Gas Facility.

Work for Others Program. Impacts are the same as contained in Alternative 1.

Site-Support Activities. Impacts are the same as contained in Alternative 1.

Nondefense Research and Development Program—Under Alternative 3, it is expected that American Indian cultural resources would be adversely impacted if natural lands are scraped during any nondefense research and development actions.

Work for Others Program—Under Alternative 3, it is expected that American Indian cultural resources would be impacted if Tonopah Test Range weapons research and development programs were expanded. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

5.3.2.11 Occupational and Public Health and Safety. Alternative 3 includes all program activities described under Alternative 1 plus additional activities. For Tonopah Test Range workers, the increased activities are expected to result in a corresponding increase in human health and safety impacts compared to Alternative 1. Table 5.3-17 summarizes the occupational and public health and safety impacts for the applicable Tonopah Test Range programs under Alternative 3.

As under Alternative 1, none of the routine activities conducted at the Tonopah Test Range under Alternative 3 involves hazards that would impact public health and safety. Section 5.3.2.7, Air Quality, identifies no active sources for airborne release of radioactivity or criteria pollutants. Section 5.1.2.2.3 addresses the impacts of transportation of radioactive materials and waste. Accidents associated with activities at the Tonopah Test Range could impact public health and safety, and are discussed in this section.

Table 5.3-17. Health risks to workers and the public from program activities, Tonopah Test Range, Alternative 3

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense	2.6	0.0046	0.0028	0.0011	8.4×10^{-12}	1.8×10^{-5}	9×10^{-9}	4.1×10^{-9}	1×10^{-10}	9.6×10^{-7}
Environmental Restoration	0.0054	0.0011	2.6×10^{-4}	1.4×10^{-4}	e	e	1.2×10^{-9}	5.7×10^{-10}	e	e
Total	**2.6**	**0.0057**	**0.0031**	**0.0012**	$\mathbf{8.4 \times 10^{-12}}$	$\mathbf{1.8 \times 10^{-5}}$	$\mathbf{1 \times 10^{-8}}$	$\mathbf{4.7 \times 10^{-9}}$	$\mathbf{1 \times 10^{-10}}$	$\mathbf{9.6 \times 10^{-7}}$

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the 10-year period of analysis
d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more
e. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified.

Defense Program. Based on occupational injury and fatality rates for construction activities, the Defense Program at the Tonopah Test Range is expected to result in 2.6 injuries and 0.0046 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same time period, no injuries or fatalities are projected as a result of routine program activities. Based on previous occupational radiation records, occupational exposure to radiation is not expected to exceed a collective dose to Defense Program workers of about 7-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0028 latent cancer fatalities and 0.0011 other detrimental health effects in the worker population. The risk of accidental exposure to radioactive or hazardous chemical releases contributes nearly zero increase to the risk of latent cancer fatality or detrimental health effect.

The health and safety impact to the public from potential Defense Program accidents at Tonopah Test Range could result in about 9.0 x 10^{-9} latent cancer fatalities and 4.1 x 10^{-9} other detrimental health effects in the population. Additional risk due to accidental exposure to hazardous chemicals would be even less.

The maximum reasonably foreseeable Defense Program radiological accident at the Tonopah Test Range would be the same as described in Section 5.1.2.11 for Alternative 1 (a failure of an artillery fired test assembly, which has a probability of occurrence of 1 x 10^{-7} [1 in 10,000,000] per year).

For Defense Programs hazardous chemical effects at the Tonopah Test Range, the maximum reasonably foreseeable accident would also be the same as described in Section 5.1.2.11 for Alternative 1 (an explosion of a rocket test assembly containing depleted uranium and beryllium, which has a probability of occurrence of 6 x 10^{-6} [1 in 170,000] per year).

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, the Environmental Restoration Program is expected to result in 0.0054 injuries and 0.0011 fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected to result from construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Tonopah Test Range Environmental Restoration Program workers of about 0.7-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 2.6 x 10^{-4} latent cancer fatalities and 1.2 x 10^{-4} other detrimental health effects in the worker population. The risk of accidental exposure to radioactive releases contributes nearly zero increase to the risk of latent cancer fatality or detrimental health effect. No Environmental Restoration Program hazardous chemical accident resulting in measurable effects at the Tonopah Test Range has been identified.

The health and safety impact to the public from potential Environmental Restoration Program accidents at Tonopah Test Range could result in about 1.2 x 10^{-9} latent cancer fatalities and 5.7 x 10^{-10} other detrimental health effects in the population.

The maximum reasonably foreseeable Environmental Restoration Program radiological accident at the Tonopah Test Range would be the same as described in Section 5.1.2.11 for Alternative 1 (an airplane crash into the Project Roller Coaster site, which has a probability of occurrence of 1 x 10^{-6} [1 in 1,000,000] per year).

5.3.2.12 Environmental Justice. Impacts for Environmental Justice for this site are discussed for the region of influence in Section 5.3.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.3.2.10, Cultural Resources, and 5.3.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Tonopah Test Range. The CGTO maintains that past, *present, and future activities on the Tonopah Test Range have, are or will disproportionately impact the American Indian people. Under the Expanded Use Alternative 3, there is a high potential of adverse impacts. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.*

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

5.3.3 Project Shoal Area

The Environmental Restoration Program is the only program scheduled for the Project Shoal Area under this alternative; therefore, it is the only program discussed. Characterization and remediation activities would continue as in Alternative 1 with the possibility of accelerated schedules.

5.3.3.1 ***Land Use***. The completion of the actions on an accelerated schedule would not appreciably decrease the time required for any given activity. Site characterization or feasibility studies action would be initiated sooner under this alternative. No impacts to land use are expected. Because of the remoteness of this site and the compatible surrounding land uses, no impacts are anticipated to surrounding land uses.

5.3.3.1.1 ***Site-Support Activities***—No significant impacts on site-support activities would occur as a result of Alternative 3 actions. Requirements for water, power, and other facilities would not be increased from Alternative 1 levels.

5.3.3.1.2 ***Airspace***—Under Alternative 3, the Environmental Restoration Program activities anticipated at the Project Shoal Area would not use air transportation. Therefore, there would be minimal effects on airspace at the Project Shoal Area as a result of this alternative.

5.3.3.2 ***Transportation***. The following sections address the environmental impacts related to transportation activities as defined under Alternative 3. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.3.3.2.1 ***On-Site Traffic***—Environmental Restoration Program activities at the Project Shoal Area would be short-term and would require relatively few personnel (less than 10 people at any given time). Therefore, no traffic impacts are expected.

5.3.3.2.2 ***Off-Site Traffic***—Under Alternative 3, Environmental Restoration Program activities would generate only an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day) on the local access roads and on the immediate regional highway (U.S. Highway 50). Therefore, under Alternative 3, there would be no traffic impacts on off-site roadways.

5.3.3.2.3 ***Transportation of Materials and Waste***—The transport of materials and wastes from the Project Shoal Area would not have a significant impact on the overall risk estimates; chances for getting cancer or having radiation detriment from these shipments would be highly unlikely.

5.3.3.2.4 ***Other Transportation***—Because Alternative 3 activities would not include direct use of local railroads or other modes of air transportation to the Project Shoal Area, direct effects on rail and other modes of transportation are expected to be minimal. Furthermore, the anticipated activities at the site do not call for a measurable transportation demand.

5.3.3.3 ***Socioeconomics***. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.3.1.3.

5.3.3.4 ***Geology and Soils***. Under Alternative 3, the impacts to geology and soils would be the same as those described under Alternative 1 in Section 5.1.3.4. Acceleration of the restoration schedule would not significantly impact geology and soils.

5.3.3.5 ***Hydrology***. Actual water demand on an accelerated schedule would not vary appreciably from Alternative 1, in which only minimal quantities of water would be required.

5.3.3.6 ***Biological Resources***. The activities at this site would be similar to those described under Alternative 1, so the impacts would be the same as those described under Alternative 1.

5.3.3.7 ***Air Quality***. Emissions from the operation of U.S. Navy aircraft over the Project Shoal Area would have little impact on surface ambient pollutant concentrations. Studies have shown that resulting concentrations would be about 0.05 percent of allowable concentrations (SAIC/DRI, 1991). About 10 acres of land would be disturbed during the Environmental Restoration Program. The average annual fugitive dust emission (PM_{10}) from Alternative 3 drilling activity would be about 3 tons. Fugitive dust calculations assume a 50-percent reduction as a result of watering the sites. Because activities are only expected to occur on a short-term basis, long-term air quality impacts are not expected.

5.3.3.8 ***Noise***. Under Alternative 3, noise impacts would be the same as those described under Alternative 1 in Section 5.1.3.8.

5.3.3.9 ***Visual Resources***. Impacts to visual resources under Alternative 3 would be similar to those described under Alternative 1 in Section 5.1.3.9.

5.3.3.10 ***Cultural Resources***. Indirect impacts to cultural resources might result from increased visitation and vehicular traffic in archaeologically sensitive areas. The indirect impacts would be monitored through site visits by archaeologists.

AMERICAN INDIAN CULTURAL RESOURCES— This section describes the American Indian concerns associated with implementing Alternative 3, as summarized by the CGTO.

This study is not within the traditional lands of the Indian people represented by the CGTO. It is recommended by the CGTO that the DOE EIS team directly contact Indian tribes and organizations having traditional lands in the Project Shoal test site area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake, and Lovelock Paiute Tribes.

Note: The Fallon Paiute, Walker River Paiute, and Lovelock Paiute Tribes were contacted by the DOE in letters dated May 12, 1995.

5.3.3.11 Occupational and Public Health and Safety. The Environmental Restoration Program is the only active program expected to result in health and safety impacts to workers at the Project Shoal Area under Alternative 3. No contamination has been detected in surficial soils at this site, and no surface soil remedial actions are proposed. Activities at this site would consist of characterization and hydrologic monitoring. Alternative 3 accelerates the program activities described under Alternative 1. For Project Shoal Area workers, the increased activities are expected to result in a corresponding increase in human health and safety impacts compared to Alternative 1. Table 5.3-18 summarizes the occupational and public health and safety impacts for Environmental Restoration Program activities under Alternative 3. As in Alternative 1, no impacts to public health and safety are reasonably foreseeable from either routine activities or accidents under Alternative 3. Potential impacts to public health and safety from subsurface contamination of groundwater are the same as those discussed under Alternative 1 in Section 5.1.3.11.

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities at the Project Shoal Area are expected to result in 1.7×10^{-4} injuries and 3.4×10^{-5} fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected from construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Project Shoal Area Environmental Restoration Program workers of about 0.05-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could

Table 5.3-18. Health risks to workers and the public from program activities, Project Shoal Area, Alternative 3

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index
Environmental Restoration	1.7×10^{-4}	3.4×10^{-5}	1.9×10^{-5}	7.6×10^{-6}	c	c	d	d	c	c
Total	**1.7×10^{-4}**	**3.4×10^{-5}**	**1.9×10^{-5}**	**7.6×10^{-6}**	**c**	**c**	**d**	**d**	**c**	**c**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified
d. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

result in about 1.9×10^{-5} latent cancer fatalities and 7.6×10^{-6} other detrimental health effects in the worker population. No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Project Shoal Area have been identified.

5.3.3.12 Environmental Justice. Impacts for Environmental Justice at this site are discussed for the region of influence in Section 5.3.1.12. *American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3)cultural survival especially access violations. The impacts are discussed in Section 5.3.8.10, Cultural Resources, and 5.3.1.11, Occupational and Public Health and Safety. There has been no systematic study of these issues for the Project Shoal Area.*

The study area is not within the traditional lands of the American Indian people represented by the CGTO. It is recommended by the CGTO that the DOE EIS team directly contact American Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake, and Lovelock Paiute Tribes

5.3.4 Central Nevada Test Area

The Environmental Restoration Program is the only program planned for the Central Nevada Test Area under this alternative; therefore, it is the only program discussed. Characterization and remediation activities would continue, but might be accelerated relative to Alternative 1.

5.3.4.1 Land Use. Under Alternative 3, the actions taken at the Central Nevada Test Area are the same as under Alternative 1, but on an accelerated schedule. An accelerated schedule would not appreciably decrease the time required for any given activity; e.g., site characterization or feasibility studies. The actions simply would be initiated sooner under this alternative. No land-use impacts are expected because of the remoteness of the Central Nevada Test Area and similar land use surrounding it. Fallon Naval Air Station intends to create military operating areas in three of Nye County's rural regions; they would be designated Smoky, Duckwater, and Diamond. The Central Nevada Test Area falls under the Duckwater military operating area.

This airspace expansion has not yet been filed and would not affect Environmental Restoration Program activities at the Central Nevada Test Area. Therefore, there would be minimal effects on airspace at the Central Nevada Test Area as a result of Alternative 3. No other programs are scheduled at the Central Nevada Test Area.

5.3.4.2 Transportation. The following sections address the discussion of the environmental impacts related to transportation activities as defined under Alternative 3. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.3.4.2.1 On-Site Traffic—Environmental Restoration Program activities at the Central Nevada Test Area would be short-term and would require relatively few personnel (less than 10 at any given time). There are no public roads currently on site, and the low level of personnel anticipated would generate a minor amount of traffic.

5.3.4.2.2 Off-Site Traffic—Under Alternative 3, Environmental Restoration Program activities would generate only an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day). Therefore, under Alternative 3, there would be minor vehicular traffic generated and no traffic impacts on off-site roadways.

5.3.4.2.3 Transportation of Materials and Waste—The transport of radioactive waste from the Central Nevada Test Area would not have a significant impact on the overall risk estimates; that is, the chances of getting cancer or having radiation detriment from these shipments is highly unlikely.

5.3.4.2.4 Other Transportation—Because Alternative 3 activities do not include direct use of local railroads, air transportation, or other modes of transportation to this site, direct effects on rail, air, and other modes of transportation are expected to be minimal.

5.3.4.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.3.1.3.

5.3.4.4 ***Geology and Soils.*** Potential impacts to the geology of the Central Nevada Test Area are the same as described for Alternative 1 in Section 5.1.4.4.

5.3.4.5 ***Hydrology.*** Under Alternative 3, the Environmental Restoration Program actions would be accelerated. Water demand on an accelerated schedule would not vary appreciably from Alternative 1, in which only minimal quantities of water would be required.

5.3.4.6 ***Biological Resources.*** The activities at this site under Alternative 3 are similar to those described under Alternative 1. Therefore, the impacts are the same as those described under Alternative 1 in Section 5.1.4.6.

5.3.4.7 ***Air Quality.*** Under Alternative 3, air quality impacts at the Central Nevada Test Area would be the same as those described for Alternative 1 in Section 5.1.4.7.

5.3.4.8 ***Noise.*** Noise impacts as a result of Alternative 3 would be the same as those described for Alternative 1 in Section 5.1.4.8.

5.3.4.9 ***Visual Resources.*** Under Alternative 3, the impacts to visual resources would be similar to those described for Alternative 1 in Section 5.1.4.9.

5.3.4.10 Cultural Resources. Under Alternative 3, impacts to cultural resources on the Central Nevada Test Area would be identical to those defined for Alternative 1 in Section 5.1.4.10.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 3, as summarized by the CGTO.

Defense Program—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if nuclear tests continue or increase and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests or construction at the Central Nevada Test Area.

Waste Management Program—Under Alternative 3, it is expected that American Indian cultural resources will not be adversely impacted because there is no Waste Management Program on the Central Nevada Test Area and none has been identified for this alternative.

Environmental Restoration Program—Under Alternative 3, it is expected that American Indian cultural resources on the Central Nevada Test Area will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during weapons research and development. No such actions are planned for this alternative, so cultural resources will not be adversely impacted.

Work for Others Program—Under Alternative 3, it is expected that American Indian cultural resources will be impacted if weapon research and development programs are implemented in the Central Nevada Test Area. No such actions are planned for this alternative, so American Indian cultural resources will not be adversely impacted.

5.3.4.11 Occupational and Public Health and Safety. The Environmental Restoration Program is the only active program expected to result in health and safety impacts to workers at the Central Nevada Test Area under Alternative 3. Activities at this site would consist of site characterization and remediation with removal of contaminated mud and sludge. Alternative 3 accelerates the program activities described under Alternative 1. For Central Nevada Test Area workers, the increased activities are expected to result in a corresponding increase in human health and safety impacts compared to Alternative 1. Table 5.3-19 summarizes the occupational and public health and safety impacts for Environmental Restoration Program activities under Alternative 3. As under Alternative 1, no impacts to public health and safety are reasonably foreseeable from either routine activities or accidents under Alternative 3. Potential impacts to public health and safety from subsurface contamination of groundwater are the same as those discussed for Alternative 1 in Section 5.1.4.11

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities at the Central Nevada Test Area are expected to result in 1.7×10^{-4} injuries and 3.4×10^{-5} fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Central Nevada Test Area Environmental Restoration Program workers of about 0.05-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 1.9×10^{-5} latent cancer fatalities and 7.6×10^{-6} other detrimental health effects in the worker population. No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Central Nevada Test Area have been identified.

5.3.4.12 Environmental Justice. Impacts for Environmental Justice for this site are discussed for the region of influence under Alternative 1 in Section 5.3.1.12.

American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.3.4.10, Cultural Resources, and Section 5.3.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Central Nevada Test Area. The CGTO maintains that past, present, and future activities on the Central Nevada Test Area have, are, or will impact these American Indian Environmental Justice issues. Under the Expanded Use Alternative 3, there is a high potential of adverse impacts to these issues, As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. Even though the CGTO has not been permitted to visit the area, the area is especially important due to the concentration of cultural resources. Therefore, this area provides a special opportunity for the DOE to undue past Environmental Justice impacts. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved. Program-by-program responses are assessed in Section 5.1.1.12.

5.3.5 Eldorado Valley

A Solar Enterprise Zone facility would be developed as part of the Nondefense Research and Development Program under Alternative 3. The only activity being considered for Eldorado Valley is the Solar Enterprise Zone facility. Therefore, it is the only program discussed for this site. A sitewide environmental impact statement, supplemental environmental impact statement, and/or other environmental analysis would be performed to describe all impacts should this site be chosen for a Solar Enterprise Zone facility. Project plans, site preparation, technical studies, and worker transition training development and implementation would also be accomplished.

According to the Nevada Solar Enterprise Zone Task Force Work Group (DOE/NV, 1994c), a reinforcement of the natural gas supply system could be required. Water supplies would also have to be secured for the site, and conveyance systems would have to be installed.

Construction of a 19-km (12-mi) water line from Boulder City and a 10-km (6-mi) natural gas line are necessary to support the alternative energy project at this site.

5.3.5.1 Land Use. The location of the Solar Enterprise Zone facility at the Eldorado Valley would not result in significant impacts on land use.

Table 5.3-19. Health risks to workers and the public from program activities, Central Nevada Test Area, Alternative 3

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index
Environmental Restoration	1.7×10^{-4}	3.4×10^{-5}	1.9×10^{-5}	7.6×10^{-6}	c	c	d	d	c	c
Total	**1.7×10^{-4}**	**3.4×10^{-5}**	**1.9×10^{-5}**	**7.6×10^{-6}**	**c**	**c**	**d**	**d**	**c**	**c**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified
d. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

Designation of the site for renewable energy development would be consistent with surrounding land uses, such as a tortoise preserve.

This site falls within the Las Vegas terminal control area. A Solar Enterprise Zone facility at this site would not be expected to affect aircraft operations in the vicinity of McCarran International Airport. However, the construction of the Dish/Stirling solar trough and other facilities (energy corridors) would need to be coordinated with airport management and the Federal Aviation Administration to ensure obstacle clearance criteria and safety; e.g., the elimination of possible glare from dishes.

*5.3.5.2 **Transportation***. The analysis of transportation impacts is presented with respect to on-site and off-site traffic.

*5.3.5.2.1 **On-Site Traffic***—Assuming that employees commute daily to work by private passenger cars (not buses), there would be 1,060 daily vehicle trips generated, based on the rate 3.02 daily vehicle trip ends per employee (ITE, 1991) and 0.44 vehicle trip ends per employee during peak hours. During peak hours, the project would generate 150 vehicle trips in both directions or 120 trips in the peak direction. This would not affect on-site traffic appreciably.

*5.3.5.2.2 **Off-Site Traffic***—U.S. Highway 95 would be the major regional access to the site; U.S. Highway 95 is a two-lane, two-way rural highway south of Boulder City with 6,600 average daily traffic in 1993. The projected peak-hour traffic and associated level of service for 1996, 2000, and 2005 are shown in Table 5.3-4. With the Solar Enterprise Project, U.S. Highway 95 near the site would continue to operate at level of service C.

*5.3.5.3 **Socioeconomics***. The socioeconomic analysis has been prepared for the region of influence regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included in Section 5.3.1.3.

*5.3.5.4 **Geology and Soils***. There would be some impacts on the geologic resources and soils of Eldorado Valley as a result of the development of a Solar Enterprise Zone facility. An extensive area of soils would be disturbed and, if blasting is required, some minor ground motion might be induced. Aggregate would be required for roads and concrete; however, the aggregate resources of the region are very large, and the use of aggregate for a Solar Enterprise Zone facility would not result in a significant loss of resources.

*5.3.5.5 **Hydrology***. The impact of a Solar Enterprise Zone facility on the hydrology and water resources of Eldorado Valley would depend on the source of the water. It is anticipated that the water requirements would be met through the purchase of water directly from Boulder City and the city of Henderson. The purchase and use of this water would increase the total use of Colorado River water in southern Nevada, but by a very small percentage. The application of this water to a Solar Enterprise Zone facility would represent an opportunity for gain or loss depending on other potential uses for the water.

The perennial yield of Eldorado Valley is only 6.2 x 10^5 m^3/yr (500 acre-feet per year), and the basin is already overdrafted. Groundwater withdrawals for support of a Solar Enterprise Zone facility would result in additional overdrafting and would result in a continual lowering of water levels in the vicinity of water supply wells.

If groundwater withdrawals from the basin are permitted and used, then the effects on water levels in the basin would be significant. Assuming a 40-year project peak, water demand and aquifer transmissivity of 189,265 L/day (50,000 gal/day) per foot and the conservative assumptions behind this non-equilibrium equation (Driscoll, 1986), the drawdown in water levels for a Solar Enterprise Zone facility can be predicted. The estimated drawdown for this scenario is appreciable, 31 m (100 ft) in the immediate vicinity of the pumping well field and as much as 9 m (30 ft) at a distance of 6 km (4 mi) from the well field.

*5.3.5.6 **Biological Resources***. A Solar Enterprise Zone facility would involve the development of up to four technologies or subprojects capable of generating electricity from solar energy. For this analysis, it was assumed that one of the four technologies would be developed, and about 2,400 acres of previously undisturbed habitat would be cleared for the site, and 420 acres for utility corridors. Loss of habitat and associated mortality of individuals, disruption of movement patterns and gene flow, and other effects should not have a negative impact on the viability of most species found in this area. The species are common throughout a large, relatively undisturbed region. No threatened, endangered, or candidate plants or animals are known to occur in the proposed area; however, this area has not been thoroughly surveyed. If populations of rare species are found, this project might impact their viability. Nests of birds, protected under the Migratory Bird Treaty Act, may be destroyed if ground clearing for construction of the project occurred during the breeding season. The abundance of desert tortoises is low in the vicinity of the proposed site (U.S. Fish and Wildlife Service, 1994), and the site is not critical habitat for this species. Tortoises living within the site could be killed, injured, or displaced during construction of the facility. Tortoises are also likely to be killed on roads during transportation activities for this project.

Construction of water and natural gas lines could significantly impact populations of rare species or the threatened desert tortoises. However, the locations of these support facilities have not been finalized, and the impacts, therefore, cannot be accurately evaluated.

5.3.5.7 Air Quality. Construction of a 100-MW solar-generated electric power station at Eldorado Valley would generate fugitive dust (PM_{10}) emissions during ground-disturbing activities. In addition, mobile source emissions would be generated by construction employee vehicles.

About 2,400 acres of land would be disturbed during a two-year period. The average annual fugitive dust (PM_{10}) emission from this activity would be about 360 tons. Fugitive dust generated from construction of the solar-powered electric power plant would be minor.

Mobile-source emissions would consist of exhaust emissions from vehicles used by construction employees to commute to and from the site. Assuming about 350 vehicles per day would travel to the site, pollutant emissions would be as follows:

- Volatile Organic Compounds: 10.57 tons/yr
- Carbon Monoxide: 71.66 tons/yr
- Nitrogen Oxides: 15.74 tons/yr

These emissions would be dispersed over a wide area and would not increase ambient pollutant concentrations sufficiently outside the Las Vegas Valley to cause any violations of the Ambient Air Quality Standards. Eldorado Valley is outside of the Las Vegas Valley, which is classified as a nonattainment area for carbon monoxide. However, emissions from vehicles driven by construction employees generated in the Las Vegas area may contribute to this area continuing to be classified as nonattainment for carbon monoxide.

5.3.5.8 Noise. Noise generation related to the construction of a Solar Enterprise Zone facility technology equipment would occur under Alternative 3. Temporary impacts resulting from construction-related noise would occur within the immediate vicinity of the construction sites. Noise impacts would be negligible. The site is located within a remote area, and no sensitive receptors are close to the construction area. Potential construction-related noise levels of 80 to 85 dBA at 15 m (50 ft) from construction equipment (e.g., large trucks and front-end loaders) would be reduced as distance increases. Because activities are only expected to occur on a short-term basis, long-term noise impacts are not expected.

5.3.5.9 Visual Resources. A Solar Enterprise Zone facility proposed for the Eldorado Valley site would disturb approximately 2,400 acres, representing about 40 percent of the site. The landscape of Eldorado Valley is common to the region. However, the site has a high visual sensitivity level because it is crossed by U.S. Highway 95. There are also three U.S. Bureau Land Management wilderness study areas within the site's viewshed. Because of the size of the area affected and the visibility from U.S. Highway 95, there would be adverse visual impacts.

5.3.5.10 Cultural Resources. The construction of a Solar Enterprise Zone facility and the expansion of existing facilities is likely to impact both previously recorded and undiscovered cultural resources in Eldorado Valley. Indirect impacts might result from increased visitation and vehicular traffic in archaeologically sensitive areas.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with the potential development of a Solar Enterprise Zone facility in the Eldorado Valley.

It is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program—It is unlikely that Work for Others Program activities will be implemented in Eldorado Valley; therefore, no adverse impacts on American Indian resources are expected under Alternative 3.

5.3.5.11 Occupational and Public Health and Safety. Health and safety issues at a Solar Enterprise Zone facility site would be related to construction activities and are not expected to be out of the ordinary; therefore, impacts would be minimal.

5.3.5.12 Environmental Justice. Impacts for Environmental Justice for this site are discussed for the region of influence in Section 5.3.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.3.5.10, Cultural Resources, and Section 5.3.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Eldorado Valley. The CGTO maintains that past activities in the Eldorado Valley have impacted these American Indian issues, especially Holy Land violations. This constitutes a disproportionate impact on American Indian People. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

5.3.6 Dry Lake Valley

A Solar Enterprise Zone facility would be developed as part of the Nondefense Research and Development Program under Alternative 3. The only activity being considered for Dry Lake Valley is the location of a Solar Enterprise Zone facility. Therefore, Nondefense Research and Development is the only program discussed. A sitewide environmental impact statement, supplemental environmental impact statement, and/or other environmental studies could be performed to describe all impacts should this site be chosen for a Solar Enterprise Zone facility. Project plans, site preparation, technical studies, and worker-transition training development and implementation could also be accomplished.

Three important support activities must be completed before a Solar Enterprise Zone facility could be constructed at this site. A 2-km (1-mi) natural gas pipe line would need to be constructed to allow connection to the Kern River pipe line. A 48-km (30-mi) power line would need to be constructed for a solar energy generating facility. Water would have to be pumped to this site, perhaps from Moapa Valley.

5.3.6.1 Land Use. The location of a Solar Enterprise Zone facility at the Dry Lake Valley would not result in significant impacts on land uses. The designation of the site for renewable energy development is consistent with surrounding land uses, which include an industrial park, the municipal landfill, a co-generation facility, and, to the northeast of California Wash, The Reid Gardner Power Station, a coal-fired power plant.

This site falls within the NAFR Complex and the Las Vegas terminal control area. A Solar Enterprise Zone facility at this site would not be expected to affect aircraft operations. The construction of the Dish/Stirling solar trough and other facilities (energy corridors) would need to be coordinated with the Federal Aviation Administration and airport management to ensure obstacle clearance criteria and safety; e.g. avoidance of conflicting glare from dishes.

5.3.6.2 Transportation. The analysis of transportation impacts is presented with respect to on-site and off-site traffic.

5.3.6.2.1 On-Site Traffic—Assuming that employees commute daily to work by private passenger cars (not buses), there would be 1,060 daily vehicle trips generated, based on the rate of 3.02 daily vehicle trip end per employee (ITE, 1991) and 0.44 vehicle trip end per employee during peak hours. During peak hours, the project would generate 150 vehicle trips in both directions or 120 trips in the peak direction. This on-site traffic would have very little impact on the site.

5.3.6.2.2 Off-Site Traffic—Interstate 15 would be the major regional access to the site; Interstate 15 is a four-lane divided freeway with 12,906 average daily traffic in 1993 south of the Lamb Boulevard intersection. The projected peak-hour traffic and associated level of service for 1996, 2000, and 2005 are shown in Table 5.3-4. With a Solar Enterprise Zone facility, U.S. Highway 93 near the site would continue to operate at level of service B or better.

5.3.6.3 ***Socioeconomics***. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analysis for this site is included under Section 5.3.1.3.

5.3.6.4 ***Geology and Soils***. There would be some impacts on the geologic resources and soils of Dry Lake Valley as a result of the development of a Solar Enterprise Zone facility. An extensive area of soils would be disturbed and, if blasting is required, some minor ground motion might be induced. Aggregate would be required for roads and concrete. However, the aggregate resources of the region are very large, and the use of aggregate for a Solar Enterprise Zone facility would not result in a significant loss of resources.

5.3.6.5 ***Hydrology***. The lack of a water supply for the construction and operation of a Solar Enterprise Zone facility is a serious limitation in Dry Lake Valley. The perennial yield of the basin is only 4.9×10^5 m^3/yr (400 acre-feet per year). There are 1.1×10^6 m^3/yr (930 acre-feet per year) of existing water rights, and more applications for water rights have been made totaling more than 2.6×10^7 m^3/yr (21,000 acre-feet per year). It is unlikely that water rights could be secured within the basin unless the use of water for a Solar Enterprise Zone facility is designated as a preferred use. In this event, the impacts of pumping would be similar to those described for the Eldorado Valley location (i.e., water level declines as much as 31 m [100 ft] in the vicinity of the operating well field and as much as 9 m [30 ft] at a distance of 6 km [4 mi] from the well field). Most likely, outflow to the California Wash would be slightly reduced, but, because of the low volume of such a reduction and the poor quality of that discharge, the impact to downgradient basins would be minimal.

If the proposed facility is not designated as a preferred use, then it is not likely that the large-scale water withdrawals needed for a Solar Enterprise Zone facility would be permitted. In this case, a source of water for the construction and operation of a Solar Enterprise Zone facility would have to be located beyond the basin boundaries.

Alternate locations for the development of a water supply are limited. The groundwater basins in the vicinity of Dry Lake Valley are either already designated as critical groundwater basins, do not have adequate groundwater resources to support such a project, or have numerous outstanding water right applications. Pending the identification of a source of water for the proposed location in Dry Lake Valley, no analyses can be performed to predict the effects on the basin from which the water is obtained.

5.3.6.6 ***Biological Resources***. It is assumed that about 2,400 acres of previously undisturbed habitat would be cleared for the site, and 560 acres for utility corridors. This loss of habitat and associated mortality of individuals, disruption of movement patterns and gene flow, and other effects would not have a negative impact on the viability of most species found in this area. The species are common throughout a large, relatively undisturbed region. A survey of the site to be disturbed has not been conducted; therefore, it is not possible to determine if any rare species would be affected. Nests of birds, protected under the Migratory Bird Treaty Act, may be destroyed if ground clearing for construction of the project occurred during the breeding season.

However, two State-protected plant species are found in this valley. If the facility causes the destruction of a population of one of these or any other rare species, the viability of that species might be significantly affected. Desert tortoises are found throughout this valley, but their densities are generally low (Clark County, 1990). This site is not critical habitat for desert tortoises. Tortoises living within the site might be killed, injured, or displaced during construction of the facility. Some tortoises could be killed on roads during transportation activities for this project.

Construction of site-support facilities, such as a water line and a natural gas pipe line, might significantly impact populations of rare species or the threatened desert tortoises.

Water sources for a Solar Enterprise Zone facility are not currently known. Given the limited water availability in this and surrounding valleys (see Section 5.3.6.5), water use may have negative impacts on springs and their associated biota, including some threatened or endangered species.

5.3.6.7 Air Quality. Construction of a Solar Enterprise Zone facility at Dry Lake Valley would generate fugitive dust (PM_{10}) emissions during ground-disturbing activities. In addition, mobile-source emissions would be generated by construction employee vehicles.

About 2,400 acres of land would be disturbed during a two-year period. The average annual fugitive dust (PM_{10}) emission from this activity would be about 360 tons. Fugitive dust generated from construction of a solar-electric power plant would be minor.

Mobile-source emissions would consist of exhaust emissions from vehicles used by construction employees to commute to and from the site. Assuming about 350 vehicles per day would travel to the site, pollutant emissions would be as follows:

- Volatile Organic Compounds: 6.61 tons/yr
- Carbon Monoxide: 44.79 tons/yr
- Nitrogen oxides: 9.84 tons/yr

These emissions would be dispersed over a wide area and would not increase ambient pollutant concentrations sufficiently outside the Las Vegas Valley to cause any violations of the Ambient Air Quality Standards. The Dry Lake Valley is outside of the Las Vegas Valley, which is classified as a nonattainment area for carbon monoxide. However, emissions from vehicles driven by construction employees generated in the Las Vegas area may contribute to this area continuing to be classified as nonattainment for carbon monoxide.

5.3.6.8 Noise. Noise impacts in Dry Lake Valley as a result of siting a Solar Enterprise Zone facility would be the same as those described for Eldorado Valley in Section 5.3.5.8.

5.3.6.9 Visual Resources. The landscape of Dry Lake Valley is common to the region and is near an industrial development. The Nevada Power Company is planning to develop four additional power plants at this site, which already contains electrical power equipment. The site has a high visual sensitivity level because it is near Interstate 15. Construction of a Solar Enterprise Zone facility at this site would result in adverse impacts; however, the degree of contrast would be moderate because of the extensive man-made modifications already existing in the areas.

5.3.6.10 Cultural Resources. The construction of a Solar Enterprise Zone facility and the expansion of existing facilities would likely impact both previously recorded and undiscovered cultural resources in Dry Lake Valley. In particular, those sites associated with shoreline adaptations and the historically important Spanish Trail/Mormon Road might be affected. The precise nature of these impacts is unknown. However, any project that involves ground disturbance or modification to existing structures or features is likely to impact resources. Indirect impacts might result from increased visitation and vehicular traffic in archaeologically sensitive areas.

AMERICAN INDIAN CULTURAL RESOURCES— This section describes the American Indian concerns associated with the development of a Solar Enterprise Zone facility, as summarized by the CGTO.

It is expected that American Indian cultural resources will be adversely impacted if a Solar Enterprise Zone facility is constructed and operated.

5.3.6.11 Occupational and Public Health and Safety. Occupational and public health and safety issues at this site would be related to construction activities. Therefore, impacts are expected to be minimal.

5.3.6.12 Environmental Justice. Impacts for Environmental Justice for this site are discussed for the region of influence in Section 5.3.1.12.

American Indian Environmental Justice include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.3.6.10, Cultural Resources, and 5.3.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Dry Lake Valley, The CGTO maintains that past activities in the Dry Lake Valley have disproportionately impacted American Indian people, especially, Holy Land violations. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in 5.1.1.12 and are not repeated here.

5.3.7 Coyote Spring Valley

A Solar Enterprise Zone facility would be developed as part of the Nondefense Research and Development Program under Alternative 3. Because this is the only alternative being considered for Coyote Spring Valley, Nondefense Research and Development is the only program discussed for this site. A sitewide EIS, supplemental environmental EIS, and/or other environmental studies would be performed to describe all impacts should this site be chosen for a Solar Enterprise Zone facility. Project plans, site preparation, technical studies, and worker transition training development and implementation would also be accomplished.

To maintain continuous power production, an 85 km (53-mi) natural gas pipe line would have to be constructed to tie into the Kern River pipe line. Development of any but the smallest subprojects would require upgrading of the power line system to this site. Water availability remains an unsettled issue, thus the size and location of water pipe line corridors are currently unknown.

5.3.7.1 Land Use. Alternative 3 actions would not significantly impact land uses. Surrounding land uses include wildlife management, mining, and recreation.

The Coyote Spring Valley falls within the NAFR Complex and the Las Vegas terminal control area. A Solar Enterprise Zone facility at this site would not be expected to affect aircraft operations. However, the construction of the Dish/Stirling solar trough and other facilities (energy corridors) would need to be coordinated with the Federal Aviation Administration and airport management to ensure obstacle clearance criteria and safety; e.g., elimination of possible glare from dishes.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.3.7.10, Cultural Resources, and Section 5.3.1.11, Occupational and Public Health and Safety. There has not been a systematic study of the issues for the Coyote Spring Valley. The CGTO maintains that past activities in the Coyote Spring Valley have disproportionately impacted the American Indian people, especially regarding Holy Land violations. This area was traditional lands for Southern Paiutes especially the Moapa Paiute Tribe. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in 5.1.1.12 and are not repeated here.

5.3.7.2 Transportation. The analysis of transportation impacts is presented with respect to on-site and off-site traffic.

5.3.7.2.1 On-Site Traffic—Assuming that employees commute daily to work by private passenger cars (not buses), there would be 1,060 daily vehicle trips generated, based on the rate of

3.02 daily vehicle trip ends per employee (ITE, 1991) and 0.44 vehicle trip ends per employee during peak hours. During the peak hours, the project would generate 150 vehicle trips in both directions or 120 trips in the peak direction. These trips would not significantly impact the site.

5.3.7.2.2 Off-Site Traffic—U.S. Highway 93 would be the major regional access to the site; U.S. Highway 93 is a two-lane, two-way rural highway with 1,210 average daily traffic in 1993 south of State Route 375 Junction. The projected peak-hour traffic and associated level of service for 1996, 2000, and 2005 are shown in Table 5.3-4. With a Solar Enterprise Zone Project, U.S. Highway 93 near the site would continue to operate at level of service C or better.

5.3.7.3 ***Socioeconomics***. One of the objectives of a Solar Enterprise Zone facility in Coyote Spring Valley is to provide local employment and economic benefits to offset the impact of defense conversion on the NTS. A Solar Enterprise Zone facility would stimulate the economy of Coyote Spring Valley and Lincoln County, while simultaneously serving national energy and environmental objectives. Building individual solar projects would provide construction jobs for a short period of time, while a fairly small, stable workforce would be required for sustained operation and maintenance of the facilities.

Solar energy could help meet the increased demand for electricity without damaging the environment. The development of a new science and manufacturing base mission is important. At the same time, environmental concerns create a growing demand for alternative generating technologies.

The socioeconomic impacts of a Solar Enterprise Zone facility will be presented when more information with respect to economic activity, population, housing, public finance, and public services is available. A sitewide EIS, supplemental EIS, and/or other environmental studies will be performed to describe all socioeconomic impacts. In addition, project plans, site preparation, technical studies, and worker transition training development and implementation would be accomplished.

5.3.7.4 ***Geology and Soils***. There would be some impacts on the geologic resources and soils of Coyote Spring Valley as a result of the development of a Solar Enterprise Zone facility. An extensive area of soils would be disturbed, and, if blasting is required, some minor ground motion might be induced. Aggregate would be required for roads and concrete. However, the aggregate resources of the region are very large, and the use of aggregate for a Solar Enterprise Zone facility would not result in a significant loss of resources. If the Coyote Spring Valley site is selected for a Solar Enterprise Zone facility, a site-specific environmental document would be prepared that covers the impacts of construction and operation of the facility.

5.3.7.5 ***Hydrology***. Although the water resources of Coyote Spring Valley are appreciable, they have been the focus of some of the largest water right filings ever made in the state of Nevada. The perennial yield of the basin is large (2.2×10^7 m^3/yr [18,000 acre-feet per year]); however, almost all of this quantity is based on the assumption that half the underflow that discharges out of the basin could be captured and placed to a beneficial use within Coyote Spring Valley.

Even though the current groundwater use in Coyote Spring Valley is minimal, there have been many applications to appropriate groundwater within the basin. Applications that have been filed total 5.2 m^3/yr (185 ft^3/sec) or 1.7×10^8 m^3/yr (133,940 acre-feet per year). Obviously, only a small portion, if any, of these water right applications will ever be granted. Unless the use of water for a Solar Enterprise Zone facility is designated as a preferred use, there would be little chance that groundwater might be appropriated in Coyote Spring Valley for its construction and operation.

The impacts of the water withdrawals from the carbonate aquifer in Coyote Spring Valley may be estimated on the basis of prior tests conducted by the U.S. Air Force. The U.S. Air Force conducted numerous well and aquifer tests, including a 30-day test at 12,870 L/min (3,400 gal/min), the same peak amount that might be required for a Solar Enterprise Zone facility. During testing, water levels were measured in adjacent monitoring wells in the downgradient basin and spring discharge rates at the

Muddy Springs area. No declines in water levels or spring discharge rates could be detected that were attributed to the testing of the carbonate well.

Thus, significant impacts from the pumping of this well at equal or lower rates for the Solar Enterprise Zone facility would not be likely. A localized lowering of water levels would occur in the vicinity of the pumping well, but, based on testing results, would be less than 6 m (20 ft) at the well and less than 1.5 m (5 ft) at a distance of 100 m (330 ft) after 20 years of continuous pumping. These impacts are not considered significant.

5.3.7.6 ***Biological Resources.*** It is assumed that about 2,400 acres of previously undisturbed habitat would be cleared for the site, and 960 acres for utility corridors. This loss of habitat and associated mortality of individuals, disruption of movement patterns and gene flow, and other effects should not have a negative impact on the viability of most species found in this area. The species are common throughout a large region. However, because a survey of the proposed site has not been conducted, it is not possible to determine if rare species will be affected. Nests of birds, protected under the Migratory Bird Treaty Act, may be destroyed if ground clearing for construction of the project occurred during the breeding season.

This valley generally has a low-to-moderate density of desert tortoises, but some areas in this valley have moderately high-to-high densities (Garcia et al., 1982). Tortoises living within the project site may be killed, injured, or displaced during construction of the facility. Tortoises also are likely to be killed on roads during transportation activities for this project. Because the abundance of desert tortoises is higher in Coyote Spring Valley than in the other sites considered for a Solar Enterprise Zone facility, and because this site is within critical habitat for desert tortoises, development of the project at this site would likely have a greater negative impact on desert tortoises than development elsewhere. Because of the presence of critical habitat, final siting discussions should be strongly influenced by potential impacts on biological resources.

It is proposed that 6.8×10^6 m³ (5,500 acre/ft) of groundwater be pumped from Coyote Spring Valley. This groundwater withdrawal is not expected to influence water quality or quantity in nearby springs (see Section 5.3.7.5) and thus should have no biological impacts.

Construction of these infrastructure support facilities could significantly impact populations of rare species or the threatened desert tortoises.

5.3.7.7 ***Air Quality.*** Construction of a Solar Enterprise Zone facility in Coyote Spring Valley would generate fugitive dust (PM_{10}) emissions during ground-disturbing emissions. In addition, mobile-source emissions would be generated by construction employee vehicles.

About 2,400 acres of land would be disturbed during a two-year period. The average annual fugitive dust (PM_{10}) emission from this activity would be about 360 tons. Mobile-source emissions would consist of exhaust emissions from vehicles used by construction employees to commute to and from the site. Assuming about 350 vehicles per day would travel to the site, pollutant emissions would be as follows:

- Volatile Organic Compounds: 13.21 ton/yr
- Carbon Monoxide: 89.58 ton/yr
- Nitrogen Oxides: 19.67 ton/yr

These emissions would be dispersed over a wide area and would not increase ambient pollutant concentrations sufficiently to cause any violations of the Ambient Air Quality Standards. Coyote Spring Valley is outside of the Las Vegas Valley, which is classified as a nonattainment area for carbon monoxide. However, emissions from vehicles driven by construction employees generated in the Las Vegas area may contribute to this area continuing to be classified as nonattainment for carbon monoxide.

5.3.7.8 ***Noise.*** Noise impacts at Coyote Spring Valley would be the same as those described for Eldorado Valley in Section 5.3.5.8.

5.3.7.9 ***Visual Resources.*** The visual quality of Coyote Spring Valley has been designated as Class B because of the extensive panoramic views of the surrounding mountain ranges. In addition, the Solar Enterprise Zone facility site has high visual sensitivity because it is visible from the west on U.S. Highway 93. There are also three U.S. Bureau of Land Management Wilderness Study Areas within the site's viewshed. Construction of a Solar Enterprise Zone facility would greatly change the landscape character of Coyote Spring Valley, adversely impacting visual resources.

*5.3.7.10 **Cultural Resources.*** The construction of a Solar Enterprise Zone facility is likely to impact both previously recorded and undiscovered cultural resources in Coyote Spring Valley. Indirect impacts might result from increased visitation and vehicular traffic in archaeologically sensitive areas.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with the development of a Solar Enterprise Zone facility in Coyote Spring Valley, as summarized by the CGTO.

It is expected that American Indian cultural resources at Coyote Spring Valley will be adversely impacted if a Solar Enterprise Zone facility is constructed and operated.

5.3.7.11 Occupational and Public Health and Safety. Health and safety impacts at this site are expected to be minor. The health and safety issues are related to construction activities that are expected to be typical.

5.3.7.12 Environmental Justice. Impacts for Environmental Justice for this site are discussed for the region of influence in Section 5.3.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.3.7.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Coyote Spring Valley. The CGTO maintains that past activities in the Coyote Spring Valley have disproportionately impacted the American Indian people, especially regarding Holy Land violations. This area was traditional lands for Southern Paiutes especially the Moapa Paiute Tribe. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these land for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

5.4 Alternative 4 - Alternate Use of Withdrawn Lands

Under Alternative 4, Alternate Use of Withdrawn Lands, all defense-related activities and most Work for Others Program activities at the NTS would be discontinued. A possible exception would be the allowance for an increased use of airspace by the U.S. Air Force. The primary activities anticipated under this alternative would be the continuation of waste management operations in support of NTS environmental restoration and waste-generating activities associated with projects sited at the NTS under this alternative. This alternative includes programs at the NTS, the NAFR Complex, the Project Shoal Area, the Central Nevada Test Area, and the three Solar Enterprise Zone locations: Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley, as well as the release of approximately 526 km^2 (203 mi^2) of lands currently within the NTS for public education and recreation. This section contains the summary of activities that are unique to Alternative 4. A more detailed description of the activities is presented in Appendix A.

Defense Program. All defense-related activities would be discontinued at the NTS. The Tonopah Test Range would continue to conduct the passive tests identified under Alternative 1 and described in Appendix A.

Waste Management Program. Under Alternative 4, the Waste Management Program would include the activities described under Alternative 3; however, these activities would be scaled back to provide service solely for the DOE waste generated within Nevada.

Environmental Restoration Program. Environmental restoration activities would continue at current or accelerated rates. Cleanup levels and remediation could be stricter (where applicable), based on designated land use and potential return of some lands to the public domain.

Nondefense Research and Development Program. Under Alternative 4, the Nondefense Research and Development Program activities would be the same as described under either Alternative 1 or 3. The Spill Test Facility, Alternative Fuels Demonstration Projects, and Environmental Research Park activities would be as described under Alternative 1. The alternative energy and environmental management and technology development activities would be as described under Alternative 3.

Work for Others Program. Activities would be the same as those described under Alternative 2 with the one exception. It is anticipated that there would be an increased use of NTS airspace by the U.S. Air Force.

5.4.1 Nevada Test Site

Under Alternative 4, the DOE would discontinue all defense-related activities and most Work for Others Program activities. The program categories applicable under Alternative 4 are Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. However, the discontinuation or reduction of the Defense Program and Work for Others Program could result in some impacts. Therefore, all five programs are discussed under Alternative 4 when impacts are possible.

5.4.1.1 Land Use. The primary difference between this alternative and Alternative 1 is that no Defense Program activities would occur under Alternative 4. Consequently, no land-use demands would be made to accommodate the construction and operation of advanced nuclear weapons simulators; construction of a facility for storing nuclear weapons and their components and for their assembly and disassembly; long-term storage of weapons-usable fissile material; a large, heavy-industrial facility; and the National Ignition Facility.

The DOE would relinquish its control of R-4808 airspace. It is assumed that the U.S. Air Force would retain control of that portion of R-4808 not overlying the NTS. Airspace over the NTS would then be publicly accessible. The bulk of the activities anticipated under this alternative would be the continuation of Waste Management Program operations in support of NTS environmental restoration and other NTS activities associated with projects sited at the NTS under Alternative 4. This alternative would result in approximately 4,600 acres of new ground disturbance. The single most important construction activity, which also appears under Alternatives 1 and 3, would be the Solar Enterprise Zone, which would disturb 2,402 acres.

Waste Management Program. Waste Management Program operations and construction would include all the activities listed under Alternative 1, with the restriction that these services be provided solely for the DOE waste generation within Nevada. The construction of new or expanded disposal facilities would change the land-use status of limited areas adjacent to existing disposal sites. The areas used for waste disposal would be committed for the long term to that use and would be unavailable for other, less restricted uses.

Environmental Restoration Program. The Environmental Restoration Program under Alternative 4 would continue as identified under Alternative 1. The acceleration of some actions might allow more rapid changes in the land-use status of areas that contain contaminated soils and former industrial sites.

Nondefense Research and Development Program. Under Alternative 4, land areas previously designated as nuclear test zones and nuclear and high-explosive test zones would be designated as Nondefense Research and Development Program testing zones; this new zone designation would represent an approximately 2,849 km^2 (1,100 mi^2) increase in land use. In addition, minor modifications to land-use status would be needed to accommodate some actions. The construction and operation of a Solar Enterprise Zone facility would preclude other land use within the zone.

Work for Others Program. Under Alternative 4, it is anticipated that the NTS airspace would be accessible by the public. Conventional weapons demilitarization activities would not be sited at the NTS under this alternative, and defense-related research and training by other government agencies would not be conducted at the NTS. Therefore, these lands would be available for a greater variety of unrestricted land uses. However, the DOE would be required to provide for overflights and inspections of the NTS in accordance with international arms control treaties.

Potential Public Uses of Relinquished NTS Lands. Under Alternative 4, likely public uses of NTS lands would include educational and recreational activities.

Public education use of NTS lands would focus on the unique and remote characteristics of the site and the availability of existing site support for public activities. A nuclear era museum located at the NTS highlighting the testing activities would be an important contribution to a better understanding of the United States' nuclear programs. The NTS is the only place where the public can see how the nuclear era unfolds; they can revisit nuclear rocket development and see the impacts that weapons effects testing had on common structures. The public could also learn more about the testing conducted for peaceful purposes (Plowshare tests), as well as the other programs that were part of the nuclear era. Student education through field trips and studies have taken place in the past to a limited extent. This type of education would allow students to see firsthand some of the nuclear testing impacts, as well as the geology and biology on the NTS. The environmental impacts as a result of this activity would be relatively minor.

Public recreation on the NTS would focus on scenic areas, such as Timber Mountain and the isolated forested areas. Timber Mountain is a National Natural Landmark and is one of the best examples of a caldera with all the associated volcanic features. This area is also the location of American Indian petroglyphs. The road system on the NTS would provide a location for such events as 42 km (26 mi) marathon runs, closed-circuit bicycle and car races, and similar activities. The variety of terrain, the ability to control traffic in a cost-effective manner, and the available medical facilities make this an attractive alternative. Deer herds on the NTS have not been hunted within the site boundaries for many decades. A hunt could be run similar to the bighorn sheep trophy hunt, in which a drawing is held for a limited number of hunters who must attend a one-day training session to be properly oriented. These events could represent a widening of the types of land uses on the NTS to include dispersed and organized recreation. Additional recreational use could result in impacts to other natural and cultural resources found on the NTS.

Relinquished NTS Lands. Under Alternative 4, an area of approximately 526 km^2 (203 mi^2) of currently withdrawn land has been identified for possible turn-back to the jurisdiction and management of the U.S. Bureau of Land Management pursuant to the provisions of the Federal Land Policy and Management Act. Should such an option be pursued, the U.S. Bureau of Land Management would conduct an evaluation of the suitability of the land for return to the public domain, and assess the value of the resources associated with the land for existing programs. If the lands were accepted for return to the public domain, the U.S. Bureau of Land Management would determine the proper management prescriptions for the lands being returned.

5.4.1.1.1 Site-Support Activities—The NTS site-support activities would be reduced under this alternative. However, land-use designations are not expected to be impacted by this reduction in site support. Facilities associated with security and environmental monitoring would remain at a reduced level. Services required for this activity under Alternative 4 would be reduced.

UTILITIES—The power grid would remain largely as it is described under Alternative 1. Parts of the grid could be shut off and abandoned; however, the lines and substations would not be removed because of the potential for future power requirements in remote locations to support environmental restoration and other turn-back activities. Power would continue to be provided by the existing 138 kV supply lines.

Approximately 161 km (100 mi) of water supply lines would continue to be used for distributing water to various facilities around the NTS. In addition to the distribution lines, there would be numerous wells, water storage sumps, and tanks. Many of these water distribution and storage utilities would be shut down and abandoned or removed. It is not known at this time which utilities would need to remain functional to support the environmental restoration activities. The wells and storage utilities that support waste management activities in Areas 3 and 5 would remain in use. Some of the utilities in Areas 23 and 25 would also remain in use to support base camp and Yucca Mountain Project activities.

The NTS sewage handling systems include sewage lagoons and septic tanks with leachfields. Most of the sewage handling systems would be discontinued and remediated. The sewage systems in Areas 3 and 5 might need to be expanded to provide coverage for the increase in waste management activities. The sewage systems in Areas 23 and 25 might receive some reduction in capacity.

COMMUNICATION—Radio communications would be controlled through remote-control units. These units would use telephone-radio-telephone order lines connected to local transceivers. Mobile radio communications, which are primarily provided by digital microwave systems, would be reduced from three separate systems to one or two systems as mandated by the level of activity. Central monitoring of NTS radio nets would continue to be maintained at Station 900. This station function would remain as an emergency reporting point for both radio and telephone. The public safety network, which provides coverage to most of Nevada and portions of nearby states, would be abandoned.

The system components would remain intact. It would take less effort and expense to maintain the system than it would to remove the system. The existing features of the NTS telecommunications network would be more than adequate to support the level of activity at the NTS.

Video and data communications would continue to be provided by the digital microwave system as it is at this time. This system would continue to provide for security and alarms, as necessary.

Retention of site infrastructure would require that the associated land uses remain similar to the present uses. Land use is already established in a zone surrounding the radioactive waste management facilities in Areas 3 and 5. Neither area would require additional land designated for disposal. Land so used would be restricted for most other uses for the long term to ensure the integrity of the closure and the safety of those who might inadvertently breach the waste. Construction of the Solar Enterprise Zone facilities would represent a long-term, single-land use, which could be reversed when the project is completed and the site restored.

5.4.1.1.2 Airspace—There are few proposed changes in airspace associated with the other federal agency programs within this area. These changes would be local and would not change the overall NAFR Complex airspace structure. These changes are usually minor path changes to accommodate population changes in the areas of concern. The changes might redefine the boundaries between restricted areas R-4807 and R-4808 and redesignate a restricted area to facilitate joint use by civilian aircraft.

Under this alternative, the restricted airspace that overlies the NTS would be relinquished and would be available for commercial and general aviation use.

All defense-related activities at the NTS would be discontinued. Therefore, the discontinuation of airspace operations at the NTS associated with the Defense Program and Work for Others Program under this alternative would result in a beneficial impact for civilian air traffic.

The DOE would be required to provide for overflights and inspections for the NTS in accordance with international arms control treaties.

It is estimated that 200,000 people could visit the NTS for recreational purposes each year. It is possible that some visitors would come by air; however, the anticipated air traffic would be minimal, and its impact on airspace would be insignificant.

There are few proposed changes in airspace associated with the NAFR Complex mission (SAIC/DRI, 1991). These changes would be local and would not change the overall airspace structure. Examples of changes would include relocation of a visual military training route to avoid residential areas in Pahrump, redefining the boundary between the restricted areas R-4807 and R-4808, and redesignating a restricted area to facilitate joint use by civil aircraft.

5.4.1.2 ***Transportation***. The following sections address the environmental impacts related to transportation activities as defined under Alternative 4.

The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.4.1.2.1 On-Site Traffic—Traffic generated within the NTS as a result of the land use, projects, and activities associated with Alternative 4 is estimated to be 12,180 trips per day. Table 5.4-1 shows the estimates of average daily trips for each program. The daily trips were distributed on site, based on existing travel patterns for commuters and the current NTS areas affected by each program. Table 5.4-2 summarizes the average daily traffic volume for the key roadways on the NTS for Alternative 4. The portion of the average daily traffic volume that would be attributable to each program is also provided. All key on-site roadways have capacities exceeding 2,000 vehicles per hour for both directions combined (Transportation Research Board, 1994). A comparison of capacity to the volumes assigned to each segment on Table 5.4-2 shows that no roadway would experience any significant traffic congestion under Alternative 4.

Defense Program. Impacts resulting from the discontinuation of Defense Program activities under Alternative 4 would be the same as those described for Alternative 2 in Section 5.2.1.2.1.

Waste Management Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with waste management is estimated to be 200 average daily trips under Alternative 4.

Road 5-01, the access to the Radioactive Waste Management Site in Area 5, is scheduled for improvement by the second quarter of Fiscal Year 1997. The improvement project is described under Alternative 1 in Section 5.1.1.2.1. No adverse effects on traffic flow would occur as a result of the Waste Management Program.

Environmental Restoration Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Environmental Restoration Program is estimated to be 480 average daily trips for Alternative 4. No adverse effects on traffic flow would occur as a result of the Environmental Restoration Program.

Nondefense Research and Development Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Nondefense Research and Development Program is estimated to be 10,680 average daily trips under Alternative 4. Traffic volumes on Jackass Flats Road, Cane Spring Road, and the portion of Mercury Highway that is south of Cane Spring Road would be approximately 5,300 vehicles per day for each segment, representing a substantial increase over Alternative 1. These volumes, however, represent on-site trips that were assumed to be uniformly distributed throughout the day. This, together with the fact that all on-site trips were also assumed to have an endpoint in Mercury, shows that no adverse effects on traffic flow would occur as a result of the Nondefense Research and Development Program.

Work for Others Program. Traffic generated on the roads within the NTS as a result of projects and activities associated with the Work for Others Program is estimated to be 60 average daily trips under Alternative 4. No adverse effects on traffic flow would occur as a result of the Work for Others Program.

Site-Support Activities. Traffic generated on the roads within the NTS as a result of site-support activities is estimated to be 760 average daily trips under Alternative 4. No adverse effects on traffic flow would occur as a result of site-support activities.

5.4.1.2.2 Off-Site Traffic—The major traffic generators at the site with the various programs under Alternative 4 would be the construction and operations employees and their associated activities. Table 5.4-3 shows the changes in the average daily vehicle trips generated by each program activity for the years 1996, 2000, and 2005. These overall changes reflect reductions for the Defense Program, Work for Others Program, and site-support activities and slight increases for other programs relative to Alternative 1.

Under Alternative 4, vehicular traffic would decrease on key roadways from 1996 to 2005. The greatest reduction in traffic would occur in 2000 and 2005 on the access highway to the NTS, by approximately 120 vehicles during the peak hour.

Table 5.4-1. Average on-site daily vehicle trip generation (one-way trips) by program, Alternative 4

Program	Trips per Day	Difference from Alternative 1
Defense	0	-635
Waste Management	200	+55
Environmental Restoration	480	+90
Nondefense Research and Development	10,680	+10,500
Work for Others	60	-80
Site-Support Activities	760	-1,120

The ramps on the Mercury interchange and U.S. Highway 95 between Mercury and Las Vegas would also experience a reduction of 100 vehicles during peak hours. The traffic on all other key roads are likely to be reduced by less than 100 vehicles. Trip generations would remain constant after an initial reduction in 1997. The projected peak-hour traffic on key roads and the associated level of service that would result under Alternative 4 for 1996, 2000, and 2005 are shown in Table 5.4-4. By 2005, all key roads in the immediate vicinity of the site (U.S. Highway 95, the Mercury interchange ramps, and the access highway to the site State Route 433) would continue to operate at level of service C or better, which is acceptable according to Association of American State Highway and Transportation Officials Standards.

Key roads within metropolitan Las Vegas (segments of Interstate 15, U.S. Highway 95, and U.S. Highway 93) already operate at levels of service ranging from A to F; by 2000, they would all deteriorate to unacceptable level of service F. These conditions would prevail even without Alternative 4 because of cumulative traffic growth (recreational, regional, and commuter traffic). U.S. Highway 93 at Hoover Dam already operates at unacceptable level of service F, and its level of service would continue to deteriorate further with or without this alternative because of its geometry (steep grades and narrow curves) and partially to its moderate traffic volume and truck traffic. All other key roadways, in general, would continue to operate at level of service C or better (Table 5.4-4).

The conditions described above would prevail with or without Alternative 4 and with or without any single program activity. The following sections address the contribution of each program to traffic impacts.

Defense Program. Under Alternative 4, a vehicle trip reduction on a typical weekday of 330 trips under Alternative 1 would occur by 2005. These trips account for construction and operations activities generated by workers at the site and would occur at the access road off U.S. Highway 95.

Waste Management Program. Under Alternative 4, the Waste Management Program would generate 40 more vehicle trips than Alternative 1.

Environmental Restoration Program. Under Alternative 4, employees associated with the Environmental Restoration Program would generate 90 more trips than Alternative 1.

Nondefense Research and Development Program. Under Alternative 4, employees associated with the Nondefense Research and Development Program would generate 40 vehicle trips above Alternative 1 in 2005.

Table 5.4-2. Average daily traffic volumes on key NTS roadway segments, Alternative 4

Roadway	Segment	Average Daily Traffic Volume						
		Defense	Waste Management	Environmental Restoration	Nondefense Research and Development	Work for Others	Site Support Activities	Total
North								
Buckboard Mesa Rd.	Pahute Mesa Rd. to Airport Rd.	0	0	35	0	0	0	**35**
Mercury Hwy.	Tippipah Hwy. to Ranier Mesa Rd.	0	40	110	0	0	0	**150**
Pahute Mesa Rd.	Mercury Hwy. to Stockade Wash Rd.	0	0	75	0	0	0	**75**
Pahute Mesa Rd.	Stockade Wash Rd. to Buckboard Mesa Rd.	0	0	35	0	0	0	**35**
Ranier Mesa Rd.	Mercury Hwy. to Tippipah Hwy.	0	0	35	0	0	0	**35**
Tippipah Hwy.	Mercury Hwy. to Pahute Mesa Rd.	0	0	150	0	0	0	**150**
Tippipah Hwy.	Pahute Mesa Rd. to Ranier Mesa Rd.	0	0	35	0	0	0	**35**
South								
Cane Spring Rd.	Lathrop Wells Rd. to Mercury Hwy.	0	0	35	5,300	30	0	**5,365**
Jackass Flats Rd.	Mercury Hwy. to Lathrop Wells Rd.	0	0	110	5,340	30	0	**5,480**
Lathrop Wells Rd.	U.S. Hwy. 95 to Jackass Flats Rd.	0	0	35	40	0	0	**75**
Mercury Hwy.	Mercury Hwy. to Road 5-01	0	200	330	5,300	30	75	**5,935**
Mercury Hwy.	Road 5-01 to Cane Spring Rd.	0	50	295	5,300	30	75	**5,750**
Mercury Hwy.	Cane Spring Rd. to Tippipah Hwy.	0	50	295	0	0	75	**420**
Road 5-01	Mercury Hwy. to Area 5 RWMS	0	130	40	0	0	0	**170**
Road 5-07	Mercury Hwy. to Area 5 RWMS	0	20	0	0	0	0	**20**

NOTE: RWMS = Radioactive Waste Management Site.

Table 5.4-3. Average off-site daily vehicle trip change, Alternative 4

Program	1996	2000	2005
Defense	-200	-330	-330
Waste Management	40	40	40
Environmental Restoration	90	90	90
Nondefense Research and Development	40	40	40
Work for Others	-50	-80	-80
Site Support Activities	-250	-370	-370
Total (all programs):	**-330**	**-610**	**-610**

NOTE: All values are rounded to the nearest 10. Daily trips shown are defined as one-way vehicle trips or vehicle trip ends. Trips shown are the change from Alternative 1.

Table 5.4-4. Peak-hour traffic volume and level of service on key roads, Alternative 4
(Page 1 of 2)

Roadway Segments	Capacity VPH[a]	1996 DDHV[b]	1996 LOS[c]	2000 DDHV	2000 LOS	2005 DDHV	2005 LOS
Regional							
I-15 @ California/Nevada state line	6,800	2,975	E	3,739	F	4,701	F
I-15 north of Sahara Avenue interchange	10,200	7,283	F	8,944	F	11,062	F
I-15 north of the downtown expressway interchange	10,200	4,413	E	5,642	F	6,971	F
I-15 just north of the 'D' and Washington interchange	10,200	4,050	D	5,086	F	6,397	F
I-15 north of the Cheyenne interchange	6,800	1,885	C	2,658	D	3,642	F
I-15 south of the Lamb Blvd. interchange	6,800	641	A	832	A	1,082	B
I-15 north of West Mesquite interchange (Nevada/Utah state line)	6,800	633	A	882	A	1,195	B
I-80 east of Apex interchange (California/Nevada state line)	6,800	1,753	C	2,002	C	2,316	C
I-80 east of the West Wendover interchange (Nevada/Utah state line)	6,800	325	A	407	A	512	A
Local							
U.S. Hwy. 95 south of Jones Blvd. interchange	10,200	7,297	F	9,165	F	11,528	F
U.S. Hwy. 95 north of Sunset Road interchange (East Las Vegas)	6,800	2,588	D	3,253	F	4,090	F
Rancho Road, SR 599 east of the northern U.S. 95/Rancho Road interchange	6,800	1,164	B	1,891	C	2,845	E
U.S. Hwy. 95 south of SR 157 north of Las Vegas	6,800	791	A	893	A	1,077	B
U.S. Hwy. 95 just east of Mercury interchange	6,800	303	A	284	A	318	A
U.S. Hwy. 95 just south of Boulder City	2,200	599	C	635	C	680	C
U.S. Hwy. 95 interchange at Mercury							
Southbound off-ramp	1,300	29	B	22	B	22	B
Southbound on-ramp	1,300	187	B	141	B	141	B
Northbound off-ramp	1,300	187	B	141	B	141	B
Northbound on-ramp	1,300	29	B	22	B	22	B
SR 433, 0.32 km (0.2 mi) north of the Mercury interchange (access to NTS)	2,200	225	C	169	B	169	B

Table 5.4-4. Peak-hour traffic volume and level of service on key roads, Alternative 4
(Page 2 of 2)

Roadway Segments	Capacity VPH[a]	1996		2000		2005	
		DDHV[b]	LOS[c]	DDHV	LOS	DDHV	LOS
U.S. Hwy. 95, 6.1 km (3.8) mi north of Mercury interchange	2,200	276	C	311	C	362	C
U.S. Hwy. 95 @ Amargosa Valley to Beatty	2,000	59	A	63	A	72	A
U.S. Hwy. 95 north of Beatty	2,000	171	B	187	B	211	B
SR 160 south of U.S. Hwy. 95	2,000	71	A	85	A	106	A
U.S. Hwy. 93 south of the Nevada/Arizona state line at Hoover Dam	1,500	815	F	977	F	1,186	F
U.S. Hwy. 93 east of westbound off-ramp of Railroad Pass interchange	6,840	2,684	E	3,219	F	3,906	F
U.S. Hwy. 93 north of I-15/U.S. 93 interchange	2,000	128	B	158	B	201	B
U.S. Hwy. 93 south of SR 375 junction near Crystal Springs	2,000	130	B	155	B	189	B
U.S. Hwy. 93 west of SR 375 junction near Crystal Springs	2,000	44	A	50	A	60	A
SR 375 west of U.S. 93 junction at Crystal Springs	1,500	28	A	29	A	31	A
SR 375 east of Warm Springs	1,500	11	A	10	A	11	A
U.S. Hwy. 6 east of Warm Springs at SR 375 junction	1,700	13	A	12	A	13	A
U.S. Hwy. 6 west of Warm Springs at SR 375 junction	1,700	19	A	18	A	20	A
U.S. Hwy. 6 east of Tonopah, west of SR 376	1,700	96	B	85	A	75	

[a] Vehicles per hour
[b] Directional design hourly volume based on thirtieth peak hour and a 70/30 split for direction (one direction)
[c] Level of service.

NOTE: SR=State Route.

Work for Others Program. Under Alternative 4, employees associated with this program would generate 80 vehicle trips below Alternative 1 in 2005.

Potential Turn-Back Uses. Under Alternative 4, it is estimated that 200,000 people would visit the NTS for recreational purposes and for museum visits. Weekends would be the peak period for these visits. On average, there would be 500 to 600 persons per day, generally less than 200 vehicles per day (one way), assuming 3 persons per car and 90 percent passenger cars and 10 percent buses, or less than 40 vehicles during peak hours. This volume is not large enough to affect any level of service on any key road segment.

Site-Support Activities. Under Alternative 4, the discontinuation of programs would result in a corresponding loss of site-support personnel. A reduction of 370 vehicle trips would occur by 2005. These trips would account for activities related to roads, utilities, communications, and other site support.

5.4.1.2.3 Transportation of Materials and Waste—Under Alternative 4, no off-site transportation of low-level waste, mixed waste, or nuclear materials would occur. The waste volumes for NTS-generated waste that would be transported on-site are given in Table 5.4-5.

The human health risks associated with on-site transportation would generally be small, particularly in comparison with off-site transportation risks, primarily because of the differences in distance traveled and population densities and the lower rates of speed. On-site transportation risks would not contribute significantly to the total risk of any alternative. Results of the on-site transportation risk analysis under Alternative 4 are shown in Table 5.4-6. The highest risk would be from vehicle-related fatalities and injuries. Cargo-related risks would be small because of the low gamma activity in the NTS-generated waste and the small exposed population.

Table 5.4-5. NTS-generated waste 10-year volumes

Program	Waste Type	m^3
Total NTS low-level and mixed waste generated by all programs	Low-level waste	150,000
	Mixed waste	500

5.4.1.2.4 Other Transportation—Because Alternative 4 activities do not include direct use of local railroads, air, or other modes of transportation, direct effects on rail, air, and other modes of transportation are expected to be minimal. Furthermore, given the nature and scale of anticipated activities under Alternative 4, transportation demand for other than commuters is expected to remain minimal. There would be little indirect impact on other modes of transportation.

5.4.1.3 Socioeconomics. This section addresses the potential socioeconomic effects associated with Alternative 4. The description of socioeconomic conditions includes indicators (population, civilian labor force, employment, unemployment rate, and income) that provide a basis for comparing regional socioeconomic conditions of the site with Alternative 1. In addition, public finance and public services (public education, police and fire protection, and health) are described. Alternative 1 was considered equivalent to future baseline conditions without new activities.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

ECONOMIC ACTIVITY, POPULATION, AND HOUSING—The net effect of Alternative 4 is the loss of 4,625 jobs (1,496 direct and 3,129 secondary) in 1996 and 7,981 jobs (2,748 direct and 5,233 secondary) in 2000 and 2005 (Table 5.4-7). In Clark County, this employment would generate the loss of 4,401 jobs in 1996; 7,582 in 2000; and 7,582 in 2005. In Nye County, this employment would contribute to the total loss of 179 jobs in 1996; 317 jobs in 2000; and 317 jobs in 2005 (see Figure 5.1-1).

The total earning levels are estimated to decrease by \$157.0 million in 1996 and \$277.0 million in 2000 and 2005. Of these decreased earnings, Clark County would lose a total of \$149.4 million in 1996 and \$263.3 million in 2000 and 2005. For Nye County, this economic activity would generate a decrease in earnings of \$7.5 million in 1996 and \$13.7 million in 2000 and 2005.

Out-migration analysis was based on historical unemployment. The lowest unemployment rate for Clark County in the last 20 years was 4.7 percent in 1990, and the highest was 10.9 percent in 1975 and 1982. The volatile unemployment rates and the high increase in population indicate that a midpoint would provide a more realistic analysis. For this analysis, 7.7 percent was assumed for Clark County unemployment. The same analysis was done for Nye County. The lowest unemployment rate was 1.8 percent in 1970, and 10.9 percent was the highest rate in 1987. A more realistic assumption rate of 4.7 percent was used for Nye County. Alternative 4 would not generate or lose enough jobs to reach the base unemployment rate. Therefore, no out-migration would be triggered, and it can be assumed that no change in population or housing demand would be generated.

Defense Program. Total employment lost as a result of Alternative 4 would include both direct and secondary jobs. In the region of influence, in addition to the loss of 1,472 direct positions, an additional 2,802 secondary positions would be lost

Table 5.4-6. On-site transportation risks from NTS-generated wastes, Alternative 4

Consequence	Risk
Vehicle-related fatalities	0.06
Radiation-induced cancer fatalities	9×10^{-8}
Radiation-induced detriment	7×10^{-8}

Table 5.4-7. Economic activity effects for Clark and Nye Counties, 1996, 1997, 1998, 2000, and 2005 totals for all programs, Alternative 4

Total Alternative 4	1996	1997	1998	2000	2005
Alternative 4					
Clark County					
Population	1,077,576	1,112,348	1,148,241	1,223,541	1,380,920
Total Jobs	503,137	516,334	533,240	568,706	642,831
Unemployment Rate	6.6	7.2	7.1	7.0	6.9
Personal Income ($Millions)	21,094.5	22,151.8	23,371.1	25,809.8	31,906.3
Nye County					
Population	27,407	28,918	30,511	33,966	38,516
Total Jobs	10,811	11,279	11,918	13,304	15,128
Unemployment Rate	6.7	7.8	7.7	7.4	6.9
Personal Income ($Millions)	470.3	497.1	534.8	618.1	761.9
Changes from Alternative 1 (Alternative 4 effects)					
Clark County					
Population	0	0	0	0	0
Total Jobs	-4,401	-7,582	-7,582	-7,582	-7,582
Unemployment Rate	0.8	1.4	1.3	1.2	1.1
Personal Income ($1,000)	-212.6	-374.6	-374.6	-374.6	-374.6
Nye County					
Population	0	0	0	0	0
Total Jobs	-179	-317	-317	-317	-317
Unemployment Rate	1.5	2.6	2.5	2.2	1.7
Personal Income ($1,000)	-10.4	-18.8	-18.8	-18.8	-18.8

for a total of 4,274 jobs. Secondary positions are lost because of the decrease in procurement and personal consumption expenditures of site personnel. In Clark County, the reduction in civilian employment (4,060 jobs) would contribute to the total increase in the unemployment rate from 5.8 percent to 6.9 percent in 2005. In Nye County, the decrease in employment would result in a loss of 170 jobs, which would contribute to the total increase in the unemployment rate from 5.2 percent to 7.1 percent in 2005.

Waste Management Program. In the region of influence, this program would create a total of 454 jobs, including 157 direct and 297 secondary positions, starting in 1996 and continuing through 2005. In Clark County, this program would contribute 431 jobs (141 direct and 290 secondary), and in Nye County, it would contribute 18 jobs (11 direct and 7 secondary). In Clark County, this increase in civilian employment (431 jobs) would help maintain a total unemployment rate at 6.9 percent, higher when compared to the Alternative 1 level of 5.8. In Nye County, the increase of 18 jobs would help maintain the total unemployment rate at 7.1 percent, again higher when compared to the Alternative 1 level of 5.2 percent.

Environmental Restoration Program. In the region of influence, this program would create a total of 1,150 jobs, including 396 direct and 754 secondary positions, starting in 1996 and continuing through 2005. In Clark County, this program would contribute 1,093 jobs (357 direct and 736 secondary), and in Nye County, it would contribute 46 jobs (28 direct and 18 secondary). In Clark County, this increase in civilian employment (1,093 jobs) would help maintain a total unemployment rate at 6.9 percent, higher when compared to the Alternative 1 level of 5.8. In Nye County, the increase of 46 jobs would help maintain the total unemployment rate at 7.1 percent, again higher when compared to the Alternative 1 level of 5.2 percent.

Nondefense Research and Development Program. In the region of influence, the Nondefense Research and Development Program would create 468 jobs (including 161 direct and 307-secondary positions) starting in 1996 and continuing through 2005. In Clark County, this program would contribute 444 jobs (145 direct and 299 secondary) in 2005. In Nye County, this program would contribute 19 jobs (11 direct and 8 secondary) in 2005. In Clark County, this increase in civilian employment (444 jobs) would help maintain the total unemployment rate at 6.9 percent, higher when compared to the Alternative 1 level of 5.8 percent. In Nye County, the increase of 19 jobs would help maintain the total unemployment rate at 7.1 percent, again higher when compared to the Alternative 1 level of 5.2 percent.

Work for Others Program. In the region of influence, in addition to the loss of 350 direct positions, an additional 666 secondary positions would be lost for a total of 1,016 jobs under Alternative 4. Secondary positions are lost because of the decrease in procurement and personal consumption expenditures of site personnel. In Clark County, the reduction of civilian employment (965 jobs) would help maintain a total unemployment rate at 6.9 percent, higher when compared to the Alternative 1 level of 5.8 percent. In Nye County, the reduction of 40 jobs would help maintain the total unemployment rate at 7.1 percent, again higher when compared to the Alternative 1 level of 5.2 percent.

Site-Support Activities. In the region of influence, in addition to the loss of 1,640 direct positions, an additional 3,123 secondary positions would be lost for a total of 4,763 jobs. In Clark County, the reduction of civilian employment (4,525 jobs) would help maintain a total unemployment rate at 6.9 percent, higher when compared to the Alternative 1 level of 5.8. In Nye County, the reduction of 189 jobs would help maintain the totalunemployment rate at 7.1 percent, again higher when compared to the Alternative 1 level of 5.2 percent.

PUBLIC FINANCE—The fiscal effects of Alternative 4 are presented in this section. Table 5.4-8 outlines the projected financial summary for Fiscal Years 2000 and 2005 under Alternative 4. The fiscal impact of each alternative can be determined by subtracting its income statement totals from the Alternative 1 future baseline. The remaining fiscal impact is the specific impact associated with each alternative.

Clark County. The expansion and improvement of the county infrastructure would continue to be the primary focus of Clark County fiscal efforts. In addition, Clark County has undertaken the implementation of a county facilities development program as discussed in Public Finance, Section 4.1.3.

Under Alternative 4, revenues for Clark County would increase because of increases in personal income and total employment in the county. Assuming continued small increases in revenues and slightly larger initial increases in expenditures (see discussion on capital projects in Public Finance, Section 4.1.3), Alternative 4 would result in revenues less expenditures of a negative $4,289,000 in Fiscal Year 2000. Clark County is anticipated to achieve a positive fiscal position in Fiscal Year 2001. In Fiscal Year 2005, revenues less expenditures are expected to be $35,254,000. The fund balance (or reserves) as a percentage of current expense is expected to be 246 percent in 2000 and 247 percent in 2005. To compare with Alternative 1, Clark County revenues over expenditures would be $1,787,000 more in 2000 and 2005.

City of Las Vegas. Under Alternative 4, revenues over expenditures for the city of Las Vegas are expected to become positive in Fiscal Year 1995 because of increases in personal income and total employment in the city. Assuming continued increases in revenues and expenditures, this alternative would result in revenues less expenditures of $13,652,000 in Fiscal Year 2000. It is predicted that by Fiscal Year 2005, revenues over expenditures would be $15,708,000. The fund balance as a percentage of current expense is expected to be 179 percent in 2000 and 269 percent in 2005.

To compare with Alternative 1, revenues over expenditures would be $728,000 less in 2000 and $727,000 less in 2005.

City of North Las Vegas. Expenditures for North Las Vegas are forecast to continue to outpace revenues. Revenues over expenditures in Fiscal Year 2000 would be a negative $7,229,000 and a less negative $6,732,000 in Fiscal Year 2005. This is despite increases in personal income and total employment in the city. Public safety and capital projects are anticipated to continue to be the largest expenditures. Taxes, which recently decreased (from $10,059,472 in Fiscal Year 1993 to $7,941,972 in Fiscal Year 1994), are expected to slowly grow to 1993 levels by Fiscal Year 2001. The fund balance as a percentage of current expense is expected to be 62 percent in Fiscal Year 2000 and 92 percent in Fiscal Year 2005.

Clark County School District. Revenues over expenditures would be the same as Alternative 1. This is because school enrollment, along with revenues and expenditures, is largely population-driven, and the population levels under Alternatives 1 and 4 are the same. In other words, Alternative 4 would cause no change in population growth as compared to the future baseline, which is Alternative 1.

Nye County. Under Alternative 4, revenues for Nye County would increase slightly because of increases in personal income and total employment. Assuming continued small increases in expenditures as well, a positive fiscal position is expected to be reached in Fiscal Year 1999. This alternative would result in revenues less expenditures of $1,549,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $3,437,000. The fund balance as a percentage of current expense is expected to be 56 percent in Fiscal Year 2000 and 96 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $18,000 less in 2000 and 2005.

Town of Tonopah. Revenues and expenditures for the town of Tonopah would increase slightly because of increases in personal income and total employment in Nye County. Assuming continued increases, Alternative 4 would result in revenues less expenditures of $78,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $75,000. The fund balance as a percentage of current expense would be 127 percent in Fiscal Year 2000 and 185 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $973 less in 2000 and $867 less in 2005.

Table 5.4-8. Projected financial summary for Fiscal Years 2000 and 2005, general, special revenues, debt service, and capital projects funds, Alternative 4

	Revenues Over Expenditures	Current Expense	Ending Fund Balance	Fund Balance as a Percentage of Current Expense
Fiscal Year 2000				
Clark County	($4,289,294)	$525,981,796	$1,293,385,985	245.90%
City of Las Vegas	$13,651,877	$196,970,437	$351,723,082	178.57%
City of North Las Vegas	($7,228,619)	$47,082,837	$29,273,582	62.17%
Clark County School District	($15,067,362)	$751,358,806	$124,171,528	16.53%
Nye County	$1,548,679	$25,905,977	$14,389,689	55.55%
Town of Tonopah	$77,644	$642,646	$818,617	127.38%
Town of Pahrump	$219,195	$944,592	$1,587,323	168.04%
Nye County School District	($1,402,124)	$26,698,631	($438,631)	-1.64%
Fiscal Year 2005				
Clark County	$35,253,767	$857,606,688	$2,118,927,717	247.07%
City of Las Vegas	$15,707,678	$210,832,569	$567,900,255	269.36%
City of North Las Vegas	($6,731,905)	$50,452,640	$46,204,023	91.58%
Clark County School District	($11,167,703)	$848,002,970	$190,429,375	22.46%
Nye County	$3,436,783	$27,922,658	$26,932,650	96.45%
Town of Tonopah	$74,514	$646,767	$1,196,893	185.06%
Town of Pahrump	$309,912	$1,094,844	$2,965,888	270.90%
Nye County School District	($135,592)	$30,272,304	$4,200,315	13.88%

Town of Pahrump. Under Alternative 4, revenues for the town of Pahrump would increase slightly because of increases in personal income and total employment in Nye County. Assuming continued increases in revenues and slightly smaller initial increases in expenditures compared to Fiscal Year 1994, this alternative would result in revenues less expenditures of $219,000 in Fiscal Year 2000. In Fiscal Year 2005, revenues less expenditures would be $310,000. The fund balance (or reserves) as a percentage of current expense is anticipated to be 168 percent in Fiscal Year 2000 and 271 percent in Fiscal Year 2005. To compare with Alternative 1, revenues over expenditures would be $5,000 less in 2000 and 2005.

Nye County School District. Revenues over expenditures would be the same as under Alternative 1. This is because school enrollment along with revenues and expenditures are largely population-driven, and the population levels under Alternatives 1 and 4 would be the same. In other words, Alternative 4 would cause no change in population growth as compared to the future baseline, which is Alternative 1.

PUBLIC SERVICES—Effects to key local public services are determined by the change in demand for personnel. The public service impacts can be determined by subtracting total personnel required from the Alternative 1 future baseline. The addition or reduction in personnel required would be the specific impact associated with that alternative. The current levels of service per 1,000 population discussed in Chapter 4 are assumed to continue. Alternative 4 has no in- or out-migration triggered by high or low levels of employment; therefore, this alternative has the same population level as Alternative 1. In all cases, there is no change in levels of service over the future baseline (Alternative 1).

5.4.1.4 Geology and Soils. This section addresses the potential impacts to geology and soils in each program under Alternative 4.

Defense Program. Under Alternative 4, the impacts to geology and soils would be the same as those described under Alternative 2 in Section 5.2.1.4.

Waste Management Program. Waste Management Program activities are anticipated to result in the same adverse impacts to geologic media, processes, or resources as described under the Waste Management Program under Alternative 1 in Section 5.1.1.4.

Environmental Restoration Program. Environmental Restoration Program activities are anticipated to result in adverse impacts to geologic media, processes, or resources as described under the Environmental Restoration Program under Alternative 1 in Section 5.1.1.4.

Nondefense Research and Development Program. Nondefense Research and Development Program activities are anticipated to result in the same adverse impacts to geologic media, processes, or resources as described under Alternative 1 and 3, Sections 5.1.1.4 and 5.3.1.4, respectively.

Work for Others Program. Work for Others Program activities are not anticipated to result in the same adverse impacts to geologic media, processes, or resources beyond those from past activities as described in the Work for Others Program under Alternative 1 in Section 5.1.1.4.

Site-Support Activities. The impacts associated with site-support activities under Alternative 4 would be the same as those discussed under Alternative 3 in Section 5.3.1.4.

5.4.1.5 Hydrology. The section addresses the impacts of each program to surface hydrology and groundwater. Because groundwater is the main source of water at the NTS, water resource impacts are presented in the groundwater section.

5.4.1.5.1 Surface Hydrology—The environmental impacts to surface hydrology from each program under Alternative 4 are presented in this section.

Defense Program. Under Alternative 4, all defense-related activities would be discontinued. Therefore, the impacts would be the same as those described under Alternative 2 in Section 5.2.1.5.

Waste Management Program. Waste Management Program activities are anticipated to result in the same adverse impacts to the surface hydrologic environment as described for Waste Management under Alternative 1 in Section 5.1.1.5.

Environmental Restoration Program. Environmental Restoration Program activities are anticipated to result in the same adverse impacts to the surface hydrologic environment as described for Environmental Restoration under Alternative 1 in Section 5.1.1.5.

Nondefense Research and Development Program. Nondefense Research and Development Program activities are anticipated to result in the same adverse impacts to the surface hydrologic environment as described for the Nondefense Research and Development Program under Alternatives 1 and 3 in Sections 5.1.1.5 and 5.3.1.5, respectively.

Work for Others Program. Work for Others Program activities are not anticipated to result in adverse impacts to the surface hydrologic environment beyond those from past activities as described for the Work for Others Program under Alternative 1 in Section 5.1.1.5.

Site-Support Activities. The impacts associated with site-support activities under Alternative 4 would be the same as those discussed under Alternative 3.

5.4.1.5.2 Groundwater—The demand for water resources under Alternative 4 would be greatly reduced. In fact, the demand for water resources would be substantially less than those of recent years because of the cessation of actions required to maintain test readiness.

Defense Program. Under Alternative 4, the impacts to groundwater would be the same as those described under Alternative 2 in Section 5.2.1.5.

Waste Management Program. Under Alternative 4, the water demand for Waste Management Program activities would be reduced from Alternative 1 levels. Because the demand for water would be insignificant (less than 1,233 m^3/yr [1 ac-ft/yr]), there would be no significant impacts associated with groundwater withdrawals for waste management.

Environmental Restoration Program. The demand for water resources for Environmental Restoration Program activities would accelerate under Alternative 4 if specific actions are accelerated; however, the total demand for water for environmental actions would still be quite small, less than 2.5×10^5 m^3 (200 ac-ft/yr). No significant impacts on water resources are anticipated because of an acceleration of Environmental Restoration Program activities under Alternative 4.

Nondefense Research and Development Program. The actions under Alternative 4 for this program are the same as those under Alternative 3; therefore, the expected impacts on water resources would be similar. The major demand for water would be for the Solar Enterprise Zone. The impacts would be as described under Alternative 3, except that any reductions in underflow to downgradient basins would be reduced. No significant impacts on water resources are anticipated under Alternative 4.

Work for Others Program. The water demand for the Work for Others Program under Alternative 4 would be reduced from Alternative 1. Because the demand for water would be insignificant, there are no significant impacts associated with groundwater withdrawals for the Work for Others Program.

Site Support Activities. The reduction in site support activities and personnel would result in an overall decrease in water demand. However, support activities for environmental restoration actions might offset this water demand reduction.

5.4.1.6 Biological Resources. The Solar Enterprise Zone Project would significantly increase the risk of tortoises being crushed during construction and would remove approximately 2,400 acres of undisturbed habitat. Surface-disturbing activities may kill or displace wildlife such as small mammals, reptiles, and soil-dwelling invertebrates. If ground clearing for construction occurs during the breeding season, the eggs of birds in nests on the ground within a project area may be destroyed. Most birds that breed on the NTS are protected under the Migratory Bird Treaty Act. Under this alternative, approximately 14,300 acres may be disturbed. This project would also greatly increase traffic compared to Alternative 1 and thus the risk of accidental crushing of tortoises. The Alternative Energy Project would be sufficiently large to remove small localized populations depending on final siting decisions. Given these potential impacts of the Alternative Energy Project, Alternative 4 could reduce biodiversity in the region.

Defense Program. Under Alternative 4, the impacts to biological resources would be the same as those described under Alternative 2 in Section 5.2.1.6.

Waste Management Program. Under Alternative 4, this program would consist of activities in Areas 3, 5, 6, and 11 on the NTS. Activities at these sites would be similar to those described under Alternative 1, and only 11 acres of habitat would be disturbed; therefore, the impacts of this program would be less than those described under Alternative 1.

Environmental Restoration Program. Under Alternative 4, activities from this program are similar to those described under Alternative 1, except that the rate at which these activities would be initiated and completed is likely to be accelerated; therefore, impacts would also be similar.

Nondefense Research and Development Program. Five of the projects in this program would be in operation under Alternative 4. For four of these projects (Environmental Management and Technology Development, Alternative Fuels Demonstration Projects, National Environmental Research Park, and Spill Test Facility), the impacts would be similar to those described under Alternative 1. Activities and impacts for the fifth, the Alternative Energy project, would be the same as those described under Alternative 3.

Work for Others Program. The only activity that would occur is treaty verification; therefore, there are no anticipated impacts on biological resources.

Site-Support Activities. Activities associated with site-support activities should be about 75 percent less than under Alternatives 1 and 3. About 18 acres of habitat would be disturbed during construction and maintenance of roads under Alternative 4. As was concluded under Alternative 1, these activities would have little or no impact on biological resources.

Potential Public Uses of Relinquished NTS Lands. Activities associated with these proposed uses are not likely to adversely affect biological resources on the NTS. Trophy hunts for deer would be run by the Nevada Division of Wildlife with the intent to provide recreation while maintaining healthy herds. Few individuals will be removed and population viability will not be adversely affected. Other public uses of the NTS for such activities like educational tours or bike and car racing are not expected to significantly impact biological resources as long as no off-road vehicle use is permitted.

5.4.1.7 ***Air Quality***. This section addresses the potential effects that the five programs and site-support activities of the NTS might have on regional air quality. The region of influence for this air quality analysis includes Nye and Clark counties, Nevada. Construction and mobile-source emissions are shown in Table 5.4-9, and site-support activities stationary-source emissions are shown in Table 5.4-10.

Carbon monoxide emissions from mobile sources in the Las Vegas Valley nonattainment area would be approximately 61 tons per year (40 percent of 153 tons, see Table 5.4-9 and Section 5.1.1.7). This value is below the 100 ton carbon monoxide de minimus value shown in Table 5.1-14; therefore, a general conformity analysis would not be required for this alternative.

Defense Program. Under Alternative 4, the impacts to air quality would be the same as those described under Alternative 2 in Section 5.2.1.7.

Even a doubling in the increased use of airspace would contribute only about 0.10 percent to the allowable ambient pollutant surface concentrations (SAIC/DRI, 1991). Thus, the emission reduction would provide a small beneficial impact on the regional air quality.

Waste Management Program. Waste Management Program impacts under Alternative 4 would be the same as those described under Alternative 1. No new construction would occur, and fugitive dust emissions were not estimated. No air quality impacts are anticipated.

Environmental Restoration Program. Under this alternative, the Environmental Restoration Program impacts would be the same as those described under Alternative 3.

Nondefense Research and Development Program. Under Alternative 4, impacts would be the same as those described under Alternative 3.

If lands are redesignated as turn-back areas, one potential use that has been proposed is a nuclear era museum. Available facilities would be used and no new construction would be required. It has been estimated that about 200,000 people would visit the museum each year. Exhaust emissions would be produced by the visitors' vehicles. Assuming an average of three occupants per vehicle, approximately 66,700 vehicles would visit the area each year. For the purpose of emission calculations, it was assumed that a trip would consist of 145 km (90 mi) in Nye County and 97 km (60 mi) in Clark County. The 145 km (90 mi) in Nye County would include travel on the site.

Work for Others Program. Emissions from increased use of NTS airspace would have a negligible effect on surface air quality. A doubling of airspace usage would produce no more then 0.10 percent of the allowable surface-pollutant concentration (SAIC/DRI, 1991). There would be no construction activity on-site, and off-site emissions would be negligible.

Site-Support Activities. Emissions from NTS stationary sources related to site-support activities are shown in Table 5.4-10. Examples of the sources include boilers, fuel storage tanks, and a concrete batch plant. Portable compressor emissions are also included. Total Nye County emissions are presented in the table for comparison with NTS emissions. These emissions were obtained from the Bureau of Air Quality (State of Nevada, 1995). It is anticipated that 14 acres of land would be disturbed, generating 4.2 tons of fugitive dust (PM_{10}) emissions.

RADIOLOGICAL AIR QUALITY—Impacts to the air quality from radioactive effluents under Alternative 4 would be the same as under Alternative 2.

5.4.1.8 Noise. This section addresses the potential effects of the five programs and site-support activities on noise.

Defense Program. Under Alternative 4, the impacts of noise would be the same as those described under Alternative 2 in Section 5.2.1.8.

Waste Management Program. Noise impacts associated with Waste Management Program activities under Alternative 4 would be similar to those described under Alternative 1 in Section 5.1.1.8.

Environmental Restoration Program. Noise impacts from Environmental Restoration Program activities under Alternative 4 would be the same as described under Alternative 1 in Section 5.1.1.8. The noise levels produced by environmental restoration activities with this alternative would produce only minor noise impacts, both on site and off site.

Nondefense Research and Development Program. Noise impacts under Alternative 4 of the Nondefense Research and Development Program would be the same as those discussed under Alternative 1, in Section 5.1.1.8.

Work for Others Program. Overflights to support treaty verification are flown at high altitudes and would not be detectable on or near the NTS.

Site-Support Activities. Transportation noise levels on the site would be minimal and would not produce any noise impacts.

5.4.1.9 Visual Resources. The effects of Alternative 4 on visual resources are presented in this section.

Increased public access for museum visits, road races, special hunts, and other recreation would make substantially more area of the NTS visible to increasing numbers of visitors, thus increasing the impact of existing or new development on visual resources. However, much of the landscape character is common to the region. Some operations would produce PM^{10} and mobile-source emissions.

Defense and Work for Others Programs. Under Alternative 4, all facilities associated with each program would be abandoned in place. Only maintenance necessary for safety would occur. There could be a slow deterioration of facilities; however, there would be little change in the overall appearance of the existing landscape. Sensitivity levels could increase because of greater public access. Therefore, impacts to visual resources would be negligible.

Waste Management Program. Under Alternative 4, the Waste Management Program would continue its activities at a reduced level. No new ground disturbance would occur, and activities would take place in areas currently used for waste management. Impacts to visual resources would be negligible.

Table 5.4-9. Summary of Nevada Test Site construction emissions and mobile source emissions (on site and off site), tons per year, Alternative 4

Program	Construction	Mobile Sources								
		On Site			Off Site					
					Nye County			Clark County		
	Fugitive PM_{10}[a]	CO[b]	VOC[c]	NO_x[d]	CO	VOC	NO_x	CO	VOC	NO_x
Defense	NA[e]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Waste Management	NA	11.50	1.56	2.05	6.09	0.91	1.58	11.83	1.76	3.07
Environmental Restoration	220.5	22.24	3.02	3.96	11.78	1.75	3.06	22.88	3.40	5.93
Nondefense Research and Development Program[f]	360	10.00	1.36	1.78	72.76	9.86	14.87	51.25	7.57	11.65
Work for Others	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Site Support Activities	4.2	64.76	8.80	11.53	34.32	5.10	8.90	66.62	9.90	17.28
Total	**584.70**	**108.47**	**14.74**	**19.32**	**124.95**	**17.62**	**28.41**	**152.58**	**22.63**	**37.93**

a. Particulate matter with a diameter equal to or less than 10 micrometers
b. Carbon monoxide
c. Volatile organic compounds
d. Nitrogen oxides
e. Not applicable
f. Includes nuclear era museum.

Table 5.4-10. Site support activities stationary source emission at the NTS and Nye County, tons per year, Alternative 4

Area	TSP [a]	SO_2 [b]	NO_X [c]	Hc [d]	Co [e]
Area 1	34.70	3.40	2.20	0.10	0.50
Area 6	6.50	0.0	0.0	0.0	0.0
Area 23	1.12	10.62	9.40	0.0	2.54
U.S. DOE Portable [f]	17.68	15.24	229.32	0.0	49.68
Fuel Storage Tanks	0.00	0.00	0.00	10.68	0.00
Total	60.00	29.26	240.92	10.78	52.72
Nye County	1,685.70	960.68	933.28	____ [g]	187.68

[a] Total suspended particulates
[b] Sulfur dioxide
[c] Nitrogen oxides
[d] Hydrocarbon
[e] Carbon monoxide
[f] Compressors
[g] No data; Nye County hydrocarbon emission inventory is not complete.

Source: Bureau of Air Quality, State of Nevada, 1995.

Environmental Restoration Program. Under Alternative 4, the Environmental Restoration Program impacts would be similar to those described under Alternative 3 in Section 5.3.1.9. However, sensitivity levels could increase because of greater public access to the NTS.

Nondefense Research and Development Program. The Nondefense Research and Development Program impacts under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.1.9.

Site-Support Activities. Approximately 14 acres of new ground disturbance would occur for site-support activities under this alternative. Most ground disturbance would be related to new road and utility corridor construction. The ground disturbance would be scattered throughout the NTS. Impacts to visual resources would be negligible.

5.4.1.10 Cultural Resources. Impacts would be similar to those listed under Alternative 3. However, the total amount of acreage disturbed will be reduced to 14,400 acres, because of a reduction in defense-related testing, reduction in the size of waste facilities, and a lack of landlord-related construction. Continued visitation and vehicular traffic could lead to vandalism or artifact collecting that could indirectly affect recorded archaeological sites and archaeologically sensitive areas.

Although archaeological surveys have not been conducted in these areas, it is estimated that more than 67 sites could be impacted by projects associated with this alternative based on surveys conducted in adjacent areas in 1994. The precise location and number of these resources are unknown until archaeological surveys are conducted. Surveys will be conducted prior to any ground-disturbing activities, and impacts would be mitigated through the measures described in Chapter 7. At least eight structures will be decommissioned under Alternative 4. If these buildings are determined to be historically significant, they would be mitigated using measures described in Chapter 7.

Defense Program. Under Alternative 4, the impacts to cultural resources would be the same as those described under Alternative 2 in Section 5.2.1.10.

Waste Management Program. Under Alternative 4, the Waste Management Program would continue its activities at a reduced level. At Area 5, construction for new facilities has been proposed. These activities may disturb the physical integrity of some cultural resources. Increased pedestrian activity and vehicular traffic could result in unauthorized artifact collecting and vandalism that could indirectly affect cultural resources.

Environmental Restoration Program. Under Alternative 4, the impacts to cultural resources would be the same as those contained in Section 5.1.1.10. All Environmental Restoration Program activities are expected to accelerate. Accelerated remediation at contaminated sites would be likely to result in both direct and indirect impacts to cultural resources.

Few sites have been recorded directly within the area of potential effect for Area 13, and impacts directly within the area of potential effect are predicted to be minimal. However, sites have been recorded in the general area, and it is likely that indirect impacts to these sites might be incurred as a result of increased visitation to the site area.

Nondefense Research and Development Program. Direct impacts to cultural resources are likely to result from the construction of new facilities and utility upgrades associated with the Solar Enterprise Zones located on the NTS and at one other off-site location. Additional facilities may be required under the Environmental Management and Technology Development Program. Construction of such facilities may also result in impacts to undiscovered cultural resources. Indirect impacts resulting from increased access to the NTS as part of the Environmental Research Park may occur.

Work for Others Program. Many activities would be discontinued under Alternative 4. The two exceptions would be for treaty verification and the increased use of NTS airspace by the U.S. Air Force. Because most activities would be discontinued under Alternative 4, there would be no impacts to cultural resources.

Site-Support Activities. Cultural resource impacts from Site-support activities under Alternative 4 would be the same as those described under Alternative 1 in Section 5.1.1.10.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 4, as summarized by the CGTO.

Defense Program at NTS—Under Alternative 4, it is expected that American Indian cultural resources will no longer be impacted by defense activities; however, oversight and monitoring have the potential for impacting American Indian cultural resources. Indian people require further information before completely evaluating the cultural impacts of this Defense Program alternative.

Waste Management Program at NTS—Under Alternative 4, it is expected that American Indian cultural resources will continue to be adversely impacted because the waste has not been disposed of in a culturally appropriate manner. Access to culturally significant places on the NTS will be reduced because waste isolation facilities increase Indian people's perception of health and spiritual risks.

Environmental Restoration Program at NTS—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted by monitoring well program and access road activities, but will be positively impacted by actions that return disturbed lands to their natural condition in a culturally appropriate manner and with the participation of Indian people.

Nondefense Research and Development Program at NTS—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted by visits by students and researchers.

Work for Others Program at the NTS—Under Alternative 4, it is expected that American Indian cultural resources will be impacted if activities at the Spill Test Facility in Area 5, the Treatability Test Facility in Area 25, and the newly renovated decontamination pad in Area 6 are expanded. It is expected that American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons.

Defense Program at Area 13—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted.

Waste Management Program at Area 13—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted because there is no program at the Area 13 site and none has been identified.

Environmental Restoration Program at Area 13—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program at Area 13—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if military training exercises and weapons tests continue.

Work for Others Program at Area 13.—Under Alternative 4, it is expected that American Indian cultural resources will be impacted if the military training exercises and weapons test continue.

5.4.1.11 Occupational and Public Health and Safety. Most of the program activities under the Defense Program and Work for Others Program would be discontinued under Alternative 4. Waste Management Program activities would be reduced in scope compared to Alternative 3. Activities under the Environmental Restoration and Nondefense Research and Development programs would be similar to Alternative 3. Table 5.4-11 summarizes the occupational public health and safety impacts for each NTS program under Alternative 4.

Impacts to public health and safety under Alternative 4 are primarily related to routine air emissions. Potential impacts to the public from routine air emissions of radioactivity and priority pollutants are discussed in Section 5.4.1.7, Air Quality. Transportation impacts, which are discussed in Section 5.4.1.2, Transportation, would be reduced by the elimination of waste shipments to the NTS from other sites.

Subsurface radioactivity from past underground nuclear weapons tests would continue to be a potential exposure pathway for the public under Alternative 4. Potential impacts to the public would be identical to those described under Alternative 1. The maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 8×10^{-13} (about one in one trillion) and 1×10^{-5} (about one in 100,000). The public exposure scenario assumes that the individual consumes contaminated well water for 70 years centered around the time of peak tritium concentration in well water. These impacts are not expected to occur within the 10-year timeframe of this EIS.

Defense Program. Under Alternative 4, the impacts to public health and safety would be the same as those described under Alternative 2 in Section 5.2.1.11.

Waste Management Program. Based on occupational injury and fatality rates for construction and other industrial activities and on projected changes in the worker population under Alternative 4, the Waste Management Program at the NTS is expected to result in 50 injuries to workers during routine program activities and 14 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same time period, 0.95 fatalities are expected because of routine activities, and 0.024 fatalities are expected to result from construction activities.

Based on previous NTS occupational radiation records and on projected changes in the worker population under Alternative 4, occupational exposure to radiation is estimated to result in a collective dose to NTS Waste Management Program workers of about 10-person rem in 10 years. Based on the dose to health effects

Table 5.4-11. Health risks to workers and the public from program activities, Nevada Test Site, Alternative 4

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense	e	e	e	e	e	e	e	e	e	e
Waste Management	64	0.97	0.020	0.0099	5.2×10^{-7}	0.48	5.1×10^{-5}	2.3×10^{-5}	2×10^{-5}	3.8×10^{-6}
Environmental Restoration	10	0.031	0.0085	0.0034	3×10^{-7}	0.14	2.3×10^{-10}	1.1×10^{-10}	6×10^{-6}	2.4×10^{-6}
Nondefense Research and Development	8.6	0.0015	f	f	3.2×10^{-6}	0.58	f	f	1.9×10^{-4}	1.5×10^{-4}
Work for Others	e	e	e	e	e	e	e	e	e	e
Site Support Activities	19	0.033	0.046	0.018	f	f	g	g	f	f
Total	**102**	**1**	**0.075**	**0.031**	**4×10^{-6}**	**0.58**	**5.1×10^{-5}**	**2.3×10^{-5}**	**2.3×10^{-4}**	**1.5×10^{-4}**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the 10-year period of analysis
d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more
e. No activities
f. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified
g. No reasonably foreseeable scenarios resulting in exposure to hazardous chemicals have been identified.

correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.004 latent cancer fatalities and 0.0016 other detrimental health effects in the worker population.

The risk of accidental exposure increases the latent cancer fatality risk by 0.016 and detrimental health effect risk by 0.0064. The risk of a single cancer in the worker population as a result of accidental exposure to hazardous chemicals is estimated to be 5.2×10^{-7}. The risk of life-threatening noncarcinogenic effects to a single worker from Waste Management Program hazardous chemical accidents has a hazard index of 0.48. A hazard index less than 1.0 indicates that no life-threatening noncarcinogenic health effects would be expected to occur.

The health and safety impact to the public from potential Waste Management Program accidents could result in about 5.1×10^{-5} latent cancer fatalities and 2.3×10^{-5} other detrimental health effects in the population. Waste Management Program accidents involving hazardous chemicals could result in about 2.0×10^{-5} cancers in the population. No noncancer effects from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Waste Management Program radiological accident at the NTS would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Area 5 transuranic waste storage unit, which has a probability of occurrence of 6×10^{-7} [1 in 1,700,000] per year).

For Waste Management Programs hazardous chemical effects, the maximum reasonably foreseeable accident would also be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Area 5 hazardous waste storage unit, which has a probability of occurrence of 1×10^{-7} [1 in 10,000,000] per year).

Environmental Restoration Program. Based on occupational injury and fatality rates for construction and other industrial activities, and projected changes in the worker population under Alternative 4, the Environmental Restoration Program at the NTS is expected to result in 8 injuries to workers during routine program activities and about 2 injuries as a result of construction activities over the 10-year period evaluated in this EIS. During the same period, 0.027 fatalities are expected because of routine activities, and 0.004 fatalities are expected to result from construction activities.

Based on previous NTS occupational radiation records and on projected changes in the worker population under Alternative 4, occupational exposure to radiation is estimated to result in a collective dose to NTS Environmental Restoration Program workers of about 21-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0085 latent cancer fatalities and 0.0034 other detrimental health effects in the worker population.

The risk of accidental worker exposure to hazardous chemicals increases the risk of a single cancer in the worker population by 2.8×10^{-7}. The risk of life-threatening noncarcinogenic effects to a single worker from Environmental Restoration Program hazardous chemical accidents has a hazard index of 0.14.

The health and safety impact to the public from potential Environmental Restoration Program accidents could result in about 2.3×10^{-10} latent cancer fatalities and 1.1×10^{-10} other detrimental health effects in the population. Environmental Restoration Program accidents involving hazardous chemicals could result in about 1.6×10^{-5} cancers in the population. No noncancer effects to the public from chemical accidents would be expected to occur.

The maximum reasonably foreseeable Environmental Restoration Program radiological accident at the NTS would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Area 13 site, which has a probability of occurrence of 7×10^{-7} [1 in 1,400,000] per year).

For Environmental Restoration Program hazardous chemical effects, the maximum reasonably foreseeable accident would also be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into a hypothetical environmental restoration site consisting of a composite of hazardous sites across the NTS, which has a probability of occurrence of 7 x 10^{-7} [1 in 1,400,000] per year).

Nondefense Research and Development Program. Based on occupational injury and fatality rates for construction activities and on projected changes in the worker population under Alternative 4, the Nondefense Research and Development Program at the NTS is expected to result in about 9 injuries and 0.015 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of routine activities.

Based on previous NTS occupational radiation records and on projected changes in the worker population under Alternative 4, occupational exposure to radiation is estimated to result in a collective dose to NTS Nondefense Research and Development Program workers of about 11-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0042 latent cancer fatalities and 0.0017 other detrimental health effects in the worker population.

No Nondefense Research and Development Program accident resulting in measurable radiological effects at the NTS has been identified.

The risk of accidental worker exposure to hazardous chemicals increases the risk of a single cancer in the worker population by 3.2 x 10^{-6}. The risk of life-threatening noncarcinogenic effects to a single worker from Nondefense Research and Development hazardous chemical accidents has a hazard index of 0.58.

The health and safety impact to the public from potential Nondefense Research and Development Program accidents could result in about 1.9 x 10^{-4} cancers in the population. No noncancer effects to the public from chemical accidents would be expected to occur.

For Nondefense Research and Development Program hazardous chemical effects, the maximum reasonably foreseeable accident would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the tank farm at the Fuel Spill Test Facility, which has a probability of occurrence of 1 x 10^{-7} [1 in 10,000,000] per year).

Work for Others Program. Under Alternative 4, the impacts to public health and safety would be the same as those described under Alternative 2 in Section 5.2.1.11.

Site-Support Activities. Site-support activities are distributed among the program areas. Under Alternative 4, site-support activities at the NTS are expected to result in 19 injuries and 0.033 fatalities as a result of construction activities during the 10-year period evaluated by this EIS. No injuries or fatalities are projected as a result of routine site-support activities.

Occupational exposure to radiation is expected to result in a collective dose to NTS site-support workers of about 0.046-person rem in 10 years. This dose could result in about 0.063 latent cancer fatalities and about 0.025 other detrimental health effects in the worker population.

Perceptions of radiation effects are discussed in Section 4.1.11 and are well known among the Western Shoshone, Southern Paiute, and Owens Valley Paiute people of this region. These perceptions of risks from radiation are frightening, and remain an important part of our lives. We will always carry these thoughts with us. Today, people are afraid of many things and places in this whole area, but we still love to come out and see our land. We worry about more radiation being brought to this land.

If the DOE wants to better understand our feelings about the impacts of radiation on our cultures, they should support a study of risks from radiation designed, conducted, and produced by the CGTO. At this time there has not been a systematic study of American Indians' perceptions of risk. Therefore, it is not possible to provide action by action estimation of risk perception impacts. We believe it is a topic that urgently needs to be studied so that

Indian people may better address the actual cultural impacts of proposed DOE actions. There have been recent workshops funded by the National Science Foundation to understand how to research the special issue of culturally based risk perception among American Indian communities, and at least one major project has been funded. Although this is a relatively new topic of research, it is one that can be more fully understood by research that deeply involves the people being considered. To understand our view of radiation is to begin to understand why we responded in certain ways to past and present, and why we will continue to respond to future DOE activities.

5.4.1.12 Environmental Justice. Environmental Justice analysis involves two tiers of investigation. One is the determination of significant and adverse impacts as a result of the alternative. The other is an evaluation of whether a minority or low-income population is disproportionately affected by these significant and adverse impacts. If there are no significant and adverse impacts, there would be no significant, disproportionately high and adverse impacts experienced by minority and low-income populations. The location of minority or low-income populations is shown on the figures in Section 4.1.12.

The CGTO has identified impacts to American Indian groups as a result of Alternative 4. While not physically located in Clark, Nye, or Lincoln counties, these groups have traditional ties to the NTS and surrounding areas. Impacts would include continued reduced access to culturally significant areas, the potential for unauthorized artifact collection, and the potential for culturally inappropriate environmental restoration techniques. With Alternative 4, access impacts would be less than with Alternative 1. However, the potential for unauthorized artifact collection would be increased because of the increased number of visitors. These impacts would be perceived only by American Indian groups and would, therefore, have a disproportionately high impact on these groups.

No other significant adverse impacts as a result of this alternative were ascertained; therefore, there would be no disproportionately high and adverse impacts to other minority and low-income populations.

American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.1.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the NTS. The CGTO maintains that past, present, and future activities on the NTS have, are, or will disproportionately impact these American Indian people. Under Alternative 4, there is a high potential of adverse impacts to these issues, even though most DOE activities would be discontinued. The continuation of waste management operations, the physical activities associated with environmental restoration and other planned activities are expected to cause both risks from radiation and reduced access from the land disturbance which is expected to occur. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

5.4.2 Tonopah Test Range

Under Alternative 4 for the Tonopah Test Range, activities are restricted to the Defense Program, Environmental Restoration Program, Work for Others Program, and site support activities. Therefore, these are the only programs discussed in all sections, with the exception of Section 5.4.2.1.2, Airspace.

Defense Program. Under Alternative 4, Tonopah Test Range activities associated with maintaining readiness and assisting with the DOE weapons research and design would be in accordance with treaty requirements. Certain defense-related activities might be scaled down or discontinued.

Environmental Restoration Program. Environmental Restoration Program activities at the

Tonopah Test Range would continue at current or accelerated rates.

Work for Others Program. Under Alternative 4, the DOE would continue to support other federal agencies' programs and research and development projects, as well as provide for overflights and inspections of the Tonopah Test Range in accordance with international arms control treaties such as the Open Skies Treaty.

5.4.2.1 Land Use. There would be no significant adverse impacts on surrounding land use as a result of the cleanup goals under this alternative. Other land-use impacts would be the same as those discussed under Alternative 1.

5.4.2.1.1 Site-Support Activities—Under Alternative 4, three scenarios could occur with respect to site-support activities. If the planned programs are aligned with the DOE or other federal agencies, site-support requirements could increase by 20 percent. Otherwise, the intended users of the Tonopah Test Range would have to determine if all site-support activities could be integrated within their operations. If not, some site-support activities would cease.

Facilities would be maintained to prevent deterioration. Efforts that would be required to conserve needed services would continue. In addition, services would increase with new technologies and programs at the Tonopah Test Range. Utilities would be maintained to ensure they are in working order. Utilities that are not currently being used could be put back into service if new technologies and operations were started at the Tonopah Test Range. It is estimated that the water supply system and the wastewater system would support new activities. The estimated lifespan of the sanitary landfill would support all new activities at the Tonopah Test Range. The communications systems have the capacity to be expanded to meet the needs of new activities at the Tonopah Test Range.

5.4.2.1.2 Airspace—Airspace actions associated with Alternative 4 would most likely be similar to those discussed under Alternative 1. Maintenance of the current level of air traffic control, as well as the same airspace structure, would continue.

Defense Programs. The continuation of Defense Program operations at the Tonopah Test Range under Alternative 4 would not result in any airspace or air traffic impacts. The continued coordination with the U.S. Air Force would be required to ensure that both missions are accommodated.

Environmental Restoration Program. Environmental Restoration Program activities would have no impact on airspace at the Tonopah Test Range.

Work for Others Program. Airspace requirements under Alternative 4 would be the same as those described under Alternative 1, with the Nellis Air Force Base Air Traffic Control Facility assuming coordination of air traffic control at the Tonopah Test Range and surrounding area. The continuation of operations at the Tonopah Test Range under the Work for Others Program under this alternative would result with continued coordination between the DOE and the U.S. Air Force to ensure that both missions are accommodated.

5.4.2.2 Transportation. The following sections address the environmental impacts related to transportation activities as defined under Alternative 4. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.4.2.2.1 On-Site Traffic—Traffic volumes on the Tonopah Test Range roadways are believed to be below 1,000 vehicles per day on any roadway. Activities associated with Tonopah Test Range programs would add a very small amount of traffic volume to these already under used roadways.

5.4.2.2.2 Off-Site Traffic—Under Alternative 4, activities at the Tonopah Test Range as a result of Defense, Environmental Restoration, and Work for Others Programs would generate only minor amounts of vehicular traffic on the local access roads and on the immediate regional highway (U.S. Highway 6 near Tonopah). In 1993, the average daily traffic on U.S. Highway 6 near Tonopah amounted to 1,095 vehicles. This traffic volume is far below the capacity of U.S. Highway 6 at this location. Therefore, under Alternative 4, there would be no traffic impacts on off-site roadways.

5.4.2.2.3 Transportation of Materials and Waste—Under Alternative 4, the risks discussed in Section 5.1.2.2.3 apply. To summarize the risks (for all the DOE/NV environmental restoration sites), the highest risk is in traffic fatalities and injuries. Both were calculated as less than one person being affected. Even if the environmental restoration projects were accelerated under this alternative, the risks would remain the same. These risks are based on the number of shipments and not on annual rate.

5.4.2.2.4 Other Transportation—Under Alternative 4, the impacts related to other transportation would be similar to those described under Alternative 1 in Section 5.1.2.2.4.

5.4.2.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic issues. The analysis for this site is included in Section 5.4.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.4.2.4 Geology and Soils. Impacts to geology and soils under Alternative 4 would be the same as those described for Alternative 1 in Section 5.1.2.4.

5.4.2.5 Hydrology. The potential impacts to hydrology under Alternative 4 are discussed in this section. The discussion is broken into two subsections: surface hydrology and groundwater.

5.4.2.5.1 Surface Hydrology—Impacts to surface hydrology as a result of Alternative 4 are the same as those described under Alternative 1 in Section 5.1.2.5.

5.4.2.5.2 Groundwater—Water demand, impacts, and productivity are the same for the Tonopah Test Range as those described under Alternative 3 and are not significantly different from those under Alternative 1. There would be no significant additive or subtractive impacts under Alternative 4.

5.4.2.6 Biological Resources. Under Alternative 4, the impacts to biological resources would be the same as those described under Alternative 1 in Section 5.1.2.6.

5.4.2.7 Air Quality. Under Alternative 4, the impacts to air quality would be the same as those described under Alternative 1 in Section 5.1.2.7.

5.4.2.8 Noise. Noise impacts as a result of Alternative 4 for the Environmental Restoration and Work for Others Programs would be the same as those described under Alternative 1 in Section 5.1.2.8. The only impact to noise as a result of Defense Program activities would be the periodic, short-term noise caused by artillery and explosive testing operations.

5.4.2.9 Visual Resources. Under Alternative 4, the only program anticipated to have impacts on visual resources at the Tonopah Test Range would be the Environmental Restoration Program. The impacts to visual resources would be the same as those described under Alternative 1 in Section 5.1.2.9.

5.4.2.10 Cultural Resources. Direct impacts to cultural resources include ground disturbing activities associated with new construction, and possible off-road vehicle travel. Direct impacts such as unauthorized artifact collecting and vandalism, may also occur.

Defense Program. Under Alternative 4, the impacts to cultural resources would include ground disturbing activities associated with off-road vehicle travel for the Smart Transportation Project and construction of the Climatic Test Operation Facility (Appendix A). Increased access may result in unauthorized artifact collecting.

Waste Management Program. Under Alternative 4, no waste management activities will occur at the

Tonopah Test Range. Therefore, cultural resources will not be affected.

Environmental Restoration Program. Under Alternative 4, direct impacts to archaeological resources from cleanup activities could include disturbance of sites found within the area of potential effect. Indirect impacts could result from increased visitation to the site area.

Work for Others Program. Treaty verification activities at the Tonopah Test Range would have no impact on cultural resources.

Site-Support Activities. Impacts resulting from site-support activities under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.2.10.

AMERICAN INDIAN CULTURAL RESOURCES—This section addresses the American Indian cultural concerns associated with implementing Alternative 4, as summarized by the CGTO.

Defense Program—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted by defense activities; however, overflights and monitoring have the potential for impacting American Indian cultural resources. Indian people require further information before completely evaluating the cultural impacts of this Defense Program alternative.

Waste Management Program—Under Alternative 4, it is expected that American Indian cultural resources will not be adversely impacted because there are no actions planned.

Environmental Restoration Program—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted because no activities are planned under this alternative.

Work for Others Program—Under Alternative 4, it is expected that American Indian cultural resources will be impacted by military training exercises and conventional weapons tests.

5.4.2.11 Occupational and Public Health and Safety. Under Alternative 4, the only activities that would be important to health and safety are associated with the Environmental Restoration Program. Defense Program activities are mostly discontinued. Table 5.4-12 summarizes the occupational and public health and safety impacts for the applicable Tonopah Test Range program areas under Alternative 4. None of the activities under Alternative 4 have a potential to impact public health and safety.

Defense Program. Based on occupational injury and fatality rates for construction activities, the Defense Program at the Tonopah Test Range is expected to result in 2.5 injuries and 0.0044 fatalities to workers during construction activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are projected as a result of routine program activities.

Based on previous occupational radiation periods, occupational exposure to radiation is not expected to exceed a collective dose to Defense Program workers of about 6 person-rem in 10-years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 0.0025 latent cancer fatalities and 0.001 other detrimental health effects in the worker population.

The risk of accidental exposure to radioactive or hazardous chemical releases contributes nearly zero increase to the risk of latent cancer fatality or detrimental health effect.

The health and safety impact to the public from potential Defense Program accidents at Tonopah

Test Range could result in about 9.0×10^{-9} latent cancer fatalities and 4.1×10^{-9} other detrimental health effects in the population. Additional risk due to accidental exposure to hazardous chemicals would be even less.

The maximum reasonably foreseeable Defense Program radiological accident at the Tonopah Test Range would be the same as described in Section 5.1.2.11 for Alternative 1 (a failure of an artillery fired test assembly, which has a probability of occurrence of 1×10^{-7} [1 in 10,000,000] per year).

For Defense Programs hazardous chemical effects at the Tonopah Test Range, the maximum reasonably foreseeable accident also would be the same as described in Section 5.1.2.11 for Alternative 1 (an explosion of a rocket test assembly containing depleted uranium and beryllium, which has a probability of occurrence of 6×10^{-6} [1 in 170,000] per year).

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities are expected to result in 0.0049 injuries and 0.001 fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected to result from construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Tonopah Test Range Environmental Restoration Program workers of about 0.6-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 2.4×10^{-4} latent cancer fatalities and 9.6×10^{-5} other detrimental health effects in the worker population.

The risk of accidental exposure to radioactive releases contributes nearly zero increase to the risk of latent cancer fatality or detrimental health effect. No Environmental Restoration Program hazardous chemical accident resulting in measurable effects at the Tonopah Test Range has been identified.

The health and safety impact to the public from potential Environmental Restoration Program accidents at Tonopah Test Range could result in about 1.2×10^{-9} latent cancer fatalities and 5.7×10^{-10} other detrimental health effects in the population. The maximum reasonably foreseeable Environmental Restoration Program radiological accident at the Tonopah Test Range would be the same as described in Section 5.1.1.11 for Alternative 1 (an airplane crash into the Project Roller Coaster site, which has a probability of occurrence of 1×10^{-6} [1 in 1,000,000] per year).

5.4.2.12 Environmental Justice. Environmental Justice impacts for the region of influence are the same as those described in Section 5.4.1.12.

American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.2.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Tonopah Test Range. The CGTO maintains that past, present and future activities on the Tonopah Test Range have, are, or will disproportionately impact the American Indian people. Under Alternative 4, there is a high potential of adverse impacts to these issues. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

5.4.3 Project Shoal Area

Under Alternative 4, activities at the Project Shoal Area would be limited to Environmental Restoration Program activities; therefore, it is the only program discussed in this section. Activities

Table 5.4-12. Health risks to workers and the public from program activities, Tonopah Test Range, Alternative 4

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]
Defense	2.5	0.0044	0.0025	0.001	8.4×10^{-12}	1.8×10^{-5}	9×10^{-9}	4.1×10^{-9}	1×10^{-10}	9.7×10^{-7}
Environmental Restoration	0.0049	9.7×10^{-4}	2.4×10^{-4}	9.5×10^{-5}	e	e	1.2×10^{-9}	5.7×10^{-10}	e	e
Total	**2.5**	**0.0054**	**0.0027**	**0.0011**	$\mathbf{8.4 \times 10^{-12}}$	$\mathbf{1.8 \times 10^{-5}}$	$\mathbf{1 \times 10^{-8}}$	$\mathbf{4.7 \times 10^{-9}}$	$\mathbf{1 \times 10^{-10}}$	$\mathbf{9.7 \times 10^{-7}}$

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with the activities conducted over the 10-year period of analysis
d. A hazard index of greater than one indicates that the non-cancer health effects could be life-threatening to individuals exposed for one hour or more
e. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified.

include continuation of characterization and remediation actions at the Project Shoal Area.

5.4.3.1 ***Land Use***. Under Alternative 4, the impacts expected at the project area would be the same as under Alternative 1. Continued site characterization and long-term hydrologic monitoring could result in the disturbance of 10 acres of land. The 10 acres identified for Environmental Restoration Program activities would represent less than 0.4 percent of the project land area. Adverse impacts from Environmental Restoration Program activities to land-use resources would be negligible.

5.4.3.1.1 Site-Support Activities—Impacts resulting from Alternative 4 would be the same as those described under Alternative 1 in Section 5.1.3.1.1.

5.4.3.1.2 Airspace—Under Alternative 4, impacts to airspace would be the same as those described under Alternative 1 in Section 5.1.3.1.2.

5.4.3.2 ***Transportation***. The following sections address the environmental impacts related to transportation activities as defined under Alternative 4. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of radioactive materials and waste, and other transportation.

5.4.3.2.1 On-Site Traffic—Environmental Restoration Program activities would be short-term and would require relatively few personnel (less than 10 people at any given time). No public roads currently exist on the site. Minor vehicular traffic is anticipated, but no traffic impacts are expected.

5.4.3.2.2 Off-Site Traffic—Environmental Restoration Program activities would generate only an occasional and minor amount of vehicular traffic (less than 100 vehicle trips per day) on the local access roads and on the immediate regional highway (U.S. Highway 50). In 1993, the average daily traffic on U.S. Highway 50 near the site amounted to 1,340 vehicles (NDOT, 1993); this traffic volume is far below the capacity of U.S. Highway 50 at this location. Therefore, under Alternative 4, there would be no traffic impacts on off-site roadways.

5.4.3.2.3 Transportation of Materials and Waste—Under Alternative 4, the risks discussed in Section 5.1.3.2.3 apply. The highest risk from environmental restoration activities would be in traffic fatalities and injuries. Both were calculated as less than one person being affected. Even if the environmental restoration activities were accelerated under this alternative, the risks would remain the same. These risks are based on shipments and not an annual rate.

5.4.3.2.4 Other Transportation—Because Alternative 4 would not include direct use of local railroads, air transportation, or other modes of transportation to the Project Shoal Area, direct effects on rail, air, and other modes of air transportation are expected to be minimal.

5.4.3.3 ***Socioeconomics***. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic issues. The analysis for this site is included in Section 5.4.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.4.3.4 ***Geology and Soils***. The Project Shoal Area would be used for any of the described expanded uses, so the potential impacts to the geology and soils would be the same as described under Alternative 1 in Section 5.1.3.4.

5.4.3.5 ***Hydrology***. Under Alternative 4, the impacts to surface water and groundwater would be the same as those described under Alternative 1 in Section 5.1.3.5. Acceleration of the schedule would not significantly impact water demand.

5.4.3.6 ***Biological Resources***. The impacts to biological resources under Alternative 4 would be very similar to those described under Alternative 1 in Section 5.1.3.6.

5.4.3.7 Air Quality. Under Alternative 4, the impacts to air quality would be the same as those described under Alternative 1 in Section 5.1.3.7.

5.4.3.8 Noise. Noise impacts as a result of Alternative 4 would be the same as those described under Alternative 1 in Section 5.1.3.8.

5.4.3.9 Visual Resources. Under Alternative 4, impacts to visual resources would be the same as described under Alternative 1 in Section 5.1.3.9.

5.4.3.10 Cultural Resources. Impacts to cultural resources under Alternative 4 would be the same as those described under Alternative 1 in Section 5.1.3.10.

AMERICAN INDIAN CULTURAL RESOURCES— This section describes the American Indian concerns associated with implementing Alternative 4 as summarized by the CGTO.

This study area is not within the traditional lands of the Indian people represented by the CGTO. It is recommended by the CGTO that the DOE NTS EIS team directly contact Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake, and Lovelock Paiute Tribes.

NOTE: The Fallon Paiute, Walker River Paiute, and Lovelock Paiute Tribes were contacted by the DOE in letters dated May 12, 1995.

5.4.3.11 Occupational and Public Health and Safety**.** The Environmental Restoration Program is the only program expected to result in health and safety impacts to workers at the Project Shoal Area under Alternative 4. No contamination has been detected in surficial soils at this site, and no surface soil remedial actions are proposed. Activities at this site would consist of characterization and hydrologic monitoring. Alternative 4 would accelerate the program activities described under Alternative 1. For Project Shoal workers, the increased activities are expected to result in a corresponding increase in human health and safety impacts compared to Alternative 1. Table 5.4-13 summarizes the occupational and public health and safety impacts for Environmental Restoration Program activities under Alternative 4.

As under Alternative 1, no impacts to public health and safety are reasonably foreseeable from either routine activities or accidents under Alternative 4. Potential impacts to public health and safety from subsurface contamination of groundwater are the same as those discussed under Alternative 1 in Section 5.1.3.11.

Environmental Restoration. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities at the Project Shoal Area are expected to result in 1.6×10^{-4} injuries and 3.1×10^{-5} fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same time period, no injuries or fatalities are expected because of construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Project Shoal Area Environmental Restoration Program workers of about 0.04-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 1.7×10^{-5} latent cancer fatalities and 6.8×10^{-6} other detrimental health effects in the worker population.

No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Project Shoal Area have been identified.

5.4.3.12 Environmental Justice**.** Environmental Justice impacts for the region of influence would be the same as those discussed in Section 5.4.1.12.

The American Indian response regarding Environmental Justice is discussed in Section 4.1.12. American Indian Environmental Justice concerns include: (1) Holy Land violations. (2) perceived risks from radiation, and (3) cultural survival especially access violations. There has been no systematic study of these issues for the Project Shoal Area site.

This study area is not within the traditional lands of the American Indian people represented by the Consolidated Group of Tribes and Organizations. It is recommended by the CGTO that the DOE NTS EIS team directly contact American Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake, and Lovelock Paiute Tribes.

5.4.4 Central Nevada Test Area

Under Alternative 4, the programs at the Central Nevada Test Area would be limited to the Environmental Restoration Program; therefore, the only impacts discussed in this section are the results of that program. Activities would include continuation of characterization and remediation actions at the Central Nevada Test Area.

5.4.4.1 Land Use. Under Alternative 4, the impacts expected at the Central Nevada Test Area would be the same as under Alternative 1. Acceleration of activities and more stringent cleanup requirements would impact the schedule, but impacts to land use are not expected.

5.4.4.1.1 Site-Support Activities—No significant impacts on site-support activities would occur as a result of Alternative 4 actions. Requirements for water, power, and other facilities would not be increased over Alternative 1.

5.4.4.1.2 Airspace—There would be minimal effects on airspace at the Central Nevada Test Area as a result of Alternative 4.

5.4.4.2 Transportation. The following sections address the environmental impacts related to transportation activities as defined under Alternative 4. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.4.4.2.1 On-Site Traffic—Environmental Restoration Program activities would be short term and would require relatively few personnel (less than 10 at any given time). There are no public roads currently on the site, and the low level of personnel anticipated would generate a minor amount of traffic. No public roads currently exist on the Central Nevada Test Area.

5.4.4.2.2 Off-Site Traffic—Under Alternative 4, there would be minor vehicular traffic generated. No traffic impacts are expected on off-site road ways. The impacts would be the same as those described under Alternative 1 in Section 5.1.4.2.2.

5.4.4.2.3 Transportation of Materials and Waste—Under Alternative 4, the risks discussed in Section 5.1.4.2.3 apply. Even if the Environmental Restoration Program activities were accelerated under this alternative, the risks would remain the same. These risks are based on the number of shipments and not on an annual rate.

5.4.4.2.4 Other Transportation—Because Alternative 4 activities do not include direct use of local railroads, air transportation, or other modes of transportation to this site, direct effects on rail, air, and other modes of transportation are expected to be minimal.

5.4.4.3 Socioeconomics. The socioeconomic analysis has been prepared for the region of influence, regardless of where employees work; therefore, the place of employment would not change the effects in any of the socioeconomic issues. The analysis for this site is included under Section 5.4.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.4.4.4 Geology and Soils. The Central Nevada Test Area would not be used for any of the described expanded uses, so the potential impacts to geology and soils would be the same as described under Alternative 1 in Section 5.1.4.4.

5.4.4.5 Hydrology. Under Alternative 4, the impacts to surface water and groundwater would be the same as those described under Alternative 1 in Section 5.1.3.5. Acceleration of the activities would not significantly impact water demand.

Table 5.4-13. Health risks to workers and the public from program activities, Project Shoal Area, Alternative 4

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index
Environmental Restoration	1.6×10^{-4}	3.1×10^{-5}	1.7×10^{-5}	6.8×10^{-6}	c	c	d	d	c	c
Total	$\mathbf{1.6 \times 10^{-4}}$	$\mathbf{3.1 \times 10^{-5}}$	$\mathbf{1.7 \times 10^{-5}}$	$\mathbf{6.8 \times 10^{-6}}$	c	c	d	d	c	c

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis
b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis
c. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified
d. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

5.4.4.6 ***Biological Resources.*** The impacts to biological resources under Alternative 4 would be the same as those described under Alternative 1 in Section 5.1.4.6.

5.4.4.7 ***Air Quality.*** Under Alternative 4, the impacts to air quality would be the same as those described for Alternative 1 in Section 5.1.4.7.

5.4.4.8 ***Noise.*** Noise impacts as a result of Alternative 4 would be the same as those described under Alternative 1 in Section 5.1.4.8.

5.4.4.9 ***Visual Resources.*** Under Alternative 4, impacts to visual resources would be the same as those described under Alternative 1 in Section 5.1.4.9.

5.4.4.10 ***Cultural Resources.*** Under Alternative 4, impacts to cultural resources would be the same as those described under Alternative 1 in Section 5.1.4.10.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 4, as summarized by the CGTO.

Defense Program—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted.

Waste Management Program—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted.

Environmental Restoration Program—Under Alternative 4, it is expected that American Indian cultural resources on the Central Nevada Test Area will be impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian people's perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program—Under Alternative 4, it is expected that American Indian cultural resources will not be adversely impacted.

Work for Others Program—Under Alternative 4, it is expected that American Indian cultural resources will not be impacted.

5.4.4.11 Occupational and Public Health and Safety. The Environmental Restoration Program is the only active program expected to result in health and safety impacts to workers at the Central Nevada Test Area under Alternative 4. Activities at this site would consist of site characterization and remediation with removal of contaminated mud and sludge. Alternative 4 accelerates the program activities described under Alternative 1. For Central Nevada Test Area workers, the increased activities are expected to result in a corresponding increase in human health and safety impacts compared to Alternative 1. Table 5.4-14 summarizes the occupational and public health and safety impacts for Environmental Restoration Program activities under Alternative 4.

As in Alternative 1, no impacts to public health and safety are reasonably foreseeable from either routine activities or accidents under Alternative 4. Potential impacts to public health and safety from subsurface contamination of groundwater are the same as those discussed under Alternative 1 in Section 5.1.4.11.

Environmental Restoration Program. Based on occupational injury and fatality rates for industrial activities, Environmental Restoration Program activities at the Central Nevada Test Area are expected to result in 1.6×10^{-4} injuries and 3.1×10^{-5} fatalities to workers during routine program activities over the 10-year period evaluated in this EIS. During the same period, no injuries or fatalities are expected because of construction activities.

Based on previous occupational radiation records, occupational exposure to radiation is estimated to result in a collective dose to Central Nevada Test Area Environmental Restoration Program workers of about 0.04-person rem in 10 years. Based on the dose to health effects correlation factors recommended by the International Commission on Radiological Protection (1991), this dose could result in about 1.7×10^{-5} latent cancer fatalities and 6.8×10^{-6} other detrimental health effects in the worker population.

No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Central Nevada Test Area have been identified.

5.4.4.12 ***Environmental Justice.*** Environmental Justice impacts for the region of influence would be the same as those discussed in Section 5.4.1.12.

American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations. These impacts are discussed in Section 5.4.4.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Central Nevada Test Area. The CGTO maintains that past, present, and future activities on the Central Nevada Test Area have, are, or will disproportionately impact the American Indian people. Under Alternative 4, there is a high potential of adverse impact. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. Even though the CGTO has not been permitted to visit the area, the area is especially important due to the concentration of cultural resources. Therefore, this area provides a special opportunity for the DOE to resolve past Environmental Justice impacts. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.1.2 and are not repeated here.

5.4.5 Eldorado Valley

Under Alternative 4, the only program expected to occur in Eldorado Valley is the Nondefense Research and Development Program; therefore, the impacts discussed in this section are limited to that program. A sitewide EIS, supplemental EIS, and or other environmental studies could be performed to describe all impacts should this site be chosen for a Solar Enterprise Zone facility. Project plans, site preparation, technical studies, and worker-transition training development and implementation could also be accomplished.

5.4.5.1 ***Land Use.*** The location of a Solar Enterprise Zone facility in Eldorado Valley would not result in significant impacts on land uses under Alternative 4. The designation of the site for renewable energy development is consistent with the plans for a tortoise preserve and other uses for the annexed land. Boulder City has already designated 6,000 acres of the land annexed for the purpose of renewable resource development. This designation is consistent with the location of a Solar Enterprise Zone facility in Eldorado Valley.

A Solar Enterprise Zone facility at this site, under Alternative 4, would have the same impacts as described under Alternative 3 in Section 5.3.5.1.

5.4.5.2 ***Transportation.*** The following sections address the environmental impacts related to transportation activities as defined under Alternative 4. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.4.5.2.1 ***On-Site Traffic***—Impacts under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.5.2.1.

5.4.5.2.2 ***Off-Site Traffic***—Under Alternative 4, impacts would be the same as those described under Alternative 3 in Section 5.3.5.2.2.

5.4.5.2.3 ***Transportation of Materials and Waste***—This section is not applicable to the Eldorado Valley Solar Enterprise Zone site.

5.4.5.2.4 ***Other Transportation***—Because this alternative does not assume extensive transportation of personnel and materials via rail or air, impacts to these transportation modes would be minimal and would not be significant.

5.4.5.3 ***Socioeconomics.*** The socioeconomic analysis has been prepared for the region of influence regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analyses for this site is included in Section 5.4.1.3.

Table 5.4-14. Health risks to workers and the public from program activities, Central Nevada Test Area, Alternative 4

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers	Chemical Hazard Index
Environmental Restoration	1.6×10^{-4}	3.1×10^{-5}	1.7×10^{-5}	6.8×10^{-6}	c	c	d	d	c	c
Total	$\mathbf{1.6 \times 10^{-4}}$	$\mathbf{3.1 \times 10^{-5}}$	$\mathbf{1.7 \times 10^{-5}}$	$\mathbf{6.8 \times 10^{-6}}$	**c**	**c**	**d**	**d**	**c**	**c**

a. Number of radiation-induced latent cancer fatalities in the exposed population associated with the activities conducted over the 10-year period of analysis

b. Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with the activities conducted over the 10-year period of analysis

c. No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified

d. No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

5.4.5.4 ***Geology and Soils.*** Impacts on the geologic resources and soils of Eldorado Valley, as a result of developing a Solar Enterprise Zone facility would be the same under Alternative 4 as under Alternative 3 and are described in Section 5.3.5.4.

5.4.5.5 ***Hydrology.*** Surface water and groundwater impacts under Alternative 4 would be the same for Eldorado Valley as Alternative 3. There would be no significant impacts under Alternative 4, as described in Section 5.3.5.5.

5.4.5.6 ***Biological Resources.*** The impacts at this site under Alternative 4 would be the same as those under Alternative 3, as described in Section 5.3.5.6.

5.4.5.7 ***Air Quality.*** Under Alternative 4, impacts to air quality would be the same as those described under Alternative 3 in Section 5.3.5.7.

5.4.5.8 ***Noise.*** Noise impacts under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.5.8.

5.4.5.9 ***Visual Resources.*** The impacts on the visual resources of Eldorado Valley under Alternative 4 would be the same as those under Alternative 3, as described in Section 5.3.5.9.

5.4.5.10 Cultural Resources. Under Alternative 4, impacts to cultural resources would be the same as those described under Alternative 1 in Section 5.1.1.10.

<u>AMERICAN INDIAN CULTURAL RESOURCES</u>—This section describes the American Indian concerns associated with implementing Alternative 4, as summarized by the CGTO.

<u>Defense Program</u>—Under Alternative 4, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Eldorado Valley.

<u>Waste Management Program</u>—Under Alternative 4, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Eldorado Valley.

<u>Environmental Restoration Program</u>—Under Alternative 4, no environmental restoration activities are planned for Eldorado Valley; therefore, no adverse impacts to American Indian resources are expected.

<u>Nondefense Research and Development Program</u>—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

<u>Work for Others Program</u>—It is unlikely that Work for Others Program activities will be implemented in Eldorado Valley; therefore, no adverse impacts on American Indian resources are expected under Alternative 4.

5.4.5.11 Occupational and Public Health and Safety. Minimal occupational health and safety impacts are expected as a result of construction and operation of a Solar Enterprise Zone facility. All activities at the site would be conducted in compliance with Occupational Safety and Health Administration regulations and requirements.

5.4.5.12 Environmental Justice. Environmental Justice impacts in the region of influence would be the same as those described in Section 5.4.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.5.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Eldorado Valley. The CGTO maintains that past activities in the Eldorado Valley have disproportionately impacted the American Indian people, especially regarding Holy Land violations. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

5.4.6 Dry Lake Valley

Activities at Dry Lake Valley are limited to the Nondefense and Research Program; therefore, impacts discussed in this section would be the result of Nondefense and Research Program activities. A sitewide environmental impact statement, supplemental environmental impact statement, and or other environmental studies could be performed to describe all impacts should this site be chosen for a Solar Enterprise Zone facility. Project plans, site preparation, technical studies, and worker-transition training development and implementation could also be accomplished.

5.4.6.1 ***Land Use.*** The location of a Solar Enterprise Zone facility in Dry Lake Valley would not result in significant impacts on land uses under Alternative 4. The designation of the site for renewable energy development is consistent with the plans for energy production in this area.

The impacts to airspace under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.6.1.

5.4.6.2 ***Transportation.*** The following sections address the environmental impacts related to transportation activities as defined under Alternative 4. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.4.6.2.1 ***On-Site Traffic***—Impacts would be the same as described under Alternative 3, Section 5.3.6.2.1.

5.4.6.2.2 ***Off-Site Traffic***—U.S. Highway 93 would be the major regional access to the site. It is a two-lane, two-way rural highway with 1,210 average daily traffic in 1993 south of State Route 375 Junction. The projected peak hour traffic and associated level of service for 1996, 2000, and 2005 are shown in Table 5.4-4. With the Solar Enterprise Zone facility in operation, U.S. Highway 93 near the site would continue to operate at level of service C or better.

5.4.6.2.3 ***Transportation of Materials and Waste***—Transportation of materials and waste are not expected to occur at a Solar Enterprise Zone facility. Therefore, this section is not applicable to this site.

5.4.6.2.4 ***Other Transportation***—Because activities under Alternative 4 do not include extensive rail or air transportation of personnel and materials, impacts to these transportation modes would be minimal and would not be significant.

5.4.6.3 ***Socioeconomics.*** The socioeconomic analysis has been prepared for the region of influence regardless of where employees work. Therefore, the place of employment would not change the effects in any of the socioeconomic indicators. The analyses for this site is included in Section 5.4.1.3.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3

5.4.6.4 ***Geology and Soils.*** Impacts on the geologic resources and soils of Dry Lake Valley as a result of the development of a Solar Enterprise Zone facility would be the same under Alternative 4 as under Alternative 3 in Section 5.3.6.4.

5.4.6.5 ***Hydrology.*** Surface water and groundwater impacts under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.6.5.

5.4.6.6 ***Biological Resources.*** The impacts to biological resources at this site under Alternative 4 would be the same as under Alternative 3, as described in Section 5.3.6.6.

5.4.6.7 ***Air Quality.*** Impacts to air quality would be the same as those described under Alternative 3 in Section 5.3.6.7.

5.4.6.8 ***Noise.*** Noise impacts under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.6.8.

5.4.6.9 Visual Resources. The impacts on the visual resources of Dry Lake Valley under Alternative 4 would be the same those under Alternative 3, as described in Section 5.3.6.9.

5.4.6.10 Cultural Resources. Under Alternative 4, impacts to cultural resources at Dry Lake Valley would be the same as those described for Alternative 3 in Section 5.3.6.10.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 4, as summarized by the CGTO.

Defense Program—Under Alternative 4, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Dry Lake Valley.

Waste Management Program—Under Alternative 4, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Dry Lake Valley.

Environmental Restoration Program—No environmental restoration activities are planned for Dry Lake Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 4.

Nondefense Research and Development Program—Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program—It is unlikely that Work for Others Program activities will be implemented in Dry Lake Valley; therefore, no adverse impacts on American Indian resources are expected under Alternative 4.

5.4.6.11 Occupational and Public Health and Safety. Minimal occupational health and safety impacts are expected as a result of construction and operation of a Solar Enterprise Zone facility. All activities at the site would be conducted in compliance with Occupational Safety and Health Administration regulations and requirements.

5.4.6.12 Environmental Justice. Environmental Justice impacts for the region of influence would be the same as those discussed in Section 5.4.1.12.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.6.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety. There has not been a systematic study of these issues for the Dry Lake Valley have disproportionately impacted these American Indian people especially regarding Holy Land violations. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

5.4.7 Coyote Spring Valley

Under Alternative 4, the Nondefense Research and Development Program would be the only program conducting activities; therefore, the impacts discussed in this section are limited to Nondefense Research and Development Program activities. A sitewide EIS, supplemental EIS, and or other environmental studies could be performed to describe all impacts should this site be chosen for a Solar Enterprise Zone facility. Project plans, site preparation, technical studies, and worker-transition training development and implementation could also be accomplished.

5.4.7.1 Land Use. Under Alternative 4, alternative energy projects would be located as approved. Alternative 4 actions would not significantly impact surrounding land uses, which include wildlife management, mining, and recreation.

Under Alternative 4, impacts to airspace would be the same as those described under Alternative 3 in Section 5.3.7.1.2.

5.4.7.2 ***Transportation***. The following sections address the environmental impacts related to transportation activities as defined under Alternative 4. The analysis of transportation impacts is presented with respect to on-site and off-site traffic, transportation of materials and waste, and other transportation.

5.4.7.2.1 ***On-Site Traffic***—Impacts to on-site traffic under alternative 4 would be the same as those described under Alternative 3 in Section 5.3.7.2.1.

5.4.7.2.2 ***Off-Site Traffic***—Impacts to off-site traffic would be the same as those described under Alternative 3 in Section 5.3.7.2.2.

5.4.7.2.3 ***Transportation of Materials and Waste***—Transportation of materials and waste are not expected at the Solar Enterprise Zone facility. Therefore, this section is not applicable to this site.

5.4.7.2.4 ***Other Transportation***—Because this alternative's activities do not include extensive rail or air transportation of personnel and materials, impacts to these transportation modes would be minimal and would not be significant.

5.4.7.3 ***Socioeconomics***. A major objective of the Solar Enterprise Zone facility in Coyote Spring Valley is to provide local employment and economic benefits to offset the impact of defense conversion and Alternative 4 activities on the NTS. A Solar Enterprise Zone facility would stimulate the economy of Coyote Spring Valley and Lincoln County, while simultaneously serving national energy and environmental objectives. Building individual solar projects would provide construction jobs for a short period of time, while a fairly small, stable work force would be required for sustained operation and maintenance of the facilities.

Solar energy could fill the increased demand for electricity without damaging the environment. The development of a new science and manufacturing base mission is important. At the same time, environmental concerns create a growing demand for alternative generating technologies.

The socioeconomic impacts of the Solar Enterprise Zone facility will be presented when more information with respect to economic activity, population, housing, public finance, and public services is available. A sitewide EIS, supplemental EIS, and/or other environmental studies will be performed to describe all socioeconomic impacts. In addition, project plans, site preparation, technical studies, and worker-transition training development and implementation could be accomplished.

American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in 5.1.1.3.

5.4.7.4 ***Geology and Soils***. There would be the same impacts on the geologic resources and soils of Coyote Spring Valley as a result of the development of a Solar Enterprise Zone under Alternative 4 as under Alternative 3. Impacts under Alternative 3 are described in Section 5.3.7.4.

5.4.7.5 ***Hydrology***. Surface water and groundwater impacts under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.7.5.

5.4.7.6 ***Biological Resources***. The impacts to biological resources activities at this site under Alternative 4 would be the same as under Alternative 3. These are described in Section 5.3.7.6.

5.4.7.7 ***Air Quality***. Impacts to air quality under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.7.7.

5.4.7.8 ***Noise***. Noise impacts under this alternative would be the same as those described under Alternative 3 in Section 5.3.7.8.

5.4.7.9 ***Visual Resources***. The impacts to visual resources of Coyote Spring Valley under Alternative 4 would be the same as those described under Alternative 3 in Section 5.3.7.9.

5.4.7.10 ***Cultural Resources***. Impacts to cultural resources would be the same as those described under Alternative 3 in Section 5.3.7.10.

AMERICAN INDIAN CULTURAL RESOURCES—This section describes the American Indian concerns associated with implementing Alternative 4, as summarized by the CGTO.

Defense Program—Under Alternative 4, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Coyote Spring Valley.

Waste Management Program—Under Alternative 4, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Coyote Spring Valley.

Environmental Restoration Program—No environmental restoration activities are planned for Coyote Spring Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 4.

Nondefense Research and Development Program—Under Alternative 4, it is expected that American Indian cultural resources at Coyote Spring Valley will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program—It is unlikely that Work for Others Program activities will be implemented in Coyote Spring Valley; therefore, no adverse impacts on American Indian resources are expected under Alternative 4.

5.4.7.11 Occupational and Public Health and Safety. Minimal occupational health and safety impacts are expected as a result of construction and operation of a Solar Enterprise Zone facility. All activities at the site would be conducted in compliance with Occupational Safety and Health Administration regulations and requirements.

5.4.7.12 Environmental Justice. The Environmental Justice impacts for the region of influence are the same as those discussed in Section 5.4.1.12.

American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. There has not been a systematic study of these issues for the Coyote Spring Valley The CGTO maintains that past activities in the Coyote Spring Valley have impacted these American Indian Environmental Justice issues, especially Holy Land violations. This area was traditional lands for Southern Paiutes especially the Moapa Paiute Tribe. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by program responses are assessed in Section 5.1.1.12 and are not repeated here.

5.5 Unavoidable Adverse Effects

Unavoidable impacts constitute a substantial adverse change to existing environmental conditions that cannot be fully mitigated by implementing mitigation measures. The potential unavoidable adverse impacts that could arise from implementing the alternatives discussed in Chapter 5 are summarized below. Under Alternatives 1, 2, 3, and 4, the unavoidable adverse impacts of past underground nuclear testing activities would remain.

5.5.1 Alternative 1

The unavoidable adverse effects that would result from implementing Alternative 1 are presented in the following sections.

5.5.1.1 Nevada Test Site. All continuing programs and operations at the NTS would produce some environmental impacts that are not mitigated. The unavoidable adverse effects at the NTS are presented in this section.

UNDERGROUND TESTING—First and foremost among the unavoidable adverse effects are the impacts resulting from underground testing, both in terms of the magnitude of the impacts and their duration. As noted in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977), other activities conducted at the NTS "for the most part are registered immediately and those effects are very small in comparison with the effects of underground nuclear testing." Under Alternative 1, the DOE would maintain the readiness and capability to conduct one or more underground nuclear weapons tests, if directed by the President, within the 10-year timeframe.

The major unavoidable effects of underground testing include the release of large quantities of radioactivity into the subsurface, the formation of new subsidence craters, and the generation of ground motion that might be felt outside the boundaries of the NTS.

The underground nuclear tests conducted under Alternative 1 would contaminate the subsurface with a large amount of short- and long-lived radionuclides. As discussed in Section 4.1.2, approximately 45,000 Ci/kt would remain in the subsurface 180 days after a test. The types of radionuclides produced are further discussed in Section 4.1.5.2, with tritium likely to be the most abundant radionuclide. Many of the other radionuclides would remain bound up in the melt glass in the event cavity. Some groundwater might be unavoidably contaminated if the shot cavity is below or intercepts the water table. The surface areas below which the contaminants are released are strictly controlled for safety and security reasons.

An underground nuclear test would also unavoidably disrupt the integrity of the subsurface geologic environment. Contamination might extend as far as five times the radii of the cavity from the shot point. Following the tests, subsidence craters often form because of the collapse of the geologic units. These impacts preclude the use of the geologic values inherent at the site for the long term. Subsidence craters alter the natural surface drainage and might locally increase soil erosion. Preferential drainage from subsidence craters down the rubble chimney to the shot cavity might occur and might contaminate the groundwater as a result, although little data exist to determine whether this is the case.

Ground motions accompanying underground nuclear explosions and some other tests conducted at the NTS are felt in Las Vegas, Nevada, and elsewhere in the surrounding region. Occasionally, ground motion from a larger test might cause nonstructural off-site damage, such as plaster cracks. A larger underground test could cause perceptible motion at off-site locations, particularly in high-rise structures in Las Vegas.

SUBCRITICAL EXPERIMENTS—Underground subcritical experiments would produce some physical effects on the geologic media. Approximately 2,314 m^3 (81,700 ft^3) would be disturbed each year in association with the conduct of up to four experiments. Irreversible effects would include the deposition of radiological material within and near the cavity mined in the subsurface. Approximately 20 acres of surface geologic media are currently disturbed in association with the Lyner Complex, where these experiments would be conducted.

LAND USE—Land uses would continue to be restricted at the underground test areas and at the radioactive waste management sites because of subsurface contamination and the presence of landfilled wastes, respectively. Revegetation of the surfaces as sections of the radioactive waste management sites are closed would create stable soils and better habitat. Decommissioning of some contaminated facilities would result in their demolition. If the facility is of historic significance, as many of them are, the loss of the structure would represent an unavoidable adverse impact. The loss would be partially mitigated by data gathered in accordance with the documentation requirements of the Historical American Buildings Survey/ Historical Engineering Records system of the National Park Service.

Airspace restrictions would continue to prohibit commercial and general aviation use. Because the NTS airspace is nearly surrounded by NAFR Complex restricted airspace, the added increment of limitation would be minor.

TRANSPORTATION—Vehicular traffic at the NTS would continue at about 1,890 average daily trips, while off-site trips would continue at a rate of about 2,480. The contribution of NTS-related traffic to the Las Vegas area's already unsatisfactory level of service on major roadways would be minimal. Though a small increment in emissions would not cause additional violations, mobile-source emissions would continue to contribute to the Las Vegas Valley's sometimes poor air quality.

GEOLOGY AND SOILS—The impact to geology and soils is presented in the discussion of the underground testing effects.

HYDROLOGY—The impacts to hydrology are discussed in the underground testing effects section.

BIOLOGICAL RESOURCES—Surface disturbance associated with remediation, construction, and testing programs would cause unavoidable impacts on habitat. Surface-disturbing activities may kill or displace wildlife such as small mammals, reptiles, and soil-dwelling invertebrates. If ground clearing for construction occurs during the breeding season, the eggs of birds in nests on the ground within a project area may be destroyed. Despite attempts to find and relocate desert tortoises before events occur that could threaten them, some tortoises, particularly juveniles, might be missed and could be killed by heavy equipment or vehicles. Training exercises that take place in desert tortoise habitat could result in tortoise mortality. Normal road traffic on the NTS has resulted in less than one tortoise mortality per year. This rate would be anticipated to continue. Wildfires in tortoise habitat would also constitute a source of potential tortoise mortality.

Sumps at the underground test area wells and open containers at the proposed Liquid Waste Treatment System Facility might attract some birds, bats, or mammals and cause their deaths through drowning or contamination. Although not studied, it is likely that losses would be very small. Developed areas of the NTS that have buildings, roads, storage lots, sewage lagoons, and other infrastructure would remain unavailable for natural habitat.

AIR QUALITY—Certain activities would produce PM_{10} and mobile-source emissions. Particulate matter less than 10 microns (PM_{10}) would be produced through surface disturbance. Particulates would not threaten Nye County's attainment, however, and would only contribute 0.03 percent of the County's total. Similarly, the PM_{10} contribution to Clark County's total would be very small.

VISUAL RESOURCES—Developed areas of the NTS that have buildings, roads, storage lots, sewage lagoons, and other infrastructure would continue in many cases to affect the viewshed. Project areas are initially accessed by graded gravel or dirt roads. If the projects become long-term, these roads would require upgrading, which would have increased impacts on habitat and visual resources.

CULTURAL RESOURCES—If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, then these resources may be lost when remediation disturbs the surface. This is an unavoidable impact. Impacts resulting from the illicit collection of artifacts by NTS workers may be partially mitigated through education, but it is likely that some workers would persist in such activities. This would be an unavoidable impact.

OCCUPATIONAL AND PUBLIC HEALTH AND SAFETY—Preparations for activities, such as the Big Explosives Experimental Facility and radioactive waste management sites, would result in new surface disturbances. Similarly, Environmental Restoration Program activities would disturb surface areas during the process of remediating industrial sites, plutonium-contaminated soils, Defense Nuclear Agency sites, and during the preparation of well pads for groundwater characterization. Approximately 1,890 acres on the NTS and 1,169 acres on the NAFR Complex would be affected. It should be noted, however, that the restoration of contaminated areas represents the mitigation of impacts that have resulted from past actions at the NTS. Thus, the unavoidable negative impacts associated with these actions would be counterbalanced by the reduction in the risk to human health caused by the contamination.

NOISE—While there would be no off-site impacts, temporary high noise levels would prevail in the proximity of operations like the Spill Test Facility, drilling operations, and the Big Explosives Experimental Facility during detonations.

5.5.1.2 Tonopah Test Range. Remediation of the environmental restoration sites and the Soils

Media Corrective Action Unit areas would result in removal of the vegetation and surface soil layers. This would produce PM_{10} at about 27 kilograms (kg) (60 pounds [lb]) per acre per year. Particulates and mobile-source emissions represent a minor degradation of the air quality. Vegetation and some animals would be destroyed, but no population's viability would be threatened. Visual resources would be unavoidably altered. Removal of vegetation and disturbed soils that differ from the surroundings in color or tone would become visually evident until revegetation had progressed. In some cases, however, vegetation types might be substantially different from that in surrounding areas if rehabilitation with local native species is unsuccessful. The change in species could produce areas that differ in color, tone, or texture from the surroundings. Since these areas are not located where they can be observed from public viewpoints and are classified as common scenery, the effects to visual resources would be minor.

GEOLOGY AND HYDROLOGY—Grading of the surface for restoration of the Soils Media Corrective Action Unit sites would cause some minor alteration of surface-water drainage patterns and some accelerated erosion until stabilization occurred. Minor use of groundwater for dust control and revegetation of the Soils Media Corrective Action Unit sites would be an unavoidable, but minor, impact.

NOISE—Local noise from heavy equipment and drill rigs would be an unavoidable, but minor, impact.

CULTURAL RESOURCES—In some cases, contamination levels might pose an unacceptable high risk to archeological surveyors. Any cultural resources in these areas would be lost to surface disturbance during remediations. The necessity of removing cultural resource materials that would otherwise be destroyed by remediation activities would represent a benefit to the present knowledge base. However, data recovered represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology, would be unavailable for subsequent study using improved future technologies.

*5.5.1.3 **Project Shoal and Central Nevada Test Areas**.* Monitoring, characterization, and minor remediation would result in very limited surface disturbance, totaling about 54 acres. This would result from well drilling, minor excavation, and backfilling of the Project Shoal area emplacement shaft. Small amounts of PM_{10} and mobile-source emissions would be produced. Heavy equipment and drill rig operations would produce sporadic local noise.

Remediation activities might require data recovery from some cultural resource sites. Removing cultural resource materials that would otherwise be destroyed by these activities would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. Impacts resulting from the illicit collection of artifacts by workers may be partially mitigated through education, but it is likely that some workers would persist in such activities. This would be an unavoidable impact.

Geologic media contaminated by the test would remain contaminated and would be unavailable for other uses. Groundwater in the vicinity of the shot cavity at each test area might be contaminated and, if so, would remain unavailable for any use.

5.5.2 Alternative 2

The unavoidable adverse effects resulting from implementation of Alternative 2 are discussed in the following sections.

*5.5.2.1 **Nevada Test Site**.* Closure of operations at the NTS would produce some environmental impacts that could not be mitigated, but significantly fewer than those under Alternative 1. Areas developed with buildings, roads, storage lots, sewage lagoons, and other infrastructure, except as slowly modified by deterioration, would remain unavailable for natural habitat and would continue to affect the viewshed in many cases. There would be minor production of PM_{10} from operations at the radioactive waste management sites as they finish operations and close, and from security patrols on unpaved roads. Monitoring and patrols would produce minor mobile-source emissions. These would be reduced when compared to Alternative 1. The facilities would no longer contribute to research and development, training, and employment levels.

Deterioration of unmaintained facilities and infrastructure would result in a need for major repairs or demolition and reconstruction if the site were to be reactivated at some future time.

Closure of the NTS would result in unavoidable adverse impacts to the regional socioeconomic conditions, including the loss of a substantial number of relatively high-paying jobs, increases in unemployment rates, loss of economic diversification, and out-migration of DOE and contractor employees and their families. These adverse effects would be relatively short term. Unrelated and economic community growth would be expected to overshadow these effects in time.

Preparations for closure activities at the radioactive waste management sites would result in minor new surface disturbances. At those sites where action would be necessary because of hazard or monitoring requirements, the Environmental Restoration Program would disturb some surface areas in the process of stabilizing or remediating industrial sites and Defense Nuclear Agency sites and in the preparation of well pads for groundwater monitoring. The total disturbance would be considerably less than with Alternative 1.

Subsurface contamination from historic underground nuclear tests would continue to restrict access to the underground zone surrounding the expended test for reasons of safety and security. The presence of subsidence craters would result in alteration of surface drainages and increased soil erosion. Most of the radionuclides are thought to be bound up in the melt glass surrounding the shot cavity. However, some groundwater would be unavoidably contaminated if the shot cavity was below, or intercepted, the water table. Preferential drainage from subsidence craters down the rubble chimney might occur and might contaminate the groundwater. The underground effects of this alternative vary little from those in Alternative 1 except that there would be no remediation of the underground testing areas other than possible long-term institutional controls.

Surface disturbances have caused unavoidable impacts on habitat that would not be restored under Alternative 2. Normal road traffic at the NTS has resulted in less than one tortoise mortality per year. This rate would be anticipated to decline with the decreased road traffic under Alternative 2. Wildfires in tortoise habitat would also constitute a source of potential tortoise mortality.

Shutdown of some wells would result in drying up of associated sumps that are presently perennial water sources. Wildlife that is dependent upon these sources and unable to relocate would be unavoidably lost.

Sumps at Underground Test Area wells would be temporarily wet during sampling activities and might attract some birds, bats, or mammals and cause their deaths through drowning or contamination.

Under Alternative 2, on-site average daily trips at the NTS would decrease by 1,868, while off-site trips would decrease by 760 in 1996, and by 1,440 in 2000 and 2005. The contribution of NTS-related traffic to the Las Vegas area's already unsatisfactory level of service on major roadways would be minimal. Though a small increment that would not cause additional violations, mobile-source emissions would continue to contribute to the Las Vegas Valley's sometimes poor air quality.

The NAFR Complex airspace restrictions would continue to prohibit commercial and general aviation use. Since the NTS airspace is nearly surrounded by NAFR Complex restricted airspace, the added increment of limitation would be minor.

Since the site would be locked up, the NTS would be unavailable for most human-oriented land use. Natural recovery would slowly progress, and ecosystems would begin to approach an equilibrium largely unaffected by humans.

Impacts resulting from the illicit collection of artifacts by workers may be partially mitigated through education, but it is likely that some workers would persist in such activities. This would be an unavoidable impact.

5.5.2.2 Tonopah Test Range. No Environmental Restoration Program projects would occur except at those sites that present an immediately hazardous situation. This would result in no change to present land use. Presently, applicable land-use restrictions would continue to limit the types of access and activities for which these lands could be used.

Affected soils would remain unavoidably contaminated, thereby restricting their use and potentially reducing their productive capacity. Under certain conditions, it would be possible for surface water to transport contamination to other areas and become contaminated itself. Similarly, under certain uncommon conditions, it would be possible for air to suspend and transport contamination to other areas.

5.5.2.3 Project Shoal and Central Nevada Test Areas. Geologic media contaminated by each of the tests would remain so and would be unavailable for other use. Groundwater in the vicinity of each shot cavity might be contaminated and, if so, would remain unavailable for any use. A contaminated mud pit at the Central Nevada Test Area would not be remediated.

5.5.3 Alternative 3

The unavoidable adverse effects resulting from implementation of Alternative 3 are discussed in the following sections.

5.5.3.1 Nevada Test Site. The unavoidable adverse environmental impacts addressed in this alternative would include those discussed for Alternative 1, as well as additional ones. New projects, which would include a facility for handling and storing weapons-usable fissile materials; expansion of the Device Assembly Facility; and a large, heavy-industrial facility, would increase the amount of land committed to other land use. Some additional disposal area would result from increased disposal of low-level waste, mixed waste, and sanitary waste. Since this disposal would occur within the boundaries of the sites already designated for waste disposal, it would not represent a significant new commitment of land use.

No specific location has been proposed for some of these projects, so it is not possible to identify impacts precisely. Therefore, a range of potential impacts is discussed in terms of how these differ from the impacts in Alternative 1.

Visual impacts would vary with location, but would generally be negligible because most of the NTS is not visible from public viewpoints, and much of the site has scenery common to the region.

An added increment of air contaminants would result both from construction and operations. The effect of one or more underground nuclear tests would be the same as under Alternative 1.

Most of the additional projects proposed would affect relatively limited surface areas. The notable exception would be the alternative energy proposal. Depending upon the technology or technologies pursued, the solar energy projects could affect up to 2,400 acres. If located in habitats containing plants of limited distribution, the viability of the population could be threatened. Increased road traffic, in addition to habitat destruction and crushing because of construction activity, would result in increased tortoise mortality. The overall doubling of traffic on the NTS would likely produce tortoise mortality of about two per year.

Increased groundwater pumping at the NTS might have the potential to reduce discharge at regional springs such as Devils Hole and Ash Meadows. Devils Hole harbors a population of pupfish, which is very sensitive to falling water levels. Ash Meadows has a great number of sensitive species of fish, invertebrates, and plants dependent upon its springs.

Project areas would initially be accessed by graded gravel or dirt roads. Traffic impacts resulting from the construction of new facilities would peak during the construction phase. If the projects become long term, these roads would require upgrading that would create additional visual, erosional, and habitat impacts.

Average daily trips on the NTS would be about 13,300, an increase of 11,400 over Alternative 1. Additional off-site average daily trips over Alternative 1 would range from 210 in 1996 to a high of 1,520 in 2000. This would not cause any air-quality violations. The increased traffic would add a small increment to the Las Vegas area's freeways and arterials, which are anticipated to be at unacceptable levels of service without any NTS activity. This would also add a small increment of pollution to the sometimes poor air quality of the Las Vegas Valley.

Because of the presence of a doubled workforce, an increase in vandalism to cultural resource sites would occur. Despite efforts to control workers' impacts on cultural resources by training, site avoidance through relocation of activities, or data recovery, some individuals would persist in vandalizing sites. This is, to some degree, an unavoidable impact.

Decommissioning of some contaminated facilities would result in their demolition. If the facility is of historic significance, as many of them are, the loss of the structure would represent an unavoidable adverse impact. The loss would be partially mitigated by data gathered in accordance with the documentation requirements of the Historical American Buildings Survey/Historical American Engineering Records system of the National Park Service.

If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, then these resources may be lost when remediation disturbs the surface. This is an unavoidable impact. Impacts resulting from the illicit collection of artifacts by NTS workers may be partially mitigated through education, but it is likely that some workers would persist in such activities. This would be an unavoidable impact.

5.5.3.2 ***Tonopah Test Range***. Risk to the public would remain the same as that discussed under Alternative 1.

Remediation of the Environmental Restoration Program sites and the Soils Media Corrective Action Unit areas would unavoidably result in removal of the vegetation and surface soil layers. This would produce PM_{10} at a rate of 27 kg (60 lb) per acre per year in the case of the Environmental Restoration Program sites. Particulates and mobile-source emissions would represent a degradation of air quality, though minor in this case. Vegetation and some animals would be destroyed, but no population's viability would be threatened. Visual resources would be unavoidably altered. Removal of vegetation and disturbance of soils that differ from the surroundings in color or tone would become visually evident until recovery had progressed. In some cases, however, vegetation types might be substantially different from that in surrounding areas if rehabilitation with local native species is unsuccessful. The change in species could produce areas that differ in color, tone, or texture from the surroundings. Since these areas are not located where they can be observed from public viewpoints and are classified as common scenery, the effects to the visual resource would be minor. Grading of the surface for restoration of the Soils Media Corrective Action Unit sites would cause some minor alteration of surface-water drainage patterns and some accelerated erosion until stabilization occurred. Minor use of groundwater for dust control and revegetation of the Soils Media Corrective Action Unit sites would be an unavoidable, though minor impact.

Local production of noise from heavy equipment and drill rigs would be a minor impact.

The necessity of removing cultural resource materials that would otherwise be destroyed by remediation activities would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. In some cases, contamination levels might pose an unacceptably high risk to archeological surveyors. Any cultural resources in these areas would be lost to surface disturbance during remediation.

5.5.3.3 ***Project Shoal and Central Nevada Test Areas***. Monitoring, characterization, and any minor remediation would result in very limited surface disturbance. This would result from well drilling, minor excavation, and backfilling of the Project

Shoal Area emplacement shaft. Small amounts of PM_{10} and mobile-source emissions would be produced. Heavy equipment and drill rig operation would produce temporary local noise. Drilling sumps would pose a minor threat to some animals. The level of habitat recovery would depend upon the degree to which native plants could be reestablished.

Remediation activities might require data recovery from some cultural resource sites. Removing cultural resource materials that would otherwise be destroyed by these activities would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies.

Geologic media contaminated by the test would remain contaminated and would be unavailable for other uses. Groundwater in the vicinity of the shot cavity might be contaminated and, if so, would remain unavailable for any use.

5.5.3.4 Eldorado Valley. Land used for this proposal is designated for renewable energy development and would be committed to a single use. Depending on where in Eldorado Valley the project is sited, existing land use would be affected to a greater or lesser degree. Some of the more intensive present uses of the playa are recreational, including land sailing, model aircraft flying, ultralight operations, off-highway vehicle use, and camping. Areas off the playa are used for bird hunting and off-highway vehicle races. All these uses would be incompatible within the area developed for solar generation; those uses that disturb the surface would probably be considered undesirable in the vicinity of collectors where they cause airborne particulates. The loss of these opportunities would be an unavoidable adverse impact.

Some power and natural gas line construction would be necessary. This construction would create additional access roads in the region. Access roads would cause habitat fragmentation and adverse effects to tortoises and other species. Fragmentation would reduce or prevent movement and consequently would affect gene-pool flow in less mobile species like tortoises. Construction of the projects would cause an increase in traffic in the area with potential to increase tortoise mortality on the highways and roads and on the construction sites themselves. A total of up to 2,400 acres of habitat could be lost to project construction, and approximately 42 acres may be lost to power and pipe line construction. A similar amount of soils would be disturbed.

The site lies within the Class B airspace (Terminal Control Area) for McCarran International Airport. Glare from the collectors could affect aircraft operations. Should this occur, operations at the Solar Enterprise Zone facility would have to be altered to lessen the effect, which would adversely affect its production, or airport operations would have to be modified to avoid this conflict.

Although the scenery is common to the region, the site is viewed by large numbers of the public traveling Highway 95 and engaging in recreational pursuits. There are also three U.S. Bureau of Land Management Wilderness Study Areas within the site's viewshed. Construction of the solar facilities and associated infrastructure would create considerable change in the visual environment of the valley.

Surface disturbance and construction would result in the production of PM_{10} and mobile-source emissions. Local noise levels would be present during construction. Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies.

5.5.3.5 Dry Lake Valley. Land used for this proposal would be committed to a single use. Some areas of the valley are used for occasional off-highway vehicle races. This use would be incompatible within the area developed for solar generation, and because it disturbs the surface, it would probably be considered undesirable in the vicinity of collectors because of airborne particulates. The loss of vehicle race opportunities would be an unavoidable adverse impact.

A limited amount of power and natural gas line construction would be necessary. A proposal exists to construct a water line to Coyote Spring Valley to support the facility. This construction would create additional access roads in the region. Access roads would cause habitat fragmentation and adverse effects to tortoises and other species. Fragmentation would reduce or prevent movement and consequently would affect gene-pool flow in less mobile species like tortoises. The water line has the potential to affect a large area of tortoise habitat in the area to the north along the west side of the Arrow Canyon Range. Construction of the projects would cause an increase in traffic in the area with potential to increase tortoise mortality on the highways and roads and on the construction sites. A total of 2,400 acres of habitat could be lost to project construction, and approximately 560 acres may be lost to power and pipe line construction.

Depending on the quantity of water involved and the source of that water, the use of groundwater from Coyote Spring Valley would have the potential to affect discharge at Muddy Spring, which has a population of threatened Moapa dace.

The site lies within the Class B (Terminal Control Area) for McCarran International Airport and Nellis Air Force Base. Glare from the collectors could affect aircraft operations. In that event, either the solar facility would have to alter its operations to lessen the effect, which would adversely affect its production, or the airfields would have to modify their operations to avoid conflict.

Although the scenery is common to the region, the site is viewed by large numbers of the public traveling the highways and engaging in recreational pursuits. Construction of the solar facilities and associated infrastructure would have a large impact on the visual environment.

Surface disturbance and construction would result in the production of PM_{10} and mobile-source emissions. Local noise levels would be present during construction.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies.

5.5.3.6 Coyote Spring Valley. Land used for this proposal would be committed to a single use. Some areas of the valley are lightly used for dispersed recreation. This use would be incompatible within the area developed for solar generation. The loss of the opportunities would be a minor unavoidable adverse impact.

Substantial power and natural gas line construction would be necessary. A water line would have to be constructed to support the facility. This construction would create additional access roads in the region. Access roads would cause habitat fragmentation and adverse effects to tortoises and other species. Fragmentation would reduce or prevent movement and consequently would affect gene-pool flow in less mobile species like tortoises. Construction of the projects would cause an increase in traffic in the area with potential to increase tortoise mortality on the highways and roads, and on the construction sites. A total of 2,400 acres of habitat could be lost to project construction, and approximately 960 acres may be lost to power and pipe line construction. The habitat in Coyote Spring Valley has been designated by the U.S. Bureau of Land Management as critical habitat for the threatened desert tortoise. Specific project locations are necessary before a determination can be made regarding the potential to adversely affect any other sensitive species present in the valley.

Depending on the quantity of water involved, the use of groundwater from Coyote Spring Valley would have the potential to affect discharge at Muddy Spring, which has a population of threatened Moapa dace. The use of groundwater might also have the potential to affect local springs in the valley.

Scenic quality of the site has been designated Class B. The site is viewed by the public traveling U.S. Highway 93 and engaging in recreational pursuits. There are also three U.S. Bureau of Land Management Wilderness Study Areas within the site's viewshed. Construction activities of the solar facilities and associated infrastructure would greatly change the landscape character of Coyote Spring Valley and have an adverse impact on the visual environment.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies.

5.5.4 Alternative 4 -

The unavoidable adverse effects resulting from the implementation of Alternative 4 are discussed in the following sections.

5.5.4.1 ***Nevada Test Site***. Continued operations at the NTS, even without the Defense Program, would produce some environmental effects that remain unmitigated. Areas would remain developed in buildings, roads, storage lots, sewage lagoons, and other infrastructure, as in Alternative 1, and would be unavailable for natural habitat. In addition, development of a Solar Enterprise Zone facility would affect a land base of up to 2,400 acres. This may substantially increase the impact on public viewsheds as the solar site proposed for Area 22 may be visible from U.S. Highway 95. Increased public access for museum visits, road races, special hunts, and other recreation would make substantially more area of the NTS visible to increasing numbers of visitors, thus increasing the impact of existing or new development on visual resources. However, much of the scenery in the region is common. Some operations would produce PM_{10} and mobile-source emissions.

Underground test areas would unavoidably remain contaminated and result in continued restricted access to the subsurface. Construction sites and subsidence craters would result in altered surface drainage and increased soil erosion. Most of the radionuclides are thought to be bound up in the melt glass surrounding the shot cavity. However, some groundwater would be unavoidably contaminated when the shot cavity was below, or intercepted, the water table. Preferential drainage from craters down the rubble chimney might occur and might contaminate the groundwater as a result. There would not be the small additional increment of impact with this alternative as no further underground nuclear tests would occur.

Surface disturbance would cause unavoidable impacts on habitat. While no additional increment would ensue because of the Defense Program, a Solar Enterprise Zone facility would require a substantial acreage. If the Solar Enterprise Zone facility were located in an area that supports sensitive species, a threat to their viability would exist. Reduced habitat and increased risk of crushing during construction and on roads would unavoidably affect tortoises if the sites were located in their habitat. Increased groundwater use for the Solar Enterprise Zone efforts might adversely affect discharge at regional springs. Reductions at Devils Hole and Ash Meadows could have a large impact on the numerous sensitive species depending on the water levels and discharge rates.

Some mortality might occur to birds, bats, and other mammals through drowning or contamination at the Underground Test Area well sumps and open tanks at the Liquid Waste Treatment System Facility.

Particulate and mobile-source emissions would not threaten attainment in Nye County. They would not cause additional violations in Clark County, but would add a small increment to Clark County's existing air-quality problems.

Average daily trips offsite would fall by 330 relative to Alternative 1. This would cause an additional small increment to the unsatisfactory levels of service on key roadways in the Las Vegas Valley.

Termination of Defense Program activities at the NTS would result in unavoidable adverse impacts to the regional socioeconomic conditions including the loss of 4,625 (1,496 direct and 3,129 secondary) jobs in 1996 and 7,981 (2,748 direct and 5,233 secondary) in 2000 and 2005. These adverse effects would be relatively short-term, and economic and natural growth would be expected to compensate for these effects over time.

Because of the presence of landfill wastes, some land uses would continue to be restricted at the radioactive waste management sites and the solid waste landfills.

If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, then these resources may be lost when remediation disturbs the surface. This is an unavoidable impact. Impacts resulting from the illicit collection of artifacts by NTS workers may be partially mitigated through education, but it is likely that some workers would persist in such activities. This would be an unavoidable impact. Increased numbers of workers and other staff during portions of the period analyzed in this EIS would result in an unavoidable adverse impact on cultural resources. Decommissioning of some contaminated facilities would result in their demolition. If the facility is of historic significance, as many of them are, the loss would be partially mitigated by data gathered in accordance with the documentation requirements of the Historical American Buildings Survey/Historical American Engineering Record system of the National Park Service.

5.5.4.2 ***Tonopah Test Range***. Remediation of the Environmental Restoration Program sites and the Soils Media Corrective Action Unit areas would unavoidably result in removal of the vegetation and surface-soil layers. This would produce PM_{10} in the case of the Environmental Restoration Program sites. Particulates and mobile-source emissions would represent a degradation of the air quality, though minor in this case. Vegetation and some animals would be destroyed, but no population's viability would be threatened. Visual resources would be unavoidably altered. Removal of vegetation and disturbance of soils that differ from the surroundings in color or tone would become evident until recovery had progressed. In some cases, however, vegetation types might be substantially different from that in surrounding areas if rehabilitation with local native species were unsuccessful. The change in species could produce areas that differ in color, tone, and/or texture from the surroundings. Since these areas are not located where they can be observed from public viewpoints and are classified as common scenery, the effects to the visual resource would be minor.

Grading of the surface for restoration of the Soils Media Corrective Action Unit sites would cause some minor alteration of surface-water drainage patterns and some accelerated erosion until stabilization occurred. Minor use of groundwater for dust control and revegetation of the Soils Media Corrective Action Unit sites would be an unavoidable, though minor impact.

Local noise from heavy equipment and drill rigs would be a minor impact.

The necessity of removing cultural resource materials that would otherwise be destroyed by remediation activities would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. In some cases, contaminated lands might pose an unacceptably high risk to archeological surveyors. Any resources in these areas would be lost to surface disturbance during remediation.

5.5.4.3 ***Project Shoal and Central Nevada Test Areas***. Monitoring, characterization, and any minor remediation would result in very limited surface disturbance. This would result from well drilling, minor excavation, and backfilling of the Project Shoal Area emplacement shaft. Small amounts of PM_{10} and mobile-source emissions would be produced. Heavy equipment and drill rig operations would produce temporary local noise.

Well drilling and characterization activities might require data recovery from some cultural resource sites. Removing cultural resource materials that would otherwise be destroyed by these activities would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. Impacts resulting from the illicit collection of artifacts by workers may be partially mitigated through education, but it is likely that some workers would persist in such activities. This would be an unavoidable impact.

Geologic media contaminated by the tests would remain contaminated and would be unavailable for other uses. Groundwater in the vicinity of the shot cavity might be contaminated and, if so, would remain unavailable for any use.

5.5.4.4 Eldorado Valley. Land used for this proposal would be designated for renewable energy development and would be committed to a single use. Depending on where in Eldorado Valley the project is sited, existing land uses would be affected to a greater or lesser degree. Some of the more intensive present uses of the playa are recreational, including land sailing, model aircraft flying, ultralight operations, off-highway vehicle use, and camping. Areas off the playa are used for bird hunting and off-highway vehicle races. All these uses would be incompatible within the area developed for solar generation, and those uses that disturb the surface would probably cause airborne particulates. This would be considered undesirable in the vicinity of solar collectors. The loss of these opportunities would be an unavoidable adverse impact.

Some power and natural gas line construction would be necessary. This construction would create additional access roads in the region. Access roads would cause habitat fragmentation and adverse effects to tortoises and other species. Fragmentation would reduce or prevent movement and, consequently, would affect gene-pool flow in less mobile species like tortoises. Construction of the projects would cause an increase in traffic in the area with the potential to increase tortoise mortality on the highways and roads and on the construction sites themselves. A total of 2,400 acres of habitat could be lost to project construction, and an unknown additional amount would be lost to power and pipe line construction.

The site lies within the Class B airspace (Terminal Control Area) for McCarran International Airport. Glare from the solar collectors could affect aircraft operations. Should this occur, operations at the Solar facility would have to be altered to lessen the effect, which would adversely affect its production, or airport operations would have to be modified to avoid this conflict.

Although the scenery is common to the region, the site is viewed by large numbers of the public traveling Highway 95 and engaging in recreational pursuits. There are also three U.S. Bureau of Land Management Wilderness Study areas within the site's viewshed. Construction of the solar facilities and associated infrastructure would create considerable change in the visual environment of the valley.

Surface disturbance and construction would result in the production of PM_{10} and mobile-source emissions. Local noise levels would be present during construction.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Construction of roads in areas proposed for solar generating facilities may increase access to archaeologically sensitive areas. This could result in unavoidable impacts such as vandalism and illicit artifact collecting.

5.5.4.5 Dry Lake Valley. Land used for this proposal would be committed to a single use. Some areas of the valley are used for occasional off-highway vehicle races. These races would be incompatible within the area developed for solar generation because the races disturb the surface. The loss of vehicle race opportunities would be an unavoidable adverse impact.

A limited amount of power and natural gas line construction would be necessary. A proposal exists to construct a water line to Coyote Spring Valley to support the facility. This construction would create additional access roads in the region. Access roads would cause habitat fragmentation and adverse effects to tortoises and other species. Fragmentation would reduce or prevent movement and, consequently, would affect gene-pool flow in less mobile species like tortoises. The water line has the potential to affect a large area of tortoise habitat in the area to the north along the west side of the Arrow Canyon Range. Construction of the projects would cause an increase in traffic in the area with potential to increase tortoise mortality on the highways and roads and on the construction sites. A total of 2,400 acres of habitat could be lost to project construction; and 560 acres would be lost to power and pipe line construction. Depending upon the quantity of water involved, the use of groundwater from Coyote Spring-Valley would have the potential to affect discharge at Muddy Spring, which has a population of threatened Moapa dace.

The site lies within the Class B airspace (Terminal Control Area) for McCarran International Airport and Nellis Air Force Base. Glare from the collectors could affect aircraft operations. Should this occur, operations at the Solar Enterprise Zone facility would have to be altered to lessen the effect, which would adversely affect its production, or airport operations would have to be modified to avoid this conflict.

The scenery is common to the region, and the site is viewed by the public traveling Highway 93 and Interstate 15 and engaging in recreational pursuits. However, construction of solar facilities and associated infrastructure would have a minor impact on the visual environment because of extensive man-made modifications to the area.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Construction of roads in areas proposed for solar generating facilities may increase access to archaeologically sensitive areas. This could result in unavoidable impacts such as vandalism and illicit artifact collecting.

5.5.4.6 Coyote Spring Valley. Land used for this proposal would be committed to a single use. Some areas of the valley are lightly used for dispersed recreation. This use would be incompatible within the area developed for solar generation. The loss of recreation opportunities would be a minor unavoidable adverse impact.

Substantial power and natural gas line construction would be necessary. A water line would have to be constructed to support the facility. This construction would create additional access roads in the region. Access roads would cause habitat fragmentation and adverse effects to tortoises and other species. Fragmentation would reduce or prevent movement and, consequently, would affect gene-pool flow in less mobile species like tortoises. Construction of the projects would cause an increase in traffic in the area with potential to increase tortoise mortality on the highways and roads and on the construction sites themselves. A total of 2,400 acres of habitat could be lost to project construction, and 960 acres would be lost to power and pipe line construction. This habitat in Coyote Spring Valley has been designated by the U.S. Bureau of Land Management as critical habitat for the threatened desert tortoise. Specific project locations are necessary before a determination can be made regarding the potential to adversely affect any sensitive species present in the valley. Depending on the quantity of water involved, the use of groundwater from Coyote Spring Valley would have the potential to affect discharge at Muddy Spring, which has a population of threatened Moapa dace. The use of groundwater might also have the potential to affect local springs in the valley.

Scenic quality of the site has been designated Class B and the site is viewed by the public traveling Highway 93 or engaging in recreational pursuits. There are also three U.S. Bureau of Land Management Wilderness Areas within the site's viewshed. Construction activities, and the solar activities and associated infrastructure would greatly change the landscape character of Coyote Spring Valley and have an adverse impact on the visual environment.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies.

5.6 Relationship of Short-Term Uses and Long-Term Productivity

Short-term uses are defined as those that take place during the 10-year timeframe covered in this EIS analysis. Long-term is defined as the time period beyond the 10-year timeframe of the NTS EIS analysis. If the resource cannot be rehabilitated to its most productive long-term use within a 10-year timeframe, then it is considered in this analysis to be impaired for the long term.

5.6.1 Alternative 1

The relationship of short-term use and long-term productivity under Alternative 1 is discussed in the following sections.

5.6.1.1 Nevada Test Site. The majority of effects on long-term productivity would result from the continuation of present land use and from future land use associated with Alternative 1. Developed areas like Mercury, forward area camps, drill yards, roads, power lines, and waste disposal sites would continue to be largely unproductive ecologically, but would continue long-term contributions through their support of research and development and training. Operating waste disposal sites would contribute to long-term productivity through the remediation of other areas and their return to productive uses. The Big Explosives Experimental Facility would result in surface clearing on 30 acres, which could be remediated and made available for most uses upon cessation of operations. The Big Explosives Experimental Facility's 7,080-acre buffer area would be unavailable for human use, but the ecological productivity should remain largely intact.

An underground nuclear test would result in the subsurface being unavailable for the long term. Following an underground nuclear test, the surface 40 acres could be available for limited uses unless cavity collapse has not occurred. Underground subcritical experiments would result in the mined cavity being unavailable for the long term. Following subcritical experiments, the land surface would be unaffected and unrestricted. Similarly, the Area 3 and Area 5 Waste Management Program sites would have an area of 34 acres of disturbed surface and an area of 821 acres of buffer zones. The disturbed areas would be restricted from subsurface access for the long term, and the surface would be restricted from most uses. Rehabilitation of the surface following closure would restore ecological productivity unless rock armor is used in closure. Rock armor would result in a sterile surface for the long term. The area in the buffer zones would have some restrictions on surface uses designed to prevent intrusion into the buried waste. Because it would likely remain undisturbed, its ecological productivity would remain unimpaired for the long term. Eighty acres would be disturbed for the long term in conjunction with weapons assembly/disassembly/interior storage.

Geologic resources and groundwater in the vicinity of the underground nuclear test would have long-term impairment of productivity. Disruption and contamination would mean the unavailability of the geologic resources in the vicinity of the shot cavity for the long term. While the effect on groundwater of underground tests detonated in or near the water table remains to be determined, any contamination in excess of regulatory levels would mean the long-term unavailability of the affected water. There also exists the possibility that collapse craters and their rubble chimney would provide preferential pathways from the surface to the vicinity of shot cavities, which could result in groundwater contamination.

Previous groundwater use in Yucca Flat has exceeded the perennial yield. However, during 1984 to 1994, water levels rose 26 m (85 ft), suggesting that reductions in the water table might not be long term. Activities within this alternative would disturb nearly 9,900 acres, most of which has been previously disturbed.

Depending on cleanup levels, the Environmental Restoration Program would result in the disturbance of up to 9,800 acres through soil removal to remediate contaminated areas. Where removed soil would be disposed of, its productivity would be lost for the long term. Revegetation would be implemented where environmental conditions favor success, which would enhance long-term productivity. Where site conditions are unfavorable, slow natural rehabilitation would impair long-term ecological productivity. Site remediation would make these areas available for other uses, thus the short-term effects of site remediation would ultimately result in enhanced long-term productivity.

Operations of the Liquid Waste Treatment System and the Spill Test Facilities might produce some limited short-term wildlife mortality. Long-term productivity would be enhanced by the remediation at the Liquid Waste Treatment System. It would contribute to understanding the effects of underground testing on the groundwater. Similarly, what is learned through use of the Spill Test Facility would assist in mitigating the environmental effects of accidental hazardous substance releases.

Visual resources would be altered by the surface manifestations of underground tests. Some Environmental Restoration Program activities and waste management sites could result in surface disturbance. Surface cratering and the slow recovery of vegetation in arid environments would cause a long-term visual resource effect. Most of the NTS is comprised of common scenery and is not visible from public viewpoints. This reduces the impact of the long-term effects.

Cultural resources that cannot be avoided by a project would be subjected to data recovery in order to mitigate the impact of the activity on their values. While this enhances the short-term knowledge base, it also removes some of the potential for an even greater recovery of information to be gained through future studies using improved technology. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to cause a negative impact to cultural resources over the long term.

5.6.1.2 Tonopah Test Range. Surface disturbance for both the Soils Media Corrective Action Unit and the Environmental Restoration Program industrial site remediation would produce short-term disruption of the ecosystem and soils. Ecological productivity would be reduced for the short term, but would probably be enhanced over the long term because of the removal of contamination. Variables would be the amount of soil removed and the ultimate success in reestablishing native vegetation species. There would be some short-term alteration of surface-water drainage patterns. Some PM_{10} would be produced in the short term from the Environmental Restoration Program sites. Temporary mobile-source emissions would be produced, but there would be no long-term effects.

Visual resources would be affected. The slow natural recovery of vegetation in arid environments would cause a long-term visual effect.

Noise associated with remediation heavy equipment and drill rigs would cause local short-term noise and no long-term effects.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to cause a negative impact to cultural resources over the long term.

*5.6.1.3 **Project Shoal and Central Nevada Test Areas**.* Short-term effects would be noise, minor local air-quality effects, and a very minor localized decline in ecological productivity at the sites of surface disturbance. Restoration of the drilling mud pits at the Central Nevada Test Area and other areas of contamination would increase the long-term ecological productivity. The long-term effect would be to open the area to a greater variety of land use since monitoring and surface remediation would assure that no accessible contamination is present.

5.6.2 Alternative 2

The relationship of short-term uses and long-term productivity under Alternative 2 are discussed in the following sections.

5.6.2.1 Nevada Test Site. Short-term use would consist primarily of shutdown activities, which would be similar to the levels of Waste Management and Environmental Restoration Program activities proposed in Alternative 1. However, Alternative 2 shutdown activities would be more limited in scope and duration. Consequently, they pose less potential to impact the site's resources than Alternative 1.

Short-term "nonuse" of the site would mean that developed areas would remain standing and undergo slow decay. Decay of some historic structures could result in the loss of data relating to the theme of nuclear development over the long term. Only those limited facilities needed to support security and long-term environmental monitoring would be maintained. The remaining industrial areas, e.g., Mercury and the forward area camps, would slowly regain their ecological productivity as they physically decline. Compared to Alternative 1, some recovery of ecological productivity would occur. However, the lack of maintenance would result in either extensive repairs or demolition and reconstruction should the site be reactivated.

Waste disposal would result in some minor amount of land being committed to long-term use as a disposal site. Alternative uses would be very limited because of the need to protect the subsurface from intrusion.

Environmental Restoration Program activities would cease except for those sites that are immediately hazardous. This would mean that over the long term, contaminants could slowly spread in soils, geologic media, and groundwater, thus affecting much larger areas.

Migration of uncontained contaminants over the long term could cause restrictions on land and groundwater use in surrounding lands, primarily the NAFR Complex. Some presently contaminated areas would remain contaminated and would be of restricted use for the long term. Lined drilling sumps that partially fill with precipitation would continue to cause some drowning of animals and birds.

Clark County unemployment would rise an additional 3.2 percent under Alternative 2, while Nye County rates would rise an additional 6.1 percent in 1997 when compared to Alternative 1. Similarly, housing vacancy rates for Clark County would rise from 7.9 percent with Alternative 1 to 8.5 percent with Alternative 2 in 1998. Nye County vacancy rates would rise from 16.2 percent to 17.8 percent in 1998. Over the long term, growth in these areas would compensate for these losses. The lasting effect would be the out-migration of technical and engineering personnel and the loss of significant employment opportunities for graduates of Nevada's universities.

Vastly reduced groundwater pumping would result in aquifer recovery and enhanced storage. Long-term effects on springs in regional discharge areas might include maintenance of current flows or enhanced flows.

Some continuing effects on biological resources would exist because of shutoff of water sources that support populations of birds and animals. Tortoise mortality would decline because of limited traffic on roads. Potential public health risk from tritium in the groundwater would remain the same as under Alternative 1.

5.6.2.2 Tonopah Test Range. No short-term effects would accumulate under Alternative 2. The chief potential long-term effects would depend on the amount of migration or spreading that would occur from those sites that are presently contaminated. Migration could affect potential future land-use options and soil productivity. Remediation would be economically unfeasible if contaminants migrate.

5.6.2.3 Project Shoal and Central Nevada Test Areas. There would be no short-term effects. Some limited use of the land could be viable for the long term; access to the subsurface would remain restricted.

There would be no short-term need to conduct data recovery at cultural resource sites; therefore, the resource sites would remain available to future researchers. They might be able to obtain greater data recovery because of enhanced future technology. These resource sites would, however, remain vulnerable to vandalism and the consequent loss of all data.

5.6.3 Alternative 3

The relationship of short-term uses and long-term productivity under Alternative 3 are discussed in the following sections.

5.6.3.1 Nevada Test Site. The majority of effects on long-term productivity would result from the continuation of present land uses and from future land uses associated with this alternative. Developed areas (e.g., Mercury, forward area camps, drill yards, roads, power lines, and waste disposal sites) would continue to be largely unproductive ecologically, but would continue long-term contributions through their support of research and development, and training. A large area would be unproductive ecologically within the alternative energy sites. However, the energy produced would be clean and would prevent the occurrence elsewhere of the more significant impacts associated with other forms of energy production, such as fossil, fuels, hydropower, and nuclear. Thus, alternative energy production would create a substantial long-term benefit. Operation of waste disposal sites would contribute to long-term productivity through the remediation of other areas and their return to productive uses. The Big Explosives Experiment Facility would result in surface clearing on 30 acres, which could be remediated and made available for most uses upon cessation of operations. Its 7,000-acre buffer area would be unavailable for human use, but the ecological productivity should remain largely intact. Underground nuclear tests would result in the subsurface being unavailable for the long term. The surface above an underground test could be available for limited use unless cavity collapse has occurred at the underground test. Underground subcritical experiments would result in the mined cavity being unavailable for the long-term. Following subcritical experiments, the land surface would be unaffected and unrestricted. The Waste Management Program sites would be restricted from subsurface access for the long term. Rehabilitation of the surface upon closure would result in restored ecological productivity unless rock armor is used in closure. Construction of a large, heavy-industrial facility, expansion of the Device Assembly Facility, facilities for the handling and storage of weapons-usable fissile materials, and advanced hydrodynamic testing would take land and habitat out of production for the long term. The area involved would be very small compared to the size of the NTS and would have limited effect.

Geologic resources and groundwater would have long-term impairment on productivity with an underground nuclear test. Disruption and contamination would cause the unavailability of geologic resources in the vicinity of the shot cavity for the long term. While the effect on groundwater of underground tests detonated in or near the water table remains to be determined, any contamination in excess of regulatory levels would mean the long-term unavailability of the affected water. There also exists the possibility that collapsed craters would provide preferential pathways down rubble chimneys from the surface to the vicinity of shot cavities. This could result in groundwater contamination.

Previous groundwater use in Yucca Flat has exceeded the perennial yield. However, during 1984 to 1994, water levels rose 26 m (85 ft), suggesting that reductions in the water table might not be long term. This alternative would result in substantially greater groundwater use, which might result in long-term effects on the aquifer.

Depending on cleanup levels, Environmental Restoration Program activities would result in the disturbance of up to 9,800 acres through soil removal to remediate contaminated areas. The productivity of removed soil would be lost for the long term. Revegetation would be implemented where environmental conditions favor success. Success would enhance long-term productivity. Where site conditions are unfavorable, slow natural rehabilitation would impair long-term ecological productivity. Site remediation would make these areas available for other uses. The short-term effects of remediation would ultimately result in enhanced long-term productivity.

Operations of the Liquid Waste Treatment Facility and the Spill Test Facility might produce some limited short-term wildlife mortality; long-term productivity would be enhanced by the remediation that the Liquid Waste Treatment System would support. Operations would contribute to understanding the effects of underground testing on the groundwater. Similarly, what is learned through use of the Spill Test Facility would assist in mitigating the environmental effects of accidental hazardous substance releases.

Visual resources would be affected by underground tests. Some Environmental Restoration Program activities and waste management sites could result in surface disturbance. Surface cratering and the slow recovery of vegetation in arid environments would cause a long-term visual resource effect. Most of the NTS is comprised of common scenery and is not visible from public viewpoints. This would reduce the impact of the long-term effects.

Cultural resources that cannot be avoided by a project are subjected to data recovery. While this enhances the short-term knowledge base, it also removes some of the potential for an even greater recovery of information to be gained through future studies using improved technology. Implementation of the new projects proposed in Alternative 3 would result in the need to conduct surveys over large areas and to recover the data from these sites. This would represent an increase in the impact of Alternative 3 on cultural resources as compared to Alternative 1. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to increase as compared to Alternatives 1 and 2. This could result in a cumulative negative impact to cultural resources over the long term.

5.6.3.2 Tonopah Test Range. Surface disturbance for both Soils Media Corrective Action Unit and the Environmental Restoration Program industrial site remediation would produce short-term disruption of the ecosystem and soils. Ecological productivity would be reduced for the short term, but would probably be enhanced over the long term because of the removal of contamination. Variables would be the amount of soil removed and the ultimate success in reestablishing native vegetation species. See Section 4.1.6, Biological Resources (FLORA), for a description of variables that influence natural plant succession rates, revegetation techniques, and revegetation success. There would be some short-term alteration of surface-water drainage patterns. Some PM_{10} would be produced in the short term from the Environmental Restoration Program sites. Temporary mobile-source emissions would be produced. There would be no long-term effects.

Visual resource would be affected. The slow natural recovery of vegetation in arid environments would cause a long-term visual effect.

Noise associated with remediation heavy equipment and drill rigs would cause local short-term noise and no long-term effects.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to cause a negative impact to cultural resources over the long term.

5.6.3.3 Project Shoal and Central Nevada Test Areas. Short-term effects would be noise, minor local air-quality effects, and a very minor localized decline in ecological productivity at the sites of surface disturbance. Restoration of the drilling mud pits at the Central Nevada Test Area and other areas of contamination would increase the long-term ecological productivity. The long-term effect would be to open the area to a greater variety of land use. Monitoring and surface remediation would ensure that no accessible contamination would be present.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to cause a negative impact to cultural resources over the long term.

Contaminated geologic media and groundwater would remain unavailable for the long term.

5.6.3.4 Eldorado Valley. Land use would be committed to a single use for the long term. Other primarily recreational uses would be precluded or substantially reduced. The installation or upgrading of infrastructure would facilitate future development in the valley. The long-term effect on the area's low-density tortoise population would be negative. Since it is difficult to restore pristine conditions in arid environments, it would be likely that even upon removal of a solar project, habitat would not reach its former condition over the long term.

The use of aggregate and fill materials for construction would be a long-term commitment of these resources, which are common in the region.

The necessity of removing cultural resource materials that would otherwise be destroyed by construction would represent an impact. Data recovered represents a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. Construction of roads in areas proposed for solar generating facilities may increase access to archaeologically sensitive areas. This could result in unavoidable long-term impacts such as vandalism and illicit artifact collecting.

5.6.3.5 Dry Lake Valley. Land use would be committed to a single use for the long term. Other primarily recreational uses would be precluded or substantially reduced. The installation or upgrading of infrastructure would facilitate future development in the valley. The long-term effect on the area's low- density tortoise population would be negative. Construction of a water line to Dry Lake Valley has the potential to substantially impact tortoise habitat. This would have a substantial long-term impact on tortoise populations to the north, particularly if existing power line rights-of-way were not used. Additionally, if groundwater use were sufficient to reduce the discharge at Muddy Spring, there could be an impact on its Moapa dace population. Since it is difficult to restore pristine conditions in arid environments, it is likely that even upon removal of a solar project, the habitat would not reach its former condition over the long term.

The use for construction of aggregate and fill materials, which are common in the region, would be a long-term commitment of these resources.

Removing cultural resource materials that would otherwise be destroyed by construction would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies.

5.6.3.6 Coyote Spring Valley. Land use would be committed to a single use for the long term. Other primarily dispersed light recreational uses would be precluded or substantially reduced. Depending on the location within the valley, the long-term effect on the area's tortoise population and critical habitat for this species would be negative. Construction of a water line in Coyote Spring Valley has the potential to substantially impact tortoise habitat. This could have a substantial long-term impact on tortoise populations particularly if existing power line rights-of-way were not used. The installation or upgrading of infrastructure would facilitate future development in the valley. Additionally, if groundwater use were sufficient to reduce the discharge at Muddy Spring, there could be an impact on its Moapa dace population. If local spring discharges were reduced or stopped, species dependent on them could be lost for the long term. Because it is difficult to restore pristine conditions in arid environments, it would be likely that even upon removal of a solar project, the habitat would not reach its former condition over the long term.

The use for construction of aggregate and fill materials, which are common in the region, would be a long-term commitment of these resources.

Removing cultural resource materials that would otherwise be destroyed by construction would represent a benefit to the present knowledge base. However, removed from their context these materials would be unavailable for subsequent study using improved future technologies. Construction of roads in areas proposed for solar-generating facilities may increase access to archaeologically sensitive areas. This could result in unavoidable long-term impacts such as vandalism and illicit artifact collecting.

5.6.4 Alternative 4

The relationship of short-term use and long-term productivity under Alternative 4 is discussed in the following sections.

5.6.4.1 Nevada Test Site. The majority of effects on long-term productivity would result from the continuation of present land use and from future land use associated with Alternative 4. Developed areas like Mercury, e.g., forward area camps, drill yards, roads, power lines, and waste disposal sites, would continue to be largely unproductive ecologically, but would continue long-term contributions through their support of research and development and training. Operating waste disposal sites would contribute to long-term productivity through the remediation of other areas and their return to productive uses. Similarly, the waste management sites would be restricted from subsurface access for the long term. Rehabilitation of the surface upon closure would result in restored ecological productivity.

Previous underground testing has resulted in long-term impairment of geologic resources and groundwater productivity, but Alternative 4, unlike Alternative 1 would not include the impacts of additional underground nuclear tests. Disruption and contamination would mean the unavailability of the geologic resources in the vicinity of the shot cavity for the long term. The effect on groundwater of underground tests detonated in or near the water table remains to be determined. Any contamination in excess of regulatory levels would mean the long-term unavailability of the affected water. There also exists the possibility that collapsed craters would provide preferential pathways from the surface down rubble chimneys to the vicinity of shot cavities, which could result in groundwater contamination.

There are two candidate sites at the NTS for the Solar Enterprise Zone facility, Fortymile Canyon in Area 25 and Mercury Valley in Area 22. Peak historic demand has not exceeded perennial yield at either location. However, a Solar Enterprise Zone facility would require a substantial increase in groundwater use. Total groundwater withdrawal would increase above the natural recharge of the affected aquifer. This would require the use of some underflow and could result in long-term effects on groundwater resources.

Depending on cleanup levels, Environmental Restoration Program activities would result in the disturbance of up to 9,800 acres, through soil removal to remediate contaminated areas. Removed soil productivity would be lost for the long term. See Section 4.1.6, Biological Resources (FLORA), for a description of natural plant succession rates, revegetation techniques, and revegetation success. Revegetation would be implemented where environmental conditions favor success. Success would enhance long-term productivity. Where site conditions are unfavorable, slow natural rehabilitation would impair long-term ecological productivity. Site remediation would make these areas available for other uses. The short-term effects of remediation would ultimately result in enhanced long-term productivity.

Operations of the Liquid Waste Treatment System and the Spill Test Facility might produce some limited short-term wildlife mortality; long-term productivity would be enhanced by the remediation that the Liquid Waste Treatment System would support and by its contribution to understanding the effects of underground testing on the groundwater. Similarly, what is learned through use of the Spill Test Facility would assist in mitigating the environmental effects of accidental hazardous substance releases.

Visual resources would be affected by some Environmental Restoration Program activities that result in surface disturbance, and waste management sites. The slow recovery of vegetation in arid environments would cause a long-term visual resource effect. Much of the NTS is comprised of common scenery, but would become more visible to the public with its opening to other public uses. This would increase the impact of the long-term effects.

Cultural resources that cannot be avoided by a project are subjected to data recovery to mitigate the impact of the activity on their values. While this enhances the short-term knowledge base, it also removes some of the potential for an even greater recovery of information to be gained through future studies using improved technology.

5.6.4.2 Tonopah Test Range. Surface disturbance for both the Soils Media Corrective Action Unit and the Environmental Restoration Program site remediation would produce short-term disruption of the ecosystem and soils. Ecological productivity would be reduced for the short term, but would probably be enhanced over the long term because of the removal of contamination. Variables would be the amount of soil removed and the ultimate success in reestablishing native vegetation species. There would be some short-term alteration of surface-water drainage patterns. Some PM_{10} would be produced in the short term from the Environmental Restoration Program sites. Temporary mobile-source emissions would be produced. There would be no long-term effects.

Visual resources would be affected. The slow natural recovery of vegetation in arid environments would cause a long-term visual effect.

Noise associated with remediation heavy equipment and drill rigs would cause local short-term noise and no long-term effects.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to cause a negative impact to cultural resources over the long term.

5.6.4.3 Project Shoal and Central Nevada Test Areas. Short-term effects would be noise, minor local air-quality effects, and a very minor localized decline in ecological productivity at the sites of surface disturbance. Restoration of the drilling mud pits at the Central Nevada Test Area and other areas of contamination would increase long-term ecological productivity. The long-term effect would be to open the area to a greater variety of land uses since monitoring and surface remediation would ensure that no accessible contamination would be present.

Recovery of cultural resource data would be a short-term benefit, but would reduce the opportunity to gain greater data recovery using enhanced future technologies. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to cause a negative impact to cultural resources over the long term.

Contaminated geologic media and groundwater would remain unavailable for the long term.

5.6.4.4 Eldorado Valley. Land use would be committed to a single use for the long term. Other primarily recreational use would be precluded or substantially reduced. The installation or upgrading of infrastructure would facilitate future development in the valley. The long-term effect on the area's low- density tortoise population would be negative. Since it is difficult to restore pristine conditions in arid environments, it would be likely that, even upon removal of a solar project, the habitat would not reach its former condition over the long term.

The use of aggregate and fill materials for construction would be a long-term commitment of these resources, which are common in the region.

The necessity of removing cultural resource materials that would otherwise be destroyed by construction would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. Construction of roads in areas proposed for solar-generating facilities may increase access to archaeologically sensitive areas. This could result in unavoidable long-term impacts such as vandalism and illicit artifact collecting.

5.6.4.5 Dry Lake Valley. Land use would be committed to a single use for the long term. Other primarily recreational use would be precluded or substantially reduced. The long-term effect on the area's low-density tortoise population would be negative. Construction of a water line to Dry Lake Valley has the potential to substantially impact tortoise habitat. This would have a substantial long-term impact on tortoise populations to the north, particularly if existing power line rights-of-way were not used. The installation or upgrading of infrastructure would facilitate future development in the valley. Additionally, if groundwater use were sufficient to reduce the discharge at Muddy Spring, there could be an impact on its Moapa dace population. Since it is difficult to restore pristine conditions in arid environments, it would be likely that, even upon removal of a solar project, habitat would not reach its former condition over the long term.

The use of aggregate and fill materials for construction would be a long-term commitment of these resources, which are common in the region.

The necessity of removing cultural resource materials that would otherwise be destroyed by construction would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. Construction of roads in areas proposed for solar-generating facilities may increase access to archaeologically sensitive areas. This could result in unavoidable long-term impacts such as vandalism and illicit artifact collecting.

5.6.4.6 Coyote Spring Valley. Land use would be committed to a single use for the long term. Other primarily dispersed light recreational uses would be precluded or substantially reduced. Depending on the location within the valley, the long-term effect on the area's tortoise population and critical habitat for this species would be negative. Construction of a water line in Coyote Spring Valley has the potential to substantially impact tortoise habitat. This could have a substantial long-term impact on tortoise populations, particularly if existing power-line rights-of-way were not used. The installation or upgrading of infrastructure would facilitate future development in the valley. Additionally, if groundwater use were sufficient to reduce the discharge at Muddy Spring, there could be an impact on its Moapa dace population. If local spring discharges were reduced or stopped, species dependent on them could be lost for the long term. Since it is difficult to restore pristine conditions in arid environments, it would be likely that, even upon removal of a solar project, habitat would not reach its former condition over the long term.

The use for construction of aggregate and fill materials would be a long-term commitment of the resources that are common in the region.

The necessity of removing cultural resource materials that would otherwise be destroyed by construction would represent a benefit to the present knowledge base. However, materials removed from their context and studied with present technology would be unavailable for subsequent study using improved future technologies. Construction of roads in areas proposed for solar generating facilities may increase access to archaeologically sensitive areas. This could result in unavoidable long-term impacts such as vandalism and illicit artifact collecting.

5.7 Irreversible and Irretrievable Commitment of Resources

This section identifies the major irreversible and irretrievable commitments of resources that are identifiable at the sitewide level of analysis. A commitment of resources is irreversible when its primary or secondary impacts limit the future options for a resource. An irretrievable commitment refers to the use or consumption of resources neither renewable nor recoverable for later use by future generations. The major irreversible and irretrievable commitment is land use, with lesser commitments of harvestable products, materials, groundwater, and energy.

Implementation of any of the alternatives would result in a permanent commitment of certain air, groundwater, soil, biota, mineral, surface, and subsurface resources. There would be an irreversible and irretrievable commitment of the associated natural resource services. In addition to the National Environmental Policy Act requirement to identify the irreversible and irretrievable commitments of resources, it is also the intent of the DOE to identify these resources within the meaning of the Comprehensive Environmental Response, Compensation, and Liability Act, Section 107(f)(1). Section 107(f)(1) which addresses natural resource damage liability and states that the liability is obviated if:

> ". . . the damages to natural commitments of resources complained of were specifically identified as irreversible and irretrievable commitments of resources in an environmental impact statement, or other comparable environmental analysis, and the decision to grant a permit or license authorizes such commitment of natural resources, and the facility or project was otherwise operating within the terms of its permit or license, so long as, in the case of damages to an Indian tribe occurring pursuant to a Federal permit or license, the issuance of that permit or license was not inconsistent with the fiduciary duty of the United States with respect to such Indian tribe."

5.7.1 Alternative 1

The irreversible and irretrievable commitments of resources that would result under Alternative 1 are presented for the NTS, the Tonopah Test Range, the Project Shoal Area, and the Central Nevada Test Area.

5.7.1.1 Nevada Test Site. Developed areas like Mercury, Area 12 Camp, Area 25 Complex, Control Point 1, and so on would remain in an urban or industrial configuration. Thus, a long-term land-use commitment exists that would preclude alternative, nonurban use. Natural habitat productivity at these locations would be reduced. Even with removal of the structures and infrastructure, completely natural conditions would be unlikely to be achieved.

Although technically reversible through excavation and clean closure, use of the radioactive waste management facilities for waste disposal would result in an irreversible and irretrievable commitment of the sites and surrounding buffer areas. Land uses would be severely restricted, as would access to the subsurface. Some surface areas would be rehabilitated upon closure and would provide natural habitat, but little other human use. Most closures would likely be designed using rock armor to inhibit vegetation or burrowing by animals. Sanitary and construction landfills would represent an irreversible and irretrievable commitment of the subsurface and some limitation of the surface uses.

Underground nuclear tests would represent, in large part, an irreversible and irretrievable commitment of the subsurface for any subsequent use. The surface above an underground nuclear test would be restricted from all access if cratering has not occurred. Where cratering has occurred, some limited surface use would be permissible. Underground subcritical experiments would result in an irreversible and irretrievable commitment of the mined cavity for subsequent use. Following subcritical experiments, the land surface would be unaffected and unrestricted.

Decontamination and decommissioning activities would produce mixed results depending on the remedy selected. Entombment would result in an irretrievable and irreversible commitment of the surface or associated subsurface for most land use. Most decontamination and decommissioning activities would result in either decontamination and consequent availability of the facility for other use or demolition of the facility and disposal. Reuse would entail the facility remaining in an industrial mode, which would represent a long-term commitment to that type of land use. Demolition of the facility would result in the land's availability for other development or for site rehabilitation and use as natural habitat.

Although technically reversible through excavation and clean closure, closure in place would result in an irreversible and irretrievable commitment for those Resource Conservation and Recovery Act industrial sites that are so treated. Land use on these sites and in a surrounding buffer zone would be severely constrained. Rehabilitation by revegetation would permit their functioning as natural habitat, but closure would likely be designed using rock armor to inhibit vegetation or burrowing by animals.

Continued airspace restriction would represent an irreversible and irretrievable commitment because access would be limited to government use only, to the detriment of general aviation and commercial users.

Energy and materials utilized in the construction, operation, maintenance, decontamination, demolition, and closure of the facilities would be irreversibly and irretrievably committed. Detonation of high or nuclear explosives would be an irreversible and irretrievable commitment of energy resources.

Industrial accidents resulting in injuries or deaths and latent cancer fatalities caused by worker exposure to radiation at the NTS would represent an irreversible and irretrievable commitment of human resources.

Continued restriction of harvest of products like game, pine nuts, or grass, and maintenance of areas in development that precludes their natural productivity, would represent an irretrievable commitment of resources. However, the area of the

NTS that would be developed or committed to such use as radioactive waste disposal is a small fraction of the total area.

Removal of soils for environmental restoration projects would result in their irreversible and irretrievable loss since they would be landfilled and any associated natural resource services that they provide would be lost as well. Environmental restoration would involve up to about 9,800 acres, most of which have been previously disturbed. The amount that would be redisturbed during remediation depends, first, upon the levels of contamination that would be determined during characterization and, second, upon the agreements reached with the state of Nevada regarding cleanup levels.

The conduct of one or more underground nuclear tests would result in an undetermined impact on groundwater quality if it occurred in or near the water table. Any groundwater contamination in excess of EPA drinking water standards would constitute an irreversible and irretrievable commitment of a presently unquantifiable amount of water. Similarly, any contamination of groundwater above EPA drinking water standards at the existing underground test cavity locations would represent an irreversible and irretrievable commitment of the resource.

The subsurface area and geologic values at existing and future potential underground test cavity locations would represent an irreversible and irretrievable commitment of their associated natural resource services.

A total of 2.1×10^6 m^3 per year (5.5×10^8 gal/yr) of water would be used to support all NTS programs under Alternative 1. This water would represent an irreversible and irretrievable commitment of this resource.

Electric usage would total 6.9×10^6 kW hrs/month, while fuel usage would total 708 m^3 per month (187,000 gal/month), which would represent an irreversible and irretrievable commitment of the energy resources.

A total of about 59,000 acres has been disturbed to date, and an additional 9,900 acres would be disturbed over the next 10 years. With the exception of some of those areas that would be remediated under the Environmental Restoration Program, most of these acres would be irreversibly and irretrievably committed to their present uses. This would result in a minimal to total reduction of their associated natural resource services.

When an activity cannot be relocated, cultural resources must be removed in the process of data recovery. To the extent that this action precludes future data recovery using improved technology, it would represent an irreversible and irretrievable commitment of the information value represented. If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, these resources may be lost when remediation disturbs the surface. This is an irreversible and irretrievable loss of the information value that such resources contain. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to result in irreversible and irretrievable loss of their information value.

*5.7.1.2 **Tonopah Test Range***. Much of the activity at the Tonopah Test Range takes place on the playas, hence surface disturbance would produce no effects on most other resources. No new surface disturbance would occur under Alternative 1. Removal of soils for environmental restoration projects would result in their irreversible and irretrievable loss since they would be landfilled and any associated natural resource services that they provide would be lost as well. Environmental restoration activities could involve several hundred acres, most of which have been previously disturbed. The amount that would be redisturbed during remediation depends, first, upon the levels of contamination that would be determined during characterization and, second, upon the agreements reached with the state of Nevada regarding cleanup levels. With the exception of some of those areas that would be remediated under the Environmental Restoration Program, most of these acres would be irreversibly and irretrievably committed to their present uses. This would result in a minimal to total reduction of their associated natural resource services.

When an activity cannot be relocated, cultural resources must be removed in the process of data recovery. To the extent that this action precludes future data recovery using improved technology, it would represent an irreversible and irretrievable commitment of the information value represented. If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, these resources may be lost when remediation disturbs the surface. This is an irreversible and irretrievable loss of the information value that such resources contain. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to result in irreversible and irretrievable loss of their information value.

*5.7.1.3 **Project Shoal and Central Nevada Test Areas***. About 10 acres at the Project Shoal Area and 40 acres at the Central Nevada Test Area would be disturbed through environmental remediation. Most of these areas were previously disturbed, so this would represent a setback in the ecological succession that has occurred. In addition, the subsurface areas at the cavity locations and any associated groundwater contaminated above EPA drinking water standards would represent an irreversible and irretrievable commitment of their associated natural resource services.

Some cultural resource site data recovery represents, to a degree, an irreversible and irretrievable commitment of the potential information resource represented. This is because the recovery in the future of some information would be precluded due to the limited capability of present technology to recover certain information. Other irreversible and irretrievable losses may be incurred as a result of vandalism and illicit artifact collecting.

5.7.2 Alternative 2

The irreversible and irretrievable commitment of resources that would result under Alternative 2 are presented for the NTS, the Tonopah Test Range, the Project Shoal Area, and the Central Nevada Test Area.

*5.7.2.1 **Nevada Test Site***. Developed areas like Mercury, Area 12 Camp, Area 25 Complex, and Control Point 1 would remain in an urban or industrial configuration. Thus, a long-term land-use commitment exists that would preclude alternative, nonurban uses. Natural habitat productivity at these locations would be reduced.

Although less use of the radioactive waste management facilities for waste disposal would occur with this alternative than with Alternative 1, there would still be an irreversible and irretrievable commitment of the sites and surrounding buffer areas. Land use would be severely restricted as would access to the subsurface. Some surface areas would be rehabilitated upon closure and would provide natural habitat, but little other human use. Most closures would be designed using rock armor to inhibit vegetation or burrowing by animals. Sanitary and construction landfills would represent an irreversible and irretrievable commitment of the subsurface and some limitation of the surface uses.

The effects of this alternative would be similar to those of Alternative 1. An insignificant lower increment of effect would exist since there would be no Defense Program activities. The existing underground nuclear test areas represent, in large part, an irreversible and irretrievable commitment of the subsurface for any subsequent uses. The surface would continue to be restricted from all access if cratering has not occurred.

Continued airspace restriction would represent an irreversible and irretrievable commitment of that access to government uses only, to the detriment of general aviation and commercial users.

Continued restriction of harvest of annually perishable products like game, pine nuts, or grass and maintenance of areas in development that precludes their natural productivity represent an irretrievable commitment of resources. However, the area of the NTS that is developed or committed to such uses as radioactive waste disposal is a small fraction of the total area.

Any contamination of groundwater above EPA drinking water standards at the existing underground test cavity locations would represent an irreversible and irretrievable commitment of the resource.

The subsurface area and geologic values at the existing underground test cavity locations would represent an irreversible and irretrievable commitment of their associated natural resource services. Contaminated soils that are not remediated would be irretrievably lost as a soil resource.

Water used to support the environmental monitoring and security functions remaining at the NTS under Alternative 2 would represent an irreversible and irretrievable commitment of the resource.

Electric usage would total 89,744 kW hrs/month, while fuel usage would total 11 m^3 per month (2,778 gal/month), which would represent an irreversible and irretrievable commitment of the energy resources.

A total of about 59,000 acres has been disturbed to date, and no additional acres would be disturbed over the next 10 years. These acres would be irreversibly and irretrievably committed to their present use. This would result in a minimal to total reduction of their associated natural resource services.

5.7.2.2 Tonopah Test Range. The only irreversible and irretrievable commitment that would occur is if contaminant migration was such that future remediation were rendered to be uneconomic.

5.7.2.3 Project Shoal and Central Nevada Test Areas. Contaminated mud pits at the Project Shoal and Central Nevada Test Areas would remain irreversible and irretrievable commitments to a restricted land use in their vicinity. In addition, the subsurface area at the cavity locations and any associated groundwater contaminated above EPA drinking water standards would represent an irreversible and irretrievable commitment of their associated natural resource services.

5.7.3 Alternative 3

The irreversible and irretrievable commitment of resources that would result under Alternative 3 is presented for the NTS, the Tonopah Test Range, the Project Shoal Area, the Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.

5.7.3.1 Nevada Test Site. Developed areas like Mercury, Area 12 Camp, Area 25 Complex, Control Point 1, and so on are likely to remain in an urban or industrial configuration. Thus, a long-term commitment exists that would preclude alternative, nonurban use. Natural habitat productivity at these locations would be reduced. Even with removal of the structures and infrastructure, completely natural conditions would be unlikely to be achieved.

Although technically reversible through excavation and clean closure, use of the radioactive waste management facilities for waste disposal would result in an irreversible and irretrievable land use commitment of the sites and surrounding buffer areas. Land use would be severely restricted as would access to the subsurface. Some surface areas would be rehabilitated upon closure and would provide natural habitat, but little other human use. Most closures would be designed using rock armor to inhibit vegetation or burrowing by animals. Sanitary and construction landfills would represent an irreversible and irretrievable commitment of the subsurface and some limitation of the surface uses. Rehabilitation of the surface upon closure would make the sites available as natural habitat.

Underground nuclear tests would represent, in large part, an irreversible and irretrievable commitment of the subsurface for any subsequent use. The surface above an underground nuclear test would be restricted from all access if cratering has not occurred. Where cratering has occurred, some limited surface use would be permissible. Underground subcritical experiments would result in an irreversible and irretrievable commitment of the mined cavity for any subsequent use. Following subcritical experiments, the land surface would be unaffected and unrestricted.

Decontamination and decommissioning activities would produce mixed results depending on the remedy selected. Entombment would result in an irretrievable and irreversible commitment of the surface or associated subsurface for most land use. Most decontamination and decommissioning activities would result in either decontamination and consequent availability of the facility for other use or demolition of the facility and disposal. Reuse would entail the facility remaining in an industrial mode, which represents a long-term commitment to that type of land use. Demolition of the facility would result the land's availability for other development or for site rehabilitation and use as natural habitat.

Although technically reversible through excavation and clean closure, closure in place would result in an irreversible and irretrievable commitment for those Resource Conservation and Recovery Act industrial sites that are so treated. Land use above these sites and in a surrounding buffer zone would be severely constrained. Rehabilitation by revegetation would permit their functioning as natural habitat, but closures would likely be designed using rock armor to inhibit vegetation or burrowing by animals.

Continued airspace restriction would represent an irreversible and irretrievable commitment of that access to government use only.

Energy and materials utilized in the construction, operation, maintenance, decontamination, demolition, and closure of the facilities would be irreversibly and irretrievably committed. Detonation of high or nuclear explosives would be an irreversible and irretrievable commitment of energy resources. Additional projects, including the alternative energy developments, would constitute a greater commitment of resources than would Alternative 1.

Industrial accidents resulting in injuries or deaths and latent cancer fatalities caused by worker exposure to radiation at the NTS would represent an irreversible and irretrievable commitment of human resources.

Continued restriction of harvest of products like game, pine nuts, or grass and maintenance of areas in development that precludes their natural productivity would represent an irretrievable commitment of resources. However, the area of the NTS that is developed or committed to such use as radioactive waste disposal is a small fraction of the total area.

Removal of soils for environmental restoration projects would result in their irreversible and irretrievable loss since they would be landfilled, and any associated natural resource services that they provide would be lost as well. See Section 4.1.6, Biological Resources (FLORA), for a description of variables that influence natural plant succession rates, revegetation techniques, and revegetation success. Where suitable subsoils occur with acceptable parameters (e.g., low soluble salts, appropriate texture, and adequate quantities to ensure plant establishment and rooting), they could be used directly for revegetation. Subsoils could be amended, if necessary, to provide a suitable substrate for plant establishment and growth. Amendments would be based on a site evaluation of what soil resources are available and prevailing site conditions (e.g., climatic conditions). See Section 5.1.1.4 for a discussion of reclamation options. Environmental restoration would involve up to about 9,800 acres, most of which have been previously disturbed. The amount that would be redisturbed during remediation depends, first, upon the levels of contamination that would be determined during characterization and, second, upon the agreements reached with the state of Nevada regarding cleanup levels.

The conduct of one or more underground nuclear tests would result in an undetermined impact on ground water quality if it occurred in or near the water table. Any groundwater contamination in excess of EPA drinking water standards would constitute an irreversible and irretrievable commitment of a presently unquantifiable amount of water. Similarly, any contamination of groundwater above EPA drinking water standards at the existing underground test cavity locations would represent an irreversible and irretrievable commitment of the resource.

The subsurface area and geologic values at the existing and potential future underground test cavity locations would represent an irreversible and irretrievable commitment of their associated natural resource services.

A total of 1.1×10^7 m^3 per year (2.9×10^9 gal/yr) of water would be used to support all NTS programs under Alternative 3. This water would represent an irreversible and irretrievable commitment of this resource.

Electric usage would total 1.4×10^6 kW hrs/month, while fuel usage would total 1,427 m^3 per month (376,987 gal/month).

A total of about 59,000 acres has been disturbed to date, and approximately 15,600 more acres would be disturbed over the next 10 years. With the exception of some of those areas that would be remediated under the Environmental Restoration Program, most of these acres would be irreversibly and irretrievably committed to their present and proposed use. This would result in a minimal to total reduction of their associated natural resource services.

When an activity cannot be relocated, cultural resources must be removed in the process of data recovery. To the extent that this action precludes future data recovery using improved technology, it would represent an irreversible and irretrievable commitment of the information value represented. If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, these resources may be lost when remediation disturbs the surface. This is an irreversible and irretrievable loss of the information value that such resources contain. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to result in irreversible and irretrievable loss of their information value.

5.7.3.2 ***Tonopah Test Range***. Much of the activity at the Tonopah Test Range takes place on the playas, hence surface disturbance would produce no effects on most other resources. No new surface disturbance would occur under Alternative 3. Removal of soils for environmental restoration projects would result in their irreversible and irretrievable loss since they would be landfilled, and any associated natural resource services that they provide would be lost as well. Environmental restoration activities could involve several hundred acres, most of which has been previously disturbed. The amount that would be redisturbed during remediation depends, first, upon the levels of contamination that would be determined during characterization and, second, upon the agreements reached with the state of Nevada regarding cleanup levels. With the exception of some of those areas that would be remediated under the Environmental Restoration Program, most of these acres would be irreversibly and irretrievably committed to their present use. This would result in a minimal to total reduction of their associated natural resource services.

When an activity cannot be relocated, cultural resources must be removed in the process of data recovery. To the extent that this action precludes future data recovery using improved technology, it would represent an irreversible and irretrievable commitment of the information value represented. Other irreversible and irretrievable losses may result from vandalism and illicit artifact collecting.

5.7.3.3 ***Project Shoal and Central Nevada Test Areas***. About 10 acres at the Project Shoal Area and 40 acres at the Central Nevada Test Area would be disturbed through environmental remediation. Most of these areas were previously disturbed, so this would represent a setback in the ecological succession that has occurred. In addition, the subsurface area at the cavity locations and any associated groundwater contaminated above EPA drinking water standards would represent an irreversible and irretrievable commitment of their associated natural resource services.

Some cultural resource site data recovery represents, to a degree, an irreversible and irretrievable commitment of the potential information resource represented. This is because the recovery in the future of some information would be precluded due to the limited capability of present technology to recover certain information. Other irreversible and irretrievable losses may result from vandalism and illicit artifact collecting.

5.7.3.4 ***Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley***. The irreversible and irretrievable commitment of resources resulting from the construction and operation of a Solar Enterprise Zone facility in Eldorado, Dry Lake, or Coyote Spring Valleys would be the same and are presented in the following section. Ecological productivity would be greatly reduced or completely stopped during the period of time in which the Solar Enterprise Zone facility would be operating. The ecosystem's contribution would be irretrievably lost for that period of time and would likely never return to its present status.

The use of materials for construction would be an irreversible and irretrievable long-term commitment of the resources.

Some cultural resource site data recovery represents, to a degree, an irreversible and irretrievable commitment of the potential information resource represented. This is because the future recovery of some data would be precluded due to the limited capability of present technology to recover certain information.

Construction of roads in areas proposed for solar generating facilities is likely to result in a greater incidence of vandalism and illicit artifact collecting within archaeologically sensitive areas. This could result in an irreversible and irretrievable loss of their information value.

5.7.4 Alternative 4

The irreversible and irretrievable commitment of resources that would result under Alternative 4 is presented for the NTS, the Tonopah Test Range, the Project Shoal Area, the Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.

5.7.4.1 Nevada Test Site. Developed areas like Mercury, Area 12 Camp, Area 25 Complex, and Control Point 1 are likely to remain in an urban or industrial land use. Thus, a long-term land-use commitment exists that would preclude alternative, nonurban use. Natural habitat productivity at these locations would be reduced. Even with removal of the structures and infrastructure, completely natural conditions would be unlikely to be achieved.

Although technically reversible through excavation and clean closure, use of the radioactive waste management facilities for waste disposal would result in an irreversible and irretrievable commitment of the sites and surrounding buffer areas. Land use would be severely restricted as would access to the subsurface. Some surface areas would be rehabilitated upon closure and would provide natural habitat, but little other human use. Most closures would be designed using rock armor to inhibit vegetation or burrowing by animals. Sanitary and construction landfills would represent an irreversible and irretrievable commitment of the subsurface and some limitation of the surface use.

Past underground nuclear tests would represent, in large part, a continuing irreversible and irretrievable commitment of the subsurface for any subsequent use. The surface above an underground test would be restricted from all access if cratering has not occurred. Where cratering has occurred, some limited surface use would be permissible.

Decontamination and decommissioning activities would produce mixed results depending on the remedy selected. Entombment would result in an irretrievable and irreversible commitment of the surface or associated subsurface for most land use. Most decontamination and decommissioning activities would result in either decontamination and consequent availability of the facility for other use or demolition of the facility and disposal. Reuse would entail the facility remaining in an industrial mode that represents a long-term commitment to that type of land use. Demolition of the facility would result in the land's availability for other development or for site rehabilitation and use as a natural habitat.

Although technically reversible through excavation and clean closure, closure in place would result in an irreversible and irretrievable commitment for those Resource Conservation and Recovery Act industrial sites that are so treated. Land use at these sites and in a surrounding buffer zone would be severely constrained. Rehabilitation by revegetation would permit their functioning as natural habitat, but closures would likely be designed using rock armor to inhibit vegetation or burrowing by animals.

Energy and materials utilized in the construction, operation, maintenance, decontamination, demolition, and closure of facilities would be irreversibly and irretrievably committed.

Industrial accidents resulting in injuries at the NTS could, depending on the type of injury, represent an irreversible and irretrievable commitment of human resources.

Continued restriction of harvest of annually perishable products like some game, pine nuts, or grass and maintenance of areas in development that precludes their natural productivity, represents an irretrievable commitment of resources. However, the area of the NTS that is developed or committed to such use as radioactive waste disposal is a small fraction of the total area.

Removal of soils for environmental restoration projects would result in their irreversible and irretrievable loss since they would be landfilled, and any associated natural resource services that they provide would be lost as well. Environmental restoration activities would involve up to about 9,800 acres, most of which has been previously disturbed. The amount that would be redisturbed during remediation depends, first, upon the levels of contamination that would be determined during characterization and, second, upon the agreements reached with the state of Nevada regarding cleanup levels.

Any contamination of groundwater above EPA drinking water standards at the existing underground test cavity locations would represent an irreversible and irretrievable commitment of the resource.

The subsurface area and geologic values at the existing underground test cavity locations would represent an irreversible and irretrievable commitment of their associated natural resource services.

A total of 8.1×10^6 m^3 per year (2.1×10^9 gal/yr) of water would be used to support all NTS programs under Alternative 4. This water would represent an irreversible and irretrievable commitment of this resource.

Electric usage would total 4.6×10^6 kW hrs/month, while fuel usage would total 461 m^3 per month (121,671 gal/month) that would represent an irreversible and irretrievable commitment of the energy resources.

A total of about 59,000 acres has been disturbed to date and approximately 14,400 more acres would be disturbed over the next 10 years. With the exception of some of the areas that would be remediated under the Environmental Restoration Program, most of these acres would be irreversibly and irretrievably committed to their present and proposed use. This would result in a minimal to total reduction of their associated natural resource services.

When an activity cannot be relocated, cultural resources must be removed in the process of data recovery. To the extent that this action precludes future data recovery using improved technology, it would represent an irreversible and irretrievable commitment of the information value represented. If cultural resources exist in an area too highly contaminated to survey or to conduct data recovery, these resources may be lost when remediation disturbs the surface. This is an irreversible and irretrievable loss of the information value that such resources contain. Vandalism and illicit artifact collecting within archaeologically sensitive areas are likely to result in irreversible and irretrievable loss of their information value.

*5.7.4.2 **Tonopah Test Range***. Much of the activity at the Tonopah Test Range takes place on the playas hence, surface disturbance would produce no effects on most other resources. No new surface disturbance would occur under Alternative 4. Removal of soils for environmental restoration projects would result in their irreversible and irretrievable loss since they would be landfilled, and any associated natural resource services that they provide would be lost as well. Environmental restoration could involve several hundred acres, most of which has been previously disturbed. The amount that would be redisturbed during remediation depends first, upon the levels of contamination which would be determined during characterization and second, upon the agreements reached with the state of Nevada regarding cleanup levels. With the exception of some of the areas that would be remediated under the Environmental Restoration Program, most of the acres would be irreversibly and irretrievably committed to their present use. This would result in a minimal to total reduction of their associated natural resource services.

When an activity cannot be relocated, cultural resources must be removed in the process of data recovery. To the extent that this action precludes future data recovery using improved technology, it would represent an irreversible and irretrievable commitment of the information value represented. Other irreversible and irretrievable losses may result from vandalism and illicit artifact collecting.

5.7.4.3 Project Shoal and Central Nevada Test Areas. About 10 acres at the Project Shoal Area and 40 acres at the Central Nevada Test Area would be disturbed through environmental remediation. Most of these areas were previously disturbed, so this would represent a setback in the ecological succession that has occurred. In addition, the subsurface area at the cavity locations and any associated groundwater contaminated above EPA drinking water standards would represent an irreversible and irretrievable commitment of their associated natural resource services.

Some cultural resource site data recovery represents, to a degree, an irreversible and irretrievable commitment of the potential information resource represented. This is because the recovery in the future of some information would be precluded due to the limited capability of present technology to recover certain information. Other irreversible and irretrievable losses may result from vandalism and illicit artifact collecting.

5.7.4.4 Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley. The irreversible and irretrievable commitment of resources resulting from the construction and operation of a Solar Enterprise Zone facility in Eldorado Valley, Dry Lake Valley, or Coyote Spring Valley would be the same and are presented in this section. Ecological productivity would be greatly reduced or completely stopped during the period of time in which the plant is operating. The ecosystem's contribution would be irretrievably lost for that period of time and would likely never return to its present status.

Some cultural resource site data recovery represents, to a degree, an irreversible and irretrievable commitment of the potential information resource represented. This is because the recovery in the future of some information would be precluded due to the limited capability of present technology to recover certain information. Construction of roads in areas proposed for solar-generating facilities is likely to result in a greater incidence of vandalism and illicit artifact collecting within archaeologically sensitive areas. This could result in an irreversible and irretrievable loss of their information value.

The use of materials for construction would be an irretrievable and irreversible long-term commitment of the resources.

5.8 References

REGULATION, ORDER, LAW

40 CFR 6 — Environmental Protection Agency (EPA), "Protection of Environment: Procedures for Implementing the Requirements of the Council on Environmental Quality on the National Environmental Policy Act," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.

40 CFR 51 — EPA, "Protection of Environment: Requirements for Preparation Adoption and Submittal of Implementation Plan," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.

40 CFR 93 — EPA, "Protection of Environment: Determining Conformity of Federal Actions to State or Federal Implementation Plans," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.

EO 12898 — Executive Order, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," Office of the President, U.S. Government Printing Office, Washington, DC, 1994.

GENERAL

AASHTO, 1990 — American Association of State Highway and Transportation Officials (AASHTO), *A Policy on Geometric Design of Highways and Streets*, Washington, DC, 1990.

Avon and Durbin, 1994 — Avon, L., and T.J. Durbin, *Hydrologic Evaluation of Recent Water-Level Decline of Devils Hole*, Report No. 2, Las Vegas Valley Water District, Las Vegas, NV, 1994.

Blomquist, et al., 1995 — Blomquist, K.W., T.A. Lindeman, G.E. Lyon, D.C. Steen, C.A. Wills, S.A. Flick, and W.K. Ostler, *Current Distribution, Habitat, and Status of Category 2 Candidate Plant Species On and Near the U.S. Department of Energy's Nevada Test Site*, EG&G Energy Measurements, Las Vegas Area Operations, Las Vegas, NV, 1995.

Borg et al., 1976 — Borg, I.Y., R. Stone, H.B. Levy, and L.D. Ramspott, *Information Pertinent to the Migration of Radionuclides in Ground Water at the Nevada Test Site, Part 1: Review and Analysis of Existing Information*, UCRL-52078, Pt. 1, Lawrence Livermore National Laboratory, Livermore, CA, 1976.

Bryant and Fabryka-Martin, 1991 — Bryant, E.A., and J. Fabryka-Martin, *Survey of Hazardous Materials Used in Nuclear Testing*, LA-12014-MS, Los Alamos National Laboratory, Los Alamos, NM, 1991.

CEQ, 1995	Council on Environmental Quality (CEQ), Memorandum dated July 25, 1995, for the Chiefs of Staff from the Council on Environmental Quality, C.J. Rasco, K.A. McGinty, and C.M. Brownes, regarding requirements or agencies with respect to Environmental Justice, and attachment titled "Guidance for Federal Agencies on Key Terms in Executive Order 12898," Washington, DC, 1995.
Call and Roundy, 1991	Call, C.A., and B.A. Roundy, "Perspective and Processes in Revegetation of Arid and Semiarid Rangelands," *Journal of Range Management*, Vol. 44, No. 6, pp. 543-549, Portland, OR, 1991.
Chapman et al., 1995	Chapman, J.B., K. Pohlmann, and R. Andricevic, *Exposure Assessment of Groundwater Transport of Tritium from the Shoal Site*, Publication #45132, Desert Research Institute, Las Vegas, NV, 1995.
Clark County, 1990	Clark County, *Approved Apex Heavy Industrial Use Park Conceptual Master Plan and Environmental Assessment*, Clark County, Las Vegas, NV, 1990.
Daniels et al., 1993	Daniels, J.I., L.R. Anspaugh, R.L. Jacobson, "Risk-based Screening Analysis of Ground Water Contaminated by Radionuclides Introduced at the Nevada Test Site (NTS)," in the *Pilot Study Risk Assessment for Selected Problems at the Nevada Test Site*, UCRL-LR-113891, Lawrence Livermore National Laboratory, Livermore, CA, 1993.
DOE/NV, 1991	U.S. Department of Energy, Nevada Field Office, (DOE/NV), *Biological Assessment of the Effects of Activities of the U.S. Department of Energy Field Office, Nevada on the Threatened Desert Tortoise*, Las Vegas, NV, 1991.
DOE/NV, 1993	DOE/NV, *U.S. Department of Energy Annual Report for Actions Taken under Authorization of the Biological Opinion on Nevada Test Site Activities*, Report LV93-SRB-83, EG&G Energy Measurements, Las Vegas, NV, 1993.
DOE, 1994	DOE, *Yucca Mountain Site Characterization Project, Socioeconomic Monitoring Program 1994, U.S. Department of Energy/Nevada Employee Survey Data Report, Executive Summary*, Las Vegas, NV, 1994.
DOE/NV, 1994a	DOE/NV, *U.S. Department of Energy Annual Report of Actions Taken under Authorization of the Biological Opinion on Nevada Test Site Activities (August 1, 1993 - July 31, 1994)*, Submitted to DOE/NV by EG&G Energy Measurements' Environmental Sciences Division, Las Vegas, NV, 1994.
DOE/NV, 1994b	DOE/NV, *Project Chariot Site Assessment and Remedial Action, Final Report*, DOE/NV-368, Environmental Restoration Division, Las Vegas, NV, 1994.
DOE/NV, 1994c	DOE/NV, *Nevada Solar Enterprise Zone Development Study*, prepared by Nevada Solar Enterprise Zone Task Force Work Group and DynCorp-Meridan for the DOE/NV, LasVegas, NV, 1994.
DOE, 1995a	DOE, *Integrated Data Base Report for 1994: U.S. Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics*, DOE/RW-0006, Rev. 11, Washington, DC, 1995.

| DOE, 1995b | DOE, *Draft Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste,* DOE/EIS-0200-D, Washington, DC, 1995.

| DOE, 1996 | U.S. Department of Energy, Environmental Assessment, *Environmental Assessment for Double Tracks Test Site, Nevada Test Site, Nye County, Nevada,* DOE/EA-1136, 1996.

| DOE, 1996 | *DOE, Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management,* DOE/EIS-0236, Washington, DC, 1996.

DOE/OFE, 1994 DOE/Office of Fossil Energy (OFE), *Environmental Assessment for Hazardous Materials Testing at the Liquefied Gaseous Fuels Spill Test Facility, Frenchman Flat, Nevada Test Site,* DOE-EA-0864, Washington, DC, 1994.

Driscoll, 1986 Driscoll, F.G., *Groundwater and Wells,* Second Edition, John Division, St. Paul, MN, 1986.

EG&G/EM, 1991 EG&G Energy Measurements (EG&G/EM), *The Distribution and Abundance of Desert Tortoises on the Nevada Test Site,* EGG 10617-2081, Santa Barbara Operations, Goleta, CA, 1991.

EG&G/EM, 1993 EG&G/EM, *Reconnaissance Survey Report for Potential Ground Water Characterization Activities in Sand Springs Range,* Survey Report LV93-GEL-8, Las Vegas, NV, 1993.

EG&G/EM, 1994 EG&G/EM, *Biological Resources Preacitvity Survey and Zone of Influence Survey Report for the Area 5 Radioactive Waste Management Site,* Survey Report LV94-DLP-11, Las Vegas, NV, 1994.

| EG&G/EM, 1995 | EG&G/EM, *Draft Status of Candidate Plant Species on and near the Nevada Test Site,* Las Vegas Area Operations, Las Vegas, NV, 1995.

| ERDA, 1977 | U.S. Energy Research and Development Administration (ERDA), *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada,* ERDA-1551, Las Vegas, NV, 1997.

Garcia et al., 1982 Garcia, J., K.G. Berry, and P.B. Schneider, "The Distribution and Relative Abundance of the Desert Tortoise (GOPHERUS AGASSIZII) in Coyote Spring Valley Nevada, with a Discussion of Possible Impacts of the MX Project Development," in *Proceedings of the Desert Tortoise Council Symposium, 1982,* pp. 12-35, 1982.

GeoTrans, 1995 Geo Trans, Inc., *A Fracture/Porous Media of Tritium Transport in the Underground Weapons Testing Areas, Nevada Test Site*, Geo Trans, Inc., Boulder, CO, 1995.

Greger, 1995 Greger, P.D., "Status of Horses, Deer, and Birds on the Nevada Test Site," in *Draft Status of the Flora and Fauna on the Nevada Test Site,* DOE/NV/11432-195, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1995.

Hunter and Medica, 1992	Hunter, R.B., and P.A. Medica, "Extent of Land Disturbance on the Nevada Test Site," in *Status of the Flora and Fauna on the Nevada Test Site, 1988*, DOE/NV/10630-29, pp. 3-7, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1992.
ICRP, 1991	International Commission on Radiological Protection (ICRP), 1990, *Recommendations of the International Commission on Radiological Protection*, Publication 60, Pergamon Press, Oxford, England, 1991.
ITE, 1991	Institute of Transportation Engineers (ITE), *Trip Generation, An Informational Report*, 5th Edition, Washington, DC, 1991.
Long, 1986	Long, J.W., *Component Ground Motion at the Nevada Test Site from Pahute Mesa Underground Nuclear Explosions*, SAND86-0439, Sandia National Laboratories, Albuquerque, NM, 1986.
NDOT, 1993	Nevada Department of Transportation (NDOT) Safety Engineering Division, *1993 Annual Traffic Report*, Nevada Department of Motor Vehicles, and the Federal Highway Administration, Carson City, NV, 1993.
Owen, 1981	Owen, G.N., "Earthquake Engineering of Large Underground Structure," in *Proceedings, Workshop on Seismic Performance of Underground Facilities*, held February 1981, Atlanta, GA, 1981.
Pantex, 1995	Pantex Plant, *Environmental Information Document, The Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components Environmental Impact Statement*, Amarillo, TX, 1995.
Pohlmann et al., 1995	Pohlmann, K., J.B. Chapman, and R. Andricevic, *Exposure Assessment of Groundwater Transport of Tritium from the Central Nevada Test Area*, Publication #45133, Desert Research Institute, Las Vegas, NV, 1995.
Rautenstrauch et al., 1994	Rautenstrauch, K.R., G.A. Brown, and R.G., Goodwin, *The Northern Boundary of the Desert Tortoise Range on the Nevada Test Site*, EGG-11265-1103, EG&G Energy Measurements, Las Vegas, NV, 1994.
SAIC/DRI, 1991	Science Applications International Corporation and Desert Research Institute (SAIC/DRI), *Special Nevada Report*, September 23, 1991, prepared for Department of the Air Force, Department of the Navy, and the Department of the Interior, Las Vegas, NV, 1991.
Schaeffer et al., 1990	Schaeffer, D.J., T.R. Seastedt, D.J. Gibson, D.C. Hartnett, B.A.D. Hetrick, S.W. James, D.W. Kaufman, A.P. Schwab, E.E. Herricks, and E.W. Novak, "Field Bioassessments for Selecting Test Systems to Evaluate Military Training Lands in Tallgrass Prairie," *Ecosystem Health, v. Environmental Management*, Vol. 14, No. 1, pp. 81-93, 1990.
Scott et al., 1971	Scott, B.R., T.J. Smales, F.E. Rush, and A.S. Van Denburgh, *Water for Nevada*, Report 3, Department of Conservation and Natural Resources Division of Water Resources, Carson City, NV, 1971.

Shott et al., 1995	Shott, G.J., C.J. Muller, L.E. Barker, D.E. Cawlfield, F.T. Lindstrom, D.G. Linkenheil, M.J. Sully, D.J. Thorne, and L. McDowell-Boyer, *Performance Assessment for the Area 5 Radioactive Waste Management Site at the Nevada Test Site, Nye County, Nevada*, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1995.
State of Nevada, 1994	State of Nevada, *State of Nevada Plan of Action for the Future of the Nevada Test Site and Its Work Force*, The Nevada Test Site Economic Adjustment Task Force, Carson City, NV, 1994.
State of Nevada, 1995	State of Nevada, *Permit Tracking Database-Nye County*, Bureau of Air Quality, Carson City, NV, 1995.
Thomas, 1995	Thomas, A.R., Personal communication dated April 11, 1995 from A.R. Thomas, Reynolds Electrical & Engineering Co., Inc., to R.W. Morris, Science Applications International Corporation, regarding bus transportation data at the Nevada Test Site, Las Vegas, NV, 1995.
Transportation Research Board, 1994	Transportation Research Board, *Highway Capacity Manual Special Report 209*, pp. 8-6, National Research Council, Washington, DC, 1994.
Tyler et al., 1986	Tyler, S.W., M.R. Whitbeck, M.W. Kirk, J.W. Hess, L.G. Everett, D.K. Kreamer, and B.H. Wilson, *Processes Affecting Subsurface Transport of Leaking Underground Tank Fluids*, Desert Research Institute, Las Vegas, NV, 1986.
URS/John A. Blume, 1986	URS/John A. Blume & Associates, *Ground Motion Evaluations at Yucca Mountain, Nevada with Application to Repository Conceptual Design and Siting*, SAND85-7104, Sandia National Laboratories, Albuquerque, NM, 1986.
U.S. Air Force, 1994	U.S. Air Force, *Environmental Assessment for Supersonic Flight Operations over the Nellis Range complex*, Nellis Air Force Base, Las Vegas, NV, 1994.
U.S. Fish and Wildlife Service, 1992	U.S. Fish and Wildlife Service, *Biological Opinion on Nevada Test Site Activities*, File 1-5-91-F-225, Department of the Interior, Reno Field Office, Reno, NV, 1992.
U.S. Fish and Wildlife Service, 1994	U.S. Fish and Wildlife Service, *Biological Opinion on the Sale of Public Lands in Eldorado Valley (PL 85-339, as Amended)*, File No. 1-5-94-F-283, Department of the Interior, Reno Field Office, Reno, NV, 1994.
Van Cleave, 1996	Van Cleave, K.K., letter report to Stephen A. Mellington, Acting Director for the Nevada Operations Waste Management Division, regarding the potential for groundwater recharge below UE3ax/bl, Las Vegas, NV, 1996.

Chapter 6

CUMULATIVE IMPACTS

CHAPTER 6
CUMULATIVE IMPACTS

This chapter is comprised of five sections: (1) definition of cumulative impacts, methods of analysis, analytical baseline, and information sources; (2) inventory and characterization of past, present, and reasonably foreseeable actions (including federal and non-federal actions); (3) summary of impacts attributable to implementation of the Nevada Test Site (NTS) alternatives; (4) cumulative impact analysis by resource area; and (5) a summary of cumulative impacts.

The U.S. Department of Energy (DOE) is currently planning or conducting a variety of Programmatic Environmental Impact Statements (EISs) that have the potential for impacting activities at the NTS. These activities are discussed in Chapter 2, Purpose and Need. The impact of actions proposed by the DOE in these Programmatic EISs is accounted for in the assessment presented in Chapter 5, Environmental Consequences. Impacts experienced at the NTS attributable to activities contained in Programmatic EISs prepared by agencies other than the DOE are not individually identified and specifically addressed in Chapter 5.

6.1 Definition of Cumulative Impacts, Methods of Analysis, Analytical Baseline and Information Sources

The following subsections provide the definition of cumulative impacts, and description of methods used in the analysis. Also included is the analytical baselines and a summary of the information sources used.

6.1.1 Definition

In accordance with the Council on Environmental Quality regulations, a cumulative impact analysis within an EIS includes the anticipated impacts to the environment resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time." (40 CFR Part 1508.7).

6.1.2 Methods of Analysis

A cumulative impact analysis is based on a number of assumptions. Cumulative impacts are examined by combining the impacts of the proposed program alternatives with the impacts of other past, present, and reasonably foreseeable activities in a region of influence. The extent of the region of influence can vary widely from one resource to another. For example, the region of influence for land use generally includes all impacts on land use in a broad region surrounding the area affected by the program alternatives. The region of influence for groundwater would generally be much smaller, encompassing only those groundwater-flow systems that are affected by the program alternatives, and by all past, present, and future actions that have or could affect these groundwater-flow systems. The region of influence for transportation could include an entire state, whereas the region of influence for socioeconomics could include all the cities and towns affected by the major economic activities in the region.

Public documents prepared by agencies of federal, state, and local government are the primary sources of information. It is assumed that actions undertaken by private persons and entities are captured in the information provided by such agencies.

The cumulative impacts methodology employs an approach that references resource management plans and economic and demographic projections as the sources of non-DOE-related baseline conditions. These plans provide an assessment of impacts to the environment associated with the implementation of these plans and scenarios. This approach is used rather than one that employs a compilation of specific future projects anticipated to occur in the respective regions of influence. In most cases the geographical areas in question are extensive and can also contain large populations, making it infeasible to achieve a project-by-project aggregation.

Because of the wide geographic scope of a cumulative assessment and the variety of activities assessed, cumulative impacts are commonly examined at a less detailed level than are direct and indirect impacts.

The resource management plans and economic and demographic projections developed by public agencies present a consolidated picture of activities that are projected to occur in their respective geographical areas. In general terms, the resource management plans apply to large areas of relatively undeveloped land (virtually all of which is in federal ownership), and the economic and demographic projections apply to Clark and Nye counties, respectively.

6.1.3 Analytical Baseline

Except for the Las Vegas metropolitan area, southern Nevada is sparsely populated with large tracts of uninhabited desert and forested mountains controlled by a few federal agencies. Other land owners control relatively little land area.

FEDERAL LAND—The U.S. Bureau of Land Management controls the largest amount of land in the region. The U.S. Bureau of Land Management's lands are open to the public and are used chiefly for grazing and dispersed recreation; mineral exploration and mining have affected small areas. The U.S. Bureau of Land Management manages the Red Rock Canyon National Recreation Area 10 miles west of Las Vegas. The U.S. Bureau of Land Management also manages a few dozen areas surrounding the NTS and Nellis Air Force Range (NAFR) Complex as Wilderness Study Areas. The U.S. Bureau of Land Management has recommended to the Secretary of the Interior that some of these areas be included in the National Wilderness Preservation System.

The NAFR Complex, controlled by the U.S. Air Force, is the next largest block of land in the region. It surrounds the NTS on the north and east sides, and most of the west side (public lands border the NTS on its southern and southwestern sides). The NAFR Complex is used for military training and is closed to public access. The NTS is the next largest block of land in the region and is closed to public access. Combined, the NAFR Complex and the NTS form a single northwest-trending block of land that contains approximately 4,000,000 acres.

The U.S. Fish and Wildlife Service manages a large block of land north of Las Vegas as the Desert National Wildlife Range, and a smaller block of land 24 kilometers (km) (15 miles [mi]) south of the NTS as Ash Meadows National Wildlife Refuge. These lands are managed for wildlife conservation, with an emphasis on bighorn sheep in the Desert National Wildlife Range and pupfish in the Ash Meadows National Wildlife Refuge.

The National Park Service manages a large block of land bordering Lake Mead and the Colorado River as part of the Lake Mead National Recreation Area, and another block of land west of Beatty, Nevada, as part of Death Valley National Park. Lands controlled by the National Park Service are managed for conservation and recreation.

The U.S. Forest Service manages a single segment of land west of Las Vegas as part of the Toiyabe National Forest. Other U.S. Forest Service lands are located just north of Tonopah. U.S. Forest Service lands are used chiefly for recreation.

AMERICAN INDIAN LAND—The Moapa River Indian Reservation is 48 km (30 mi) northeast of Las Vegas and is the largest reservation in the region. Other reservations include the Las Vegas Indian Reservation, which is located about 24 kilometers (15 miles) northwest of Las Vegas, and the Fort Mojave Indian Reservation at the southern tip of Clark County. Within this region, there also are several Indian reservation schools, tribal enterprises, tribally controlled schools, tribal police departments, and tribal emergency response units. The following reservations are located within the region: Duckwater Shoshone Tribe, Las Vegas Paiute Tribe, Moapa Paiute Tribe, and the Yomba Shoshone Tribe. In addition, there are tribes which are located geographically outside of the region, but are potentially impacted by NTS activities. (One of these tribes is the Timbisha Shoshone Tribe, based in Death Valley, California and is located closer to the Nevada Test Site than many towns in northern Nye County). As a consequence of this proximity, people from the Timbisha Shoshone Tribe, are a part of the social and economic region of influence of the NTS. For example, students from the Timbisha Shoshone Tribe attend public school in Beatty, Nevada, whereas many Shoshone students from Tacopa, California attend school in Pahrump, Nevada. Timbisha tribal members both work and shop in Clark and Nye counties.

The Pahrump Paiute Tribe, located in Pahrump Valley, is composed of Indian people who have been historically recognized by state and federal agencies as qualified to receive services as Indian people, and who as a group are currently seeking federal acknowledgment.

STATE LAND—The state of Nevada manages the Valley of Fire State Park. This park is used for recreational purposes and is located about 64 km (40 mi) northeast of Las Vegas. Other small parcels of undeveloped state lands are scattered throughout the region.

PRIVATE LANDS—The Las Vegas Valley and nearby Boulder City contain the single largest block of private land in the region. Pahrump Valley, located about 32 km (20 mi) south of the NTS, also contains large amounts of private land, but relatively little of this land has been developed. Large blocks of private land occur also in the Overton area at the north end of Lake Mead, in Coyote Spring Valley immediately east of the Desert National Wildlife Range, and in the Amargosa Desert, 16 km (10 mi) northwest of Ash Meadows National Wildlife Refuge. These lands are used chiefly for agriculture, with smaller amounts dedicated to residential and business development. Other small blocks of private agricultural lands are scattered around many of the small communities in the region.

6.1.4 Information Sources

Resource management plans, and EISs associated with their implementation, have been prepared by the U.S. Bureau of Land Management for the NAFR Complex (BLM, 1990) and the Stateline and Tonopah resource areas (BLM, 1994a; 1994b) near the NTS. A framework for a resource management plan has been prepared for the NTS and is included as Volume 2 of the NTS EIS. Such plans are designed to guide and control future management actions, including the development of limited and more detailed plans for specific resources and land uses. Resource management plans identify objectives for each resource area, management direction designed to attain these objectives, and restricted land-use designations associated with the management direction (where appropriate).

The resource categories commonly considered in resource management plans, include air, soils, water, vegetation, riparian, visual, fish and wildlife habitat, forestry, livestock grazing, wild horses and burros, cultural and paleontological, lands, natural areas, recreation, wild and scenic rivers, rights-of-way, minerals, fire management, and socioeconomic values.

The resource management plans and economic and demographic projections for the following geographic areas are:

- U.S. Bureau of Land Management Tonopah Resource Area
- U.S. Bureau of Land Management Stateline Resource Area
- Nellis Air Force Range
- Clark County Region Economic and Demographic Projections
- Nye County Economic and Demographic Projections.

6.2 Past, Present, and Reasonably Foreseeable Future Actions

In the following subsections, the past, present, and reasonably foreseeable future action of federal agencies, non-federal (public and private) entities, and American Indian Tribes, which contribute to the cumulative impacts, are presented.

6.2.1 Past and Present Actions

Past and present actions associated with activities of the DOE and other public and private entities are included in the baseline conditions described in Chapter 4, Affected Environments.

6.2.2 Reasonably Foreseeable Future Actions

Reasonably foreseeable future projects are presented below under the following three categories: federal, non-federal (public and private), and American Indian. Following the description of plans and programs, the relationships between their implementation and potential environmental impacts (by resource area) are presented.

FEDERAL ACTIONS—Actions of agencies of the federal government included in this section are those of the DOE, U.S. Air Force, Department of the Interior (U.S. Bureau of Land Management and U.S. Fish and Wildlife Service), and U.S. Navy.

U.S. DEPARTMENT OF ENERGY—Site characterization studies at Yucca Mountain in Nye County, Nevada, are ongoing and designed to determine whether the site is suitable for the storage and isolation of high-level radioactive waste and spent nuclear fuel. Activities being carried out include surface-based studies, underground studies, laboratory tests, modeling, and various associated analyses. The purpose of these studies and tests is to determine whether (1) a geologic repository can be constructed and operated at the site in such a way that the health and safety of the public and workers are protected and (2) nuclear waste emplaced in a repository will remain isolated from the accessible environment.

The DOE anticipates making a recommendation to the President on the suitability of Yucca Mountain for the disposal of spent nuclear fuel and high-level radioactive waste in 2001. If found suitable, a license application for construction of the repository would be submitted to the Nuclear Regulatory Commission in 2002. Construction of the repository would only begin after the Nuclear Regulatory Commission grants a construction license. It is anticipated that construction would be complete and the repository would start operations in 2010.

In support of the process that led to the recommendation of the Yucca Mountain site as the location where site characterization activities would be carried out, the DOE prepared a site-specific Environmental Assessment (DOE, 1986). This document concluded that no significant adverse environmental impacts were expected from site characterization activities carried out at the Yucca Mountain site. Environmental impacts associated with site characterization activities are monitored and outlined in detail in an annual Site Environmental Report. Such reports have been prepared for calendar years 1991, 1992, 1993, and 1994 (DOE, 1992a; 1993; 1994a; 1995f). Until 1994, with the positioning of the tunnel-boring machine in the starter tunnel, the main focus of site characterization was on surface activities. During the entire period covering site characterization activities, the DOE has complied with all environmental requirements and permit conditions. In addition, numerous monitoring activities have been carried out, especially in the areas of radiological field studies, air quality, meteorology, cultural resources (archaeological and American Indian), water resources, and terrestrial ecosystems.

No significant adverse impacts are anticipated as a result of site characterization activities. According to the 1986 Yucca Mountain Environmental Assessment, limited impacts are expected to occur in the following resource areas: approximately 704 acres of surface soils will be disturbed, wildlife habitat will be disturbed, air quality will be affected through the generation of particulate and gaseous emissions, noise effects will temporarily impact sensitive receptors (wildlife), impacts to aesthetics will result from the construction of access roads; and additional trips on U.S. Highway 95 will occur but are not expected to affect the current level of service.

Estimates of these impacts are described in the Environmental Assessment. Annual monitoring, as described in the Site Environmental Reports, is conducted to ensure that impacts associated with site characterization activities remain well within the levels projected in the Environmental Assessment. Certain mitigation actions, including reclamation of disturbed lands, studies of the desert tortoise and its habitat, and archaeological monitoring, have been implemented as part of the site characterization program. (Areas scheduled for ground disturbance are also surveyed in advance to determine the presence of cultural and biological resources and appropriate mitigation measures, such as avoidance or collection of resources). Mitigation activities required as part of applicable site permits, such as dust suppression in conformance with air quality permits, are also implemented.

The cumulative impacts from site characterization activities at Yucca Mountain, added to the impacts anticipated from implementation of program alternatives analyzed in this EIS, are expected to be minimal. Because most of these anticipated impacts will occur on the NTS, the cumulative contribution to off-site, regional conditions is expected to be negligible. In addition, given the recent reductions in weapons testing activity at the NTS, cumulative impacts would be expected to have declined during the period of site characterization activities. Further discussion regarding potential cumulative impacts to specific resource areas and the general population can be found in Section 6.4, and are summarized in Table 6-1.

U.S. AIR FORCE—The major land area associated with activities conducted at the Nellis Air Force Base is that of the NAFR Complex. The NAFR Complex comprises 3,035,326 acres (of which 826,000 acres are administered by the U.S. Fish and Wildlife Service as the Desert National Wildlife Range) located in south-central Nevada. Included in the NAFR Complex are about 123 acres of private land (patented mining claims).

Environmental concerns that could contribute to cumulative impacts in a resource region of influence are addressed in the *Nellis Air Force Range Proposed Resource Plan and Final Environmental Impact Statement* (BLM, 1990). Two alternatives were identified in the *Resource Management Plan* and selected for detailed analysis. They were (1) No Action Alternative, or a continuation of current management direction within the framework of present laws and regulations, and (2) Preferred Alternative which is designed to improve rangeland vegetation conditions and wildlife habitat by achieving and maintaining the appropriate management level of the wild horse population in the planning area. Four major issues were identified for consideration: (1) vegetation, (2) wildlife habitat, (3) wild horse and burro management, and (4) cultural resources.

In addition to operational activities associated with the NAFR Complex, other potential actions include return of approximately 7,200 to 7,500 acres of NAFR Complex lands to the U.S. Bureau of Land Management (Donegan, 1995). It is anticipated that property currently managed by the Nellis Air Force Base will be returned to the U.S. Bureau of Land Management. The property is comprised of approximately 4,800 acres within the old small arms range located west of the Nellis Air Force Base near Interstate 15 and less than 3,000 acres located west of the Indian Springs Auxiliary Airfield.

U.S. BUREAU OF LAND MANAGEMENT—Resource management plans, and EISs associated with their implementation, have been prepared by the U.S. Bureau of Land Management for the Stateline and Tonopah resource areas.

The Stateline resource area comprises 3.7 million acres of public land in Clark and Nye counties. The resource area is bordered by the Caliente resource area, the U.S. Fish and Wildlife Service, the Desert National Wildlife Range, the NAFR Complex, and the NTS.

Table 6-1 Population projections

County	Year 2000	Year 2005
Clark County		
NTS EIS	1,223,541	1,380,920
Clark County Regional Transportation Plan	1,130,000	1,289,000
Clark County Desert Conservation Plan	1,088,197	1,205,070
Nye County	33,966	38,516

The *Resource Management Plan* (BLM, 1992) provides a detailed characterization of five resource management plans (Alternatives A through D and the No Action Alternative). Alternative D is the Bureau of Land Management's Preferred Alternative. Following public and agency review of the draft version of the NTS EIS, an additional alternative was developed (Alternative E) and a Supplemental EIS was issued in 1994 (BLM, 1994a). The alternatives are as follows:

- No Action Alternative—This represents a continuation of current management direction within the framework of present laws and regulations, including existing Memoranda of Understanding and Cooperative Agreements. The No Action Alternative also provides a baseline against which the environmental effects of implementing other alternatives are compared.

- Alternative A—This Alternative is designed to provide for a full spectrum of public land uses in the traditional sense of multiple-use and sustained yield. Consumptive and non-consumptive uses would be balanced.

- Alternative B—This alternative attempts to provide maximum opportunities for land-based growth and development needs of the state of Nevada while continuing to provide for multiple-use and sustained yield of the public lands.

- Alternative C—This alternative provides for the management of the public lands on an ecosystemic basis, with an emphasis on biodiversity, nonconsumptive uses, and the protection and recovery of the desert tortoise.

- Alternative D—This alternative is the U.S. Bureau of Land Management's Preferred Alternative and would continue to allow for the multiple-use of the public lands, permit maximum flexibility in the disposal of public lands, and provide for the protection and recovery of the desert tortoise.

- Alternative E—This alternative proposes management direction to provide for public land uses on the basis of multiple-use and sustained yield, while emphasizing biodiversity and the protection and recovery of the threatened desert tortoise.

The *Resource Management Plan*/EIS focuses on 10 management issues, each of which is incorporated in the alternative plans under assessment. The identified issues are as follows:

1. Land Tenure
2. Desert Tortoise
3. Mineral Development
4. Off-Highway Vehicle Use
5. Special Management Areas and Areas of Critical Environmental Concern
6. Utility Corridors
7. Rangeland Classification
8. Utility Corridor Locations and Widths
9. Minerals Management and Post Congressional Non-designation of Wilderness Study Areas
10. Desert Tortoise Habitat Management in Conformance with the Recovery Plan for the Desert Tortoise (Mojave Population).

The potential environmental consequences in each of the resource areas are assessed from a number of perspectives. For example, effects on air resources are assessed from the perspective of land management, recreation management, and minerals management. The effects on soils are addressed from the perspectives of livestock grazing management, recreation management, rights-of-way management, and minerals management. The effects (quantified in terms of disturbed land area) attributable to reasonably foreseeable future actions are identified in the *Supplement to the Stateline Draft Resource Management Plan and EIS (BLM, 1994a).*

The total area potentially disturbed over the 10-year period could reach approximately 197,000 acres.

The Tonopah resource area encompasses 6.1 million acres of land in Nye and Esmeralda counties of central Nevada. Significant resources and program emphases include locatable minerals, livestock grazing, wild horses and burros, real estate, cultural resources, and wildlife.

Four detailed alternative management scenarios were analyzed in the NTS EIS (BLM, 1994b) which aim at resolving six major issues:

- Alternative 1 (No Action Alternative)— This alternative represents a continuation of management under existing planning guidance and also provides a baseline against which the potential environmental impacts associated with implementation of the other alternatives are compared.

- Alternative 2—This alternative provides management with an emphasis on private economic development and economic diversity through the use of a wide range of resources. Lands will be made available for expansion and development while protecting sensitive resources.

- Alternative 3—This alternative provides for private economic development and economic diversity which are constrained by environmental safeguards designed for the preservation and enhancement of environmental systems, and for species diversity.

- Alternative 4—This alternative is the preferred alternative and it provides for the development of renewable and nonrenewable resources while ensuring that the preservation and enhancement of fragile and unique resources will occur.

The issues addressed in the *Tonopah Resource Management Plan* and accompanying EIS are outlined below:

1. Wild horses and burros (determine what intensity of management should be implemented to ensure a thriving natural ecological balance)

2. Special management areas (determine if lands should be given special management to protect high resource values)

3. Off-highway vehicle use (determine if lands should be limited or closed)

4. Management of released wilderness study areas (determine what objectives should be established for areas now designated by Congress as nonwilderness)

5. Utility corridors (determine lands for preferred routes for utility corridors and to minimize conflicts)

6. Locatable and fluid minerals (determine lands for closure to leasing or location of minerals, and lands for special considerations).

The total area potentially disturbed over the 10-year period could reach approximately 26,800 acres.

U.S. FISH AND WILDLIFE SERVICE—Approximately 28 bighorn sheep were recently introduced into the Spotted Range of the Desert National Wildlife Range. Their introduction involved the construction of two water developments (wildlife guzzlers), and a third is planned for the future. These water developments comprise two or three water tanks (11.356 to 15.141 liters [3,000 to 4,000 gallons] each), a surface water collection apron, and a drinking device. Potential impacts to biological resources would be minor.

U.S. NAVY—The U.S. Navy proposes to withdraw 189,000 acres of U.S. Bureau of Land Management land in Churchill County around existing training ranges to accommodate increased levels of flight training activity at Naval Air Station Fallon. The action is referred to as the Master Land Withdrawal. The objectives of the proposed action are fourfold: (1) meet training requirements for national defense, (2) fulfill established operation and Range Air Installation Compatibility Use Zone safety guidelines, (3) facilitate protection of the public from off-range ordnance, and (4) provide for continued public access to and safety on public lands adjacent to the military withdrawals. The withdrawn land would be managed for military purposes for a proposed term of 20 years. A Resource Management Plan will be developed for the withdrawn lands to provide for public safety by defining public uses compatible with military training operations (McMillan, 1995).

A number of sensitive issues were identified prior to scoping. They include land use (including public recreational uses), public health and safety, cultural resources, and unexploded ordnance on withdrawn lands. The principal concern is the proposed withdrawal of land. This potential issue is of a statewide nature and is not directly related to NTS programs.

NON-FEDERAL ACTIONS—This section includes information from the following public entities: state of Nevada, Clark County, and Nye County. Activities that would likely take place within the incorporated places of both Clark and Nye counties are assumed under the economic and demographic growth projections presented for each of the counties.

STATE OF NEVADA—Virtually all state involvement in development activities in the region involve regional transportation. This area of concern, and others related to it, are addressed under county governmental entities.

CLARK COUNTY—The Regional Transportation Plan for Clark County (Regional Transportation Commission, 1994) documents an average annual rate of population growth over the period 1980 to 1990 of 5.2 percent, and 5.7 percent for employment. The respective growth rates over the period 1990 to 2000 are projected to be 3.9 percent for population and 4.6 percent for employment. Over the period 2000 to 2015, these growth rates fall to 2.5 percent for both population and employment.

A number of factors will influence the rate of future development in the Las Vegas Valley. They include, but are not limited to, the availability of water, air quality, the strength of the tourism industry (the gaming sector in particular), the cost of housing, and the disposal of public lands making areas available for urban development.

Population projections for Clark County anticipate a population of between 1.1×10^6 and 1.2×10^6 persons by the year 2000. Population is expected to rise to between 1.2×10^6 and 1.4×10^6 persons by the year 2005 (see Table 6-1). It is further projected that approximately 58,000 acres of undeveloped land, in the Las Vegas Valley, will be converted to urban uses between 1996 and the year 2005. (See Table 6-2).

CLARK COUNTY DESERT CONSERVATION PLAN—The Clark County Desert Conservation Plan (Regional Environmental Consultants, 1995) was prepared for two reasons: (1) support an application for a Section 10(a) incidental take permit under the Endangered Species Act applicable to the desert tortoise, and (2) outline a strategy that will allow Clark County (as well as state and federal resource managers) to address the conservation and protection of habitat necessary to preserve other plant and wildlife resources to avoid the need for listing those species.

The incidental take of desert tortoises applies to an area of approximately 525,000 acres which comprises all non-federal land in Clark County and on approximately 2,900 acres of desert tortoise habitat associated with the Nevada Department of Transportation activities (rights-of-way and material sites) in Clark, Esmeralda, Lincoln, and Nye counties.

Over the permit period (30 years), it is estimated that about 114,000 acres of land (111,000 acres in Clark County and 2,900 acres in Nevada Department of Transportation rights-of-way and material sites) will be developed, most of which is desert tortoise habitat. In order to offset this destruction of desert tortoise habitat, the Desert Tortoise Recovery Plan proposed six distinct population segments or recovery units within the range of the Mojave population of the desert tortoise. Each recovery unit includes one or more Desert Wildlife Management Areas. The Desert Wildlife Management Areas that fall primarily in Clark County are Paiute-Eldorado, Coyote Spring, Gold Butte, and Mormon Mesa. The recovery units are located in areas of prime desert tortoise habitat

Table 6-2. Land area disturbed (acres)

Locality	Disturbed Area
Stateline Resource Area	197,000
Tonopah Resource Area	26,800
Las Vegas Valley	58,000
Nye County	2,100
Total	283,900

and are subject to a number of land-use constraints designed to optimize the survival and recovery of the desert tortoise in these areas. Funding for the program is derived mainly from the imposition of a $500-per-acre mitigation fee on development projects in the permit area.

NYE COUNTY—Several key economic and demographic forces influence future activities and the character of Nye County and the communities contained in it. They include the NTS, Tonopah Test Range, mining activity, tourist activity, commuting, migration patterns, local service sector activity, and demographic factors.

Baseline population projections prepared for the county (Nye County Board of Commissioners, 1993) indicate an average annual compound growth rate of 4.6 percent for the entire county over the period 1990 to 2010. However, this population increase is highly localized and concentrated in the Pahrump area. It is projected that this area will experience a growth rate of 7.6 percent annually over the time period. The share of total county population located in Pahrump is projected to increase from 42 percent in 1990 to 74 percent in 2010. This urbanization trend will entail the conversion of land currently in an undeveloped state. It is anticipated that over 2,000 acres of land will be converted to urban uses by the year 2005 (see Table 6-2). The rapid urban development occurring in Pahrump is fueled by the low cost of land, proximity to the Las Vegas metropolitan region, and relocation of retirees. This residential activity, in turn, creates development and construction of service activities and infrastructural improvements.

AMERICAN INDIAN ACTIONS—The following American Indian tribal organizations and representatives have been contacted: Pahrump Paiute Tribe, Pahrump, Nevada; Las Vegas Paiute Tribe, Las Vegas, Nevada; Moapa Paiute Tribe, Moapa, Nevada; Kaibab Paiute Tribe, Glendale, Arizona; Las Vegas Indian Center, Las Vegas, Nevada; Owens Valley Paiute Tribe, Lone Pine, California; Yomba Shoshone Tribe, Austin, Nevada; and Duckwater Shoshone Tribe, Duckwater, Nevada.

Information regarding reasonably foreseeable future actions was received from the Las Vegas Paiute Tribe. Plans have been developed for the construction of a destination resort to be located on the east side of the reservation fronting U.S. Highway 95. The core of the resort area will encompass 150 acres and will include a 450-room hotel/casino and four championship golf courses. A 300-acre theme park will be built next to the resort area. On the west side of the reservation, a planned development includes 200 single-family homes for tribal members, a laundry plant, a 20-mw solar park, and a solar research center. The Bureau of Indian Affairs has prepared an Environmental Assessment for the construction of the four golf courses.

6.3 Nevada Test Site Program Alternatives

A summary of the anticipated impacts associated with implementing each of the program alternatives, on a resource-specific basis, is presented in Table 3-5. An inspection of this table reveals minimal impact from new programs or projects at the NTS over the 10-year period. In general, the level of intensity of impacts declines from those projected under Alternative 1 (No Action) for those under Alternative 2 (Discontinue Operations) and Alternative 4 (Alternative Use of Withdrawn Lands). The intensity of potential impacts associated with implementation of Alternative 3 (Expanded Use) is expected to be higher than under Alternative 1 (No Action). Potential impacts to the three areas associated with the Solar Enterprise Zone facility (Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley) represent new rather than incremental potential impacts as is the case of the NTS, the fourth Solar Enterprise Zone facility area.

6.4 Cumulative Impact Analysis

Most of the land near the NTS is held in public ownership by the U.S. Bureau of Land Management (contained in the Stateline and Tonopah resource areas, respectively), the U.S. Air Force (NAFR Complex), and the U.S. Fish and Wildlife Service (Desert National Wildlife Range), while much of the land in the Las Vegas Valley is privately owned and undergoing widespread and rapid conversion to urban uses. The following assessment of cumulative impacts associated with reasonably foreseeable future actions is based on information presented in EISs prepared by the U.S. Bureau of Land Management for the Stateline and Tonopah resource areas, an EIS prepared for the Resource Plan at the NAFR Complex, a general development scenario applicable to private lands in the Las Vegas Valley section of Clark County, and economic and demographic projections prepared by both Clark and Nye counties.

It is likely that large areas of land will be disturbed throughout the entire region because of changes in use. These changes include urban development, development of mineral resources, the opening of areas for recreational use, and development of utility easements. The vast majority of the projected urban development will occur in areas adjacent to the Las Vegas urban area; additional rapid development will be localized in southern Nye County.

It is projected that approximately 284,000 acres of land could be disturbed within the region during the 10-year period. Of this total, about 58,000 acres would be located in the Las Vegas Valley. The general location of this disturbance is presented in Table 6-2. Much of the land disturbance in the Las Vegas Valley and southern Nye County is attributable to the conversion of land from non-urban to urban uses in the Las Vegas metropolitan area of Clark County and around Pahrump in Nye County. A series of population projections exist for Clark County as seen in Table 6-1. For purposes of this analysis, the higher projections are used.

6.4.1 Land Use

It is anticipated that the major land-use designations and land users within the region will remain unchanged through the foreseeable future. Under Alternative 4, some NTS land could be returned to the U.S. Bureau of Land Management. This action, along with the possible return of small tracts of U.S. Air Force land to the public, would increase the amount of public land in this area. However, the NTS (and the NAFR Complex) would continue to form a large, continuous block of land closed to the public.

It is likely that, over the next decade, Congress will designate some U.S. Bureau of Land Management lands in southern Nevada for inclusion in the National Wilderness Preservation System. Management and use of these wilderness areas would be similar to their current management and use as wilderness study areas. Wilderness study areas not included in the National Wilderness Preservation System will be released for general use, thereby increasing the types of activities that can be conducted by the public on thousands of acres of U.S. Bureau of Land Management land.

Rapid urbanization in Las Vegas and its vicinity, and the potential sale of U.S. Bureau of Land Management land to accommodate this growth, would reduce the acreage of public-owned lands in this area.

Under Alternative 3, defense-related aircraft operations within the DOE and NAFR Complex airspace would increase gradually over a 10-year period. This increase and the expected increases in civilian aviation activities would not have an adverse cumulative impact on airspace use in southern Nevada. The majority of DOE and the Department of Defense (DoD) aircraft transiting to and from the DOE and NAFR Complex airspace use corridors that do not conflict with those routes flown by commercial aircraft between Las Vegas and other key cities.

6.4.2 Transportation

An increase of 1,030 one-way vehicle trips generated by an additional 4,400 workers employed at the NTS in 2005 under Alternative 3 (Expanded Use Alternative) would contribute negligible amounts to approximately 4.0 x 10^6 daily vehicle trips projected for the year 2005 by the Regional Transportation Plan (Regional Transportation Commission, 1994). The Regional Transportation Commission of Clark County has been actively engaged in highway improvement programs to relieve traffic congestion and reduce traffic accidents in Clark County.

TRANSPORTATION OF RADIOACTIVE MATERIALS—The cumulative impacts of the transportation of radioactive material consist of impacts from (1) historical shipments of radioactive waste and spent nuclear fuel to the NTS, (2) other historical shipments, (3) contributions made by the alternatives evaluated in the NTS EIS, (4) reasonably foreseeable actions that include transportation of radioactive material, and (5) transportation of general radioactive materials that are not related to a particular action.

The Yucca Mountain Repository EIS will consider other relevant transportation information and analyses, including the NTS EIS and other EISs prepared by the DOE to address other proposed actions. The Yucca Mountain Repository EIS will incorporate information from the NTS EIS, as appropriate, in its description of the existing environment as well as in its analysis of cumulative impacts. In this way, the DOE will ensure that the cumulative effects from all activities taking place or contemplated at the NTS are considered in its decisionmaking process, along with the public's comments on these activities.

The assessment of cumulative transportation impacts concentrates on the cumulative impacts of off-site transportation, because off-site transportation yields potential radiation doses to a greater portion of the general population than does on-site transportation. The collective dose to the general population and workers is the measure used to quantify cumulative transportation impacts. This measure of impact was chosen because it may be directly related to latent cancer fatalities using a cancer risk coefficient and because of the difficulty in identifying a maximally exposed individual for shipments throughout the United States spanning the period 1951 (the year corresponding to the start of operations at the NTS) through 2005, a 55-year period.

1. Historical Shipments to NTS

Collective doses from historical shipments of spent nuclear fuel to the NTS were summarized in Jones and Maheras (1994). Data for these shipments were available for 1971 through 1993 and were linearly extrapolated back to 1951 because data prior to 1971 were not available. The results of this analysis are summarized in Table 6-3.

Other collective doses from historical shipments of low-level waste, low-level mixed waste, and transuranic waste to the NTS were also estimated. From 1974 through 1994, there were about 8,400 of these shipments. The results of this analysis are also summarized in Table 6-3.

2. Other Historical Shipments

Collective doses from other historical shipments of radioactive material were evaluated in DOE (1995a). These include historical shipments associated with the Idaho National Engineering Laboratory, the Savannah River Site, the Hanford Site, the Oak Ridge Reservation, and Naval spent nuclear fuel and test specimens. The results of these analyses are summarized in Table 6-3.

3. Shipments for NTS Alternatives

The collective doses for radioactive waste shipments associated with the alternatives evaluated in this EIS are summarized in Volume 1, Appendix I of the NTS EIS. The number of waste shipments from off-site generators ranges from none in Alternative 2, Discontinue Operations, to about 40,000 shipments in Alternative 3, Expanded Use. The range of collective doses estimated to result from these shipments is summarized in Table 6-3.

4. Reasonably Foreseeable Actions

Transportation impacts may also result from reasonably foreseeable projects taking place within

Table 6-3. Cumulative transportation-related radiological collective doses and latent cancer fatalities (1951 to 2005) (Page 1of 2)

Category	Collective occupational dose (person-rem)	Collective general population dose (person-rem)
1. Historical shipments to the NTS		
Spent nuclear fuel (Jones and Maheras, 1994)	1.4	0.70
Radioactive waste	82	100
2. Other historical shipments (DOE, 1995a)	250	130
3. Shipments for alternatives evaluated in the NTS EIS	d	0.0 to 154.0[d]
4. Reasonably foreseeable actions		
Spent nuclear fuel management (DOE, 1995a; 1996a)	360	810
Waste Isolation Pilot Plant (DOE, 1994b)	2,900	8,400
Molybdenum-99 production (DOE, 1996b)	240	520
Tritium supply and recycling (DOE, 1995b)	--	--
Waste Management Programmatic EIS (DOE, 1995c)[a]	16,000	20,000
Surplus highly enriched uranium disposition (DOE, 1995d)	1,100	1,200
Storage and Disposition of Fissile Materials (DOE, 1996c)	--	2,400.0[b]
Stockpile Stewardship (DOE, 1996d)	--	170.0[b]
Container system for Naval spent nuclear fuel (USN, 1996)	18	24
Pantex (DOE, 1996e)	250.0[c]	490.0[c]
West Valley (DOE, 1996f)	1,400	12,000
Submarine reactor compartment disposal (USN, 1984)	--	0.053
Return of Cs-137 capsules (DOE, 1994c)	0.42	5.7
Uranium billets (DOE, 1992b)	0.50	0.014
Nitric acid (DOE, 1995e)	0.43	3.1
5. General transportation		
1951 to 1982	180,000	130,000
1983 to 2005	39,000	42,000

Table 6-3. Cumulative transportation-related radiological collective doses and latent cancer fatalities (1951 to 2005) (Page 2of 2)

Summary		
Historical	330	230
Shipments for alternatives evaluated in the NTS EIS	d	154
Reasonably foreseeable actions	22,000	46,000
General transportation (1951 to 2005)	220,000	170,000
Total collective dose	240,000	220,000
Total latent cancer fatalities	96	110

[a] Includes low-level mixed waste and low-level waste; transuranic waste included in DOE (1995c)
[b] Includes public and occupational collective doses
[c] Includes all highly enriched uranium shipped to Y-12
[d] Collective occupational dose included in the total for collective general population dose.

the timeframe of the NTS EIS (1996 to 2005), such as the transportation impacts contained in other DOE National Environmental Policy Act analyses.

- Shipments associated with the DOE Tritium Supply and Recycling Program
- The shipment of radioactive and hazardous wastes associated with the DOE Waste Management Program
- Shipments associated with the disposition of surplus highly enriched uranium
- Shipments associated with the storage and disposition of weapons-usable fissile materials
- The shipment of Defense Program materials associated with the DOE Stockpile Stewardship and Management Program
- Shipments of spent nuclear fuel associated with a proposed container system for Naval spent nuclear fuel
- Shipments of Defense Program materials associated with continuous operation of the Pantex Plant
- Shipments of radioactive waste associated with the West Valley Demonstration Project.

The results of these analyses are summarized in Table 6-3. For many of these analyses, a preferred alternative was not identified nor has a Record of Decision been issued. In those cases, the alternative that was estimated to result in the largest transportation impact was included in Table 6-3. It should be noted that although the DOE is presently determining the suitability of Yucca Mountain, Nevada, as a site for a geologic repository for spent nuclear fuel and high-level waste, these shipments were not included in this analysis because they are scheduled to start in 2010, which is outside the timeframe evaluated in this EIS.

There are also reasonably foreseeable projects that involve limited transportation of radioactive material: (1) shipment of submarine reactor compartments from the Puget Sound Naval Shipyard to the Hanford Site for burial, (2) return of cesium-137 isotope capsules to the Hanford Site, (3) shipment of uranium billets from the Hanford Site to the United Kingdom, and (4) shipment of low specific activity nitric acid from the Hanford Site to the United Kingdom. The results of these analyses are summarized in Table 6-3. While this is not an exhaustive list of projects that may involve limited transportation of radioactive material, it does illustrate that the transportation impacts associated with these types of projects are extremely low when compared to major projects or general transportation.

5. General Transportation

General transportation activities also take place that are unrelated to the alternatives evaluated in the NTS EIS or to reasonably foreseeable actions. Examples of these activities are shipments of radiopharmaceuticals to nuclear medicine laboratories and shipments of commercial low-level waste to commercial disposal facilities. The U.S. Nuclear Regulatory Commission evaluated these types of shipments based on a survey of radioactive materials transportation published in 1975 (NRC, 1977). Categories of radioactive material evaluated in the U.S. Nuclear Regulatory Commission document (1977) included limited quantity shipments, medical, industrial, fuel cycle, and waste shipments.

Because comprehensive transportation doses were not available, collective dose estimates derived from transportation dose assessments in the U.S. Nuclear Regulatory Commission document (1977) were used to estimate transportation collective doses for 1951 through 1982 (32 years). These dose estimates included spent nuclear fuel and radioactive waste shipments made by truck and rail. The cumulative transportation collective doses for 1951 through 1982 are summarized in Table 6-3. The cumulative transportation doses for 1983 through 2005 are also summarized in Table 6-3.

The total worker and general population collective doses are summarized in Table 6-3. Total collective worker doses from all types of shipments (historical, the alternatives, reasonably foreseeable actions, and general transportation) were estimated to be 240,000 person-rem (96 latent cancer fatalities) for the period 1951 through 2005 (55 years). Total general population collective doses were estimated to be 220,000 person-rem (110 latent cancer fatalities). The majority of the collective dose for workers and the general population was because of general transportation of radioactive material. The total number of latent cancer fatalities over the period 1951 through 2005 was estimated to be 210. Over this same period (55 years), approximately 27,000,000 people would die from cancer, based on 510,000 latent cancer fatalities per year (U.S. Bureau of the Census, 1993). The estimated number of transportation-related latent cancer fatalities attributable to NTS alternatives would be indistinguishable from other latent cancer fatalities, and the transportation-related latent cancer fatalities attributable to NTS alternatives would be 0.0008 percent of the total number of latent cancer fatalities.

VEHICULAR ACCIDENT IMPACTS— Fatalities involving the shipment of radioactive materials were surveyed for 1971 through 1993 using the Radioactive Material Incident Report database. For 1971 through 1993, 21 vehicular accidents involving 36 fatalities occurred. These fatalities resulted from vehicular accidents and were not associated with the radioactive nature of the cargo. No radiological fatalities because of transportation accidents have ever occurred in the United States. During the same period, over 1,000,000 persons were killed in vehicular accidents in the United States.

For the alternatives evaluated in the NTS EIS, zero to eight vehicular accident fatalities are estimated to occur. During the 10-year period from 1996 through 2005, approximately 400,000 people would be killed in vehicular accidents in the United States. The vehicular accident fatalities associated with NTS radioactive waste shipment would be 0.002 percent of the total vehicular number accident fatalities. Activities related to the NTS would not measurably increase regional vehicular fatalities.

6.4.3 Socioeconomics

Cumulative socioeconomic impacts are defined as impacts generated by NTS activities under Alternative 3 (Expanded Use), which represents maximum impacts, added to the impacts generated by all economic activities projected for Clark and Nye counties in the year 2005. Employment and population projections embracing all economic activities including the continuation of current NTS-related activities as described under Alternative 1 were based on Economic Outlook (Schwer, 1995) and Draft Baseline Economic and Demographic Projections: 1990-2010 (Nye County Board of Commissioners, 1993). Impacts on selected socioeconomic indicators are presented in Table 6-4. Employment associated with activities at the NTS under Alternative 3 would contribute 2 percent of the projected employment level in

Table 6-4. Cumulative socioeconomic impacts

Socioeconomic Indicators	NTS Activities (Alternative 3) 2005	All Other Economic Activities 2005	Cumulative Impacts 2005	Percent Change (attributable to NTS activities)
Clark County				
Total Jobs	12,857.00	650,413.00	663,270.00	2.00
Personal Income ($million)	633.00	32,281.00	32,914.00	2.00
Population	10,020.00	1,380,920.00	1,390,940.00	0.70
Unemployment Rate (percent)	(1.10)	5.80	4.70	Not Applicable
Nye County				
Total Jobs	516.00	15,445.00	15,961.00	3.30
Personal Income ($million)	31.00	781.00	812.00	4.00
Population	656.00	38,516.00	39,172.00	1.70
Unemployment Rate (percent)	(0.50)	5.20	4.70	Not Applicable

Clark County in the year 2005 and reduce the projected unemployment rate by just over one percentage point. Although the total number of jobs held by residents of Nye County are significantly less than those held by Clark County residents, they correspond to 3.3 percent of the projected labor force in the year 2005. This NTS-related employment will reduce the unemployment rate by one half of one percentage point.

Under Alternative 2 there would be a reduction in employment at the NTS. There would be a reduction of almost 750 jobs held by Nye County residents which represents 5.5 percent of the projected labor force in 1997, the year when minimal site employment levels are reached.

Given the considerable growth of the economies of both Clark and Nye counties, it is estimated that increases or decreases of the magnitude referenced above will not severely impact the ability of county government to provide adequate public services to their residents. No fiscal impacts to cities and counties are anticipated.

6.4.4 Geology and Soils

Actions related to underground testing would add incrementally to the levels of subsurface contamination in underground nuclear zones. For tests conducted more than 100 m (328 ft) above the water tables, there would be an incremental increase in the deposition of radioactive materials in the subsurface and the activation of naturally occurring elements bound in the rock in the near test environments. Underground subcritical dynamic experiments would result in incremental increases in the deposition of radioactive material in the mined cavities of the Lyner Complex. The land surface would be unaffected by these experiments.

Excavation of contaminated soils during remediation will result in a substantial, but temporary, increase in disturbed areas. These areas will be regraded and revegetated, however, rendering the impacts temporary.

The continued restriction of the NTS to mining activities will result in the continued loss of some mineral resources and potential geothermal resources. The use of aggregate resources for construction will result in a cumulative impact to regional aggregate mining. However, aggregate resources are more than adequate to fill projected regional needs and the impact will not be significant.

Discontinuation of activities at the site would result in an increase in the areas of geological media and soils that are irretrievably lost as a resource.

6.4.5 Hydrology

Testing-related actions would add incrementally to the levels of subsurface contamination in underground testing areas if any tests are conducted under or within 100 m (328 ft) of the water table.

Groundwater withdrawals on the NTS in excess of historic pumping levels, in conjunction with existing water withdrawals, will decrease the water available for future appropriation in the Death Valley flow system. The only action that would cause water withdrawals to exceed past levels would be the construction and operation of a Solar Enterprise Zone facility. The impacts of water withdrawals for a Solar Enterprise Zone facility are expected to be limited to a lowering of water levels at the NTS. No incremental impacts to downgradient water levels or water quality are anticipated. The withdrawal of water for a Solar Enterprise Zone facility in Clark County would add incrementally to the overall demand for water and would decrease the water available for future appropriation in the Colorado River flow system.

If a Solar Enterprise Zone facility is located in Eldorado Valley, water supplies would come largely from existing allocations and there would be minimal or no cumulative impact on groundwater availability. The Las Vegas Valley Water District once planned to import water from rural areas; however, if this plan proceeds, actual development will not occur within the 10-year planning period covered by the NTS EIS. An incremental demand for water in the Las Vegas basin may occur in response to population increases attributable to the proposed actions. However, such increases are not expected to be large.

6.4.6 Biological Resources

Cumulative impacts to desert tortoises would occur throughout the region, although the intensity of the impact would vary from location to location depending on the habitat. Impacts in the Las Vegas Valley could be substantial. The Clark County Desert Conservation Plan is authorized to take all tortoises on 110,000 acres of non-federal land in the county, and on 2,900 acres disturbed by Nevada Department of Transportation activities in Clark County and adjacent counties. Because the Las Vegas Valley does not have large "islands" of habitat capable of sustaining viable populations, the loss of habitat is not expected to jeopardize the continued existence of the Mojave population of the desert tortoise.

The Biological Opinion for the Yucca Mountain Site Characterization Project authorizes the incidental killing or injury of 15 tortoises, but only 4 have been killed along roads in the 6 years since the opinion was issued. The number killed is expected to decline further because surface disturbing activities have been largely completed.

The Draft Biological Opinion for the NTS (U.S. Fish and Wildlife Service, 1996) authorizes incidental take of: three desert tortoises injured or killed per year as a result of project activities; ten tortoises taken through capture and displacement from project sites; an unknown number taken through predation by ravens; an unknown number of tortoise eggs destroyed during construction activities; an unknown number taken indirectly in the form of harm or harassment through increased noise associated with operation of heavy equipment; and a total of 3,015 acres of desert tortoise habitat disturbed. No tortoises were killed due to project activities and only four have been killed along roads in the four years since an earlier opinion for the NTS was issued (U.S. Fish and Wildlife Service, 1992). Because similar rates of mortality are predicted for the future, the most important consideration would be that given to desert tortoise habitat. Under the Expanded Use Alternative approximately 15,600 acres of habitat would be disturbed. The areal extent of these disturbances within desert tortoise habitat won't be known until project sites are selected. Even if all of the disturbances were in tortoise habitat, which is unlikely, the loss would represent a small amount of available habitat, and negative effects on the tortoise population would be unlikely.

Because the NTS is surrounded by federal lands that are managed in part for wildlife, it is also unlikely that the small amount of habitat disturbed would negatively affect other biological resources.

Since historic groundwater withdrawals, including those from Yucca Flat at rates beyond the perennial yield, have not resulted in any detectable impacts on water table levels, no cumulative impacts on flora and fauna associated with Devils Hole or Ash Meadows are anticipated.

6.4.7 Air Quality

For the NTS, it is projected that construction activities under Alternative 3 would generate about 600 tons of fugitive dust (PM_{10}) per year. This level of construction-related grading activity will extend over a period of three years. This quantity of fugitive dust (PM_{10}) would comprise just over 3 percent of the total of 177,660 tons associated with land disturbance activities throughout the region represented by the Stateline and Tonopah resource areas and the Las Vegas Valley.

Of the air sheds within which NTS-related activities are located, only the Las Vegas Valley metropolitan area is classed as a non-attainment area for carbon monoxide. Quantities of other criteria pollutants associated with activities proposed under Alternative 3 would not generate a measurable increase in the Las Vegas metropolitan area. It is projected that quantities of carbon monoxide generated by mobile sources associated with NTS activities in Clark County would contribute 90 tons per year to the projected 47,532 tons per year identified in the Regional Transportation Plan of Clark County (Regional Transportation Commission, 1994). Such an increment represents less than 0.2 percent of the Clark County pollutant burden. This contribution would not produce any additional violations of the carbon monoxide ambient air quality standard. The Regional Transportation Commission of Clark County, Nevada, has determined that the Regional Transportation Plan conforms with the applicable State Implementation Plan for the National Ambient Air Quality Standards. Project-related mobile source emissions distributed throughout Nye County would not increase ambient pollutant concentrations above ambient standards.

6.4.8 Noise

At the regional level, it is expected that ambient noise levels will increase, especially in areas undergoing urban development and those that are adjacent to industrial and mineral extraction activities. Noise impacts associated with activities at the NTS will be restricted to the geographical area contained therein and would not affect persons resident in adjacent areas or add measurably to regional noise levels.

6.4.9 Visual Resources

The visual character of the region will change in selected areas especially in those undergoing urban development and near mineral extraction activities. In such areas, natural landscapes will be modified by human activities. In those areas undergoing development, it is anticipated that activities associated with the implementation of program alternatives will have only a minor effect on visual resources. In the case of a Solar Enterprise Zone facility, implementation would have more noticeable effects.

6.4.10 Cultural Resources

As a result of DOE activities, 40,492 acres on the NTS have been surveyed for cultural resources. The area surveyed represents approximately 4.7 percent of the land surface of the site. A site density of 0.043 sites per acre is estimated for the NTS. This estimate is based on the recording of 1,764 sites for DOE projects. This site density represents an average based on all of the sites recorded on the NTS. However, it must be recognized that site density can vary significantly with location.

General site densities for surrounding areas have been estimated by the U.S. Bureau of Land Management. Based on data for the Tonopah resource area, site density is estimated to be approximately 0.024 sites per acre. Also, according to the State Historic Preservation Officer's (SHPO) records, approximately 12 percent of all sites identified in Nevada are found to be eligible.

For non-NTS programs and projects, it is estimated that approximately 284,000 acres of land are likely to be disturbed over the next decade. About 80 percent of this disturbed acreage is located on federal lands and is associated with federal or state actions, with the remaining 20 percent attributable to development on privately held land. Using a site density value derived from the NTS, over 12,000 sites may be located within the disturbed area of the region. Approximately 1,460 of these sites may be eligible for inclusion in the National Register of Historic Places.

Impacts to cultural resources will occur through ground-disturbing activities, unauthorized artifact collecting, and vandalism. This may result in a loss of over 12,000 sites, 1,460 of which may be eligible for the National Register of Historic Places. Cultural resources associated with federal and state projects will be subject to Section 106 of the National Historic Preservation Act. For these cultural resources, identification, evaluation, and data recovery are likely to occur resulting in increases of cultural resources information to the regional database. Cultural resources on about 20 percent of the acreage disturbed (located on privately held land) may be destroyed without data recovery, resulting in a serious loss of the information value inherent in these nonrenewable resources.

For the combination of NTS and non-NTS programs and projects, it is estimated that between 284,000 and 300,000 acres are likely to be disturbed in the next 10 years. NTS programs and projects account for between 3.5 to 5.5 percent of the overall disturbed acreage. Using a site density value derived from the NTS, ground-disturbing activities at the NTS could result in the potential loss of an additional 670 sites under Alternative 3. Of these, about 80 may be eligible for the National Register of Historic Places. The addition of these NTS-related impacts to those attributable to all other activities could raise the number of potentially lost sites to between 12,200 and 12,900. Of these sites, between 1,460 and 1,550 could be eligible for the National Register of Historic Places.

6.4.11 Occupational and Public Health and Safety

Based on occupational injury and fatality rates for construction and other industrial activities, NTS actions would result in up to 775 injuries and 9 fatalities over the 10-year period evaluated in the NTS EIS. The NTS actions should not elevate regional rates, which should remain unchanged. Occupational radiation exposure to the worker population could be about 380 person-rem over the 10-year period, resulting in 0.128 latent cancer fatalities and about 1 in 17 of any other detrimental health effects in the worker population. Over the same period, the worker population would receive about 9,000 person-rem from naturally occurring cosmic radiation and radon, airplane travel, and personal medical procedures (X-rays, radiodiagnostics).

The remote location of the NTS insulates the general public from NTS activities. Potential impacts to the public from routine airborne emissions of radioactivity and priority pollutants would be minimal. Over the same period, the population in the Las Vegas Metropolitan planning area would receive a radiation dose of about 3.0×10^6 person-rem from naturally occurring cosmic radiation and radon, airplane travel, and personal medical procedures (X-rays, radiodiagnostics). No impacts to the public from exposure to groundwater containing radioactivity from past activities would be expected during the 10-year period evaluated in the NTS EIS.

6.4.12 Environmental Justice

American Indian Environmental Justice concerns, as identified by the Consolidated Group of Tribes and Organizations, include holy land violations, perceived risks from radiation, and cultural survival. Increased land disturbance associated with all forms of development in the region of influence could result in a decrease in access to these areas for American Indians. Limiting access could reduce the traditional use of the area and affect its sacred nature. Increased development throughout the region of influence has the potential for greater disturbance and vandalism of American Indian cultural resources. Such impacts would be perceived, in the main, by American Indian groups who would comprise the population group experiencing disproportionate impacts as a result of project implementation.

6.5 Summary of Cumulative Impacts

A summary of cumulative impacts described on a resource-specific basis is presented in Table 6-5.

Table 6-5. Summary of cumulative impacts (Page 1 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Land Use	Over the period 1996-2005, it is likely that changes in ownership involving the disposal of public lands in the Las Vegas area will continue. As the Las Vegas metropolitan area continues to expand, land-use development and zoning regulations will extend over a larger geographical area. Where land-use zoning regulations are absent, as in Nye County, incompatible land-use patterns may evolve. The number of civilian aircraft operations in the region will increase as the levels of population and economic activity grow. Military aircraft operations associated with activities at Nellis Air Force Base and the NAFR Complex are expected to increase gradually over the next decade.	Activities at the NTS under all alternatives are not expected to effect land-use patterns or land ownership in measurable ways. The majority of DOE and DoD aircraft transiting to and from the NTS/NAFR Complex use existing corridors that are adequate to accommodate future use. These corridors do not conflict with routes flown by commercial aircraft.	Activities at the NTS are expected to have negligible effects on regional land-use patterns and land ownership. Activities at the NTS would have negligible effects on regional airspace and its use.
Transportation	Rapid urban development will continue to place pressure on existing transportation infrastructure. Level of service on key roads within the metropolitan Las Vegas region and on segments of I-15, U.S. Hwy.95, and U.S. Hwy.93 could deteriorate to unacceptable levels by the year 2000. Approximately 4.0×10^6 vehicle trips per day are projected for Clark County in the year 2005. Planned highway improvements over the next two decades are expected to meet the increased vehicle use. Impacts of transportation of radioactive materials consist of impacts from (1) historical shipments of radioactive waste and spent nuclear fuel to the NTS, (2) other historical shipments, (3) contributions made by the alternatives evaluated in the NTS EIS, (4) reasonably foreseeable actions that include transportation of radioactive material, and (5) transportation of general radioactive materials that are not related to a particular action.	Virtually all impacts to transportation would occur on site under all project alternatives. Maximum off-site impacts would occur under Alternative 3 as additional workers at the NTS commute over regional highways. Such impacts are expected to be negligible. In the year 2005, NTS-related activities would add approximately 1,030 one-way vehicle trips per day to approximately 4.0×10^6 occurring daily in Clark County. Trucks bringing radioactive wastes to NTS would increase from 2 under Alternative 1 to 11 under Alternative 3. The total number of waste shipments from off-site generators could reach 40,000 under Alternative 3. The collective general population dose (person-rem) could reach 154.0.	Impacts to regional transportation facilities associated with NTS activities will comprise a negligible increment. The estimated number of transportation-related latent cancer fatalities attributable to NTS Alternative 3 would be indistinguishable from other latent cancer fatalities. They would comprise 0.0008 percent of the total number of latent cancer fatalities.
Socioeconomics	Population in Clark County is projected to increase to approximately 1.2×10^6 persons by the year 2000 and 1.4×10^6 by the year 2005. This rapid growth could result in substantial increases in demand for housing, schools, and other public services. Additional expenses associated with construction of new facilities and personnel could produce adverse conditions in the area of public finances for local jurisdictions and service providers.	NTS-related activities under Alternative 3 would add only 10,000 persons to a projected population of approximately 1.4 million in Clark County in the year 2005. This minor (less than 1-percent) increase would not result in adverse socioeconomic impacts. Under Alternative 2, some out-migration of NTS workers and their families from the region could occur. Impacts would be negligible.	In- and out-migration potentially associated with Alternatives 3 and 2, respectively, would contribute only negligible impacts to regional socioeconomic effects.

Table 6-5. Summary of cumulative impacts (Page 2 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Geology and Soils	Geological resources include sand and gravel, mineral products, petroleum and natural gas, and geothermal resources. Continued urban development will influence the demand for sand and gravel with the demand for other resources related more to national and international market forces.	Types of activities at the NTS relate to subsurface contamination through underground testing. Restrictions placed on public access to the site adversely impact the use of mineral and geothermal resources.	It is not anticipated that continued inaccessibility of mineral and geothermal resources at the NTS will result in measurable adverse impacts. These resources are widespread in their occurrence and exist in adequate quantities to fulfill anticipated regional needs.
Hydrology	Rapid urban development in the Las Vegas area and southern Nye County has contributed to a state of groundwater overdraft. This condition is likely to be exacerbated as water made available through allocation from the Colorado River is committed.	Groundwater withdrawals on the NTS in excess of historic pumping levels will decrease the water available for future appropriation in the Death Valley flow system. Such increases in withdrawals would be associated with the location of the Solar Enterprise Zone on the NTS. The location of this proposed facility could lower water table levels on the NTS.	Any additional demand for water derived from groundwater sources could exacerbate an existing overdraft condition. Although the development of the Solar Enterprise Zone has the possibility of lowering the water table on the site (or at other potential locations offsite), water withdrawals associated with its operation are not expected to affect downgradient water levels or water quality.
Biological Resources	Development and implementation of the Desert Tortoise Recovery Plan is designed to ensure the sustainability of the species. It is unlikely, however, that the species will survive in large sections of the Las Vegas Valley. The Clark County Desert Conservation Plan authorizes the "take" of all tortoises on 110,000 acres of non-federal land in the county. The Plan designates several recovery units located in areas of prime desert tortoise habitat that are subject to a number of land-use constraints designed to optimize the survival and recovery of the species in these units.	The potential exists for disturbance to as much as 15,600 acres of land at the NTS under Alternative 3. Such a loss represents a small amount of the available habitat, and adverse effects to the desert tortoise are not anticipated.	Activities at the NTS will not add measurably to the loss of desert tortoise habitat.

Table 6-5. Summary of cumulative impacts (Page 3 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Air Quality	The Las Vegas metropolitan area is a nonattainment area for PM_{10} and carbon monoxide (CO). It is anticipated that continued rapid urban development will exacerbate these conditions. The Regional Transportation Commission of Clark County has prepared a Regional Transportation Plan which would allow the county to be in conformity with the State Implementation Plan for all National Ambient Air Quality Standards (NAAQS). Nye County is in attainment for all criteria pollutants.	Much of the local impact under Alternative 3 is associated with ground disturbance and the generation of fugitive dust (PM_{10}). The NTS is located in Nye County and, although activities would increase quantities of dust, it is not expected that State and national ambient air quality standards would be exceeded. Only a small portion of the pollutants associated with mobile sources would occur in Clark County. Although this would add approximately 90 tons per year of carbon monoxide (CO) to the projected CO emissions of 47,532 tons per year in Clark County by the year 2000, it would not create additional violations of the CO ambient air quality standard. Marginal improvements in air quality standards could be expected under Alternative 2.	With implementation of the Regional Transportation Plan in Clark County, it is expected that conformity with the State Implementation Plan for all National Ambient Air Quality Standards will be achieved. Effects associated with NTS activities are not expected to hinder this achievement of conformity. It is not expected that ambient air quality standards in Nye County would be exceeded in the near future.
Noise	In areas undergoing urban development, ambient noise levels can be expected to increase. In areas lacking land-use controls to guide development, incompatible land uses could occur.	Noise impacts associated with activities at the NTS have the potential to affect only an extremely small number of persons because of constraints that exist for access to the site by the general public.	Activities associated with implementation of Alternative 3 would not add measurably to regional noise levels.
Visual Resources	The visual character of areas would change as urban development and mineral extraction activities continue.	No significant changes are expected to occur to existing facilities at the NTS under Alternatives 1, 3, and 4. Under Alternative 2, deterioration of facilities could occur that would marginally degrade the visual environment.	Facilities at the NTS are not accessible to the general public, and impacts would have a negligible impact on regional visual resources
Cultural Resources	As a result of ground-disturbing activities and unauthorized artifact collecting, over 12,000 sites, 12 percent of which (1,460) may be eligible for the National Register of Historic Places, will be adversely affected. Cultural resources found on private lands may be destroyed without data recovery, resulting in a serious loss of the information value inherent in these nonrenewable resources.	Ground-disturbing activities at the NTS could result in the potential loss of an additional 670 sites under Alternative 3. Of these, about 80 may be eligible for the National Register of Historic Places.	The addition of these NTS-related impacts to those attributable to all other activities could raise the number of potentially lost sites to between 12,200 and 12,900. Of these sites, between 1,460 and 1,550 could be eligible for the National Register of Historic Places.

Table 6-5. Summary of cumulative impacts (Page 4 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Occupational and Public Health and Safety	With the number of persons residing and working in the region, the number of injuries and fatalities will increase. However, injury and mortality rates should remain unchanged, or decrease, assuming the continued enforcement of occupational and public health and safety regulations.	Activities at the NTS could result in up to 775 injuries and 9 fatalities over the period 1996-2005. Occupational radiation exposure to the worker population at the NTS could be 380 person-rem, resulting in 0.128 latent cancer fatalities and 0.096 other detrimental health effects in the worker population.	Activities at the NTS contribute extremely small increments to the risks to which the general population is exposed on a daily basis and should not increase injury and mortality rates in the region.
Environmental Justice	The non-NTS programs and projects account for approximately 284,000 acres of land disturbance. Land disturbance of this size could have adverse impacts on Americans Indians who have expressed concerns about holy land violations and the continued survival of their culture.	Concerns that representatives of American Indian groups have expressed relative to activities at the NTS include holy land violations, perceived risks from radiation, and the continued survival of their culture. Land disturbance at the site could have adverse impacts in these areas of concern.	Land disturbance in the region, attributable to changes in use away from an undeveloped state, could potentially raise environmental justice concerns. The increment to such land disturbance contributed by proposed actions at the NTS would be minimal and would not add measurably to the level of concern.

6.6 References

REGULATION, ORDER, LAW

40 CFR Part 1508.7 — Environmental Protection Agency (EPA), "Protection of the Environment: Cumulative Impact," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.

GENERAL

DOE, 1986 — U.S. Department of Energy (DOE), *Yucca Mountain Site, Nevada Research and Development Area, Nevada*, Vol. I, DOE/RW-0073, Washington, DC, 1986.

DOE, 1992a — DOE, *Site Environmental Report for Calendar Year 1991, Yucca Mountain Site, Nye County, Nevada*, Yucca Mountain Site Characterization Office, Las Vegas, NV, 1992.

DOE, 1992b — DOE, *Environmental Assessment for the Shipment of Low Enriched Uranium Billets to the United Kingdom from the Hanford Site, Richland, Washington*, DOE/EA-0787, U.S. Department of Energy, Washington, DC, 1992.

DOE, 1993 — DOE, *Site Environmental Report for Calendar Year 1992, Yucca Mountain Site, Nye County, Nevada*, Yucca Mountain Site Characterization Office, Las Vegas, NV, 1993.

DOE, 1994a — DOE, *Site Environmental Report for Calendar Year 1993, Yucca Mountain Site, Nye County, Nevada*, Yucca Mountain Site Characterization Office, Las Vegas, NV, 1994.

DOE, 1994b — DOE, *Comparative Study of Waste Isolation Pilot Plant (WIMP) Transportation Alternatives*, DOE/WIMP 93-058, U.S. Department of Energy, Carlsbad, NM, 1994.

DOE, 1994c — DOE, *Environmental Assessment for Return of Isotope Capsules to the Waste Encapsulation and Storage Facility*, DOE/EA-0942, Washington, DC, 1994.

DOE, 1995a — DOE, *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement*, DOE/EIS-0203-F, Washington, DC, 1995.

DOE, 1995b — DOE, *Final Programmatic Environmental Impact Statement for Tritium Supply and Recycling*, DOE/EIS-0161, Washington, DC, 1995.

DOE, 1995c — DOE, *Draft Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*, DOE/EIS-0200-D, Washington, DC, 1995.

DOE, 1995d	DOE, *Disposition of Surplus Highly Enriched Uranium Draft Environmental Impact Statement,* DOE/EIS-0240-D, Washington, DC, 1995.
DOE, 1995e	DOE, *Environmental Assessment: Disposition and Transportation of Surplus Radioactive Low Specific Activity Nitric Acid, Hanford Site, Richland, Washington,* DOE/EA-1005, Washington, DC, 1995.
DOE, 1995f	DOE, *Site Environmental Report for Calendar Year 1994, Yucca Mountain Site, Nye County, Nevada,* Yucca Mountain Site Characterization Office, Las Vegas, NV, 1995.
DOE, 1996a	DOE, *Final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Spent Nuclear Fuel,* DOE/EIS-0218F, Washington, DC, 1996.
DOE, 1996b	DOE, *Medical Isotopes Production Project: Molybdenum-99 and Related Isotopes, Environmental Impact Statement,* DOE/EIS-0249F, U.S. Department of Energy, Washington, DC, 1996.
DOE, 1996c	DOE, *Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement,* DOE/EIS-0229-D. Washington, DC, 1996.
DOE, 1996d	DOE, *Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management,* DOE/EIS-0236, Washington, DC, 1996.
DOE, 1996e	DOE, *Draft Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components,* DOE/EIS-0225D, Washington, DC, 1996.
DOE, 1996f	DOE, *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center,* DOE/EIS-0226-D, Washington, DC, 1996.
BLM, 1990	U.S. Bureau of Land Management (BLM), *Nellis Air Force Range Proposed Resource Plan and Final Environmental Impact Statement,* U.S. Department of the Interior, Reno, NV, 1990.
BLM, 1992	BLM, *Stateline Resource Management Plan and Draft Environmental Impact Statement,* U.S. Department of the Interior, Las Vegas, NV, 1992.
BLM, 1994a	BLM, *Stateline Resource Management Plan and Supplement to the Draft Environmental Impact Statement,* U.S. Department of the Interior, Las Vegas, NV, 1994.
BLM, 1994b	BLM, *Tonopah Resource Management Plan and Final Environmental Impact Statement,* U.S. Department of the Interior, Tonopah, NV, 1994.

Donegan, 1995	Donegan, W., personal communication dated May 2, 1995, from W. Donegan, USAF Weapons and Tactics Center, Environmental Management Directorate, Nellis AFB, NV, to R.W. Smith, Science Applications International Corporation, Las Vegas, NV, regarding relevant potential actions associated with operations at Nellis AFB, NV, 1995.
Jones and Maheras, 1994	Jones, S. and S. J. Maheras, *Summary of Doses and Health Effects From Historical Offsite Spent Nuclear Fuel Shipments to the Nevada Test Site,* Engineering Design File (EDF) EIS-TRANS-31, 1994.
McMillan, 1995	McMillan, A., personal communication dated June 13, 1995, from A. McMillan, Office of Public Affairs, Naval Air Station (NAS), Fallon, NV, to Christopher Clayton, Science Applications International Corporation, Las Vegas, NV, regarding Master Land Withdrawal in Churchill County, NV, 1995.
NRC, 1977	U.S. Nuclear Regulatory Commission (NRC), *Final Environmental Impact Statement on the Transportation of Radioactive Materials By Air and Other Modes,* NUREG-170, Washington, DC, 1977.
Nye County Board of Commissioners, 1993	Nye County Board of Commissioners, *Baseline Economic and Demographic Projections: 1990-2010 Nye County and Nye County Communities,* prepared for the Nye County Board of Commissioners by Planning Information Corporation, Denver, CO, 1993.
Regional Transportation Commission, 1994	Regional Transportation Commission of Clark County, *Regional Transportation Plan, 1995-2015,* Las Vegas, NV, 1994.
Regional Environmental Consultants, 1995	Regional Environmental Consultants, Clark County Desert Conservation Plan, prepared for Clark County, NV, San Diego, CA, 1995
Schwer, 1995	Schwer, R.K., *U.S. Economic Outlook: 1995,* the Center for Business and Economic Research, University of Nevada, Las Vegas, NV, 1995.
U.S. Bureau of the Census, 1993	U.S. Bureau of the Census, *Statistical Abstract of the United States: 1993 (113th Edition),* U.S. Department of Commerce, Washington, DC, 1993.
U.S. Fish and Wildlife Service, 1992	U.S. Fish and Wildlife Service, *Biological Opinion on Nevada Test Site Activities,* U.S. Department of the Interior, Reno, NV, 1992.
U.S. Fish and Wildlife Service, 1996	U.S. Fish and Wildlife Service, *Draft Programmatic Biological Opinion for Nevada Test Site Activities,* U.S. Department of the Interior, Reno, NV, 1996
USN, 1984	U.S. Department of the Navy (USN), *Final Environmental Impact Statement on the Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants,* PB90-193855, 1984.
USN, 1996	USN, *Department of the Navy Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel, 1996.*

This Page Intentionally Left Blank

Chapter 7

MITIGATION MEASURES

CHAPTER 7
MITIGATION MEASURES

This section presents the mitigation measures that would be implemented by the DOE to reduce potentially adverse impacts to the environment. The four alternatives analyzed in this EIS represent a wide range of projects and activities that have associated with them a corresponding range of potentially adverse environmental impacts. There are, therefore, a range of mitigation measures that would be implemented and that are designed to ameliorate the potentially adverse impacts associated with specific activities. The mitigation measures presented in this chapter comprise a series of actions which address the full range of potential impacts likely to occur under the identified alternatives. They are summarized below by resource category. Where impacts and mitigation measures vary across alternatives, measures specific to each alternative are described. Under Alternative 2, closure of the NTS would include the development and implementation of monitoring programs necessary to protect human health and the natural environment. Under all alternatives, DOE will continue to maintain the Waste Minimization/Pollution Prevention Program as described in Appendix C, Section 6.

Throughout the history of the NTS, the DOE, the State of Nevada, Nye, Esmeralda, Clark, and Lincoln counties, and local communities have contributed to the success of the NTS. As Nye County encompasses most of the NTS land area, DOE has worked closely with Nye County as activities have changed over the years. In accordance with 10 CFR Part 1021.331 and in the interest of continuing this relationship with the state, counties, and communities, the DOE will prepare a Mitigation Action Plan. This document will describe the actions to implement commitments made in this EIS and its associated Record of Decision (ROD) to mitigate adverse environmental impacts associated with the alternative adopted through the ROD. The Mitigation Action Plan will be as complete as possible commensurate with information available regarding the course of action directed by the ROD. The DOE may revise the plan as more specific and detailed information becomes available.

7.1 Land Use

Impacts to land use in areas surrounding the NTS under Alternatives 1, 2, and 3, and at the off-site locations under Alternatives 1 and 2 would be minimal and require no mitigation. Under Alternative 4, there is a possibility that a portion of currently withdrawn lands would be relinquished to the U.S. Bureau of Land Management. Should this land be found suitable for return to the public domain, the U.S. Bureau of Land Management would determine the ultimate land management and use policies. The land-use impact under this scenario would be an increase in lands available for use by the public, and mitigation measures appropriate to the use designation would be developed and implemented by the U.S. Bureau of Land Management.

Land-use impacts on the NTS under Alternative 1, the continuation of current activities, and Alternative 3, expanded use, would be generally consistent with existing site and zone designations. Although certain activities would intensify and others would expand under Alternative 3, additional mitigation measures beyond those presently employed would not be required. Under Alternative 2, all activities would cease at the NTS and no new activities would be allowed. Access to, and use of, the lands would be restricted. Minimal monitoring and security operations would continue, and no mitigation would be required under this non-use scenario.

Activities that would occur outside the NTS boundaries under Alternatives 3 and 4, e.g., Solar Enterprise Zone facility development, have the potential to result in land-use impacts. Projects that are located on federal land or are funded by agencies of the U.S. Government will be subject to additional review under provisions of the National Environmental Policy Act. This review will require the identification of significant environmental impacts, including land-use impacts, and the formulation of measures to mitigate these impacts to the extent practicable.

No adverse impacts to airspace are identified requiring mitigation under any of the alternatives at any project location.

7.2 Transportation

The following sections contain the discussion on the mitigation measures for transportation.

7.2.1 On-Site Traffic

It is anticipated that no on-site roadway segments would degrade to unacceptable levels of service under any of the alternatives at any project site; therefore, no mitigation measures would be required.

7.2.2 Off-Site Traffic

Should Alternatives 1, 2, or 4 be implemented, no substantial adverse impacts to traffic conditions are expected near the NTS at the access highway State Route 433, the ramp roadways at the Mercury Highway interchange, at U.S. Highway 95, or at any other project site; therefore, no mitigation measures, other than the continuing busing program, would be necessary.

Under Alternative 3, the highway that accesses the NTS (State Route 433) would drop to a level of service D (acceptable) between the years 2000 and 2005. The NTS-related traffic contributes minimally to the Las Vegas area traffic demands. Similarly, no mitigation measures would be necessary for roadways in the immediate vicinity of the NTS.

Ongoing and future development in the Las Vegas metropolitan area would result in an increase in traffic volumes and congestion on key roadway segments (namely, on Interstate 15, U.S. Highway 95, and U.S. Highway 93). These key segments already operate at an unacceptable level of service F at peak hours, and their conditions could continue to deteriorate even without the activities associated with all alternatives. Currently, roadway improvements are being undertaken along Interstate 15 in downtown Las Vegas and at other locations. With the improvements planned under the Regional Transportation Plan of Clark County, the highway conditions are expected to improve. No additional mitigation measures are needed.

7.2.3 Transportation of Materials and Waste

Under Alternatives 1, 3, and 4, the routes used for truck shipments would be chosen using U.S. Department of Transportation routing guidelines. These guidelines are designed to reduce the radiological risks associated with transportation. According to the guidelines, primary factors include (1) the radiation exposure from incident-free transport, (2) the risk to public health from an accidental release of radioactive material, and (3) the economic risk from an accidental release of radioactive material. Secondary factors, according to the guidelines, include (1) emergency response effectiveness, (2) evacuation capability, (3) location of special facilities such as schools or hospitals, and (4) traffic fatalities and injuries unrelated to the radioactive nature of the cargo.

The EPA has developed protective action guides and protective actions that are designed to limit doses in the event of a nuclear incident. Use of these guides and actions under Alternatives 1, 3, and 4 will minimize the impacts of transportation accidents involving radioactive material. In addition, the DOE will take the following actions:

- Conduct full government-to-government consultation with American Indian tribes that would be affected by the transportation of low-level waste and low-level mixed waste to the NTS

- Conduct a comprehensive study of the potential social and cultural effects of low-level waste and low-level mixed waste transportation on affected American Indian tribes

- Meet with the Transportation Protocol Working Group regularly to discuss low-level waste and low-level mixed waste transportation issues

- Respond to transportation concerns between meetings by phone calls, faxes, or personal meetings

- Continue to provide First Response and other emergency response training to all Nevada emergency response personnel

- Allow low-level waste and mixed waste shipments arriving at the NTS during off-hours to park in a secure area inside the gate

- Work with local emergency response agencies to determine their needs with regard to responding to emergencies involving low-level waste and low-level mixed waste and to help fulfill those needs as far as practicable

- Provide information to stakeholders concerning waste shipments

- Distribute surplus federal equipment to local agencies to the extent possible under current regulations concerning federal surplus disposition.

7.2.4 Other Transportation

All other transportation modes will follow guidelines established by the Department of Transportation, the Federal Aviation Administration, and all federal, state, and local laws and regulations under each alternative.

7.3 Socioeconomics

No long-term adverse impacts are associated with implementation of any alternative over the 10-year period of this EIS for any socioeconomic issue: economic activity, population, housing, public finance, or public service. The loss of employment and personal income and the increase in unemployment associated with Alternative 2 would result in substantial short-term adverse effects to the regional economy; however, economic and natural growth in the region of influence is expected to compensate for these reductions over time. Reductions in employment at the NTS relative to historical NTS employment levels are also inherent in Alternatives 1 and 4. While no long-term mitigation measures are required, the following supportive measures could be undertaken to the level appropriate for the alternative selected:

- Continue to extend economic adjustment efforts to reduce the impact of NTS downsizing on workers and small and medium sized companies. The DOE economic adjustment efforts could include actions such as enhanced coordination of DOE downsizing actions and employee assistance programs with public agencies and small and medium-sized companies who are current suppliers of goods and services (Alternatives 1, 2, and 4)

- Sponsor a joint local, state, and federal conference to promote a national and international environmental technology development center (Alternative 4)

- Act as a catalyst to develop joint proposals for research activities (Alternatives 1, 3, and 4).

American Indian Socioeconomics—This section describes the American Indian concerns associated with implementing Alternative 1, as summarized by the CGTO.

When Indian people are hired, special problems emerge for themselves, families and reservation communities. The DOE can assist in mitigating these problems by recognizing the exact nature of the problems and developing a culturally responsible approach to mitigating the problem. For example, an Indian employee may be required to attend a ceremony back on the reservation. When this situation occurs, the DOE could grant special leave status to the employee to participate in the ceremony. The children of the Indian employee may go to non-Indian schools causing cross-cultural stresses. The DOE could potentially mitigate this situation by developing an American Indian outreach/educational program directed at the school system and the surrounding communities. Cultural awareness activities could be implemented similar to the Yucca Mountain Project's outreach program which incorporates knowledgeable Indian people who share various *aspects of their culture. The DOE could encourage other Indian employees to participate in the development and implementation of these culturally specific programs.*

Reservation problems resulting from the loss of tribal members to external employment with the DOE/NV, cannot be fully identified without a systematic study of these issues involving the tribes. It is recommended that this issue be mitigated by the DOE/NV, and be specifically addressed by the DOE/NV Diversity Council. The CGTO potentially can serve as a management consultant to the DOE for the development and implementation of culturally specific programs which address the unique issues that may arise due to off-reservation migration caused by the employment of Indian people.

7.4 Geology and Soils

Impacts to geologic media by activities under Alternatives 1 and 3 can be generally categorized as disturbance, contamination, excavation, or instability. The magnitude of these impacts largely depends on the nature of the activities resulting in these impacts.

Disturbance to surface and subsurface geologic media and radioactive contamination of subsurface geologic media resulting from testing of conventional or nuclear weapons are inherent with the tests. Surface disturbance and the dispersion of contamination are mitigated by implementing containment practices. Containment practices also mitigate radioactive contamination of surface geologic media.

- Contamination of surface and subsurface geologic media from release of radionuclides from disposed waste is mitigated by administrative and physical controls. Siting, design, operation, and monitoring of waste management facilities on the NTS and NAFR Complex are conducted in accordance with relevant regulations. Physical controls include the various disposal and closure configurations. Contamination of surface and subsurface geologic media resulting from accidental spills is also mitigated by administrative and physical controls. Administrative controls include occurrence reporting, emergency response plans, and training. Physical controls include secondary containment and response equipment

- Excavation includes boreholes and tunnels for testing of conventional and nuclear weapons, grading for roads and facilities, borrow pits, boreholes and trenches for waste disposal, and grading for environmental restoration. Excavation for other purposes is mitigated by minimizing the area disturbed

- Surface disturbances will be mitigated on a site-specific basis, depending on various factors such as the size of the area, future use, nature of soils, annual precipitation, slope aspect, and site location. Following the removal of soils and vegetation, the site will be immediately stabilized using water or commercial-available soil stabilizers, such as polymers. Options to be considered for mitigation include natural revegetation, gravel rearmoring, chemical stabilization, seeding, planting, and irrigating. Where intensive revegetation techniques are necessary, subsoils may be amended and irrigations may be used. At drier sites, irrigation could be used to encourage germination and plant establishment. Instability of slopes resulting from excavation is mitigated as necessary to protect the environment or to ensure employee health and safety. The mitigation measures include administrative controls and physical controls such as shoring, bolting, and grouting.

Adverse impacts that would result from nuclear testing under Alternatives 1 and 3, should testing be resumed, would be unavoidable and could not be mitigated. Adverse impacts that would result from underground subcritical experiments using special nuclear material would be unavoidable and could not be mitigated.

No adverse impacts to geological resources are anticipated under Alternatives 2 and 4, and no mitigation measures are suggested.

7.5 Hydrology

Discussions of mitigation actions for surface hydrology and groundwater are presented in the following sections.

7.5.1 Surface Hydrology

Impacts to the surface hydrologic environment by activities under Alternatives 1 and 3 can be categorized generally as alteration of natural drainage, which potentially results in erosion or deposition of sediments, ponding of water, or inundation, and contamination. The extent of these impacts largely depends on the nature of the activities resulting in these impacts. Surface water quality impacts may result from the Environmental Restoration Program cleanup of plutonium-contaminated soils.

- The effects of altering natural drainage are mitigated by preactivity analysis of the flood potential and recommendations for minimizing direct and indirect flood hazards, followed by implementation of the recommendations. Typically, recommendations for minimizing direct and indirect flood hazards include construction of flood diversion structures

- Contamination may be mitigated by avoidance of surface water or groundwater contamination through lined storage/settlement ponds and environmental restoration of the affected area. Restoration typically might be excavation of contaminated geologic media, followed by grading and stabilization by revegetation

- With regard to the remediation of soils contaminated with plutonium, surface water controls will be implemented as part of the cleanup effort. However, there could be some breaching of control features resulting in the migration of contamination into downgradient areas. Such releases can be mitigated by expanding the soils media corrective action unit to include the area of release. The impacts would then be mitigated through the excavation of contaminated soils, removal of the plutonium, and return of the treated soils.

No adverse impacts to surface hydrology are anticipated under Alternatives 2 and 4, and no mitigation measures are proposed.

7.5.2 Groundwater

Potential adverse impacts on groundwater availability may be anticipated as a result of Alternatives 1, 3, and 4 actions. Large-scale groundwater withdrawals may be implemented to ensure there are no releases beyond the controlled NTS and NAFR Complex areas and other potentially affected areas via the flow of groundwater during Environmental Restoration Program activities. Any significant impacts on groundwater quality would be related to the underground testing program.

- Mitigation of groundwater availability impacts may be achieved through adjustments in the overall production of water from the well field and the drilling of new water supply wells, as required, and through the management of recharge and discharge areas in conjunction with the remedial action

- Under the Environmental Restoration Program, large-scale groundwater withdrawals may be implemented to ensure that no releases beyond the boundary of the site occur via the flow of groundwater. The potentially adverse impacts of such actions could be mitigated through the careful management of recharge and discharge areas in conjunction with the remedial action. These activities would occur as part of the underground test area corrective action unit.

The quantity and quality of groundwater resources could be substantially impacted under Alternative 3 if any of the following circumstances occur: (1) underground tests are conducted under or near the water table; (2) a Solar Enterprise Zone facility is located on the NTS; or (3) active groundwater controls are implemented under the Environmental Restoration Program.

Mitigation of the quantity of water available for appropriation in the affected basins surrounding a constructed Solar Enterprise Zone facility would not be required because the use of the water would be consistent with Nevada water laws. Although water use from Solar Enterprise Zone facility activities would be consistent with Nevada water laws, the private corporation implementing the technology would bear the responsibility of mitigating any adverse effects. The impacts of any water level declines can be mitigated through a number of potential actions: proper well field design and placement, moving the points of diversion farther away from potentially affected areas, optimizing water use, or importing water from adjacent areas.

7.6 Biology

The *Framework for the Resource Management Plan,* Volume 2 of this document, defines the ecosystem management principles which would be used to mitigate impacts related to biological resources:

- All reasonable and prudent measures required by the U.S. Fish and Wildlife Service to mitigate incidental taking of endangered or threatened species will be implemented
- Habitat disturbance may be partially mitigated by implementing a habitat reclamation program
- The DOE will conduct preactivity surveys to locate protected species such as candidates for listing under the Endangered Species Act, state-protected species, nests and eggs of migratory birds, individuals of a species that are locally rare (e.g. an isolated stand of Joshua trees on a bajada), references upon which these species may depend (e.g. free-standing water, burrows, nests), and other important biological resources such as Species of Concern. Project activities will be altered whenever possible to avoid harm.
- Migratory birds or other wildlife may drown or be exposed to drill-mud additives or could ingest chemicals in drill-fluid sumps, or evaporative tanks. These problems may be mitigated by placing flag lines that repel wildlife over the water sources, or by fencing or covering them.
- Impacts arising from military training exercises and other land-disturbing activities that have not yet been sited can be partially mitigated by developing and implementing a Resource Management Plan, which would be based on the principles of ecosystem management; identify sensitive areas, such as springs or habitats of rare species; and regulate harmful activities in those areas. This plan also would guide the collection of additional information needed to protect biological resources and the health and the ecosystem on the NTS. Volume 2 describes the DOE's framework for developing this *Resource Management Plan.*

Under Alternative 2, the following mitigation measure will be implemented:

- All reasonable and prudent measures required by the U.S. Fish and Wildlife Service to mitigate incidental taking of endangered or threatened species will be implemented.

7.7 Air Quality

Air quality mitigation measures under Alternatives 1, 3 and 4 at the NTS include the following:

- Continue the use of a central parking facility to transport workers to and from construction sites. Pooling the transportation of workers to remote sites from central parking localities would lower dust and carbon monoxide levels because fewer vehicle trips would be involved.
- Properly maintain construction vehicle engines requiring air pollution control equipment. Properly tuned equipment would emit fewer harmful pollutants. This measure is highly effective in minimizing local air degradation.
- Place speed restrictions for vehicles on unpaved roads. Dust levels generated by moving vehicles on unpaved roads are substantially reduced at low speeds. Imposing appropriate speed limits on these roads could effectively reduce fugitive dust.

- Continue to control fugitive dust by regularly watering the construction areas, as needed, thereby achieving a 50-percent reduction in emissions. This measure would be included in future construction contract specifications to minimize construction-phase emissions.

No air quality mitigation measures are required under Alternative 2 because there would be no adverse impacts.

7.8 Noise

No mitigation measures under any of the alternatives would be required at any of the project locations. However, should site activities exceed Occupational Safety and Health Administration noise level requirements, mandatory hearing protection for people working in the areas would be implemented.

7.9 Visual Resources

There would be no significant adverse impacts to visual resources under any of the alternatives. However, under those alternatives involving environmental restoration activities, areas would be revegetated with indigenous plants to return the sites to as natural an appearance as possible and to prevent excessive erosion and dust that could result in more serious, long-term adverse impacts. This measure would apply to all the project sites. Construction areas would be watered, as needed, to reduce dust.

7.10 Cultural Resources

Sites potentially eligible for listing in the National Register of Historic Places have been identified in numerous areas within which development associated with activities proposed under Alternatives 1, 3, and 4 may take place. Some of the prehistoric sites have the potential to provide information that will contribute to the understanding of hunter-gatherer settlement and subsistence patterns typical of the central Great Basin, while sites dating to the later historic period can contribute to a clearer understanding of the nuclear era (Cold War Era). Sites also have been identified on the NTS that are important to the economic or religious practices of American Indian people.

Section 106 of the National Historic Preservation Act of 1966, as amended, requires that federal agencies take into account the effects undertakings may have on historic properties (i.e., sites eligible for the National Register of Historic Places). The most effective mitigation measure is avoidance; however, avoidance is not always possible. Mitigation of adverse impacts to cultural resources would be handled on a case-by-case basis through consultation with the State Historic Preservation Office (SHPO) and through a programmatic agreement initiated by the SHPO and the DOE.

Any archaeological sites eligible for the National Register of Historic Places that cannot be avoided would be mitigated through the implementation of a data recovery plan formulated to address research goals important to an understanding of Nevada prehistory and history (Lyneis, 1982). Data recovery for prehistoric and historic archaeological sites may include, but not be limited to archival research, surface collection, photodocumentation, site evacuation, feature and artifact analyses, and specialized analysis such as radiocarbon dating, and obsidian sourcing and hydration.

Any historic or Cold War Era architectural sites eligible for the National Register of Historic Places that cannot be avoided would be mitigated through the implementation of data recovery plans formulated to address research goals important to understanding Nevada history and Cold War Era technology. Data recovery for historic and Cold War Era architectural sites may include, but not be limited to, archival research, photodocumentation, architectural recordation including the study of as-built plans, and implementing Historic American Building Survey/Historic American Engineering Record documentation standards. All mitigation measures for cultural resources including data recovery would be conducted within established health and safety guidelines.

Data recovery for prehistoric and historic archaeological sites may include, but not be limited to archival research, surface collection, photodocumentation, site excavation, feature and artifact analyses, and specialized analyses such as radiocarbon dating, and obsidian sourcing and hydration.

The CGTO recommends that mitigation programs implemented at the NTS fully incorporate the assistance of American Indian people so that adverse impacts on American Indian resources can be efficiently averted. American Indian people know the NTS landscape in great depth and thus can help scientists with the identification of plants, animals, geography, archaeological sites, and traditional cultural properties that have been or will be adversely impacted by NTS programs and activities.

The CGTO considers that the natural and spiritual balance of the NTS landscape has been profoundly upset by prolonged nuclear testing activities and that the land must be purified and the spirits appeased in order to fully restore the environment to its previous condition. Through ceremonies, prayers, and offerings, American Indian people will contribute to increase the benefits of mitigation and will aid in restoring the spiritual harmony of impacted landscapes.

There are a number of proposed NTS actions that are of great concern to Indian people because of their adverse impact on the American Indian landscape. To avert or mitigate such impacts, the CGTO recommends that the DOE/NV fund systematic American Indian studies to:

- *Identify those areas/resources that are irreparably damaged, as well as areas/resources that can be restored for human use*
- *Avoid further ground-disturbing activities*
- *Make mitigation of restorable areas a top priority*
- *Replace lost plant and animal species*
- *Avert or minimize damage to geological formations*
- *Implement environmental restoration techniques that require minimum ground-disturbing activities*
- *Develop systematic consultation with American Indians so that potentially impacted resources can be identified, alternative solutions discussed, and adverse impacts averted*
- *Give American Indian people access to adversely impacted areas so that they can contribute their knowledge, purification ceremonies, prayers, and offerings to the restoration of the natural and spiritual harmony of the NTS landscape.*

In addition to these recommendations that derive from analysis of potential action and alternative impacts to American Indian cultural resources, the CGTO made the following stipulations and recommendations at the first CGTO meeting with the DOE NTS EIS study team:

- *Consultation with the CGTO does not relieve the DOE/NV of its obligation to maintain a government-to-government relationship with American Indian tribes*
- *The DOE/NV must consult with all culturally affiliated tribes and organizations belonging to the CGTO*
- *The DOE/NV should incorporate other American Indian tribes and organizations when considering activities away from (i.e., outside the American Indian region of influence) the NTS*
- *The CGTO recommends that the DOE/NV incorporate wherever possible in the NTS EIS the "Final Tribal Recommendations to DOE" prepared at the second mitigation meeting, Nevada Test Site American Indian Religious Freedom Act, October 1-3, 1993*
- *The CGTO recommends that DOE/NV incorporate wherever possible in the NTS EIS all former American Indian recommendations made by the CGTO to the DOE*

- *The CGTO recommends the continuance and expansion of the American Indian consultation program*

- *The CGTO recommends that they be actively involved in the planning, developing, and monitoring of all future DOE/NV ground-disturbing activities*

- *Public meetings are not the proper way to consult with tribes and organizations. They should not be considered "stakeholders" as defined by the DOE.*

- *Responses to the various NTS EIS alternatives:*

  Alternative 1, (No Action, Continue Current Operations). The CGTO opposes Alternative 1 because of our strong cultural ties to the land.

  Alternative 2, (Discontinue Operations). The CGTO supports Alternative 2 with the inclusion of access and protection of all cultural resource sites.

  Alternative 3, (Expanded Use). The CGTO opposes Alternative 3 because of our strong cultural ties to the land.

  — *The CGTO recommends that lands set aside for exclusive Indian use continue to be kept free, secure, and monitored for contamination of radioactivity and hazardous waste.*

  — *The CGTO recommends that the Gold Meadow area be set aside for exclusive Indian use because the area contains a concentration of important cultural resources.*

  Alternative 4, (Alternate Use of Withdrawn Lands). The CGTO tentatively supports Alternative 4 with reservations regarding certain components of this alternative.

The following statements are specifically adapted from the first CGTO meeting by the AIWS to reflect new information compiled during the work of the AIWS. The recommendation of mitigation by the AIWS does not imply they support the alterative; it merely is the best way of responding to impacts on American Indian cultural resources.

If Alternative 1 is chosen, the following measures are recommended for DOE implementation: continue the American Indian Religious Freedom Act Compliance Program, expand American Indian ethnographic studies, provide access to the CGTO to culturally sensitive areas to conduct land restoration ceremonies, limit non-Native personnel access to culturally sensitive areas, continue to give access to American Indian monitors needed for cultural resources investigations, and provide for American Indian monitors needed for oversight of land and DOE activities.

If Alternative 2 is chosen, the following measures are recommended for DOE implementation: continue the American Indian Religious Freedom Act Compliance Program, turn back the land to the CGTO, provide for American Indian Monitors needed for oversight of the land and DOE activities, and provide access to the CGTO to conduct land restoration ceremonies.

If Alternative 3 is chosen, the measures recommended for this Alternative are the same as for Alternative 1.

If Alternative 4 is chosen, the following measures are recommended for DOE implementation: continue the American Indian Religious Freedom Act Compliance Program, limit non-Native personnel access to culturally sensitive areas, and designate joint-use areas for three ethnic groups.

Subject to funding, scheduling, and the requirements of existing agreements with state, federal, and local agencies, the DOE will continue to consult on a government-to-government basis and will evaluate study proposals to fund those studies which would:

- Identify those areas and resources that are irreparably damaged, as well as areas and resources that can be restored for human use

- To the extent practicable, avoid further ground disturbing activities
- Make mitigation of restorable areas a top priority
- Replace lost plant and animal species
- Avoid or minimize damage to geological formations
- Implement environment restoration techniques that require minimum ground disturbance.

Several of these study topics are consistent with the DOE/NV past and present restoration policies and would dovetail with remediation plans. The DOE will continue to coordinate with the Consolidated Group of Tribes and Organizations to develop formal consultation procedures as proposed in Appendix G, and will consider the steps for participation proposed by the American Indian Writers Subgroup in Volume 2, *Framework for a Resource Management Plan*. After approval and acceptance of such procedures, systematic consultation and coordination with American Indian tribes will be planned so that potentially impacted resources can be identified, alternative solutions discussed, and adverse impacts mitigated where possible.

For purposes of the contribution of knowledge, purification ceremonies, prayers, and offerings for the restoration of the natural and spiritual harmony of the NTS landscape, the DOE/NV will strive to give the American Indian people access to adversely impacted areas. Such access will be subject to reasonable times, health and safety restrictions, security requirements, and the agreement of the managing agency where sites are not on DOE-controlled lands. Reasonable efforts will be made to accommodate Indian people.

For sites not under their control, the DOE will consult and coordinate with tribes having cultural ties to sites in question, on a government-to-government basis. Through the consultation and coordination processes committed to heretofore, the Consolidated Group of Tribes and Organizations or other appropriate tribal organizations would be actively involved in the planning, developing, and monitoring of future ground disturbing activities. Such involvement would be subject to restrictions imposed by funding, scheduling, security, and agreements with the state of Nevada and federal agencies.

The DOE/NV acknowledges that consultation does not relieve the DOE/NV of its obligation to maintain a government-to-government relationship with American Indian tribes. The DOE will, to the extent practicable, incorporate wherever possible all previous Consolidated Group of Tribes and Organizations' recommendations. The DOE/NV acknowledges further that public meetings are not the appropriate way to consult with the Indian tribes and organizations, and does not consider the tribes and organizations to be "stakeholders."

7.11 Occupational and Public Health and Safety

The areas of concern are risks associated with occupational injuries and fatalities, traffic accidents resulting in injuries and fatalities, and exposures to ionizing radiation.

Implementation of activities proposed under Alternatives 1, 3, and 4 would not result in significant adverse impacts to the general public. Additionally, risks to which workers at the sites are exposed (attributable to both work-related activities and traffic activities) do not exceed those experienced by their respective occupational groups. No adverse impacts are anticipated with implementation of Alternative 2.

Hazards will be minimized by the best management practices and occupational and radiological safety programs operating under the same regulatory standards and limits that currently apply at the NTS.

Emergency response programs will be employed to mitigate impacts of accidents to workers and the public in accordance with the 5500 series of DOE orders. These programs typically involve emergency planning, emergency preparedness, and emergency response. Each plan uses resources specifically dedicated to assist the facility in emergency management. These include a warning communications center, fire departments, facility emergency command centers, a DOE emergency operations center, county and state emergency command centers, medical and industrial hygiene specialists, and protective clothing and equipment, such as respirators and breathing air supplies.

The radiation doses estimated in this EIS for the various radiological accident scenarios are the doses that would be received by the population if only limited protective actions were taken. The NTS has detailed plans for responding to accidents of the type described here, and the response activities would be closely coordinated with state and local officials. NTS personnel are trained and drilled in the protective actions to be taken if a release of radioactive or otherwise toxic materials occur. Even though this training may result in personnel receiving lower exposures should an accident occur, limited credit is taken for this training in estimating the exposure durations for workers.

For the off-site population, the need for any protective action would be based on the predicted radiation doses. The emergency response would be based on the guidance provided in the protective action guides developed by the EPA. The underlying principle for the protective action guides is that, under emergency conditions, all reasonable measures would be taken to minimize the radiation exposure to the general public and emergency workers. In the absence of significant constraints, protective actions may be implemented when projected doses are lower than the ranges given in the protective action guides.

7.12 Environmental Justice

The following supportive measures should be undertaken to mitigate Environmental Justice impacts:

- Continue to expand opportunities for low-income and minority communities to provide input within the public involvement process by seeking the constructive involvement of affected stakeholders
- Set in motion an Environmental Justice Strategy Implementation Plan, incorporating concerns expressed in Appendix G
- Continue to encourage the participation of the Consolidated Group of Tribes and Organizations in DOE-sponsored cultural resources investigations, including those associated with ground-disturbing activities such as environmental restoration
- Encourage Consolidated Group of Tribes and Organizations participation when developing educational programs, so that students and researchers receive proper guidance regarding how to interact with the physical environment and cultural landscape.

7.13 References

REGULATION, ORDER, LAW

10 CFR Part 1021.331	U.S. Department of Energy, "Energy: Mitigation Action Plans," *Code of Federal Regulations*, Office of Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.

GENERAL

Lyneis, 1982	Lyneis, M.M., *An Archaeological Element for the Nevada Historic Preservation Plan, Nevada Division of Historic Preservation and Archaeology*, University of Nevada, Las Vegas, NV, 1982.

Chapter 8

CONSULTATION AND COORDINATION

CHAPTER 8
CONSULTATION AND COORDINATION

The consultation and coordination efforts made by the DOE/NV during the preparation of this Final NTS EIS are summarized in this chapter. Meetings, briefings, and consultations were conducted with federal agencies and governments, state, county, tribal, and local. Some actions taken by the DOE/NV were mandated by regulations; other actions were initiated by the DOE/NV to further encourage participation in the National Environmental Policy Act process. Consulting and cooperating agencies have reviewed the Draft NTS EIS prior to and after its issuance, and provided comments which the DOE has addressed.

8.1 Cooperating Agencies

Four federal agencies and one county government served as cooperating agencies with the DOE/NV in accordance with Title 40 CFR Parts 1501.5 and 1501.6. The DOE/NV sought their cooperation to identify potential impacts to lands owned, administered, or managed by these agencies as a result of implementing its alternatives. Furthermore, the DOE/NV did not want its alternatives to be in conflict with the programs and policies of other agencies. And finally, specific areas of expertise within these agencies were critical to the DOE/NV for the evaluation of its alternatives. General functions applicable to all cooperating agencies were to:

- Provide land-use plans, National Environmental Policy Act documents, and other reference documents which could assist in the analysis
- Coordinate internal reviews and provide one set of comments for rough draft portions and all of the NTS EIS to assure consistency
- Ensure that ecosystem management concepts were applied to land-use impact analysis, where appropriate
- Attend and participate in periodic meetings of the technical working group, executive management group, and other appropriate groups; EIS scoping meetings, public meetings and hearings, and interagency meetings related to the NTS EIS; and assist, where applicable, with response to public comments.

The following briefly describes the specific contributions of the five cooperating agencies:

1. DoD, U.S. Air Force, Nellis Air Force Base: Provide noise analysis for the NTS EIS, as necessary, and serve as the subject matter expert for aircraft and airspace issues. Assist with impact analysis of remediation and monitoring activities of contaminated or potentially contaminated surface or groundwater as it might affect portions of the NAFR Complex.

2. DoD, Defense Nuclear Agency: Provide information on current and planned projects that are managed by the Defense Nuclear Agency, and assist with impact analysis.

3. Department of the Interior, U.S. Fish and Wildlife Service: To fulfill its obligations under the Endangered Species Act, the DOE/NV requested threatened and endangered species lists for the Central Nevada Test Area, Project Shoal Area, Tonopah Test Range/ Double Tracks and the Nevada Test Site at the beginning of the NTS EIS process. These lists are valid for 90 days and were periodically reauthorized throughout the NTS EIS process.

   In November 1995, the DOE/NV initiated formal Section 7 consultation with the U.S. Fish and Wildlife Service regarding effects of activities and programs proposed in the Draft NTS EIS on listed species. The U.S. Fish and Wildlife Service provided a Draft Biological Opinion on May 5, 1996, that concluded that the proposed activities were not likely to jeopardize the continued existence of the threatened Mojave population of the desert tortoise. No critical habitat will be destroyed or adversely modified. The U.S. Fish and Wildlife Service concurred with the DOE/NV that the programs will not affect the bald eagle or peregrine falcon. The DOE/NV has asked the U.S. Fish and Wildlife Service for a similar concurrence in the Final Biological Opinion that the programs will not affect Ash Meadows or Devils Hole.

4. Department of the Interior, Bureau of Land Management: Assist the DOE/NV in evaluating the adequacy of the existing DOE land withdrawals as they relate to the NTS EIS alternatives.

5. Nye County: Provide information regarding planning objectives and other information on long-term objectives of future Nye County planning initiatives. Provide information to assist in the evaluation of socioeconomic impacts of the NTS EIS alternatives.

8.2 American Indians

During the week of March 17, 1995, the DOE/NV met with the Consolidated Group of Tribes and Organizations to discuss American Indian involvement in the preparation of this EIS. The Consolidated Group of Tribes and Organizations recommended that two representatives from the Owens Valley Paiute, Western Shoshone, and Southern Paiute tribes be appointed to write an American Indian perspective for the NTS EIS. It was also recommended that the DOE/NV provide these representatives with funding and technical assistance. The DOE/NV agreed, and the American Indian Writers Subgroup (AIWS) was formed.

The Subgroup held its first meeting the week of May 1, 1995, in Las Vegas, Nevada, to develop a writing strategy, draft an outline of writing tasks, and begin preparing draft text. Subsequent meetings were held the week of May 22, 1995, and from June 9 through 12, 1995, to continue preparation and to finalize the draft text. At the June meeting, the development of the *Resource Management Plan* was outlined and continued American Indian involvement was discussed. A draft of American Indian Comments for the NTS EIS (Appendix G) was received by the DOE/NV June 15, 1995. The appendix provided an overview of the cultural basis for the viewpoints presented by the Consolidated Group of Tribes and Organizations' members in the Draft NTS EIS.

Two subgroup meetings were held in Las Vegas, Nevada, after the public review period for the Draft NTS EIS. The purpose of these meetings was to review and edit the Draft American Indian Comments, to respond to the public comments on the Draft document, and to prepare additional text for inclusion in the NTS EIS. On March 20 and 21, 1996, the Subgroup met with DOE/NV management officials to discuss the current American Indian involvement in the NTS EIS as well as other consultation issues. A brief presentation of the *Resource Management Plan* was also given by the DOE/NV.

On April 15 through 17, 1996, DOE/NV again consulted with Consolidated Group of Tribes and Organizations' representatives to update them on the changes, final schedule, and public comments for the NTS EIS. This meeting was held at the NTS. The AIWS presented a report of activities and a status of writing tasks completed. The Consolidated Group of Tribes and Organizations reviewed and commented on the additional text developed by the Subgroup and provided suggestions for expanding sections of the text.

On April 18 through 21, 1996, the Subgroup met in Las Vegas to incorporate the Consolidated Group of Tribes and Organizations' comments, to complete and edit the additional text, to focus writing efforts on the Transportation Study and the *Resource Management Plan*, and to complete an expanded inventory of American Indian traditional-use plants and animals. On April 21, 1996, the Subgroup completed all additional text for Appendix G as well as sections to be incorporated into Volumes 1 and 2 of the NTS EIS. The final additions for the American Indian Assessments for the NTS EIS (Appendix G) were submitted to DOE/NV.

8.2.1 American Indian Consultation Procedures

American Indian tribes are sovereign nations that acknowledge the U.S. Government and expect that, *in return, the U.S. Government recognize tribal sovereignty. In a memorandum dated April 29, 1994, President William J. Clinton wrote, "I am strongly committed to building a more effective day-to-day working relationship reflecting respect for the rights of self-government due the sovereign tribal rights." American Indian governments expect that federal agencies and state officials will honor President Clinton's explicit commitment to building such a relationship and following his mandate (Executive Orders 12875 and 12866). Accordingly, government officials must implement comprehensive consultation policies that take into consideration the vast cultural, social, and political diversity of American Indians as well as the needs, concerns, and impacts that are shared by our nations.*

American Indian tribes are not considered as, nor do they fit the definition of, businesses or stakeholders. Formal government-to-government consultation with tribal governments require diplomacy. U.S. Government officials that are in charge of maintaining friendly and productive day-to-day relationships with foreign countries, such as Japan, Mexico, or Germany, must acquire knowledge on the languages, culture, and politics of those countries in order to best represent the interests of the United States, and to achieve success in international, economic, and political negotiations. Yet, there is little or no interest among government officials to educate themselves as to how American Indians living in their own country organize themselves culturally and politically. How, we ask, are federal agencies and state officials going to succeed in following President Clinton's mandate, if they do not work at improving their knowledge of American Indian life ways?

The American Indian Writers Subgroup (AIWS), which represents the concerns of the CGTO for the Nevada Test Site Environmental Impact Statement would like to suggest a series of procedures for implementing a comprehensive day-to-day consultation relationship with the U.S. Department of Energy (DOE). The Environmental Protection Division of the U.S. Department of Energy, Nevada Operations Office (DOE/NV) has maintained its commitment to consultation and established a working relationship with culturally affiliated American Indian tribes regarding cultural resources at Yucca Mountain and the NTS since 1985. There are, however, numerous other areas of great concern for tribal governments that are currently addressed in the NTS EIS but have not been explored nor systematically subjected to consultation with tribal governments. Some of these areas are:

- *Land use*
- *Risk assessment*
- *Socioeconomic issues*
- *Nuclear waste transportation*
- *Environmental justice and equity*
- *Environmental restoration*
- *Mitigation.*

The AIWS is aware that presently there are programmatic EISs taking place without the direct involvement of Indian people. This lack of involvement is a source of great concern for culturally affiliated tribes. The gravity of past and proposed future nuclear and defense-related programs and activities at the NTS and other areas withdrawn by the DOE calls for a broadening of the scope of American Indian consultation programs. As stated in the American Indian Policy (April 29, 1994), the DOE must identify and seek to remove impediments to working directly and effectively with tribal governments on DOE programs and activities. The DOE has already recognized that there may be certain procedural impediments which limit or restrict the ability to work effectively and consistently with American Indian tribes. In keeping with the American Indian Policy, which requires government-to-government consultation, this federal agency must make every effort to remove such impediments.

The AIWS reviewed and edited the Consultation Model produced for the DOE Legacy Project (Stoffle et al., 1994). A detailed version of this American Indian Consultation Model, which has *been tailored to meet current DOE/NV consultation procedures, is included in Attachment C of Appendix G.*

The consultation procedures are drawn both from past and current consultation relationships between DOE/NV and the CGTO. Furthermore, these procedures reflect the need for adjustments on consultation strategies for future DOE programs and activities that may potentially impact the traditional culture and contemporary well-being of Indian people. Therefore, discussions presented in Appendix G not only highlight the accomplishments of DOE/NV consultation with tribal governments, but also points out procedures that have yet to be developed and implemented in the future. Because the NTS EIS will be read by government officials from sister DOE facilities and perhaps by other federal and state agencies as well, the AIWS expects that the consultation procedures will serve as a model for future interaction between tribal governments and federal and state agencies.

It is important to note that specific consultation procedures should be approved by tribal governments at the onset of each consultation process.

8.3 Other Meetings

Additional meetings were held with local governments, advisory boards, the Nevada State Clearinghouse, the DOE/NV Operations Office Environmental Management Community Advisory Board, affected units of local government, and the South-Central Nevada Federal Complex Advisory Board. Several work-group meetings with local and county governments took place, many of which were specific to transportation issues. These meetings are summarized in Table 8-1.

Table 8-1. Summary of meetings held on the NTS EIS and Transportation Study (Page 1 of 5)

Host Organization	Date	Location
Environmental Impact Statement Transportation Study Meetings		
Local or County Government	August 22, 1994	U.S. Department of Energy Nevada Operations Office 2753 S. Highland Las Vegas, NV 89109
University of Nevada, Las Vegas	November 15, 1994	University of Nevada, Las Vegas Harry Reid Center 4505 S. Maryland Parkway Las Vegas, NV 89154
Transportation Risk Working Group Meetings		
DOE Nevada Operations Office	May 16, 1995	U.S. Department of Energy Nevada Operations Office 2753 S. Highland Las Vegas, NV 89109
DOE Nevada Operations Office	June 15, 1995	IT Corporation 4330 S. Valley View, #114 Las Vegas, NV 89103

Table 8-1. Summary of meetings held on the NTS EIS and Transportation Study (Page 2 of 5)

Host Organization	Date	Location
Draft Implementation Plan Meetings		
Community Advisory Board for the NTS Programs	February 1, 1995	Holiday Inn Crowne Plaza 4225 Paradise Road Las Vegas, NV 89109
DOE Nevada Operations Office	February 7, 1995	University of Nevada, Las Vegas 4505 S. Maryland Parkway Las Vegas, NV 89154
DOE Nevada Operations Office	February 9, 1995	University of Nevada 9th and N. Virginia Reno, NV 89557
DOE Nevada Operations Office	March 7, 1995	U.S. Department of Energy Nevada Operations Office 2753 S. Highland Las Vegas, NV 89109
DOE Nevada Operations Office	March 9, 1995	Reno-Sparks Convention and Visitors Authority 4590 S. Virginia St. Reno, NV 89501
Scoping Period Meetings		
DOE Nevada Operations Office	September 7, 1994	Fallon Convention Center 100 Campus Way Fallon, NV 89046
DOE Nevada Operations Office	September 8, 1994	Carson City Community Center 851 E. Williams Street Carson City, NV 89701
DOE Nevada Operations Office	September 13, 1994	Dixie Center Convention Facilities 425 South 700 East St. George, UT 84770
DOE Nevada Operations Office	September 15, 1994	Tonopah Convention Center 301 Brougher Tonopah, NV 89049
DOE Nevada Operations Office	September 20, 1994	Cashman Field Convention Center 850 Las Vegas Boulevard No. Las Vegas, NV 89101

Table 8-1. Summary of meetings held on the NTS EIS and Transportation Study (Page 3 of 5)

Host Organization	Date	Location
DOE Nevada Operations Office	September 21, 1994	Bob Ruud Community Center Highway 93 Caliente, NV 89008
DOE Nevada Operations Office	October 4, 1994	Henderson Convention Center 200 S. Water Street Henderson, NV 89015
Other Information Meetings		
State of Nevada Clearinghouse	August 30, 1994	State Clearinghouse II Capitol Complex Carson City, NV 89710
Environmental Management Community Advisory Board	October 5, 1994	Holiday Inn Crowne Plaza 4225 Paradise Road Las Vegas, NV 89109
Affected Units of Local Government	October 21, 1994	White Pine County Convention Center 150 6th Street Ely, NV 89301
South-Central Nevada Federal Complex Advisory Board	October 28, 1994	Tonopah Convention Center 301 Brougher Tonopah, NV 89049
Air and Waste Management Association	December 14, 1994	Palace Station Hotel & Casino 2411 West Sahara Las Vegas, NV 89102
State of Nevada Clearinghouse	December 19, 1994	Nevada State Library Capitol Complex Carson City, NV 89710
Affected Units of Local Government	February 24, 1995	Tonopah, NV 89049
CGTO	March 17 - 19, 1995	Nevada Test Site Mercury, NV 89023
State of Nevada Clearinghouse	April 19, 1995	Nevada State Library Capitol Complex Carson City, NV 89710
Affected Units of Local Government	May 25, 1995	Pioche Fire Department Pioche, NV 89043
Community Technical Representative Program	July 31 - August 4, 1995	Brian Head Hotel 223 W. Hunter Ridge Drive Brian Head, UT 84719

Table 8-1. Summary of meetings held on the NTS EIS and Transportation Study (Page 4 of 5)

Host Organization	Date	Location
Environmental Management Community Advisory Board	August 2, 1995	Community College of Southern Nevada Cheyenne Campus North Las Vegas, NV 89030
Transportation Study Group	August 9, 1995	Desert Research Institute 755 E. Flamingo Road Las Vegas, NV 89119
State of Nevada Clearinghouse	August 29, 1995	Nevada State Library Capitol Complex Carson City, NV 89710
Environmental Management Community Advisory Board	October 8, 1995	Community College of Southern Nevada Cheyenne Campus North Las Vegas, NV 89030
Public Hearings, Workshops, and Other Meetings		
Environmental Management Community Advisory Board	February 7, 1996	Durango High School 7100 W. Dewey Drive Las Vegas, NV
NTS EIS Public Hearing	March 5, 1996	Dixie College Smith Convention Center 425 South 700 East St. George, UT 84770
NTS EIS Public Hearing	March 13, 1996	Town of Pahrump Bob Rudd Community Center 50 North Highway 160 Pahrump, NV 89041
NTS EIS Public Hearing	March 19, 1996	University of Nevada ASUN Auditorium Reno, NV 89557-0089
NTS EIS Public Hearing	March 26, 1996	Cashman Field Center 850 Las Vegas Blvd. No. Las Vegas, NV 89101
NV State Clearinghouse Meeting	April 10, 1996	Nevada State Library 100 Stewart Avenue Carson City, NV 89710

Table 8-1. Summary of meetings held on the NTS EIS and Transportation Study (Page 5 of 5)

Host Organization	Date	Location
NTS Transportation Big Group	April 11, 1996	Bechtel Nevada Facilities Bldg. C-1, Auditorium 2621 Losee Road North Las Vegas, NV 89030
Public Hearings, Workshops, and Other Meetings		
NTS EIS CORE Workshops	April 8, 1996	Boulder City Hall Bldg. 401 California Avenue Boulder City, NV 89005
NTS EIS CORE Workshops	April 16, 1996	Caliente Train Station 100 Depot Avenue Caliente, NV 89008
NTS EIS CORE Workshops	April 23, 1996	Tonopah Courthouse Commissioners Chambers W. P. Beko Justice Chambers 101 Radar Road Tonopah, NV 89049
NTS EIS CORE Workshops	April 25, 1996	West Las Vegas Arts Center 947 W. Lake Mead North Las Vegas, NV

8.4 References

REGULATION, ORDER, LAW

40 CFR Part 1501.5	U.S. Environmental Protection Agency (EPA), "Protection of the Environment: Lead Agencies," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.
40 CFR Part 1501.6	EPA, "Protection of the Environment: Cooperating Agencies," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.
EO 12866	Executive Order, "*Regulatory Planning and Review*," Office of the President, Washington, DC, 1993.
EO 12875	Executive Order, "*Enhancing the Intergovernmental Partnership*," Office of the President, Washington, DC, 1993.

GENERAL

Stoffle, et al., 1994	Stoffle, R.W., M.J. Evans, D.B. Halmo, M.E. Dufort, and B.K. Fulfrost, *Native American Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site*, Desert Research Institute Technical Report No. 84, Bureau of Applied Research in Anthropology (BARA), University of Arizona, Tucson, AZ, 1994.

This Page Intentionally Left Blank

Chapter 9

LIST OF PREPARERS AND CONTRIBUTORS

CHAPTER 9
LIST OF PREPARERS AND CONTRIBUTORS

9.1 Preparers

The following individuals were primarily responsible for writing the contents of this Final EIS or for providing senior management leadership during the development and production phases of this document.

ADAMS, Steven R., Senior Staff Consultant, IT Corp.
B.S. Biology; minor, Chemistry
Graduate Studies: Physics
Certification (Comprehensive) in Health Physics by American Board of Health Physics
Years of Experience: 16
EIS Contributions: Author and Reviewer - Affected Environment

ALM, Carolyn A., MIS Technical Writer, IT Corp.
B.A. English
M.A. English
Years of Experience: 15
EIS Contributions: Lead Technical Editor (Draft EIS)

ARNOLD, Richard W., Executive Director, Las Vegas Indian Center
A.A. Police Science
B.S. Criminal Justice
Certificate American Indian Studies
M.S. Educational Psychology and Counseling
Years of Experience: 20
EIS Contributions: Coordinator and Team Leader - American Indian Writers Subgroup; Author - NTS EIS *American Indian Perspective, Cultural Resources*

BAILEY, Edward R., Principal Environmental Planner, Tetra Tech, Inc.
B.S. Environmental Science
M.A. Environmental Administration
Years of Experience: 15
EIS Contributions: Reviewer - Socioeconomics, Off-Site Traffic, Air Quality, Noise, and Visual Resources

BAIRD, Frank A., Geologist, IT Corp.
B.S. Geology
Years of Experience: 6
EIS Contributions: Principal Investigator - Environmental Restoration data sheets, Underground Test Area

BAKER, Kathy, Technical Publications Specialist, IT Corporation
B.S. Education
M.A. English
Years of Experience: 28
EIS Contributions: Technical Editing

BALDWIN, Olga, Computer Modeling Specialist, Tetra Tech Inc.
B.S. Business Administration
Years of Experience: 13
EIS Contributions: Principal Investigator - Socioeconomic

BALICE, Randy G., Principal Scientist, Lockheed Martin
B.S. Biology
M.S. Geography
Ph.D. Forestry Wildlife & Range Sciences
Years of Experience: 15
EIS Contributions: Chapter 4 Lead - Affected Environments

BECK, Colleen M., Deputy Director, Quaternary Science Center, Desert Research Institute
B.A. Anthropology
M.A. Anthropology
Ph.D. Anthropology
Years of Experience: 22
EIS Contributions: Principal Investigator - Cultural Resources

BECKER, Bruce D., Radioactive Waste Section Chief, Reynolds Electrical & Engineering Co., Inc.
B.A. Social Sciences/History
Years of Experience: 6
EIS Contributions: Author - Waste Operations data sheets

BELK, William E., Production Coordinator, Professional Analysis, Inc.
B.S. Journalism
M.A. Asian Studies
Years of Experience: 15
EIS Contributions: Document Production Coordinator

BRADFIELD, Felicia, Socioeconomic Planner, Tetra Tech Inc.
B.S. Finance, Real Estate and Law
Years of Experience: 12
EIS Contributions: Principal Investigator and Author - Socioeconomic, Environmental Consequences

BROOKER, Terry B., Technical Editor, Writer, Rewrite Author, Production Supervisor, GeoTrans, Inc.
B.A. English and Journalism
Years of Experience: 22
EIS Contributions: Writer, Technical and Text Editor, Document Production

BUQO, Thomas S., Associate Hydrogeologist, Professional Analysis, Inc.
B.S. Geosciences
Years of Experience: 20
EIS Contributions: Principal Investigator - Solar Enterprise Zone, Geology and Soils, Water Resources

BUPP, Susan L., Archaeologist, Tetra Tech, Inc.
B.A. Anthropology, Emphasis Archaeology
M.A. Anthropology, Emphasis Archaeology
Years of Experience: 20
EIS Contributions: Cultural Resources, Chapters 4, 5 & 7

CALMAN, Elizabeth C., Senior Environmental Compliance Officer, Reynolds Electrical & Engineering Co., Inc.
B.A. Geology
Years of Experience: 12
EIS Contributions: Co-author - Waste Operations data sheets; Author - initial position paper for waste operations projects

CARDENAS, Linda A., EIS Project Manager, IT Corp.
B.S. Fisheries & Wildlife Management
Years of Experience: 13
EIS Contributions: Author - Implementation Plan

CAVE, Deborah L., Senior Hydrogeologist, GeoTrans, Inc.
B.A. Geology
M.S. Hydrogeology
Years of Experience: 8
EIS Contributions: Author and Reviewer - Groundwater model used in Human Health Risk Assessment

CHAPMAN, Jeannett (Jenny) B., Assistant Research Hydrogeologist, Desert Research Institute
B.S. Geology
M.A. Geology
Years of Experience: 13
EIS Contributions: Principal Investigator and Author - exposure assessment from groundwater transport of tritium from the Project Shoal Area and Central Nevada Test Area

CLAYTON, Christopher, Principal Analyst, Science Applications International Corp.
B.A. Geography
M.A. Geography
Ph.D. Geography
Years of Experience: 24
EIS Contributions: Author - Cumulative Impacts, Chapter 6

CLOQUET, Don, Tribal Elder
Board Member - Las Vegas Indian Center
Consolidated Group of Tribes and Organizations
American Indian Writers Subgroup
EIS Contributions: Co-Author - Appendix G and related sections in Volume 1 and Volume 2

CORNELIUS, Betty, Tribal Elder
Museum Director - Colorado River Indian Tribes, Consolidated Group of Tribes and Organizations, American Indian Writers Subgroup
EIS Contributions: Co-Author - Appendix G and related sections inVolume 1 and Volume 2

COTTER, Joy A., Environmental Specialist, Raytheon Services Nevada
B.A. Environmental Studies
Years of Experience: 7
EIS Contributions: Reviewer - Waste Management sections; Author - Waste Management issues, Chapter 2

CRAWLEY, Mark, Project Manager, IT Corp.
B.S. Geology
M.S. Geology
Years of Experience: 20
EIS Contributions: Author and Editor - Transportation Study, Chapter 2, Appendices A, B & C

CRENSHAW-SMITH, Denise, Senior Engineer, Science Applications International Corp.
B.A. Physics/French
Years of Experience: 19
EIS Contributions: Transportation Study

DATIAN (VARTANIAN), Christine, Technical Editor, Professional Analysis, Inc.
B.A. English Literature/Journalism
M.A. Mass Communication
Years of Experience: 20
EIS Contributions: Technical Editor, Document Production; Format Standards Editor

DESHLER, Barbara J., Technical Operations Manager, IT Corp.
B.S. Geology
Years of Experience: 11
EIS Contributions: Manager - Human Health Risk Assessment, Transportation Risk Assessment

DESHLER, Richard., Project Manager/Senior Geologist, IT Corp.
B.S. Geology
M.S. Geology
Years of Experience: 18
EIS Contributions: Author and Reviewer - Off-Site Environmental Consequences and Affected Environment, Geology and Soils

DANGS, James M., Senior Environmental Scientist, MAC Technical Services Co.
B.S. Biology
M.S. Biology
Years of Experience: 10
EIS Contributions: Reviewer - Environmental Consequences Chapter 5; Implementation Plan; Co-author - Cumulative Impacts, Chapter 6; Author - Mitigation, Cumulative Impacts resource documents

DOLENC, Max R., Senior Waste Management Specialist, Reynolds Electrical & Engineering Co., Inc.
B.S. Chemistry
B.S. Business Administration
M.S. Geology
Years of Experience: 20
EIS Contributions: Author - Waste Operations data sheets

DUBARTON, Anne E., Archaeologist, Desert Research Institute
B.A. Anthropology, emphasis Archaeology
M.A. Anthropology, emphasis Archaeology
Years of Experience: 16
EIS Contributions: Co-author - Cultural Resources, Chapters 4 and 5

DUBISKAS, Richard A., Project Manager, IT Corp.
B.S. Geology
M.S. Geology
Years of Experience: 10
EIS Contributions: Author and Reviewer - Affected Environment: Tonopah Test Range

DUNDON, Sean T., Health Physicist, IT Corp.
B.S. Public Health
M.S. Health Physics
Years of Experience: 6
EIS Contributions: Principal Investigator - Transportation Risk Assessment; Author - Environmental Consequences; Human Health Risk Assessment, Environmental Consequences

ELLE, Donald R., Director, Environmental Protection Division, DOE/NV
B.A. Mathematics/Physics
M.S. Radiological Physics
Ph.D. Bionucleonics
M.A. Applied Behavioral Sciences
Years of Experience: 26
EIS Contributions: Director - Primary responsible party for EIS

FAWAZ, Mahmoud Y., Transportation Engineer, Tetra Tech Inc.
B.S. Civil Engineering
M.S. Transportation Engineering
Ph.D. Transportation Engineering
Years of Experience: 18
EIS Contributions: Principal Investigator and Author - Off-Site Transportation; Reviewer - Airspace, On-Site Transportation, and Affected Environments

FELSKE, Donald J., Engineering Group Leader, Lawrence Livermore National Laboratory
B.S. Geography
M.B.A. Business Administration
EIS Contributions: Author - Appendix F, Document Reviewer

FRANK, Maurice, Contracts, Grants, and Cultural Resources Expert, Vice Chairman - Yomba Shoshone Tribe, Consolidated Group of Tribes and Organizations, American Indian Writers Subgroup
EIS Contributions: Co-Author - Appendix G and related sections in Volume 1 and Volume 2

FOLEY, Michael I., Senior Program Manger and Vice President, Science Applications International Corporation
B.S. Chemistry, 1967
Years of Experience: 30
EIS Contributions: Public comment response technical coordination

FOWLER, John M., Senior Engineer, Raytheon Services Nevada
B.S. Geology
Years of Experience: 15
EIS Contributions: Principal Investigator - NTS infrastructure and waste management

GIAMPAOLI, MaryEllen C., EIS Project Manager, Environmental Protection Divison, DOE/NV
B.S. Geological Sciences
M.S. Geological Sciences
Years of Experience: 11
EIS Contributions: Project Manager, Document Manager, Document Coordinator and Reviewer

GOLDEN, Bobby G., General Engineer, Environmental Protection Division, DOE/NV
B.S. Environmental Engineering
Years of Experience: 5
EIS Contributions: Author - Notice of Intent; Task Leader for Land Use and Nevada Technical Working Group; Document Reviewer

GONZALEZ, Daniel, A., Senior Principal Scientist, Raytheon Services Nevada
B.S. Zoology
M.S. Health Physics
Years of Experience: 11
EIS Contributions: Author - Defense Program data sheets

GRASSMEIER, Kathleen F., Scientist, Project Control and Technology Division, DOE/NV
B.A. Social Studies
M.A. Personnel Management
Year of Experience: 26
EIS Contributions: Task Leader Transportation Study

HARRINGTON, Scott, Scientist, Bechtel Nevada Corporation
B.S. Environmental Conservation
Years of Experience: 4
EIS Contributions: P.I. Solar Enterprise Zone

HENDERSON, James E., Project Manager, Raytheon Services Nevada
B.A. Environmental Science
Years of Experience: 14
EIS Contributions: Contractor Project Manager and Co-author - Description of Proposed Alternatives, data sheets; Reviewer - entire EIS

HOOPER, Glen, Cultural Resources Expert Consolidated Group of Tribes and Organizations, American Indian Writers Subgroup, Yomba Shoshone Tribe, Cultural Resources Expert
EIS Contributions: Co-Author - Appendix G and related sections in Volume 1 and Volume 2

HORNE, Ruth E., Lead Technical Editor, Professional Analysis, Inc.
B.A. English and Communications
Years of Experience: 12
EIS Contributions: Technical Editor; Writer: Comment Analysis and Response Plan; Contributing Editor for format standards

HOUSE, William E., Staff Scientist, Science Applications International Corp.
B.S. Geological Engineering
Years of Experience: 11
EIS Contributions: Occupational and Public Health and Safety

HOWARD, Deborah L., EIS Deputy Project Manager, Environmental Protection Division, DOE/NV
B.S. Chemistry
Years of Experience: 15
EIS Contributions: Deputy Project Manager; Author - Airspace and Tonopah Test Range sections

HUSSEY, Michael, Planner, Tetra Tech Inc.
Years of Experience: 25
EIS Contributions: Principal Investigator and Author - Land Use, Visual Resources

JACKSON, Nate D., Technical Aide, Raytheon Services Nevada
Civil Engineering student
Years of Experience: 1
EIS Contributions: Author and Principal Investigator - Affected Environment; NTS Land Use; Solar Enterprise Zone

JOHNSON, Paul E., Development Staff Member, Lockheed Martin Energy Systems
B.A. Geography
M.S. Geography
Years of Experience: 17
EIS Contributions: Provided route data for the Transportation Study

JOHNSTON, Joseph P., Engineer, Raytheon Services Nevada
Undergraduate studies in Earth Science
Years of Experience: 8
EIS Contributions: Principal Investigator - Chapter 2, Chapter 3 and Appendix A; Author and Co-author - Waste Management, Chapter 2, Chapter 3 and Appendix A; Author - Defense Program areas, Waste Management, and data sheets; Reviewer - Chapter 2, Chapter 3 and Appendix A

KILLEN, Timothy F., General Engineer, Engineering Division, DOE/NV
B.S. Electrical Engineering
Years of Experience: 22
EIS Contributions: DOE/NV Task Leader - Resource Management Plan

KONDA, Murthy Devara, Technical Associate/Project Manager, IT Corp.
B.S. Chemical Engineering
Ph.D. Environmental Engineering
Years of Experience: 7
EIS Contributions: Author and Reviewer - Transportation Study

KROGBIN, Debbie L., Environmental Scientist, GeoTrans Inc.
A.S. Environmental Restoration Technology
Years of Experience: 1.5
EIS Contributions: Author - Project Management Plan; Environmental Restoration Section, Description of Activities

LEARY, Kevin D., Hydrogeologist and Soil Scientist, DOE/Environmental Restoration Division
B.S. Soil Science
M.S. Hydrogeology/Hydrology
Years of Experience: 15
EIS Contributions: Soil Section - TTR

LESTER, Barry H., Senior Hydrogeologist, GeoTrans Inc.
B.S. Earth Sciences
M.S. Geology
Years of Experience: 15
EIS Contributions: Groundwater Modeling support for the Human Health Risk Assessment

MAIZE, Terre, Environmental Compliance Mgr., IT Corp.
BS Civil - Environmental Engineering
Years of Experience: 13
EIS contributions: ER Comment Resolution

MATHUR, Raj B., Director, Environmental Services, Tetra Tech, Inc.
B.A. Geography
M.A. Economics
Ph.D. Economic Geography
Years of Experience: 26
EIS Contributions: Coordinator: Socioeconmics, Air Quality, Noise Visual Resources, Off-Site Transportation, Environmental Justice; Cumulative Impacts.

MAXWELL, Frank R., Environmental Specialist, Environmental Restoration Division, DOE/NV
B.S. Agriculture (Renewable Natural Resources)
Years of Experience: 27
EIS Contributions: Co-author - Chapter 2; irretrievable, irreversible, unavoidable Adverse Impacts; Short-term and Long-term Productivity; Document Reviewer

MCWILLIAM, Catherine M., Physical Scientist, Project Control and Technology Development, DOE/NV
B.A. Geology
M.S. Geology
Years of Experience: 11
EIS Contributions: Task Leader - Transportation Study

MOORE, Beth A., Project Manager, Waste Management Division, DOE/NV
A.S. Computer Science
B.S. Geology
M.S. Hydrology
Certified, Marine Sciences
Years of Experience: 13
EIS Contributions: Author - Affected Environments, Groundwater; Author and Technical Reviewer - Waste Management sections

MOOSE, Gaylene, Cultural Resources Expert
Native American Youth Sports Coordinator - Owens Valley, Big Pine Paiute-Shoshone Indian Tribe, Consolidated Group of Tribes and Organizations, American Indian Writers Subgroup
EIS Contributions: Co-Author - Appendix G and related sections in Volume 1 and Volume 2

MORELAND, William B., Senior Scientist, Tetra Tech Inc.
B.A. Meteorology
M.A. Meteorology
Years of Experience: 45
EIS Contributions: Author and Principal Investigator - Air Quality, Noise

MORRIS, Robert W., Transportation Analyst, Science Applications International Corp.
B.A. Mathematics
M.S. Management Science
Years of Experience: 13
EIS Contributions: Author - On-Site Traffic Analysis

MUELLER, James M., Scientist, EG&G Energy Measurements Inc.
B.S. Wildlife & Fisheries Sciences
M.S. Wildlife & Fisheries Sciences
Years of Experience: 6
EIS Contributions: Author, Editor and Reviewer - Biological Resources

NAGY, Michael D., Chemical Engineer/Risk Assessor, IT Corp.
B.S. Chemical Engineering
Years of Experience: 4
EIS Contributions: Co-author -Human Health Risk Assessment

NAYLOR, Neddeen, Tribal Elder - Council Member, Lone Pine Paiute-Shoshone Indian Tribe Consolidated Group of Tribes and Organizations
EIS Contributions: Co-Author - Appendix G and related sections in Volume 1 and Volume 2

NICOLETTI, Mary Jo, Socioeconomist, Science Applications International Corp.
B.A. Economics
B.A. Business Analysis
M.B.A. Business Administration
Years of Experience: 12
EIS Contributions: Reviewer and Editor - Transportation Section, Socioeconomic references; Compiler - summary tables

OAKES, Edward, Geologist
Science Applications International Corp.
B.S. Geology
M.S. Geology
Years of Experience: 20
EIS Contributions: Land use

O'HAGAN, Michael, Hydrologist, IT Corp.
BSC, MSC
Years of Experience: 10
EIS contribution: Comment Resolution, ER Section

PAPAZIAN, Ghazar R., Test Director, Los Alamos National Laboratory
B.A. Mechanical Engineering
Years of Experience: 18
EIS Contributions: Author - Appendix J, Document Reviewer

PEDDADA, Anantaramam, Senior Environmental Scientist, Tetra Tech Inc.
B.S. Geology, Physics & Chemistry
M.S. Geology
M.S. Urban Environmental Studies
Years of Experience: 20
EIS Contributions: Author - Air Quality, Noise, Environmental Consequences

PERIZZOLO, Shirl, Technical Editor, Science Applications International Corp.
B.S. Library Studies
Years of Experience: 20
EIS Contributions: Editing

PFEUFFER, Sheryl Lynn, Health Physicist, Reynolds Electrical & Engineering Co., Inc.
A.A. General Science
B.S. Quantitative Management
Years of Experience: 20
EIS Contributions: Editor, Reviewer, and Author

POWERS, C. Donald, Environmental Scientist, Science Applications International Corp.
B.S. Microbiology & Public Health
M.S. Microbiology & Public Health
Ph.D. Epidemiology
Years of Experience: 26
EIS Contributions: Author - Yucca Mountain environmental program

PROHASKA, Robert F., Senior Project Scientist, Woodward-Clyde Consultants
B.A. Geography/Environmental Studies
M.S. Environmental Health Science
Years of Experience: 10
EIS Contributions: Technical Lead - IT/Tetra Tech Team

PROTHRO, Lance B., Senior Geologist, Raytheon Services Nevada
B.S. Geology
M.S. Geology
Years of Experience: 8
EIS Contributions: Reviewer - Implementation Plan and Affected Environments; Author, Principal Investigator and Reviewer - Appendix A and data sheets

RABE, Jeffrey J., Environmental Scientist, IT Corp.
B.S. Biology
M.S. Environmental Biology
Years of Experience: 5
EIS Contributions: Author and Editor - Environmental Consequences, Transportation Study

RAUTENSTRAUCH, Kurt R., Senior Scientist, EG&G Energy Measurements Inc.
B.S. Wildlife & Fisheries Sciences
M.S. Wildlife Ecology
Ph.D. Wildlife Ecology
Years of Experience: 12
EIS Contributions: Author, Editor and Principal Investigator - Biological Resources

RAWLINSON, Stuart E., Project Manager, Raytheon Services Nevada
A.A. Liberal Arts
B.S. Geology
M.S. Geology
Ph.D. Geology
Years of Experience: 18
EIS Contributions: Author, Principal Investigator and Reviewer - Geology and Surface Water; Reviewer - Implementation Plan

RUSSELL, Charles Eugene, Hydrogeologist, Desert Research Institute
B.S. Geology
M.S. Geoscience
Years of Experience: 8
EIS Contributions: Co-author - Groundwater Resources Impacts

SEGOVIA, Leticia, Civil Engineer/Regulatory Specialist, IT Corp.
B.S. Civil Engineering
M.S. Civil Engineering
Years of Experience: 5
EIS Contributions: Author and Editor - Transportation Study, Chapter 2, Appendices A, B & C

SHUPP, Elizabeth, Assistant Engineer/Scientist, IT Corp.
1993, Certificate in Environmental Restoration
Years of Experience: 1
EIS Contributions: Author - Off-Site Surface Water

SKOUGARD, Michael G., Environmental Scientist, Environmental Protection Division, DOE/NV
B.S. Law Enforcement
M.S. Botany
Years of Experience: 17
EIS Contributions: Author - Summary; Document Reviewer

SMITH, Robert W., Project Manager, Science Applications International Corp.
B.A. Psychology
Years of Experience: 30
EIS Contributions: Author - On-Site Transportation (Traffic) Cumulative Impacts. Senior National Environmental Policy Act Consultant

SOBOCINSKI, Robert W., Environmental Scientist, IT Corp.
B.S. Geology
M.S. Geology
Years of Experience: 9
EIS Contributions: Author - Transportation Study and Environmental Consequences sections

SORENSON, Sr., Robert R., Technical Editor, Science Applications International Corp.
A.A.
Years of Experience: 26
EIS Contributions: Edit authors' responses

SORG, Stacey, A., Senior Consultant, IT Corp.
B.S. Zoology
Years of Experience: 13
EIS Contributions: Author - Waste Management; Reviewer - Waste Management sections

STEWART, Carrie, E., Environmental Scientist, Professional Analysis, Inc.
B.S. Geology
Years of Experience: 7
EIS Contributions: Author and Reviewer - Chapter 1, Chapter 3, Description of Proposed Alternatives, Appendix C, Infrastructure for Environmental Consequences. Team Leader - Document Production

STOWELL, Craig A., Senior Engineer, Raytheon Services Nevada
B.S. Civil Engineering
Years of Experience: 15
EIS Contributions: Principal Investigator - On-Site Transportation

SURDZIAL, Anne, Environmental Scientist, Tetra Tech Inc.
B.S. Environmental Science
Years of Experience: 5
EIS Contributions: Reviewer - Socioeconomic, On-Site Traffic, Air Quality, Noise, Visual Resources, and Land Use

SWATON, Cheryl L., Engineer, GeoTrans, Inc.
B.S. Biomedical Engineering
Years of Experience: 6
EIS Contributions: Author and Reviewer - Soil and Geology for Tonopah Test Range and NAFR Complex

TAPPEN, Jeffrey J., Lead Health Physicist, Science Applications International Corp.
B.S. Geology
M.S. Health Physics
Years of Experience: 20
EIS Contributions: Author and Reviewer - On-Site Transportation Analysis, Traffic Infrastructure, and Traffic Data Analysis

TAYLOR, Ellen L., National Environmental Policy Act Compliance Project Leader, Lawrence Livermore National Laboratory

B.A. Zoology
Ph.D. Biology
Years of Experience: 25
EIS Contributions: Co-author, Chapter 1; Document Reviewer

TELFORD, John Scott, Waste Management Specialist, Reynolds Electrical & Engineering Co., Inc.

B.S. Civil Engineering
M.S.E. Environmental Engineering
Years of Experience: 1
EIS Contributions: Author - Waste Operations data sheets

THOMPSON, Douglas, C., Engineer, GeoTrans, Inc.

B.S. Civil Engineering
Years of Experience: 2
EIS Contributions: Author and Principal Investigator - Infrastructure at Project Shoal Area and Tonopah Test Range; Coauthor - Land Use of Central Nevada Test Area, Project Shoal Area, Tonopah Test Range, and Project 57 test areas; Task Manager - Comment Management and Comment Response Appendix

THOMPSON, Robert A., Airspace/ Environmental Compliance, Science Applications International Corp.

B.S. Mathematics
M.A. Human Resources Management
Years of Experience: 27
EIS Contributions: Response to land use and air space comments

THOMSON, Robert J., Senior Environmental Scientist, Science Applications International Corp.

B.S. Zoology
M.S. Ecology
Years of Experience: 20
EIS Contributions: Project and alternative descriptions, cumulative impacts, mitigation measures

TOYAMA, Caroleen Kimiko, Environmental Planner, IT Corp.

B.A. Geography and Sociology
Years of Experience: 26
EIS Contributions: Author - Transportation Study, Human Health Risk Assessment, Occupational and Public Health and Safety

WADDELL, Richard K., Principal Hydrologist, Vice President, GeoTrans, Inc./Tetra Tech Inc.

B.A. Geology
M.A. Geology
Ph.D. Geology
Years of Experience: 18
EIS Contributions: Author - Groundwater modeling support documents

WELCHER, Ann-Marie, Geologist, IT Corp.

B.S. Geology
Years of Experience: 3
EIS Contributions: Author - Geology and Soils sections for the Project Shoal Area and Central Nevada Test Area

WILBUR, Steve, Senior Hydrogeologist, GeoTrans Inc.

B.A. Geology
M.S. Geology
Years of Experience: 11
EIS Contributions: Author - Groundwater at NTS

WOODWARD, Bruce D., Scientist, EG&G Energy Measurements Inc.

B.S. Biology
Ph.D. Biology
Years of Experience: 20
EIS Contributions: Author and Reviewer - Biological Resources

WILCZEK, Thomas, Project Manager, International Technology Corp.

B.S./M.S. Environmental Science
Years of Experience: 10
EIS Contributions: ER comment Resolution - ER Text Revision

9.2 Contributors

The following individuals were primarily responsible for contributing administrative, technical, and production support during the process of developing this Final EIS.

ANDERSON, Doyle D., Principal Environmental Engineer, Raytheon Services Nevada

ARMSTRONG, Dennis L., Senior Health Physicist, Waste Management Division, DOE/NV

BARKER, Dennis L., Senior Engineer, Raytheon Services Nevada

BARRETT, Sami, Word Processing Operator, Professional Analysis, Inc.

BETTERIDGE, Richard D., Director, Management Services Division, DOE/NV

BROOKER, Terry, Communications Specialist, GeoTrans, Inc.

BRUMBURGH, Gregg P., Engineer, Lawrence Livermore National Laboratory

CARILLI, John T., Environmental Specialist, Waste Management Division, DOE/NV

CASTRO, Skip, Team Leader, Defense Programs, DOE/HQ

CHASE, Donald P., Project Control Section Chief, Raytheon Services Nevada

COLARUSSO, Angela P., Health Physicist, Waste Management Division, DOE/NV

DISANZA, Frank E., Director, Project Control and Technology Division, DOE/NV

DOERR, Ted Bachman, Ph.D., Science Applications International Corp.

FARRELL, Nancy A., Word Processing Operator, Professional Analysis, Inc.

FELTON, Steve, Principal Engineer, Raytheon Services Nevada

FERRIS, Rhonda L., Cost/Schedule Engineer, Raytheon Services Nevada

FISHER, Gayle R., Community Relations Manager, IT Corp.

FITZSIMMONS, Charles K., Environmental Scientist, Professional Analysis, Inc.

GERTZ, Carl P., Acting Director, Assistant Manager for Environmental Restoration Waste Management Division, DOE/NV

GERUSKY, Thomas M., Health Physicist, DOE/HQ

GINANNI, Joseph M., Health Physicist, Waste Management Division, DOE/NV

GUNDERSON, Robert, General Engineer, DOE/HQ

HALL, David Alan, Health Physicist, Health Protection Division, DOE/ NV

HERNSTROM, Jeannette, Writer/Proofreader, Raytheon Services Nevada

HODGE, Earl W., Electrical Engineer, Safety Division, DOE/NV

HOSSAIN, Quazi A., Engineer, Lawrence Livermore National Laboratory

JACOBSON, Roger L., Program Manager, Desert Research Institute

JARAMILLO, Phyllis M., Environmental Engineer, Raytheon Services Nevada

KARNEY, Catherine C., General Engineer/Project Manager, DOE/NV

LACHMAN, Kirk D., General Engineer, Waste Management Division, DOE/NV

LANGLIE, Gordon C., Program Manager/Environmental Specialist, DOE/HQ

LARASON, Pamela, Word Processing Operator, Bechtel Nevada

LEEDOM, Stephen, Physical Scientist, DOE/NV

LEPPERT, John L., Acting Director, Engineering Division, DOE/NV

LEWIS, Grover, Director, Information Management Division, DOE/NV

MAHERAS, Steven J., Health Physicist, Science Applications International Corp.

MALEY, Karen, Hydrogeologist, GeoTrans, Inc.

MATTHEWS, Patrick K., Principal Engineer, Raytheon Services Nevada

MCCANN, Edward W., Manager, Science Applications International Corp.

MCGRAIL, John M., Project Manager, Device Assembly Facility, Nevada Test Site Office, DOE/NV

MEDINA, Sandie A., Senior Clerk, Bechtel Nevada

MELLINGTON, Stephen A., Director, Environmental Restoration Division, DOE/NV

MILLER, Holly H., Environmental Analyst, Lawrence Livermore National Laboratory

MILLER, Kathleen E., Lead Word Processing Operator, Professional Analysis, Inc.

MORTON, Lee, Principal Engineer, Science Applications International Corp.

O'CONNELL, William J., Engineer, Lawrence Livermore National Laboratory

OLSSON, Karen A., Environmental Scientist, Science Applications International Corp.

OSTRANDER, Murray D., Hydrogeologist, GeoTrans, Inc.

PEDALINO, James P., Project Manager, Raytheon Services Nevada

PUTZ, Carrye D., Technical Writer, IT Corp

QUINTANA, Geralyn, Community Relations Specialist, IT Corp.

RADACK, Phyllis, Principal Specialist, Raytheon Services Nevada

REHFELDT, Kenneth R., Senior Hydrogeologist, GeoTrans, Inc.

ROBERTS, Allen J., Director, Budget & Resource Management Division, DOE/NV

SCHLICK, David L., Principal Waste Management Specialist, Reynolds Electrical & Engineering Co., Inc.

SHAFER, David S., Program Manager, Environmental Restoration Division, DOE/HQ

SHINN, Joseph, H., Group Leader, Environmental Characterization, Lawrence Livermore National Laboratory

SMITH, Debra A., Project Coordinator, Desert Research Institute

SONNENBURG, Terry, Engineer, Raytheon Services Nevada

SPAINHOWARD, Michael T., Word Processing Operator, Bechtel Nevada

STEWART, Lana Mae, Senior Verbatim Reporter, Raytheon Services Nevada

SWINGLE, Kurt W., Environmental Scientist, GeoTrans, Inc.

THOMPSON, Michael A., Team Leader, DOE/HQ

THOMPSON, Robert A., Technical Writer, Science Applications International Corp.

TYRRELL, Robert B., NTS Safeguard & Security Manager, DOE/NV

WEST-THOMPSON, Pamila R., Section Chief, Raytheon Services Nevada

WILCOX, Debra J., Staff Advisor, Science Applications International Corp.

WILKINSON, Cory H., Environmental Analyst, Lawrence Livermore National Laboratory

WILLE, Janet N., Senior Staff Consultant, IT Corp.

WILLS, Cathy Ann, Section Manager, EG&G Measurements Inc.

WOLVERTON, Ken, Senior Engineer/ Administrative Record, MAC Technical Services Co./Raytheon Services Nevada

WRUBLE, Donald T., Program Manager, Professional Analysis, Inc.

YOUNGBERG, Alv D., Environmental Scientist, DOE/NV

ZHU, Chen, Senior Geochemist, GeoTrans, Inc.

This Page Intentionally Left Blank

GLOSSARY

100-year flood. A flood event of such magnitude that it occurs, on average, every 100 years. This equates to a 1-percent probability of occurring in any given year.

A-weighted decibel (dBA). See Decibel, A-weighted.

Absorbed dose. The energy imparted to matter by ionizing radiation per unit mass of irradiated material. The unit of absorbed dose is the rad, which equals 100 ergs per gram.

Ad valorem taxes. A Latin term meaning "according to value" and referring to taxes levied on the assessed valuation of real and personal property, including automobiles.

Air Traffic Control Assigned Airspace. Airspace of defined vertical/lateral limits assigned by Air Traffic Control, for the purpose of providing air traffic separation between the specified activities being conducted within assigned airspace and other instrumental flight rules air traffic. Procedure governing operations within these areas shall be specified in letters of agreement between local military authorities and the air traffic control facility.

Aircraft operation. Air traffic control-related air activity that is counted as follows: (1) count an arrival as one operation; (2) count a departure as one operation; (3) count aircraft touch and go landings as two operations; (4) count an approach followed by a waveoff as two operations; (5) count aircraft that transit the control area of jurisdiction and are provided air traffic control service as one operation (count formation flights in this category as one operation except as provided in 6; (6) count individual aircraft in a formation as one operation when that formation is operating to/from/within an airport traffic area or within special-use airspace.

Alluvial fan. A pattern of sediment deposit caused by running water.

Alluvium. Any stream-laid sediment deposit.

Alpha activity. The emission of alpha particles by fissionable material (uranium or plutonium).

Alpha particle. A positively charged particle, consisting of two protons and two neutrons, that is emitted during radioactive decay from the nucleus of certain nuclides. It is the least penetrating of the three types of radiation (alpha, beta, and gamma).

Ambient. Surrounding or background conditions in the absence of an identifiable source.

Ambient air. That portion of the atmosphere, outside of buildings, to which the general public has access.

Ambient Air Quality Standards. Standards established on a state or federal level that define the limits for airborne concentrations of designated criteria pollutants (nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter with aerodynamic diameters less than 10 microns (PM_{10})., ozone, and lead) to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards). See Criteria Pollutants.

Apron. An outwash plain composed of sediments washed out from the ice.

Aquifer. A body of rock that contains enough saturated permeable material to transmit groundwater and to yield significant quantities of groundwater to wells and springs.

Area of potential effect. In the context of Section 106 of the National Historic Preservation Act, the area in which planned development may directly or indirectly affect a cultural resource.

Areal. The measure of a planar region or of the surface of a solid.

As low as reasonably achievable (ALARA). An approach to radiation protection designed to manage and control individual and collective radiation doses to the workforce and the general public and to ensure that exposure is kept to the lowest level reasonably achievable. The ALARA approach considers aspects of the social, technical, economic, practical, and public impacts.

Assessed valuation. A valuation set upon real estate or other property by a government as a basis for levying taxes. For example, in most municipal jurisdictions in Clark and Nye counties, 35 percent of the taxable value placed upon real and personal property by the chief appraiser of the appraisal district is used as the basis for levying property taxes.

Attainment area. A region that meets the National Ambient Air Quality Standards for a criteria pollutant under the Clean Air Act.

Attenuation. Weakening, reducing the severity.

Average annual daily traffic. For a one-year period, the total volume passing a point or segment of a highway facility in both directions, divided by the number of days in the year.

Background radiation. Radiation from cosmic sources and from radioactive materials that are naturally occurring in the environment. Background radiation due to cosmic rays and natural radioactivity is always present.

Baseline. The initial environmental conditions against which the environmental consequences of various alternatives are evaluated.

Beta activity. The emission of beta particles by radioisotopes.

Beta particle. An elementary particle emitted from a nucleus during radioactive decay; it is negatively or positively charged, identical in mass to an electron, and in most cases easily stopped, as by a thin sheet of metal.

Biocide. A substance that is hazardous to many different organisms.

Biome. A major ecological community.

Byproduct waste. Tailings or waste produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.

Caches. A hole or similar hiding place used for concealment or safekeeping.

Caliche. A desert soil formation consisting of near-surface crystallization of calcite or other soluble minerals by upward movement of solutions.

Candidate species. Species for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threat(s) to support the issuance of a proposed rule to list but issuance of the proposed rule is precluded.

Capacity (traffic). The maximum rate of flow at which vehicles can be reasonably expected to traverse a point or uniform segment of a lane or roadway during a specified time period under prevailing roadway, traffic, and control conditions.

Capital projects fund. A fund used to account for financial resources for the acquisition or construction of major capital facilities.

Carbon-14. An isotope of carbon that occurs both naturally and from the decay of certain radioactive isotopes. Carbon-14 is a well-known tool used to date archaeological finds. Carbon-14 can be generated from wastes as a gas and can rise upward to the surface if precautions are not taken.

Carbon monoxide. A colorless, odorless, poisonous gas produced by incomplete fossil-fuel combustion. One of the six pollutants for which there is a national ambient standard.

Cavity. An underground void created in the rock by the shock wave and heat from an underground nuclear detonation.

Census blocks. Cluster of blocks within the same census tract. Census blocks do not cross county or census tract boundaries and generally contain between 250 and 550 housing units.

Chimney. A tall, roughly cylindrical volume of broken rock and rubble formed underground by the collapse of the overlying medium (overburden) into the cavity.

Class I, II, and III areas. Under the Clean Air Act, clean air areas are divided into three classes. Very little pollution increase is allowed in Class I areas, some increase in Class II areas, and more in Class III areas. National parks and wilderness areas receive mandatory Class I protection. All other areas start out as Class II. States can reclassify Class II areas up or down, subject to federal requirements.

Classified waste. Weapons components and assemblies designated by the U.S. Government, pursuant to Executive Order, statute, or regulation, that require protection against unauthorized information or material disclosure for reasons of national security. Additional security and safeguards management activities are required in the handling of these materials.

Clastic. Pertaining to a rock or sediment composed principally of broken fragments that are derived from preexisting rocks or minerals and that have been transported some distance from their place of origin.

Coefficient. A numerical factor of an elementary algebraic term, as "4" in the term "4x."

Collective effective dose equivalent (person-rem). A summation of the radiation doses received by individuals in an exposed population dose. See population dose.

Colluvium. A general term applied to loose and incoherent deposits, usually at the foot of a slope or cliff and brought there chiefly by gravity, e.g., talus material or cliff debris.

Corrective Action Unit. A Resource Conservation and Recovery Act (RCRA) controlled cleanup unit for which owners and operators are required to perform corrective actions to address release of hazardous wastes.

Corridor. A strip of land of various widths on both sides of a particular linear facility, such as a highway, rail line, or utility line.

Council manager. A form of government whereby a full-time appointed manager oversees the day-to-day operations of the government. The nonpartisan elected council provides policy and direction to the manager.

Counterproliferation. Efforts taken by the U.S. government to combat the international proliferation of weapons that can cause mass destruction.

Criteria pollutants. The Clean Air Act required the U.S. Environmental Protection Agency to set air quality standards for common and widespread pollutants after preparing criteria documents summarizing scientific knowledge on their health effects. Today there are standards for six criteria pollutants: sulfur dioxide, carbon monoxide, particulate matter less than 10 micrometers in diameter (PM_{10}), nitrogen dioxide, ozone, and lead.

Cumulative impact. The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Curie (ci). A unit of radiation that describes the number of atoms undergoing nuclear transformations per unit time, i.e., 3.7×10^{10} disintegrations per second.

Daughter products. Nuclides resulting from the radioactive disintegration of a radionuclide, formed either directly or as the result of successive transformations in a radioactive series. A daughter product may be either radioactive or stable.

Day-night average sound level. A-weighted sound-pressure levels averaged over a 24-hour period with 10 dBA added for events occurring between 10 p.m. and 7 a.m.

Debt service fund. A fund accounting for the accumulation of resources for, and the payment of, interest and principal on general long-term debt.

Decibel. A standard unit for measuring sound-pressure levels based on a reference sound pressure of 0.0002 dynes per square centimeter. This is the smallest sound a human can hear.

Decibel, A-weighted (dBA). Adjusted unit of sound measurement that corresponds to the relative sensitivity of the human ear at specified frequency levels. This represents the loudness as perceived by humans.

Decontamination and decommissioning. The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment, such as radioactive contamination from facilities, soil, or equipment by washing, chemical action, mechanical cleaning, or other techniques, and then removing such from operation.

Diagnostic canister. A canister used in a nuclear test that contains the instrumentation necessary to receive data from the explosion.

Dipole hail. Defense Nuclear Agency program which consists of a series of high explosive experiments in different media to determine levels of disruption to underground facilities.

Direct impact. Effects resulting solely from the proposed program.

Direct effects. Beneficial or deleterious impacts that are caused by an action and occur at the same time and place.

Dose equivalent. The product of the absorbed dose in the tissue or organ of interest, the applicable quality factor(s), and all other necessary modifying factors at the point of interest.

Dynamic experiment. An experiment to provide information regarding changes in materials under conditions caused by the detonation of high explosives. Dynamic experiments are used to gain information on the physical properties and dynamic behavior of materials used in nuclear weapons, including changes due to aging.

Effective dose equivalent. The sum of the products of the dose equivalent to a tissue or organ and the weighting factor applicable to that tissue or organ for all tissues and organs irradiated.

Effluent. A gas or fluid discharged into the environment.

Endangered species. A plant or animal species that is threatened with extinction or serious depletion in its range and is formally listed as such by the U.S. Fish and Wildlife Service.

Environmental Impact Statement. A detailed written statement that helps public officials make decisions that are based on understanding of environmental consequences and to take actions that protect, restore, and enhance the environment.

Eolian. Applied to deposits arranged by the wind. Wind blown.

Ephemeral. Lasting only a brief period of time.

Equivalent sound level (L_{eq}). A single-number representing the fluctuating sound level in decibels over a specified period of time. The average of a fluctuating level of sound energy.

Escarpment. A long cliff or steep slope.

Evapotranspiration. The loss of water from the soil both by evaporation and by transpiration from the plants growing there.

Exclusion zone. The area around ground zero where there is a potential for subsidence.

Fiscal year. A 12-month period of time to which the annual budget applies and at the end of which its financial position and the result of its operations are determined. Clark County, the city of Las Vegas, the city of North Las Vegas, Nye County, the towns of Tonopah and Pahrump, and the Clark County School District and Nye County School District fiscal years run from July 1 through the following June 30. Federal fiscal years are from October 1 through the following September 30.

Fissile. Capable of undergoing fission by interaction with thermal (slow) neutrons. The three primary fissile materials are uranium-233, uranium-235, and plutonium-239.

Fission. A nuclear transformation characterized by the splitting of a nucleus and the simultaneous release of energy.

Fission products. A complex mixture of radioactive nuclides produced as a result of nuclear fission.

FORTRAN. A computer programming language for problems that can be expressed in algebraic terms.

Friable. Easily crumbled or pulverized.

Fugitive dust. Particulate matter composed of soil. Fugitive dust may include emissions from haul roads, wind erosion of exposed soil surfaces, and other activities in which soil is either removed or redistributed.

Fugitive emissions. Emissions released directly into the atmosphere that could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening.

Future baseline. As used in the socioeconomic sections of this document, the future baseline of economic indicators and population are provided by the Alternative 1 and projected to the year 2005. Economic indicators and population for all other alternatives are compared against this future baseline to determine the specific impact of the alternative. In other words, the economic growth of an alternative in a certain year can be determined, and the future baseline for that year is subtracted, leaving the economic impact specifically associated with the alterative.

Gabion. Large cage.

Gamma ray. Short wavelength electromagnetic radiation, with no mass, that is emitted from the nucleus.

General aviation. All aircraft that are not commercial or military aircraft.

Geologic. Any natural process acting as a dynamic physical force on the Earth; i.e. faulting, erosion, and mountain-building resulting in rock formations.

Geologic media. Refers to the characteristics of the rock or soil type at a specific site.

Grant. A contribution by a government or other organization to support a particular function. Grants may be classified as either categorical or block, depending upon the amount of discretion allowed the grantee.

Greater-Than-Class C waste. Low-level waste that is generated by the commercial sector and that exceeds U.S. Nuclear Regulatory Commission concentration limits for Class-C low-level waste as specified in 10 CFR Part 61. DOE is responsible for the disposal of greater-than-Class-C wastes from the DOE nondefense program.

Groundshine. The irradiation caused by the radioactivity which is deposited on the ground.

Groundwater. Subsurface water within the zone of saturation.

Groundwater recharge. Water that infiltrates the land surface and is not lost to evaporation or consumed by plants can percolate downward and replenish the groundwater aquifers. This deep percolation is called recharge. Much of the recharge at the NTS is from mountainous areas as much as 48 km (30 mi) away.

Grubbing. To clear of roots and stumps by digging.

Hazardous waste. Wastes that are designated as hazardous by the Environmental Protection Agency (EPA) or State of Nevada regulations. Hazardous waste, defined under the Resource Conservation and Recovery Act, is waste from production or operation activities that poses a potential hazard to human health or the environment when improperly treated, stored, or disposed. Hazardous wastes that appear on special EPA lists or possess at least one of the four following characteristics: (1) ignitability, (2) corrosivity, (3) reactivity, and (4) toxicity.

HEAST. Acronym for Health Effects Assessment Summary Tables.

Highly enriched uranium. Uranium in which the abundance of the isotope uranium-235 is increased well above the normal (naturally occurring) levels.

High-level waste. The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing of and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation.

Human environment. The natural and physical environment and the relationship of people with the environment.

Human intruder. A hypothetical individual (in a future scenario) who unknowingly contacts the waste(s) in a disposal unit(s) after the loss of institutional control and with no prior knowledge of the waste disposal activities at the site. Intrusion scenarios include, but are not limited to, drilling into the waste or farming on or near the waste disposal facility.

Hydrocarbons. Any of a vast family of compounds containing hydrogen and carbon. Used loosely to include many organic compounds in various combinations. Most fossil fuels are composed predominately of hydrocarbons.

Hydrodynamic test. A dynamic, integrated systems test of a mock-up nuclear package during which the high explosives are detonated and the resulting motions and reactions of materials and components are observed and measured. The explosively generated high pressures and temperatures cause some of the materials to behave hydraulically (like a fluid). Hydrodynamic tests are used to obtain diagnostic information on the behavior of a nuclear weapon's primary assembly (using simulant materials for the fissile materials in an actual weapon) and to evaluate the effects of aging on the nuclear weapons remaining in the greatly reduced stockpile.

Hydrology. A science dealing with the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere.

Hydronuclear experiment. Very low-yield experiment (less than a few pounds of nuclear energy released) to assess primary performance and safety with normal detonation.

Impoundment. To accumulate, as water in a reservoir.

Inertia. That property of a body by virtue of which it offers resistance to a change of its motion of translation.

Infiltration. Water that falls on the land surface that does not runoff but percolates into the ground. Some of this water evaporates, some is used by plants, and some percolates downward to the groundwater.

Infrastructure. Utilities and other physical support systems needed to operate a laboratory or test facility. Included are electric distribution systems, water supply systems, sewage disposal systems, roads, and so on.

Intergovernmental revenues. Revenues received from federal, state, and local sources, such as grants and taxes.

Intermodal. Involving more than one form of carrier during a single transport.

Inertial confinement fusion. A laser initiated nuclear fusion using the inertial properties of the reactants as a confinement mechanism.

IRIS. Acronym for Integrated Risk Information System.

Isopleth. A line, on a map or chart, drawn through points of equal size or abundance.

Isotope. Nuclides having the same number of protons in their nuclei, and hence the same atomic number, but differing in the number of neutrons, and therefore in the mass number. Almost identical chemical properties exist between isotopes of a particular element. The term should not be used as a synonym for nuclide.

Iterative. To say or do repeatedly; involving repetition.

Level of service (public services). A measure describing the amount of public services (e.g., fire protection and law enforcement services) available to community residents, generally expressed as the number of personnel providing the services per 1,000 population.

Level of service (traffic). A qualitative measure describing operational conditions within a traffic stream and how they are perceived by motorists and/or passengers.

Limiting concentrations. The radioactivity that remains in a waste after treatment that poses a limitation or bounding condition to disposal options. The radionuclide that tends to be most mobile, or has the highest potential to affect human health and the environment, becomes the limiting factor for the disposal facility.

Lithic. Made of or related to stone.

Logarithm. The exponent indicating the power to which a fixed number, the base, must be raised to produce a given number.

Low-enriched uranium. Naturally occurring uranium contains only about 0.7 percent U-235 and almost all of the rest is U-238. Low-enriched uranium is enriched in the isotopic content of U-235, greater than 0.7 percent but less than 20 percent of the total mass, for use as light water reactor fuel.

Low-level mixed waste. Low-level waste that also includes hazardous components, as identified in Title 40 CFR Part 261, Subparts C and D.

Low-level waste. Radioactive waste not classified as high-level waste, transuranic waste, or spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic elements is less than 100 nCi per gram.

Maximum individual dose. A radiation dose received by a hypothetical individual whose location and habits are such that the dose received is the maximum expected to result from some given operation or accident.

Military training route. A route developed for the high-speed (greater than 250 knots) low-altitude training of tactical aircrews. Instrument flight rules military training routes are mutually developed by the Federal Aviation Administration and the U.S. Department of Defense (DoD). Visual flight rules military training routes are developed by DoD. Military training routes are published on aeronautical charts. Each military training route has its own unique number consisting of either three or four digits. Three digits indicate that at least one segment of the route is 1,500 feet above ground level, and four digits indicate that the entire route is at or below 1,500 feet above ground level. The number is preceded by either IR or VR, specifying instrument flight rules or visual flight rules, respectively. Since routes are one way, the same route flown the opposite direction will have a separate, distinct number.

Mitigation. Actions and decisions that (1) avoid impacts altogether by not taking a certain action or parts of an action, (2) minimize impacts by limiting the degree or magnitude of an action, (3) rectify the impact by repairing, rehabilitating, or restoring the affected environment, (4) reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action, or (5) compensate for an impact by replacing or providing substitute resources or environments.

Mixed waste. Waste containing both radioactive and hazardous components, as defined by the Atomic Energy Act and the Resource Conservation and Recovery Act, respectively. Mixed waste intended for disposal must meet the Land Disposal Restrictions as listed in Title 40 CFR Part 268. Mixed waste is a generic term for specific types of mixed waste such as low-level mixed waste, and transuranic mixed waste.

Moratorium. A waiting period set by an authority—a suspension of activity.

Moving average. A method consisting of computing an average of the most recent "n" data values in the time series. This average is then used as a forecast for the next period.

National Priority List. A list of sites (federal and state) that contain hazardous materials that may cause an unreasonable risk to the health and safety of individuals, property, or the environment.

National Ambient Air Quality Standards. Section 109 of the Clean Air Act requires the Environmental Protection Agency to set nationwide standards, the National Ambient Air Quality Standards, for widespread air pollutants. Currently, six pollutants are regulated: sulfur dioxide, carbon monoxide, particulate matter less than 10 micrometers in diameter (PM_{10}), nitrogen dioxide, ozone, and lead.

Neutron activation product. The absorption of one or more neutrons into the nucleus of an atom resulting in a new isotope.

Nitrogen dioxide. Gas formed primarily from atmospheric nitrogen and oxygen when combustion takes place at high temperature. Nitrogen dioxide emissions contribute to acid deposition and formation of atmospheric ozone. See Criteria Pollutants.

Nitrogen oxides. Gases formed primarily by fuel combustion, which contribute to the formation of acid rain. Hydrocarbons and nitrogen oxides combine in the presence of sunlight to form ozone, a major constituent of smog.

Noise. Any sound that is undesirable because it interferes with speech and hearing or is intense enough to damage hearing.

Nonattainment area. An area that has been designated by the U.S. Environmental Protection Agency or the appropriate state air quality agency as exceeding one or more national or state Ambient Air Quality Standards.

Nondispersible. Cannot be scattered or spread.

Nonpotable. Water that is unsafe or unpalatable to drink because it contains pollutants, contaminants, minerals, or infective agents.

Nonproliferation. The use of political, economic, and military means to prevent the spread of weapons that cause mass destruction or protect the United States' interests against countries with such weapons.

Nonstochastic. Not random, not involving chance.

Notice of Intent. A notice that an environmental impact statement will be prepared and considered.

Nuclear testing. An underground nuclear weapons test of either a single underground nuclear explosion or two or more underground nuclear explosions conducted at the NTS within an area delineated by a circle having a diameter of two kilometers and conducted within a total period of 0.1 second. The yield of a test shall be the aggregate yield of all explosions in the test.

Operable unit. Division of cleanup of a release site into discrete action units that eliminate or mitigate a release, a threat of a release, or an exposure pathway.

Ozone (ground level). A major ingredient of smog. Ozone is produced from reactions of hydrocarbons and nitrogen oxides in the presence of sunlight and heat.

Paleontological resources. Fossils.

Parabolic. Having the form of a conic section taken parallel to an element of the intersected cone.

Particulate. Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog, found in air or emissions.

Pathogenic. Causing or capable of causing disease.

Peak hour (traffic). The hour of highest traffic volume on a given section of roadway.

Percutaneous. Absorbed through the skin.

Piedmont. Lying or formed at the base of the mountains.

Platform. The area of thinner sediments adjoining a geosynclinal wedge of thicker equivalent beds.

Pathway. The route by which a contaminant reaches a human receptor. Common pathways considered in performance assessments include, but are not limited to, air, groundwater, and surface water.

Playa. A dry, vegetation-free, flat area at the lowest point of an undrained basin.

Population dose (person-rem). A summation of the radiation doses received by individuals in an exposed population. Equivalent to collective dose.

Porosity. The percentage of the volume of rock that is occupied by pore spaces.

Primary roads. A consolidated system of connected main roads important to regional, statewide, and interstate travel. They consist of rural arterial routes and their extensions into and through urban areas of 5,000 or more population.

Protective levels. Those levels which would meet acceptable human health and risk factors based on future land uses, as established through the Federal Facility Agreement and Consent Order process.

Quality factor. A factor which is used to account for the difference in biological effectiveness for different types of radiation. The quality factor is directly related to the energy deposited per unit path length by radiation in traversing a tissue or organ.

Radiation. The emissions, either electromagnetic or particulate, resulting from the transformation of an unstable atom or nucleus.

Radioactive decay. The process in which a nucleus emits radiation and undergoes spontaneous transformation into one or more different nuclei.

Radioactive source-term. Initial quantity of radionuclides at a release point from which dose rate and total dose as a function of distance from the release point may be calculated after accounting for radioactive decay and atmospheric dispersal.

Radioactive waste. Solid, liquid, or gaseous material that contains radioactive nuclides regulated under the Atomic Energy Act of 1954, as amended, and of negligible economic value considering costs of recovery.

Radioactive Waste Management Site. Designated location where radioactive waste handling, storage, or disposal operations are conducted under management control.

Radioisotopes. Radioactive nuclides of the same element (same number or protons in their nuclei) that differ in the same number of neutrons.

Radionuclide. Radioactive particle, man-made or natural, with a distinct atomic weight number. Can have a long life as soil or water pollutants.

RADTRAN. A computer code combining user-determined meteorological, demographic, transportation, packaging, and material factors with health physics data to calculate the expected radiological consequences and accident risk of transporting radioactive material.

Receptors. Plants, animals, and people that may be exposed to contamination. A receptor can be exposed via the air and soil pathways (for example, by inhalation, ingestion, and contact), and the surface and groundwater pathways (by contact and ingestion).

Record of decision. A public document that explains which cleanup alternative will be selected for the area of concern.

Rem. A unit of dose equivalent or effective dose equivalent equal to the product of the absorbed dose in rad, the applicable quality factor(s), all other necessary modifying factors, and the applicable weighting factors as appropriate.

Remediate. The process, or a phase in the process, of rendering radioactive, hazardous, or mixed waste environmentally safe, whether through processing, entombment, or other methods.

Render-safe mission. A means to make a nuclear weapon secure from unwanted detonation.

Repository. A mined, deep geologic disposal facility for spent nuclear fuel and high-level radioactive waste.

Residuals. The composition and form of a waste after treatment. For example, solidified incineration ash would be a residual.

Restricted area (airspace). Airspace designated under Federal Acquisition Requirements Part 73 within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Restricted areas are designated when determined necessary to confine or segregate activities considered to be hazardous to nonparticipating aircraft.

Retrofit (facility). Addition of a pollution control device on an existing facility without making major changes to the generating plant.

Retrofit (weapon). Modification of the components of an existing weapon without making major changes to the basic design.

Riparian. The banks of a body of water.

Riprap. A loose assemblage of stones or other materials used in water or soft ground to prevent erosion.

Rod claddings. An external layer of material applied directly to nuclear fuel rods or other material to provide protection from a chemically reactive environment, to provide containment of radioactive products produced during the irradiation of the composite, or to provide structural support.

Roentgen (R). A unit of the amount of exposure to electromagnetic, ionizing radiation. One R is the amount of electromagnetic, ionizing radiation necessary to generate 2.58×10^{-4} coulombs of electric charge in one kilogram of dry air at standard temperature and pressure.

Scope. The range of actions, alternatives, and impacts to be considered in an environmental impact statement.

Significant. The common meaning of significant is; "having or likely to have considerable influence or effect." As it pertains to the National Environmental Policy Act, "significant" requires that both context and intensity be considered in evaluating impacts (40 CFR Part 1508). Context could include surrounding circumstances such as society as a whole, the affected region, the affected interests, and the locality. Intensity refers to the severity of the impact, and requires that several factors be evaluated. These factors may include the degree to which public health and safety are affected, unique characteristics of the geographic area, and others.

Skarn. Metamorphic rock rich in iron.

Source Material. Initial quantity of any material released into the environment.

Source-term. An initial quantity of any material released into the environment from which concentrations are a function of distance and may be estimated from calculational models which account for radiological/chemical decay and atmospheric dispersal.

Special nuclear materials. As defined in Section 11 of the Atomic Energy Act of 1954, special nuclear material means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Nuclear Regulatory Commission determines to be special nuclear material or (2) any material artificially enriched by any of the foregoing.

Special revenue fund. A fund that accounts for the proceeds of specific revenue sources that are legally restricted to expenditures for specified purposes.

Specific activity. The concentration of radioactivity, given as the number of Becquerels (Bq) or curies (Ci) per unit mass or volume.

Spent fuel. Nuclear reactor fuel that, through nuclear reactions, has been sufficiently depleted of fissile material to require its removal from the reactor.

Stakeholder(s). Interested and/or affected people or groups.

Stockpile stewardship. The science and technology aspects of ensuring the safety, security, and reliability of the United States' stockpile of nuclear weapons, including research and development to provide the technologies required for stockpile management. This includes a program of activities to maintain confidence in the safety, reliability, and performance of the stockpile.

Storage. The collection and containment of waste or spent nuclear fuel in such a manner as not to constitute disposal of the waste or spent nuclear fuel for the purposes of awaiting treatment or disposal capacity.

Stratigraphic. Division of geology dealing with the definition and description of rocks and soils, especially sedimentary rocks.

Subcritical experiment. A dynamic experiment that involves the use of special nuclear material and does not achieve a condition of criticality, i.e., no self-sustaining nuclear reaction.

Subsidence. A depression formed at the surface of the ground by an underground nuclear explosion. The dimensions of the subsidence are a function of explosive yield, depth of burial, and geologic site characteristics.

Subsurface. A zone below the surface of the Earth whose geologic features are principally layers of rock that have been tilted or faulted and are interpreted on the basis of drill hole records and geophysical (seismic or rock vibration) evidence. Generally, it is all rock and solid materials lying beneath the Earth's surface.

Sulfur dioxide. A toxic gas that is produced when fossil fuels are burned. Sulfur dioxide is the main pollutant involved in the formation of acid rain. The major source of sulfur dioxide in the United States is coal-burning electric utilities.

Surface ground zero. The location at ground level where the emplacement hole is drilled.

Surficial soils. Soils which occur on the Earth's surface, specifically, the upper 12 to 20 cm of tilled soil.

Tectonic. Of, pertaining to, or designating the rock structure and external forms resulting from the deformation of the earth's crust. As applied to earthquakes, it is used to describe shocks not due to volcanic action or to collapse of caverns or landslides.

Temporal. Limited or finite; related to time rather than space.

Threat-Nuclear-Device Simulants. Radioactive sources which simulate the radioactive character of an unexploded nuclear device.

Threatened species. A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Transmissivity. The rate at which water is passed through a unit width of rock under a unit hydraulic gradient.

Transuranic mixed waste. Waste containing both transuranic and hazardous components, as identified in Title 40 CFR Part 261, Subparts C and D.

Transuranic waste. Radioactive waste containing alpha-emitting radionuclides having an atomic number greater than 92 and half-lives greater than 20 years, in concentrations greater than 100 nanocuries (nCi) per gram.

Transuranic radionuclide. Any radionuclide having an atomic number greater than 92.

Trip generation. A determination of the quantity of trip ends associated with a parcel of land.

Tritium. A radioactive isotope of the element hydrogen, with two neutrons and one proton in its nucleus. Common symbols for the isotope are H^3 and H-3.

Unemployment rate. The number of civilians, as a percentage of the total civilian labor force, without jobs but actively seeking employment.

Unsaturated Zone. The subsurface zone between the land surface and the top of the groundwater. The unsaturated zone at the NTS is thick, ranging from 106 m (525 ft) to almost 909 m (3,000 ft) in some areas.

Use tax. A tax incurred in those instances when articles purchased in an area where no sales tax is levied are brought back for use in an area where the sales tax is imposed.

Vitrification. A waste treatment process that uses glass (e.g., borosilicate glass) to encapsulate or immobilize radioactive wastes to prevent them from reacting in disposal sites.

Volume (traffic). The total number of vehicles that pass over a given point or section of a roadway during a given time interval. Volumes may be expressed in terms of annual, daily, hourly, or subhourly periods.

Waste acceptance criteria. The requirements specifying the characteristics of waste and waste packaging acceptable to a waste receiving facility and the documents and processes the generator needs to certify that waste meets applicable requirements.

Waste management. The planning, coordination, and direction of those functions related to generation, handling, treatment, storage, transportation, and disposal of waste, as well as associated surveillance and maintenance activities.

- Site - Made up of units that accommodate specific types of waste. The Radioactive Waste Management Sites at Areas 3 and 5 are sites.
- Unit - The seven craters at Area 3, the 20 trench Mixed Waste Disposal Unit, and the low-level waste pits and trenches in the 92 acre active portion of Area 5 are units.
- Crater - An individual disposal cell similar to a trench or pit as U3ah or U3ah/at.
- Trench - The individual disposal cells in the Mixed Waste Disposal Unit, the individual cells for such as TO3U, are trenches.
- Pit - As in Pit 3 (PO3U) is an individual disposal cell similar to a trench.
- Cell - Trenches, Pits, and Craters are all waste management cells.

Waste management facility. All contiguous land, structures, other appurtenances, and improvements on the land, used for treating, storing, or disposing of waste.

Watershed. The land area that drains into a stream or river.

Wetlands. An area that is regularly saturated by surface water or groundwater and subsequently supports vegetation that is adopted for life in saturated soil conditions.

Wickiup. A frame hut covered with matting, bark, brush, or the like and used by the nomadic Indians of North America.

Work-for-Others-Program. Reimbursable programs (work) funded by other than DOE Defense Programs, i.e. Department of Defense and Defense Nuclear Agency.

X-ray. Ionizing, electromagnetic radiation emitted from the electron field of an unstable atom. X-rays are similar in nature, but generally lower in energy than gamma rays.

Zeolitized rocks. Various hydrous silicates occurring as secondary minerals in lava matrices and cavities within lavas.

This Page Intentionally Left Blank

LIST OF ACRONYMS

AIWS	American Indian Writers Subgroup
amp	ampere
Bd	baud
Bq	Becquerel
Bq/L	Becquerels per liter
BREN	Bare Reactor Experiment Nevada Tower
°C	degree Celsius
C	Coulomb
C/kg	coulomb per kilogram
CFR	Code of Federal Regulations
CGTO	Consolidated Group of Tribes and Organizations
Ci	curie
Ci/yr	curies per year
cm	centimeter
cm^2	square centimeter
dB	decibel
dBA	A-weighted sound levels
DEIS	Draft Environmental Impact Statement
DoD	Department of Defense
DOE/NV	U.S. Department of Energy, Nevada Operations Office
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
°F	degree Fahrenheit
FEIS	Final Environmental Impact Statement
ft	feet
ft^2	square feet
ft^3	cubic feet
ft/sec	feet per second
ft/yr	feet per year
g	local acceleration due to gravity
gal	gallon

gal/hr	gallon per hour
gal/s	gallons per second
gal/yr	gallons per year
gpm	gallon per minute
HE	high explosive
HF	high frequency
Hz	hertz
in.	inch
in^2	square inches
in^3	cubic inch
J	joule
kg	kilogram
kg/yr	kilograms per year
km	kilometer
km^2	square kilometer
kph	kilometers per hour
kt	kilotons
kV	kilovolt
kw	kilowatt
L	liter
L/min	liters per minute
L/s	liters per second
lb	pound
lb/yr	pounds per year
m	meter
m^2	square meter
m^3	cubic meter
m/sec	meters per second
m/yr	meters per year
MEI	maximally exposed individuals
MHz	megahertz
μCi	microcurie
μg	microgram
mg	milligram

mg/L	milligram per liter
mg/yr	milligram per year
mi	mile
mi^2	square mile
mm	millimeters
mph	miles per hour
mR	milliroentgen
mrem/hr	millirem per hour
mrem/yr	millirem per year
mW	milliwatt
MW	megawatt
NAFR	Nellis Air Force Range
nCi	nanocurie
ns	nanosecond
NTS	Nevada Test Site
NV/ERP	Nevada Environmental Restoration Program
OCC	Operation Coordinator Center
ppm	parts per million
PCB	polychlorinated biphenyl
pCi/L	picocurie per liter
PEIS	Programmatic Environmental Impact Statement
PM_{10}	airborne particulate matter smaller than 10 micrometers (microns)
R	roentgen
rem	roentgen equivalent man
SHPO	State Historic Preservation Officer
tons/yr	tons per year
TNT	trinitrotoluene
TRU	transuranic
UHF	ultra high frequency
V	volt
w	watt
yd	yard
yd^2	square yard
yd^3	cubic yard

This Page Intentionally Left Blank

Measurements and Conversions

The following information is provided to assist the reader in understanding certain concepts in this NTS Environmental Impact Statement (EIS). Definitions of technical terms can be found in the Glossary and names and symbols for units of measure can be found in the Acronym List.

The primary units used in this report are metric units with English equivalents enclosed in parenthesis. DOE Order 5900.2A, "Use of the Metric System of Measurement," prescribes the use of this system in DOE documents.

To signify decimal multiples and submultiples, the following prefixes may be used:

Submultiple	Prefix	Symbol	Multiple	Prefix	Symbol
10^{-2}	centi	c	10^{2}	hecto	h
10^{-3}	milli	m	10^{3}	kilo	k
10^{-6}	micro	μ	10^{6}	mega	M
10^{-9}	nano	n	10^{9}	giga	G
10^{-12}	pico	p	10^{12}	tera	T

The following Conversion Table lists the mathematical values or formulas needed for conversion between metric and English units:

Conversion Table

Multiply	By	To Obtain	Multiply	By	To Obtain
cm	0.3937	in	in	2.5400	cm
m	3.2808	ft	ft	0.3048	m
km	0.6214	mi	mi	1.6093	km
g	0.0353	oz	oz	28.3286	g
kg	2.2046	lb	lb	0.4536	kg
ac-ft	1233.4818	m^3	m^3	0.00081	ac-ft
ac-ft	1612.9032	yd^3	yd^3	0.00062	ac-ft
L	0.2642	gal	gal	3.7853	L
m^2	10.7639	ft^2	ft^2	0.0929	m^2

Multiply	By	To Obtain	Multiply	By	To Obtain
km^2	0.3861	mi^2	mi^2	2.5900	km^2
m^3	35.3145	ft^3	ft^3	0.0283	m^3
m^3	263.1579	gal	gal	0.0038	m^3
pCi	1,000	nCi	nCi	0.001	pCi
μCi/mL	10^9	pCi/L	pCi/L	10^{-9}	μCi/mL
Ci/m^3	10^{12}	pCi/m^3	pCi/m^3	10^{-12}	Ci/m^3
mCi/cm^3	10^{15}	pCi/m^3	pCi/m^3	10^{-15}	mCi/cm^3
nCi/m^2	1.0	mCi/km^2	mCi/km^2	1.0	nCi/m^2
ppm	1,000	ppb	ppb	0.001	ppm
R	2.58×10^{-4}	C/kg	C/kg	3876.0	R
mR	1,000	R	R	0.001	mR
Bq	2.703×10^{-11}	Ci	Ci	3.7×10^{10}	Bq
Bq	1.0	dps	dps	1.0	Bq
Gy	100	rad	rad	0.01	Gy
Sv	100	rem	rem	0.01	Sv
°C	(°C x 9/5) +32	°F	°F	(°F - 32) x 5/9	°C

INDEX

*U.S. GOVERNMENT PRINTING OFFICE: 1996-785-718

About NEPA

The National Environmental Policy Act (NEPA) was enacted to ensure that Federal decisionmakers considered the effects of proposed actions on the human environment and to lay their decisionmaking process open for public scrutiny. NEPA also created the President's Council on Environmental Quality (CEQ) to establish a NEPA review process. DOE's NEPA regulations (10 CFR 1021) augment the CEQ regulations (40 CFR 1500- 1508).

An environmental impact statement (EIS) documents a Federal agency's analysis of the environmental consequences that might be caused by major Federal actions, defined as those proposed actions that might result in a significant impact to the environment. An EIS:

- Explains the purpose and need for the agency to take action
- Describes the proposed action and the reasonable alternative courses of action that the agency could take to meet the need
- Describes what would happen if the proposed action were not implemented — the "No Action" (or Status Quo) Alternative
- Describes what aspects of the human environment would be affected if the proposed action or any alternative were implemented
- Analyzes the changes, or impacts, to the environment that would be expected to take place if the proposed action or an alternative were implemented, compared to the expected condition of the environment if no action were taken.

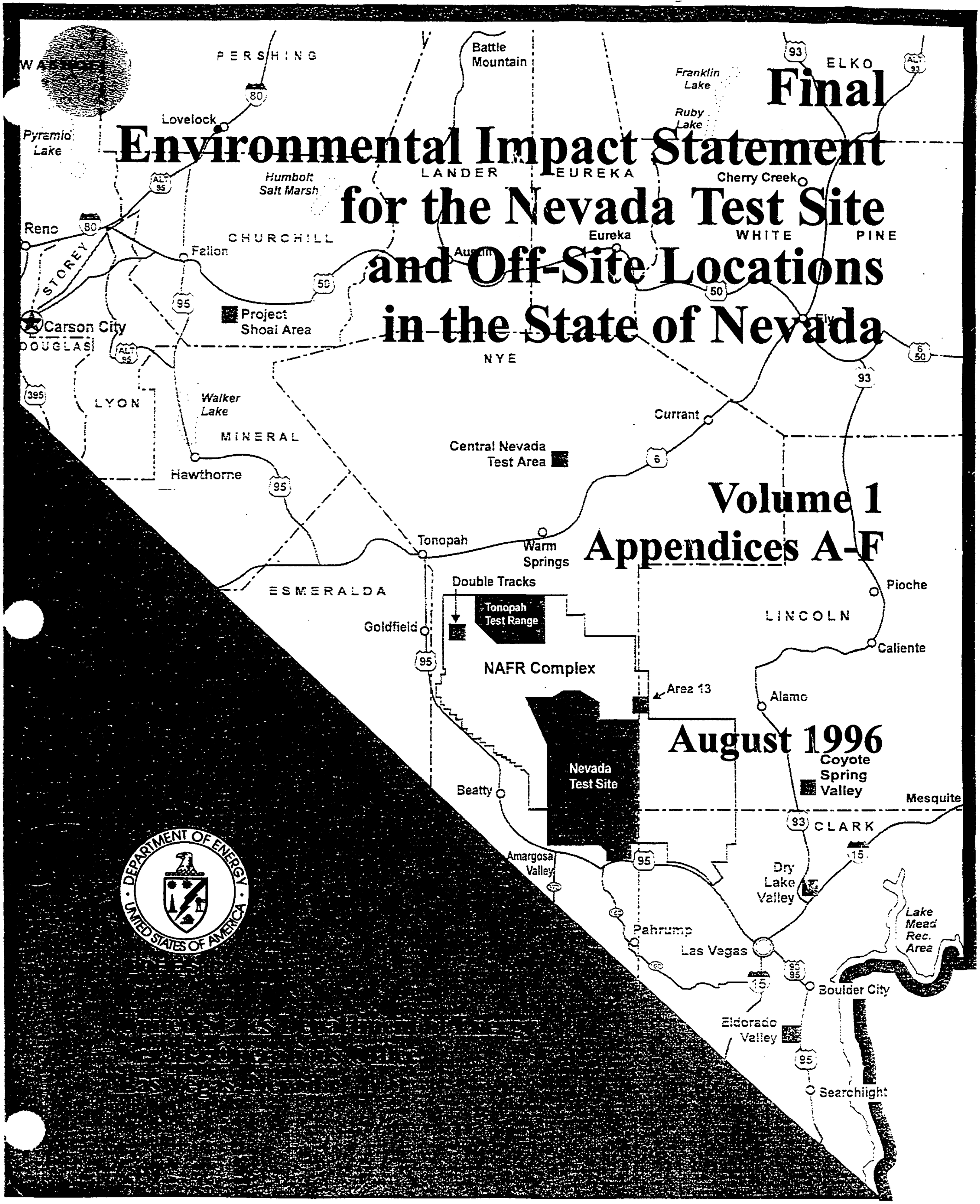
The DOE EIS process follows these steps:

- Notice of Intent, published in the *Federal Register*, identifies potential EIS issues and alternatives and asks for public comment on the scope of the analysis
- Public scoping period, with at least one public meeting
- Implementation Plan, which gives the results of public scoping and provides a "roadmap" of how the EIS will be prepared
- Draft EIS, issued for public review and comment, with at least one public hearing
- Final EIS, which incorporates the results of the public comment period on the draft EIS
- Record of Decision, which states:
  - — The decision
  - — The alternatives that were considered in the EIS, and the environmentally preferable alternative
  - — All decision factors, such as cost and technical considerations, that were considered by the agency along with environmental consequences
  - — Mitigation measures designed to alleviate adverse environmental impacts.
- Mitigation Action Plan, which explains how the mitigation measures will be implemented and monitored.

Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada

Volume 1
Appendices A-F

August 1996



Final
Environmental Impact Statement

for
the Nevada Test Site and Off-Site Locations in the State of Nevada

Volume 1

Appendices A - F

U.S. Department of Energy
Nevada Operations Office
Las Vegas, Nevada

TABLE OF CONTENTS

List of Figures

List of Tables

Appendix A

DESCRIPTION OF PROJECTS AND ACTIVITIES

APPENDIX A
DESCRIPTION OF PROJECTS AND ACTIVITIES

Appendix A contains the description of the existing and potential projects, future work activities, and services associated with the five Nevada Test Site (NTS) mission programs: Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. A description of NTS site-support activities is provided in Section A.6. Table A-4, located at the end of this appendix, presents the resource demands and requirements of the component projects and anticipated activities of mission programs at the NTS. These data were the basis of detailed environmental analyses described in Chapter 5. The back portion of Table A-4 outlines the primary assumptions used to develop the results presented in Table A-4. The assumptions are presented by resource type, (e.g., expenditures) and by mission program for each alternative and general assumption. Projects included in each of the alternatives are described within the mission program summaries in Appendix A. Within each section, the existing and potential future projects, activities and services associated with each alternative are described. Appendix A provides information on current projects and activities, as well as information on those projects, activities and services that could occur over the next 10 years. The purpose of this appendix is to:

- Present information used to evaluate the alternatives proposed in the NTS Environmental Impact Statement (EIS)
- Provide descriptions of the projects, activities, and services discussed in the main chapters of the NTS EIS.

A.1 Defense Program

Among the major responsibilities of the U.S. Department of Energy (DOE) at the NTS and the Tonopah Test Range is the continued stewardship of the nation's nuclear weapons stockpile. The NTS must also maintain a nuclear weapons testing capability. Other Tonopah Test Range Defense Program responsibilities are described in Section A.1.1.4.

A.1.1 Alternative 1

Under Alternative 1, Defense Program operations would continue under the ongoing nuclear test moratorium and negotiation of the Comprehensive Test Ban Treaty. Two scenarios could occur under this alternative. In one scenario, the President would not direct any nuclear yield testing, and the DOE's nuclear-testing-related activities would be limited to maintaining readiness to conduct tests. This scenario emphasizes NTS science-based stockpile stewardship experiments and operations. The other scenario (which the DOE believes unlikely but consistent with the site's historical mission) includes a contingent possibility that the President, through an end of the moratorium or through the "supreme national interest" clause of a test ban treaty, would direct the DOE to conduct one or more nuclear-yield tests in order to achieve a high level of confidence in the safety and reliability of the weapon type in question. One or more nuclear-yield tests could be conducted as directed by the President. The activities associated with this alternative are also presented below.

A.1.1.1 Stockpile Stewardship. Stockpile stewardship includes nuclear weapons testing and science-based weapons experimentation and ensures the safety, reliability, and performance of the nation's nuclear stockpile. The research and development of the technologies required for stockpile management are included under stockpile stewardship. The DOE Nevada Operations Office (DOE/NV) also maintains the capability of locating, retrieving, and destroying damaged nuclear weapons. Descriptions of stockpile stewardship activities addressed in the NTS EIS are provided below. These activities are related to science-based experiments which will be conducted in emplacement holes depicted in Figure A-1.

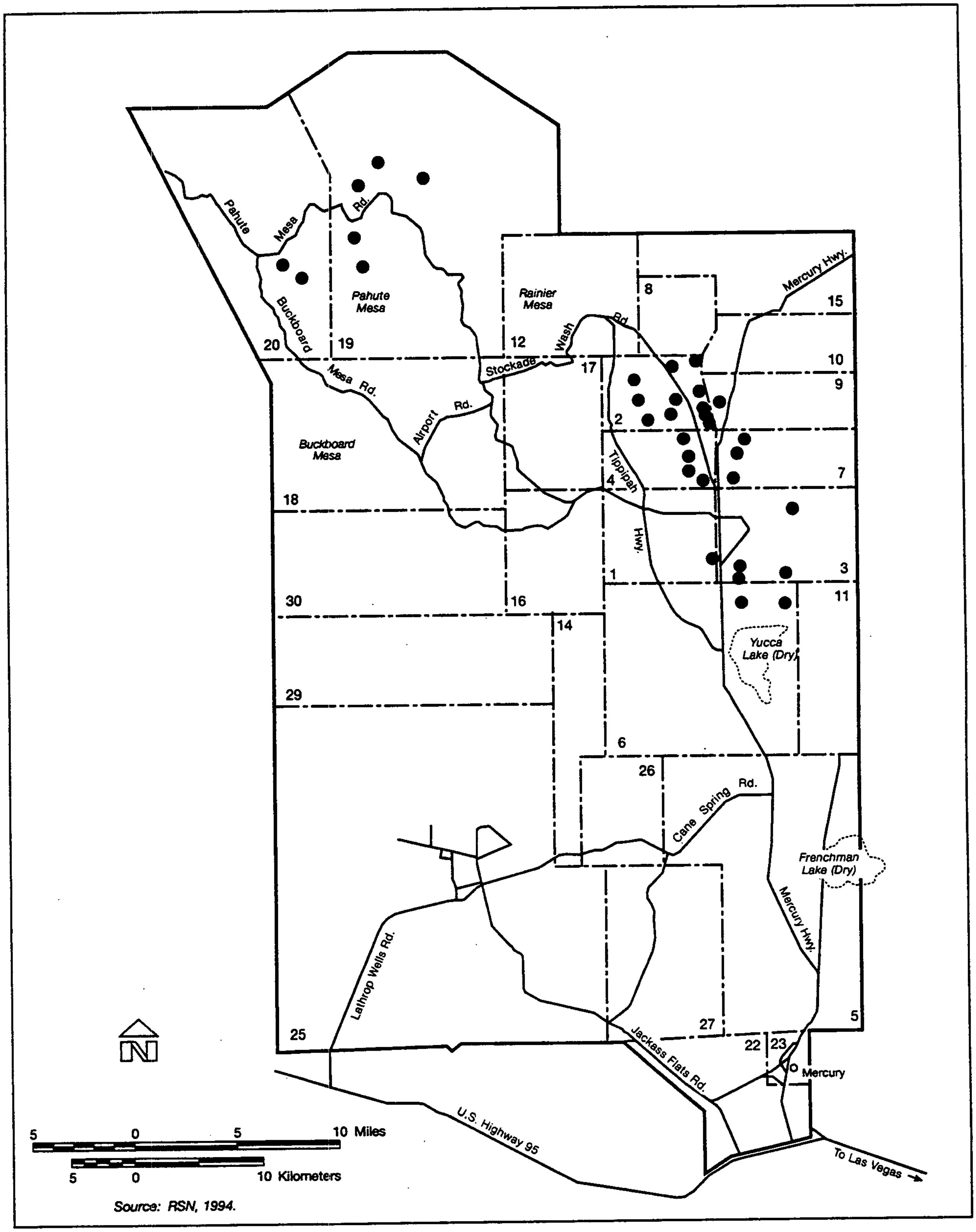


Figure A-1. Location of stockpile stewardship emplacement on the NTS

A.1.1.1.1 Nuclear Test Readiness—As required by Presidential directive, the DOE will maintain the readiness and capability to conduct nuclear tests within 2 to 3 years if directed by the President. With respect to the NTS under Alternative 1, this directive means that Defense Program efforts would continue to maintain the required infrastructure and critical personnel necessary to meet this requirement. The DOE will maintain personnel skills through the conduct of dynamic experiments, (including subcritical experiments, involving special nuclear material) hydrodynamic tests, and exercises. The few capabilities essential for nuclear testing not used during the experimental program will be exercised periodically to maintain the relevant skill bases. Laboratory personnel will maintain the necessary technical competency by performing selected nuclear explosive operations at the Device Assembly Facility. These operations have been analyzed in the Device Assembly Facility Environmental Assessment. The necessary infrastructure, including facilities, will be maintained in compliance with all regulatory, safety, and programmatic requirements.

A.1.1.1.2 Underground Nuclear Weapons Testing—Since 1963, the United States has conducted all of its nuclear weapons tests underground in accordance with the terms of the Limited Test Ban Treaty. Hence, complete containment of all nuclear weapons tests is a dominant consideration in nuclear test operations.

Various methods are used for emplacing nuclear test devices so that the ensuing explosion is contained. The most common method is to emplace a test device at the bottom of a vertically drilled hole. Another method is to emplace a test device within a tunnel that has been mined horizontally to a location that is sufficiently deep to provide containment.

Emplacement of a test device in a drill hole or tunnel is not accomplished until the containment design has been reviewed by the Containment Evaluation Panel. The Containment Evaluation Panel is composed of individuals who have extensive experience in nuclear testing and associated phenomenology. The Containment Evaluation Panel assists the Manager, DOE/NV, in the review of proposed nuclear tests to ensure that each containment design is one that will provide reasonable assurance of satisfactory containment of radioactivity[1] or release radioactivity only under controlled conditions in compliance with all treaty constraints and under health and safety guidelines established by the Secretary of Energy.

Panel membership include scientists and engineers from the Los Alamos National Laboratory, Lawrence Livermore National Laboratory, Sandia National Laboratories, the Defense Nuclear Agency, the U.S. Geological Survey, the Desert Research Institute, and up to four independent consultants. The Panel examines each factor that might contribute to the unwanted escape of radionuclides into the atmosphere during or after the detonation. Such reviews consider in detail the device yield, depth of burial, geology, hydrology, characteristics of the soil and rock, location of the emplacement site (including the proximity to and the success of previous test locations), closure methods, stemming design, and drilling and construction history.

A detailed description of the steps associated with nuclear weapons tests in vertical drill holes is provided below.

<u>TESTS IN VERTICAL DRILL HOLES</u>—Tests in vertical drill holes are of two types: smaller-yield devices in relatively shallow holes in the Yucca Flat area (Areas 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10) and higher-yield devices in deeper holes on Pahute Mesa (Areas 18, 19, and 20). Tests at the Yucca Flat and Pahute Mesa event sites have the same general requirements, but differ in the magnitude of the operations. Deeper-hole operations disturb a larger area, require more on-site equipment, and have a higher requirement for electrical power and utilities. The distance from the core of the infrastructure is also a factor; Pahute Mesa operations are 48 to 81 kilometers (km) (30 to 50 miles [mi]) farther away than Yucca Flat.

---

[1] Satisfactory containment, as defined by the Manager, DOE/NV, will result in no measurable radioactivity off site by normal monitoring equipment and no unanticipated release of radioactivity on site.

The following description of a vertical drill-hole test breaks down the operation into seven individual steps:

Step 1. Site Selection and Drilling. There are two subsets of site selection as it applies to nuclear tests, namely: selection of an existing drill hole for a specific event (Figure A-1), and selection of a new drill site from the Nuclear Test Zone (Figure 3-3) for a specific event because the stockpile does not contain a suitable site. The goal of siting is to optimize the various parameters so that operational feasibility and successful containment of yields of interest to device designers can be attained at a suitably low cost.

Many factors are considered. Some of these are: (1) scheduling of field resources; (2) event schedules; (3) shock sensitivity of a given experiment and possible interactions with other experiments; (4) depth range required for a suitable device emplacement; (5) geologic structure; (6) geologic material properties; (7) depth of standing water; (8) potential drilling problems; (9) adjacent expended sites, craters, chimneys, subsurface collapses; (10) adjacent open emplacement holes or unplugged post-shot or exploratory holes; and (11) non-test program constraints such as groundwater concerns, roads, and power lines (Olsen, 1993).

When drilling is required after a test location is chosen by the sponsoring national laboratory, a drilling program outlining the requirements of the specific hole is completed. The event site is surveyed, staked, and checked for cultural and biological resources. When all environmental clearances are completed, the site is graded and leveled, and a drilling-fluid sump is constructed to contain drilling fluid and cuttings. A drill rig, usually with its own power and utilities, is moved onto the site. Water is brought in by truck, or piped in, and mixed with drilling compounds to fill the sump. The hole is then drilled using standard NTS big-hole drilling techniques. A normal hole is from 1 to 3 meters (m) (48 to 120 inches [in.]) diameter and from 213 to 762 meters (m) (600 to 2,500 feet [ft]) deep. During drilling, samples of drill cuttings are collected at 3-m (10-ft) intervals, and rock cores are taken as required. After drilling is complete, geophysical logs are run into the hole to evaluate the condition of the hole and gain a more thorough understanding of the geology. The drill site is then secured by filling the sump and installing specially designed covers over the hole.

Step 2. Event-Site Engineering and Construction. When a hole is selected as a location for a nuclear test, the area around the hole is surveyed and staked according to the criteria set forth by the sponsoring national laboratory. The cultural and biological surveys are then rerun to determine if the status of the area has changed. The hole is also uncovered, and selected geophysical logs are refed in the hole to reconfirm its condition.

Once it is assured that the environmental clearances are complete, an area is cleared and leveled for the surface ground-zero equipment; another area close by the selected site is cleared and leveled for the recording trailer park. This is a typical earthmoving operation; native materials are used to top the pads or, if active material is unstable, decomposed granite fill is used. The on-site construction is temporary and is abandoned after the event is complete. Concrete pads are poured around the surface ground-zero to provide a stable platform for downhole operations and to provide a base for the assembly towers. Equipment is moved in to emplace the nuclear device in the hole, record the data produced, and provide radiological and seismic monitoring of the site. An extensive grounding system is used to establish baseline instrumentation grounds, which might include a pit containing salt water. The equipment to be left in position during the explosion is protected with an aluminum-foil hexcell-shaped shock-mounting material or dense foam. A circle of radiation detectors is placed back from the surface ground-zero to detect and assess any releases from the experiment. Finally, a perimeter fence is erected, and access is controlled both into and out of the event site.

Step 3. Device Delivery and Assembly. For safety reasons, the nuclear device is delivered to the NTS unassembled. The device is assembled and inserted into a container at the Device Assembly Facility in Area 6 or in the Area 27 Assembly/Staging Facilities. The Device Assembly Facility is discussed at the end of this section. The device, now encased in the container, is delivered to the event site accompanied by armored convoy. It is then attached to the diagnostics canister in preparation for emplacement into the hole. Checks are run, and alignment is assured. Heavy security is maintained during all operations that involve the nuclear device.

Step 4. Diagnostic Assembly. A diagnostic canister is assembled off site and transported to the test site. A typical diagnostic canister might be 2 m (8 ft) in diameter and 30 m (120 ft) long and contain all the instrumentation required to receive data at the time of the explosion (real time). The diagnostic canister might contain lead and other materials as shielding for the detectors. Upon arrival at the event site, the diagnostic canister is installed in the assembly tower to be mated with the device on site. Instrumentation cables are connected to the experiments and the recording trailer park. Slack in the cables allows the diagnostic canister to be lowered into the hole.

Step 5. Emplacement of the Experiment. The nuclear explosive and special measurement devices are moved to the hole and lowered to the detonation position; all required diagnostic materials and instrumentation cables are also lowered into the hole at this time. Downhole operations are conducted according to a defined checklist and are monitored by independent inspectors. The whole assembly is placed on a set of fracture-safe beams that span the opening. Any auxiliary equipment is then lowered into the hole, and the area is secured. Emplacement equipment is removed from the area, and test runs are conducted on the downhole experiment.

The hole is stemmed to prevent radioactive materials from escaping during or after the experiment. Stemming materials used to backfill the hole are generally placed in alternating layers, according to the containment specification. Alternate layers of 1-centimeter (cm) (3/8–in.) pea gravel are combined with fine material to provide a barrier equal to or better than the undisturbed material. Sand, gypsum, grout, cold tar, or epoxy plugs are also placed in the hole to provide impenetrable zones. In these zones, the instrument cables are sealed to prevent a radioactive gas path to the surface. Once completed, the area is cleared of unnecessary equipment. A report is compiled for the Containment Evaluation Panel to show that the as-built condition reflects the containment design plan.

Step 6. Test Execution. After the Containment Evaluation Panel accepts the as-built design of containment and all preliminary tests are successful, the nuclear device is ready for detonation. Security operations begin two days before the test to assure that all nonevent-related personnel are evacuated prior to the test for security and personal safety. The explosive is armed. Radiation monitors are activated, and aircraft with tracking capability circle the site in case gas and debris unexpectedly vent to the surface. Weather forecasts and fallout pattern predictions are reviewed. Then, detonation occurs.

When an underground nuclear device is detonated, the energy release almost instantaneously produces extremely high temperatures and pressure that vaporizes the nuclear device and the surrounding rock. Within a fraction of a second after detonation, a generally spherical cavity is formed at the emplacement position. As the hot gases cool, a lining of molten rock puddles at the cavity bottom.

After a period of minutes to hours, as the gases in the cavity cool, the pressure subsides and the weight of the overburden causes the cavity roof to collapse, producing a vertical, rubble-filled column known as a rubble chimney.

The rubble chimney commonly extends to the ground surface, forming a subsidence crater. Numerous subsidence craters are present at the test site (see Plate 7, Volume 2). Subsidence craters generally are bowl-shaped depressions with a diameter ranging from about 60 to 600 m (200 to 2,000 ft) and a depth ranging from a few meters up to 60 m (200 ft), depending on the depth of burial and the explosive energy yield. Some deeply buried explosions of low yield form cavities that do not collapse to the surface and, consequently, do not create subsidence craters. Past underground nuclear tests in Yucca Flat and on Pahute Mesa have fractured the ground surface above the explosions, causing displacement of the surface along preexisting faults adjacent to explosion sites.

After the test is conducted, the event site remains secure until it can be assured that the event has been contained. After a suitable time, a reentry crew is dispatched to the site. Data are retrieved, and the condition of equipment is noted. After all is assured to be secure, normal NTS operations resume. The event site is roped off, outlining an exclusion zone where there is danger of potential cratering.

Step 7. Post-shot Operations. After the temperature of the cavity has cooled, a post-shot hole is usually drilled into the point of the explosion in order to retrieve samples of the debris. These samples are highly radioactive, but provide important information on the test. The post-shot hole is as small in diameter as possible and is drilled at an angle to allow the drill rig to be positioned safely away from surface ground-zero. After drilling and sampling operations are complete, the drill rig and tools are decontaminated. Residual radiation is cleaned up at the site, and the hole is plugged back to the surface. This generally completes the event operation, and the site is turned back to the DOE.

A.1.1.1.3 Science-Based Stockpile Stewardship—Projects and activities associated with science-based stockpile stewardship include experiments that will provide essential data for the modeling of the performance, safety, and maintenance of the enduring stockpile. Examples of such types of projects are described below.

DEVICE ASSEMBLY FACILITY—The Device Assembly Facility is a multistructure facility in which nuclear devices and high explosives can be assembled, disassembled or modified, staged, and component tested. Nuclear devices and high-explosive activities might also include maintenance, repair, retrofit, and surveillance. This facility contains approximately 9,290 square meters (m^2) (100,000 square feet [ft^2]) of floor space within a 29-acre (1,263,240 ft^2) high-security area. Construction is primarily of heavy steel-reinforced concrete. The facility is earth-covered with a minimum of 2 m (5 ft) of compacted earth overlay, leaving only one exterior wall.

There are individual underground structures separated by earthfill, and they are considered as separate buildings within the Device Assembly Facility. These separate buildings are connected by a common corridor. Single- and two-story sections exist within the Device Assembly Facility, with ceiling heights up to 9 m (30 ft). Second-story sections are used primarily for security forces and for additional mechanical and electrical equipment space. The entire facility is provided with an automatic fire suppression system and, in areas where a nuclear device may be present, quick-response on-off sprinkler heads are also installed.

Assembly operations at the Device Assembly Facility are carried out in the five assembly cells, three assembly bays, and four high bays. High explosives and special nuclear materials enter through the doors on the southeast side of the complex and are staged in bunkers. The materials are transferred to assembly cells where the components are assembled to the point that the device is no longer exposed. Completion of assembly includes mechanical and electrical measurements, radiography, radiation checks, alignment, and installation of other components. Radiographic operations are conducted on the component or assembly in the radiography bays and occasionally in the assembly cells or bays. In the final step, the assembly is configured for shipment to the event location.

To provide further detail of the Device Assembly Facility, the description is divided into assembly cells, assembly bays, high bays, and other facilities as follows:

Assembly Cells—The assembly cells are 10 m (34 ft) diameter work areas that include composite roofs designed to expand upward in the unlikely event of a high-explosive detonation and to collapse into the cell where the detonation occurred. The collapsed, composite roof material provides a filtration system that reduces the dispersion of aerosolized special nuclear materials by over 99.5 percent and, at the same time, absorbs the energy of an explosive blast to prevent propagation of the explosion into other structures within the facility. Decontamination facilities with tank storage are located in close proximity to the assembly cells. The assembly cells have 30 cm (12 in.) thick concrete walls and a roof structure overlain with 8 m (25 ft) of graded gravel. Each cell has an air-locked access vestibule equipped with double sets of blast doors that are interlocked so that one door must be closed before the other can be opened. The concrete structure, composite roof, and interlocking blast doors within the assembly cells reduce the potential environmental impacts that could occur during an accident and reduce exposure to workers not located in the immediate vicinity of an accident.

Assembly Bays—The assembly bays have concrete walls with separate personnel- and equipment-access air locks and interlocking blast doors to reduce potential environmental impacts and impacts to workers outside the bay. Nuclear devices containing insensitive high explosives as the only main charge explosive are assembled in assembly bays. Activities conducted in assembly bays involve the assembly of secondary components. Uncased explosives other than insensitive high explosives can be handled in these bays if no special nuclear materials are present.

High Bays—Four high bays to support test operations are similar to the assembly bays in structure and function, except that no equipment airlock is provided. Nuclear device operations conducted in assembly bays may also be conducted in high bays. Two of the four high bays allow the device transportation vehicle to be backed in for loading and unloading.

Other Facilities—Other facilities located at the Device Assembly Facility include the following:

- Bunkers are used for staging high explosives and special nuclear material components prior to assembly
- Mechanical and electrical support areas include plant mechanical systems, diesel-powered electrical generators, an uninterruptible battery power supply station, and transformers
- Administrative offices are located on the first floor of the Device Assembly Facility. Each corridor is provided with independent heating, cooling, and ventilation systems
- Radiography procedures are conducted in one of two buildings that have air-locked access corridors, blast doors, and support facilities comprised of a control room, service area, dark room, and radiography room
- Security is provided by an entry guard station that controls traffic ingress and egress to the complex. Two hardened guard towers constructed of reinforced concrete provide for exterior security and surveillance.

AREA 27 COMPLEX—The Area 27 complex is comprised of the 5100 complex (Able Site) and the 5300 complex (Baker Site). The complex has been the primary facility for the assembly of nuclear device test assemblies for the nuclear test program. In addition, the Area 27 complex is the alternate assembly facility to the Device Assembly Facility. A number of these facilities have been and will continue to be used in support of high-explosive device assembly for the Big Explosives Experimental Facility and other programmatic activities requiring the use of the Area 27 complex. These ongoing testing activities involve the use of high explosives and/or special nuclear materials separately or in combination.

Each complex consists of several buildings, storage bunkers, and other structures used for storing, staging, assembly and disassembly, handling, evaluation, and nondestructive testing of nuclear assemblies, nuclear explosive-like assemblies, high-explosive devices, critical assemblies, and special nuclear materials. Most of the facilities at each site were constructed in the 1960s for use in the nuclear test program; missions have been successfully accomplished in these facilities without any accidents involving high explosives or special nuclear materials.

The adequacy of safety of the Area 27 complex has been demonstrated over the years by a number of safety analyses, safety evaluations, hazards analysis, and nuclear devices safety studies of the dominant accidents and management controls. The management of safety has also been re-evaluated and includes reviews of safety design features, administrative controls, procedures, and documents used by the DOE/NV, Lawrence Livermore

National Laboratory, and Los Alamos National Laboratory.

In general, the complex will house kilogram (kg) quantities of special nuclear materials and up to several thousand-pound quantities of various types of high explosives. Specific reviews and evaluations are performed, as required, to establish or revise individual quantity limits for specific buildings, bunkers, and structures. Special nuclear materials limits are established based upon dispersal consequences and nuclear criticality considerations (such as form, geometry, shape, moderation, and reflection).

The primary assembly buildings (5100, 5180, and 5310) are of conventional construction, but modified in some cases for security purposes. These buildings contain assembly bays (both normal and high) for the assembly and staging of components and assemblies; restrooms; offices; lower floors for radiographic equipment; cranes and hoists for the movement of components; and resilient and conductive flooring to reduce the risk and probability of high-explosive detonation.

Security for the Able and Baker sites is provided by double security fencing, intrusion detecting, hardened guard towers, double tumbler locking systems for buildings, surveillance television, and other security systems. All exit doors are equipped with emergency (panic) hardware or safe havens that cannot be opened from the outside.

The buildings are supported by standard utilities (water and electric) and ventilation. Class II, Division 2, Group G electrical fixtures are provided in the operating bays. Certain buildings contain tritium monitoring systems with local alarms. Lightning protection is provided for all buildings. Fire protection is provided by installed sprinkler systems and wall-mounted fire extinguishers.

A.1.1.1.4 Dynamic Experiments and Hydrodynamic Tests—Dynamic experiments provide information regarding changes in materials under conditions caused by the detonation of high explosives. Dynamic experiments are conducted in order to gain information on the physical properties and dynamic behavior of materials used in high explosives and nuclear weapons, including changes caused by aging. Dynamic experiments may include the use of special nuclear material; however, those that are to be conducted are designed to remain subcritical. These experiments are called "subcritical experiments", i.e., no self-sustaining fission chain reaction will occur.

Operations at the NTS have historically included tests or experiments that, though involving both high explosives and special nuclear materials, were intended to produce no nuclear yield or negligible nuclear energy release. These tests or experiments frequently remained subcritical. They were often performed as dedicated stand-alone experiments. Nuclear explosion did not take place, therefore, the environmental impacts of these experiments were principally due to dispersal of special nuclear materials such as plutonium, and other materials, by the detonation of high explosives. These tests or experiments were performed through the 1950s, 1960s, 1970s, and into the 1980s. Some of the earlier subcritical experiments were conducted on the surface while others were conducted underground in shafts, shallow boreholes or tunnels. Future subcritical experiments would be dynamic experiments with special nuclear materials performed to answer crucial questions concerning safety and reliability of the stockpile. Approximately 10 dynamic experiments (including subcritical experiments) or hydrodynamic tests would be conducted annually at the Lyner Complex.

Hydrodynamic tests are dynamic, integrated systems tests of mock-up nuclear packages during which the high explosives are detonated and the resulting motions and reactions of materials and components are observed and measured. The explosively generated high pressures and temperatures cause some of the materials to behave hydraulically (like a fluid). Hydrodynamic tests are used to obtain diagnostic information on the behavior of a nuclear weapons primary assembly (using simulated materials for the fissile materials in an actual weapon) and to evaluate the effects of aging on the nuclear weapons remaining in the stockpile.

For the purpose of impact analysis only, it is assumed that under Alternative 1, a total of 1,100 dynamic experiments or hydrodynamic tests would be performed within the 10-year timeframe (1996 to 2005) of the NTS EIS. Examples of science-based stewardship facilities and projects are described below.

LYNER COMPLEX—Lyner was originally designed as a site to test low-yield nuclear devices. Since the moratorium on nuclear testing began, it has been converted to the testing of conventional high explosives, as well as dynamic experiments, subcritical experiments and hydrodynamic tests. The Lyner Complex consists of a mined shaft (U-1a), a drilled hole (U-1g), a connecting mined tunnel, and surface facilities located west of the Mercury Highway in Yucca Flat. The surface facilities include a trailer park for diagnostics and a work area around the mined shaft built with transportable structures.

The Lyner Complex will be used by the National Laboratories to conduct the program of dynamic experiments and hydrodynamic tests. The U-1a shaft is 293 m (961 ft) deep, with access via a man-rated hoist. Secondary access through the drilled hole at U-1g is gained by using an emergency cage powered by a separate hoist. The U-1g drill hole also provides access for the firing and diagnostic cables. The cables and other utilities are grouted into the annulus of the 122-cm (48-in.) access casing and the 274-cm (108-in.) diameter hole. An independent ventilation system at the U-1g drill hole provides a second supply of downhole air, thus supplementing the U-1a supply and acting as a dual system in the case of an accident.

The connecting main drift is mined 335 m (1,100 ft) due north to the U-1g drill hole from the U-1a shaft. Tunnel support is provided by rock bolts, wire mesh, and shotcrete. Secondary containment for experiments is located in the main drift, along with distribution of utilities. Secondary containment assures a safe condition in the event of failure of the primary containment in the side drifts. Primary containment is provided by closing the side drifts with grouts and steel containment doors. Secondary containment is achieved by massive grout plugs keyed to the rock with gas-tight steel doors within the plugs.

Explosive events are placed in side drifts mined perpendicular to the main drift. Multiple tests could be fielded by the complex without changes to the main drift. The experiment drifts would be mined to suit the requirements of the experiment assigned. One experimental drift has been completed and successfully expended for the demonstration experiment.

Site development includes a 3-acre recording trailer park by the U-1g hole and a 17-acre pad that contains the construction support buildings at the U-1a shaft location. Downhole support equipment includes data gathering, emergency refuge chambers, distribution conduits for air and utilities, and a freight and passenger landing at the hoist. Electrical power and water are supplied from the NTS. The Lyner site is connected to the control point by a fiber-optic cable link. An emergency evacuation system is installed with self-contained power and a dedicated hoist mechanism at the U-1g hole. The U-1g hole provides emergency access to the complex and a backup access should an accident close the U-1a shaft.

Further details regarding activities conducted in the Lyner Complex are addressed in a classified appendix to the NTS EIS. However, environmental impacts of activities conducted at the Lyner Complex are included in the analysis in Chapter 5 of the NTS EIS.

BIG EXPLOSIVES EXPERIMENTAL FACILITY—The Big Explosives Experimental Facility is located in north-central Area 4. The site contains seven underground structures previously associated with atmospheric testing, one set of unidentified stanchions that might have been associated with atmospheric testing, the Bare Reactor Experiment Nevada Tower foundations and stanchions and the Japanese Village complex, the U-4ad drill hole and drill sump, the U-4af exclusion zone, and a white silicified volcanic core reduction flake. These structures were abandoned when nuclear testing went underground. Two of the buried structures, bunkers 4-300 and 4-480, have been modified to accommodate modern hydrodiagnostic equipment to serve as a hydrodynamic test facility for detonations of very large conventional high-explosive charges and devices. The electrical, lighting, and ventilation systems of the bunkers have been replaced or upgraded, optical ports and electronic control conduits have been added, the area surrounding the bunkers has been graded, and earthen berms have been added to improve blast protection, shield from X-radiation, and provide a downrange projectile stop. The intent of the modifications was to provide all of the sophisticated diagnostics capability of Lawrence Livermore National Laboratory's Site 300 Hydrotesting Facility for experiments containing more than the currently available 277-kilogram (kg) (500-pound [lb]) high-explosive weight limit.

Bunker 4-480 was modified to house up to five nitrogen or helium gas-driven rotating-mirror framing cameras, laser-illuminated image-converter cameras, continuous-rotating-mirror framing cameras, rotating-mirror streaking cameras, and/or infrared imaging cameras in various combinations. It is equipped with 5 camera stands and 5 corresponding optical ports with access to the 20 m x 20 m (66 ft x 66 ft) area gravel firing pad.

Bunker 4-300 contains three rooms: the control room, the laser room, and the utility room. The control and utility rooms were modified to house the diagnostic and firing control electronics, digitizers, electronic recording equipment, and other electronic equipment necessary for hydrodynamic tests. The laser room was modified to accommodate a pulsed Ruby laser for image-converter camera illumination and a neodumium laser for multibeam Fabry-Perot velocimetry, as well as the Fabry-Perot analyzer table.

Three large (3m [10 ft] diameter and 6m [20 ft] long) steel cylinders were placed outside the bunkers near the firing pad to house 2.3-MeV Febetron flash X-ray sources for high-energy X-ray radiography. Hycam recorders and video monitors were also placed around the firing area to monitor the aboveground activity and experimental performance of the test devices.

The structural soundness of the modified bunkers for expanded operations and the potential environmental impacts of blast, noise, and dust uplift due to hydrodynamic tests were investigated in the five experiments of the Popover test series conducted between March 1995 and August 1995. The tests consisted of detonations of successively larger amounts of spherical charges of conventional trinitrotoluene explosive beginning at 232 kg (512 lb) and ending with 3,538 kg (7,800 lb). The noise, acceleration, strain, overpressure, dust uplift, and area contamination were monitored in order to validate predictive models of shock, blast, noise, and gas product dispersion and to certify the safety of the manned operation of Bunker 4-300 during hydrodynamic tests. The bunkers were found to meet all required safety criteria, and a committee of senior scientists and engineers was chartered to evaluate the test results and recommended the facility for expanded operations.

The high-explosive weight limit for safe, manned operations at the Big Explosives Experimental Facility is based on the following facility design criteria: 454 kg (1,000 lb) of conventional high explosives detonated 5 m (15 ft) from the Bunker 4-480 outer wall or 2,268 kg (5,000 lb) of conventional high explosives detonated 8.3 m (27 ft) from the Bunker 4-480 outer wall. Based on the results of the Popover test series, the relationship between conventional high-explosive charge mass and safe detonation distance was determined to conform to these two criteria. For experiments involving larger or smaller charge masses than previously tested or involving charge configurations different from those previously tested, the safe operating distance(s) of the charge(s) will be determined using these criteria and standard engineering practice. In this way, arbitrarily large conventional high-explosive charge masses in practically any configuration can be safely detonated as long as the equivalent impact of the detonation on the facility in terms of overpressure, blast, shock, and noise is less than or equal to the facility design criteria.

Under this alternative approximately 100 hydrodynamic tests or dynamic experiments would be conducted annually at the Big Explosives Experimental Facility. No experiment performed at the Big Explosives Experimental Facility will contain special nuclear materials. A synopsis of current Big Explosives Experimental Facility projects and activities follows.

Shaped-charge Scaling Project— The purpose is to develop and test large shaped-charge technology, originated within the DOE weapons laboratories, for broad counterproliferation applications. The project includes scaling the existing technology to larger sizes; developing, testing, modifying, and characterizing the performance of the large charges; and applying the scaled shaped-charges to a variety of counterproliferation missions to test effectiveness against various targets. Typical experiments involve up to 3,600 kg (8,000 lb) or more of conventional high explosives in a variety of configurations.

Other High-Explosive Experiments—This includes potential projects with the goal of developing, improving testing and deploying advances in conventional munitions technology or their applications. Examples include the development of advanced conventional weapons, including shaped charges, explosively formed projectiles, propellant-driven devices, explosive munitions, pyrotechnics and other conventional weapons technologies, applications of these technologies to hard target and/or buried structure defeat, counterproliferation, and armor defeat. Typical experiments involve 3,600 kg (8,000 lb) or more of conventional high explosives in a variety of configurations.

A.1.1.2 Stockpile Management. Under Alternative 1, no stockpile management activities would be conducted at the NTS.

A.1.1.3 Nuclear Emergency Response. The DOE/NV Emergency Management Program is administered by the DOE/NV Emergency Management and Nonproliferation Division. The program receives significant support from the U.S. Environmental Protection Agency (EPA) Environmental Monitoring and Support Laboratory, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, Sandia National Laboratories, U.S. Department of Defense (DoD) explosive ordnance demolition experts, and the DOE/NV contractors. The program is comprised of a number of separate, but related, emergency response programs, including the Nuclear Emergency Search Team, the Federal Radiological Monitoring and Assessment Center, the Aerial Measuring System, the Accident Response Group, the Radiological Assistance Program, and the DOE/NV Internal Emergency Management Program. Program activities are based at facilities in Las Vegas, Nevada; Santa Barbara, California; Andrews Air Force Base near Washington, DC; and the NTS. These activities are individually summarized below.

A.1.1.3.1 Nuclear Emergency Search Team—DOE Order 5530.2, issued September 20, 1991, requires the Manager, DOE/NV, to maintain an operational team of specialists and equipment for response to threats involving nuclear explosives, illegal use of nuclear materials, and weapons of mass destruction. The Nuclear Emergency Search Team, comprised of members from the DOE, other federal agencies, the nuclear weapon design laboratories, and the DOE/NV contractors, is prepared to provide technical assistance to the Federal Bureau of Investigation, designated by law as the lead agency for response to terrorist acts in the United States. Since 1975, when the team was formed, significant research efforts, extensive exercises, and the DOE participation in responses to large nuclear emergencies, including the reentry of the Russian Cosmos 954 nuclear-powered satellite and the Three-Mile Island reactor accident, have contributed substantially to the development of needed response capabilities.

A.1.1.3.2 Federal Radiological Monitoring and Assessment Center—The DOE has been tasked to develop and maintain the Federal Radiological Monitoring and Assessment Center program. The DOE establishes and manages the field operations center when a major radiological emergency occurs or potentially may occur. The creation of a Federal Radiological Monitoring and Assessment Center capability is mandated by the Federal Radiological Emergency Response Plan and is assigned to the DOE/NV by the DOE Headquarters. DOE Order 5530.5, published in July 1992, specifies the purpose, organization, and responsibilities associated with the establishment of a Federal Radiological Monitoring and Assessment Center.

The Federal Radiological Monitoring and Assessment Center is responsible for acquiring, processing, and providing assessment of radiological data in the field. The Federal Radiological Monitoring and Assessment Center may be called on to support or provide follow-on support to the Nuclear Emergency Search Team. The Federal Radiological Monitoring and Assessment Center is a stand-alone organization capable of responding to any type of nuclear emergency, including nuclear weapons, transportation, or power-plant-related accidents.

A.1.1.3.3 Aerial Measuring System—The Aerial Measuring System mission is documented in DOE Order 5530.4, which defines its purpose and describes its roles and responsibilities. Primary objectives of the Aerial Measuring System are to:

- Conduct aerial surveys of the DOE facilities on a periodic basis to detect changes in conditions
- Develop remote sensing, analytical, and display technology for detection of nuclear radiation, as well as spectral characteristics in the ultraviolet, optical, and infrared spectra emitted from an environment that provides information about its condition or status
- Establish and maintain a technically competent emergency response capability, including the administrative, logistical, and technical support required in situations involving radiation, radioactive materials, or other hazardous materials.

The resources of the Aerial Measuring System are on call 24 hours a day for emergency operations.

A.1.1.3.4 Accident Response Group—The Accident Response Group, which is managed by the DOE/Albuquerque Operations Office, has a mission similar to the Federal Radiological Monitoring and Assessment Center, but focuses on accidents involving United States' nuclear weapons. The Accident Response Group deals with on-site conditions while the Federal Radiological Monitoring and Assessment Center addresses off-site measurements and assessments.

The DOE/NV, through a Memorandum of Understanding with the DOE/Albuquerque Operations Office, provides field response resources to the Albuquerque Office Accident Response Group team in support of nuclear weapons accidents, exercises, and training. The Accident Response Group is mandated by DOE Order 5530.1A, issued on September 20, 1991. It defines the purpose of the program and clarifies the responsibilities and authorities of the DOE Headquarters and the Operations Offices. The Accident Response Group resources required are normally drawn from the DOE/NV Nuclear Emergency Search Team and Aerial Measuring System programs. An Accident Response Group mission may require any of the DOE/NV major emergency management resources.

Some support requirements for this program are similar to the DOE/NV Nuclear Emergency Search Team and Aerial Measuring System programs. The use of Nuclear Emergency Search Team and Aerial Measuring System personnel, expertise, and equipment to support the Accident Response Group program eliminates the cost of duplicate services.

A.1.1.3.5 Radiological Assistance Program—The Radiological Assistance Program is prepared to furnish assistance in all types of radiological incidents. The program is mandated by DOE Order 5530.1A. Response to radiological incidents may include on- and off-site assistance when requested by other federal agencies or state, local, and tribal authorities in dealing with radiological incidents.

The DOE/NV Radiological Assistance Program provides two teams, a Radiological Assistance Team and a Radiological Cleanup Team, that can respond to radiological incidents. The Radiological Assistance Team acts to control and confine hazards resulting from incidents involving radioactive material that may pose a threat to public health and safety. The Radiological Cleanup Team may provide services for radioactive material cleanup in the event of an incident involving such materials.

A.1.1.3.6 Internal Emergency Management Program—The purpose of the Internal Emergency Management Program is to ensure capabilities exist to respond to on-site emergencies. These emergencies include unusual occurrences, such as fire, bombs or bomb threats, earthquakes, aircraft accidents, and power outages. Specific plans have been established to respond to the emergencies delineated in the current hazards assessment. The primary goals of these plans are to maximize the safety of personnel, minimize equipment and facility damage, and minimize facility downtime in the event of a major accident or emergency.

A.1.1.4 Storage and Disposition of Weapons-Usable Fissile Material. There is no activity under Alternative 1.

A.1.1.5 Large, Heavy-Industrial Facility. There is no activity under Alternative 1.

A.1.1.6 Tonopah Test Range Activities. The principal mission of the Tonopah Test Range is to provide research and development test support for the DOE-funded weapons projects. Many tests performed at the Tonopah Test Range involve aircraft and air drops; the range is capable of handling a wide variety of missions. Tests conducted vary from simple tests of hardware components and systems needing only limited support to rocket launches and air drops of test vehicles requiring full range support. A structural test of nuclear systems sometimes involves special nuclear material; however, all tests are performed on non-destructive yield assemblies only. No nuclear yield testing is conducted on the Tonopah Test Range. The principal types of tests include impact tests, passive tests, and chemical tests.

An impact testing program has been developed to test various parameters of the weapon while in flight or dropping a weapon and through the actual penetration of the ground surface. The data obtained assist in weapons development, as well as the maintenance of the nation's weapons stockpile. The weapons include conventional, nuclear, and inert projectiles. The weapons are unarmed and, for nuclear munitions, a portion of the nuclear package has been omitted. The nuclear weapons are, therefore, unable to reach criticality. Impact tests include the following:

- Air Drop Operations
- Fixed Rocket Launcher Operations
- Artillery Operations
- Cruise Missile Operations
- Compressed Air Gun (Davis Gun)
- Seismic Verifications
- Fuel Air Explosives Operations
- Hazardous Burn Test Operations
- Underground Explosives
- Open-Air Explosives
- Post-Test Procedures and Recovery Operations.

The chemical testing program involves the testing of chemical effects on stockpile weapons. The physical properties (i.e., explosive/combustible) of chemicals are tested for applicability and use in the nation's weapons stockpile. Other portions of the program test for defenses against possible hostile nations chemical warfare arsenals. Chemical tests would include testing of the following:

- Liquids (burn, explosive)
- Gas (burn, explosive)
- Particle (graphite, smoke).

The passive testing program uses high-resonance energy, lasers, and ultrasound techniques for checking the systems of the nation's conventional and nuclear weapons stockpile. Tests are also conducted on behalf of nonproliferation research to determine if other countries are using or developing nuclear capabilities. These tests would include the following:

- Telemetry, Microwave, and Photometrics Operations
- Radar Operations
- Laser Tracker
- Radiographic Operations
- Electromagnetic Radiation Test.

A.1.2 Alternative 2

No Defense Program activities would occur at the NTS under Alternative 2. DOE, Albuquerque mission related Defense Program activities at the Tonopah Test Range would be the same as those described under Alternative 1.

A.1.3 Alternative 3

Under this alternative, all NTS Defense Program activities described under Alternative 1 would continue. Many new activities would also be included under Alternative 3.

A.1.3.1 Stockpile Stewardship. Activities are essentially the same as those described under Alternative 1. However, hydrodynamic tests and dynamic experiments at the Big Explosives Experimental Facility would be expanded to include larger high-explosive charges and potentially hazardous materials. These tests are described below in Section A.1.3.1.3.

The requirements of a science-based stockpile stewardship require the design and construction of large, new pulsed-power and accelerator based simulation machines. Examples of such machines include the National Ignition Facility, the Advanced Radiation Source, Dual Axis Radiographic Hydrodynamic Test Facility, and the Advanced Hydrotest Facility. All these machines share a support infrastructure. Thus, a national test and demonstration center, based on the capabilities of these machines, is a future use of the NTS. Activities performed would be based on the capabilities of these devices, including such diverse activities as fusion research, effects testing, accelerator and pulsed power component testing and development, transmutation of elements, and basic physics research.

*A.1.3.1.1 **Nuclear Test Readiness***—Activities would be the same as those described under Alternative 1.

*A.1.3.1.2 **Underground Nuclear Weapons Testing***—Activities would be the same as those described under Alternative 1.

A.1.3.1.3 Science-Based Stockpile Stewardship—Under Alternative 3, the total number of dynamic experiments including subcritical experiments, and hydrodynamic tests conducted at the NTS would be the same as those identified under Alternative 1 (1,100 during the 10-year period). However, dynamic experiments and hydrodynamic tests at the Big Explosives Experimental Facility would be expanded to include larger high-explosive charges and potentially hazardous materials, such as beryllium, depleted uranium, deuterium, and tritium. Additional information on potentially hazardous materials associated with dynamic experiments and hydrodynamic tests is provided in Appendix F and classified Appendix J. Examples of experiments to be conducted at Big Explosives Experimental Facility include:

SHAPED-CHARGE SCALING PROJECT—The purpose is to develop large shaped-charge technology, originated within the DOE weapons laboratories, for broad counterproliferation applications. The project includes scaling the existing technology to larger sizes; developing, testing, modifying, and characterizing the performance of the large charges; and applying the scaled shaped-charges to a variety of counterproliferation missions to test effectiveness against various targets. Under Alternative 3, typical proposed experiments would involve up to 32,000 kg (70,000 lb) of conventional high explosives in a variety of configurations and the use of beryllium, depleted uranium, deuterium, and tritium.

OTHER HIGH-EXPLOSIVE EXPERIMENTS—In addition to activities in Alternative 1, high-explosive experiments in Alternative 3 would include the use of novel methods to initiate detonation of several elements and/or pieces and/or points of conventional high explosives with a high degree of simultaneity. Under Alternative 3, typical proposed experiments would involve 9,072 kg (20,000 lb) or more of conventional high explosives in a variety of configurations.

A.1.3.1.4 Advanced Nuclear Weapons Simulators—Enhancements to the science-based Stockpile Stewardship Program include advanced nuclear weapons simulators that are being considered for development based on new data and technologies emerging from current research. Advanced nuclear weapons simulators use state-of-the-art technologies to acquire data critical to evaluating the safety and reliability of the Nation's nuclear weapons stockpile in the absence of underground testing. The Next Generation Radiographic Facility and the Next Generation Magnetic Flux Compression Generation Facility are two examples of conceptual advanced simulator facilities that are analyzed for land-use planning purposes.

The Next Generation Radiographic Facility and the Next Generation Magnetic Flux Compression Generation Facility are proposed for the future and, at this time, neither of these facilities will be analyzed in detail in the Stockpile Stewardship and Management EIS. Therefore, no siting decision will appear in the Stockpile Stewardship and Management Programmatic EIS Record of Decision; however, the DOE believes that both facilities could be sited within the next 10 years. For this reason, both facilities are included under Alternative 3. Because the actual operation of the next Generation Radiographic Facility is beyond the timeframe covered by the NTS EIS, only the construction phase is addressed in this EIS. Both operations and construction of the Next Generation Magnetic Flux Compression Generation Facility are included.

A brief description of both conceptual facilities is provided as follows:

<u>NEXT GENERATION RADIOGRAPHIC FACILITY</u>—The Next Generation Radiographic Facility is potentially the next advanced high-explosive test facility featuring multiple-pulse and multiple-view diagnostic capability. This facility is described as the Advanced Hydrotest Facility in the Stockpile Stewardship and Management Programmatic EIS. The conceptual facility would provide advanced radiographic machine diagnostics with multiple (e.g., four to eight) views and with multiple (e.g., four to ten) pulses per view to provide weapons performance, safety and reliability information, to satisfy as necessary, certain needs of science-based stockpile stewardship and management programs. This next generation facility would incorporate all the latest diagnostics and provide for dynamic experiments with special nuclear materials as well as conventional explosives. This type of facility would respond to Stockpile Stewardship and Management Program requirements for inferring nuclear performance and safety.

This type of facility would be used for the investigation of the dynamics of metals subjected to the forces of a high-explosive detonation. It would be a permanent facility whose most prominent feature would be the use of containment spheres (firing chambers). The chambers would be used to contain conventional explosions, with the purpose of investigating the response of metals being driven by the explosive energy. Diagnostic equipment might include a state-of-the-art advanced diagnostic and detection system to characterize high-explosive explosions. Monitoring and control facilities for firing, personnel access, safety and health physics would also be included. Special nuclear materials would be involved, however, these experiments would be designed to remain subcritical i.e., no self-sustaining nuclear reaction would occur.

In addition to the containment spheres, the facility could include an open-air firing capability, shot staging areas, diagnostic support, maintenance facilities, monitoring, instrumentation and control facilities, office and administrative areas, and electrical and mechanical support shops.

<u>NEXT GENERATION MAGNETIC FLUX COMPRESSION GENERATION FACILITY</u>—The next Generation Magnetic Flux Compression Generating Facility could be designed to provide a cost-effective facility capable of supporting high energy, explosively powered experiments. This facility is described as High-Explosive Pulsed Power Facility in the Stockpile Stewardship and Management Programmatic EIS. In broadest terms, the facility could support experiments that could make 100 to 1,000 megajoules of electrical energy available to power experiments. Typical proposed experiments could involve 4,536 kg (10,000 lb) or more of conventional high explosives in a variety of configurations.

Individual experiments could involve consumable hardware, recording and diagnostic equipment, physics designers, engineers, and diagnosticians. Each individual experiment could require the assembly of custom hardware, the installation of explosive components, diagnostic, and data-recording equipment. The experiment would then be moved to the hardened firing location. The experiment would be executed, and data would be remotely recorded. Individual experiments could be fielded by a personnel team who would spend several weeks at the NTS. Several experiments could be scheduled per year.

A support team of two to four people permanently located at the NTS Next Generation Magnetic Flux Compression Generation Facility would be required to operate and maintain the buildings and equipment, coordinate NTS support and services, interface with the experimental teams that field individual experiment, and ensure safety and environmental integrity of the varied operations.

The facility could be located at the Big Explosives Experimental Facility. The existing facility may require reconfiguration and suitable office and support space is available, but may require modification. A new hardened remote structure rated at 3,000 kg (6,614 lb) to support pulsed-power equipment and explosive experiments would be required, as well as a sitewide remote control, diagnostic, and interlock system. A modest pulsed-power laboratory suitable for pretesting the equipment prior to committing that equipment to full-scale operation would be required. This would be performed largely using existing equipment. Some upgrade of the electrical utility service to the area would be required.

NATIONAL IGNITION FACILITY—The goal of the National Ignition Facility is to produce ignition and energy gain in Inertial Confinement Fusion targets and perform high-energy-density and radiation-effects experiments in support of national security and civilian objectives. The National Ignition Facility would be a key component in the DOE's science-based Stockpile Stewardship Program to ensure the safety and reliability of the Nation's remaining stockpile of nuclear weapons. The National Ignition Facility would make it possible to study, for the first time in a laboratory, radiation and plasma physics at a temperature and pressure regime similar to some aspects of nuclear weapon detonations. It would also provide a unique source for the study of the weapon effects on other systems. The weapon science information generated through the National Ignition Facility experimentation and research would be used to examine specific physical effects of changes due to aging or remanufacturing, and to improve the computer codes needed to certify the reliability of the remaining stockpile. In addition, the National Ignition Facility could provide a high-fidelity source for weapon effects studies that is beyond the capabilities of any other laboratory source.

The National Ignition Facility would also advance civilian application for inertial confinement fusion. The National Ignition Facility ignition and gain experiments would determine whether the inertial fusion approach to a fusion energy source for long-range commercial use is feasible. The National Ignition Facility would be a key research facility that would help keep the United States the leader in the development of inertial fusion energy. The National Ignition Facility would also provide important basic scientific research and technological development capabilities. National Ignition Facility experiments would duplicate conditions in the center of the sun, which would promote and expedite advancements in astrophysics, plasma physics, and other basic sciences. Other advances that might be a result from National Ignition Facility use and research include large-scale precision optics, rapid crystal growth technology, advanced X-ray lithography for integrated circuit manufacturing, advanced health care technologies, new material development, and various scientific and analytical instrumentation.

The DOE has two proposed sites for the National Ignition Facility in Nevada. One is at the NTS in Area 22, southwest of Mercury. The proximity to Mercury would be advantageous for accessibility to infrastructure support that would be needed in support of National Ignition Facility activities. This location would also be advantageous for accessibility to the facility by commercial and other nondefense personnel that would require clearance prior to access of the forward areas of the NTS. All work that presents the potential for exposure or contamination would receive special consideration and planning, including, but not limited to, dry-run practices, condition monitoring experiments, and personnel protective equipment upgrade analysis. Existing equipment, such as anticontamination clothing and personnel protective equipment, would be available for use at the National Ignition Facility. This type of reusable equipment would be decontaminated on site at the laundering and cleaning facilities available at the NTS.

Located on an 80-acre site in the city of North Las Vegas, Nevada, the North Las Vegas Facility supports DOE/NV Operations Office and Lawrence Livermore National Laboratory, Los Alamos

National Laboratory, and Sandia National Laboratories weapons test programs and is considered an adjunct to the NTS. The facility supports test pre-staging activities and fabrication, assembly, and testing of field diagnostic systems that collect data from the NTS weapons testing activities. This facility is being considered as an alternative location for the National Ignition Facility.

Construction of the National Ignition Facility would occur on a 45-acre parcel of previously undisturbed land. Five new buildings would be constructed on this site. An underground water pipe line would likely be built to supply the National Ignition Facility. The design and construction of a storm drain system would depend on the specific layout of the facility and its proximity to existing roads and structures.

Sanitary wastewater would be treated using a sewage lagoon system dedicated to the National Ignition Facility. Nonhazardous solid waste would be handled on site in designated landfill areas. Hazardous wastes (liquid and solid) would be sent off site to permitted treatment, storage, and disposal facilities outside Nevada. Solid radioactive wastes could be disposed of at the NTS. Plans are under way for a low-level liquid waste treatment facility at the NTS. Current plans are to permit mixed solid waste disposal units at the NTS for wastes that meet Resource Conservation and Recovery Act land disposal restriction requirements. Low-level mixed liquid wastes could be stored at the Area 5 Radioactive Waste Management Site until an on-site treatment facility was available. If such a facility is not developed, low-level mixed liquid waste would be shipped to off-site facilities with appropriate treatment and disposal capabilities.

The North Las Vegas Facility has adequate site infrastructure to support the proposed National Ignition Facility without major modifications. About 3 million L/yr (0.8 million gal/yr) of water would be required for construction. The total raw water supply required for the National Ignition Facility operations would be about 153 million L/yr (40 million gal/yr), of which 18 million L/yr (4.8 million gal/yr) would be for domestic use. The water required for National Ignition Facility operations would be equivalent to an increase of 220 percent over the current usage of 69 million L/yr (18 million gal/yr). Sanitary wastewater volume is estimated to be 72.55 million L/yr (17.7 million gal/yr). Water supply and sanitary wastewater treatment are provided by the city of North Las Vegas. Current water and wastewater utility capacity would be adequate to meet the additional requirements for the proposed National Ignition Facility.

A.1.3.2 Stockpile Management. Stockpile management is the hands-on, day-to-day functions and operations involved in maintaining the enduring nuclear weapons stockpile. This includes assembly, disassembly, modification, and maintenance of nuclear weapons; quality assurance testing of weapons components; and the interim storage of nuclear weapons and components. Currently, the vast majority of this work is conducted at the Pantex Plant near Amarillo, Texas. Under Alternative 3, activities associated with stockpile management could be undertaken.

A.1.3.2.1 Construction of a Stockpile Management Complex—Under Alternative 3, Pantex stockpile management operations could be transferred to the NTS. Therefore, this alternative includes the construction of a full-scale stockpile management complex at the NTS. Relocation of Pantex operations to the NTS would require the construction of approximately 30,379 m² (327,000 ft²) of new facilities centered around the Device Assembly Facility in Area 6. These facilities would be necessary to perform the following operations:

- Disassembly of nuclear weapons
- Modification and maintenance and surveillance of nuclear weapons
- Quality assurance testing of weapons components
- Assembly of nuclear weapons
- Storage of strategic reserves of special nuclear material.

A.1.3.3 Nuclear Emergency Response. Activities would be the same as those described under Alternative 1.

A.1.3.4 Storage and Disposition of Weapons-Usable Fissile Materials. The DOE is responsible for management, storage, and disposition of weapons-usable fissile materials from the nation's nuclear weapons dismantlement and weapons production processes. Weapons-usable fissile materials include plutonium, highly enriched uranium, and other materials. These materials are currently stored at eight DOE sites across the nation: Pantex, Hanford, Idaho National Engineering Laboratory, Rocky Flats Plant, Savannah River Site, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and Oak Ridge Reservation.

The DOE is in the process of preparing a Programmatic EIS to evaluate alternatives for long-term storage of all weapons-usable fissile materials and disposition of surplus weapons-usable fissile materials. Five sites, including the NTS, are under consideration for a consolidated long-term storage site. This Programmatic EIS is expected to be completed in 1996.

A.1.3.4.1 Storage of Weapons-Usable Fissile Materials—The NTS can develop the capability of storing weapons-usable fissile material that results from the output of the disassembly process. Two options have been investigated. One option involves the construction of either a new plutonium storage facility, or a new plutonium storage facility and a highly enriched uranium storage facility depending on the programmatic storage alternative selected. These facilities are proposed to be located in Area 6 near the Device Assembly Facility. This capability may limit other uses of the facility, but is a viable option. The changes required would be internal, with no major modifications to the building. The other option is to utilize one of the horizontal event tunnels as the monitored storage site. P-Tunnel has been proposed as a potential site. Other tunnels are available, however they would require extensive modification. The selected tunnel would have a new drift driven off the existing main access drift and would be dedicated to the storage of the device pits and/or other special nuclear material. An automatic retrieval system would be installed to be able to call the stored material up for periodic checking. The total operation would be conducted underground, minimizing security and safety issues. Little modifications would be needed to secure the P-Tunnel portal area. It is unlikely that previously undisturbed land would need to be used for the construction of security fences or any other security structures or facilities. P-Tunnel is 40 km (25 mi) from the proposed site slated for disassembly, so a transportation system would be required. The road and security infrastructure is in place and would require only some upgrade and maintenance. If a tunnel other than P-Tunnel were designated, the tunnel would require extensive upgrades to meet standards of safety, ventilation, and access in addition to inspections to assure the safety of the in-place work.

A.1.3.4.2 Disposition of Weapons-Usable Fissile Materials—There are three main categories for disposition of plutonium each with several alternatives. There are a range of facilities that could be constructed including pit disassembly/conversion, plutonium conversion, immobilization, mixed oxide fuel fabrication, and evolutionary light water reactor. Some of these are mutually exclusive. The Record of Decision for the Storage and Disposition of Weapons-Usable Fissile Materials Programmatic EIS would only select the technology not the site. The large heavy-industrial facility, described in Section A.1.3.5, is representative of impacts that might be expected if the NTS were selected for example as a site for a mixed oxide fuel fabrication facility.

A.1.3.5 Large, Heavy-Industrial Facility. Under Alternative 3, an area has been set aside to be used by industrial facilities. For this EIS a large heavy-industrial facility has been assumed to determine maximum potential impact. A land disturbance of 600 acres and employment of 4,000 individuals are assumed for this facility. Those other resources required to support such a facility (e.g., water requirements, waste management requirements, and fuel requirements) were considered in the analysis of impacts resulting from construction and operation of this facility.

A.1.3.6 Tonopah Test Range Activities. Activities would be the same as those described under Alternative 1, with the addition of several potential tests included under this alternative.

A.1.3.6.1 Potential Tests—Activities could include those described under Alternative 1. Additional tests proposed under Alternative 3 could include the following:

- Robotics (handling, application, and recovery of hazardous [chemical] material)
- Smart Transportation - Preprogrammed/Remote Control Vehicles (air and ground)
- Smoke Obscuration Operations
- Thermal Test Operation Facility
- Climatic Test Operation Facility
- Armor/Anti-Armor Tests
- Infrared Tests
- Seismic Verification Studies
- Rocket Development, Testing and Deployment.

A.1.4 Alternative 4

Under Alternative 4, the DOE would discontinue all defense-related activities at the NTS. At the Tonopah Test Range, the same passive tests identified under Alternatives 1, 2, and 3 would be conducted related to the DOE, Albuquerque mission. Seismic verification impact tests and the following proposed tests would also be conducted under Alternative 4:

- Robotics (handling, application, and recovery of hazardous chemical material)
- Smart Transportation - Preprogrammed/Remote Control Vehicles (air and ground)
- Climatic Test Operation Facility.

A.2 Waste Management Program

The primary mission of the NTS Waste Management Program is to serve as a low-level waste disposal facility in support of the DOE. The NTS provides disposal capability for NTS-generated waste and other DOE-approved waste generators. The NTS will continue to store existing transuranic and transuranic mixed waste pending the opening of the Waste Isolation Pilot Plant. Hazardous waste will be accumulated and stored at the Resource Conservation and Recovery Act Part B permitted storage facility, and the majority will be sent off site for treatment or disposal after storage. Waste explosives will be treated in the Resource Conservation and Recovery Act Part B permitted Explosive Ordnance Disposal Unit. Hazardous waste from off site will not be accepted at the NTS. Mixed waste will be stored pending characterization and disposal certification activities. Closure of inactive waste sites will take place. The NTS waste management activities are conducted in four primary areas: Areas 3, 5, 6, and 11. The remainder of this section describes the types of wastes that are managed and the performance assessments that are in progress to support the management of radioactive wastes.

There is no long-term storage or disposal of hazardous, radioactive, or mixed waste on the Tonopah Test Range. All hazardous waste are shipped off site for ultimate disposition.

<u>WASTE TYPES</u>—Radioactive waste is solid, liquid, or gaseous material that contains radioactive nuclides regulated under the Atomic Energy Act of 1954, as amended, and of negligible economic value considering costs of recovery. Mixed waste is waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the Resource Conservation and Recovery Act, respectively. Mixed waste intended for disposal must meet the land disposal restrictions as listed in 40 CFR Part 268.

Low-level waste is defined as radioactive waste not classified as high-level waste, transuranic waste, or spent nuclear fuel or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic elements is less than 100 nanocuries per gram. Low-level mixed waste is low-level waste that also includes hazardous components as identified in 40 CFR Part 261, Subparts C and D.

Transuranic waste is radioactive waste containing alpha-emitting radionuclides having an atomic number greater than 92 and half-lives greater than 20 years in concentrations greater than 100 nanocuries per gram. Transuranic mixed waste is waste containing both transuranic and hazardous components, as identified in 40 CFR Part 261, Subparts C and D.

Hazardous waste is waste that is designated as hazardous by the Environmental Protection Agency or State of Nevada regulations. Hazardous waste, defined under the Resource Conservation and Recovery Act, is waste from production or operation activities that pose a potential hazard to human health or the environment when improperly treated, stored, or disposed. Hazardous wastes are identified on special EPA lists or possess at least one of the four following characteristics: (1) ignitability, (2) corrosivity, (3) reactivity, and (4) toxicity.

Radioactive waste disposal operations began at the NTS in 1961. Radioactive, mixed, hazardous, and classified waste was disposed in select pits, trenches, landfills, and greater confinement disposal boreholes on the NTS. Near-surface burial (3 to 20 m deep [10 to 60 ft]) of low-level waste and low-level mixed waste in subsidence craters, pits, and trenches has been the historical practice at the NTS.

Greater confinement burial (33 to 40 m deep [70 to 120 ft]) was adopted as a concept in 1981 by the DOE for wastes that are not appropriate for near-surface disposal due to the radioactive exposure levels from the waste. Specifically, these waste types include certain high-specific-activity low-level waste (for example, fuel rod cladings and sealed sources), transuranic waste, and some classified wastes. Projected waste volumes were obtained from various sources depending on which alternative was described. Low-level waste projections were compiled from (1) waste generator forecasts provided to the DOE/NV per requirements in the waste acceptance criteria (DOE, 1992) the 1994 Baseline Environmental Management Report (DOE, 1995a); (3) the 1994 Integrated Data Base Report (DOE, 1994); and (4) the Draft Waste Management Programmatic Environmental Impact Statement (DOE, 1995b). Projected mixed waste volumes were obtained primarily from the DOE Headquarters database for the Mixed Waste Inventory Report and Baseline Environmental Management Report.

PERFORMANCE ASSESSMENTS—Waste management activities at the NTS have completed or are in the process of completing performance assessments. The assessments are as follows:

The Area 5 Radioactive Waste Management Site Performance Assessment (Shott et al., 1995)–addresses the post-1988 waste source term for the facility and was submitted to the DOE Peer Review Panel in August 1995 for technical review and recommendation. Panel review and dialogue are now in progress. Depending on the extent of the Peer Review Panel review comments and recommendations, the Area 5 report should be published by January 1997. The Area 5 Radioactive Waste Management Site Composite Analysis will include the pre-1988 waste source-term analysis, as stated in the Implementation Plan, Defense Nuclear Facilities Safety Board Recommendation 94-2 (DOE, 1995c). Refer to Volume 1, Section 2.5.6 for more information on Performance Assessments and Composite Analyses.

Fernald Byproduct Waste Performance Assessment–Operable Unit 4 vitrified silo wastes from Fernald are being evaluated for disposal at the NTS in deeper confinement disposal configurations, under Chapter III of DOE Order 5820.2A, as a small quantity of byproduct material. The Fernald Byproduct Waste Performance Assessment is currently in progress and is scheduled for draft completion by September 1996.

Operable Unit 4 vitrified silo wastes are characterized by high-specific activity and longer-lived radionuclides (such as uranium, thorium, and their daughter products). Selection of the NTS for disposal of the Operable Unit 4 vitrified silo waste is supported by very favorable site-specific characteristics, particularly the "no groundwater pathway" conceptual model, and by very low population density. Scientists predict no movement of direct rainfall through waste cells to the deep groundwater because of the presence of thick, dry sediments and rock in combination with very low precipitation levels and high evapotranspiration rates (Shott et al., 1995). Treatability studies conducted on the vitrified waste form indicate that the vitrified waste fully satisfies NTS waste acceptance criteria and may provide a higher level of long-term protectiveness (DOE, 1993) (Battelle, 1994). Performance assessment analyses will rigorously test various disposal scenarios over a 10,000-year period. The limiting analysis for waste acceptance for disposal is expected to be the inadvertent human intruder dose assessment.

The Area 3 Radioactive Waste Management Site Performance Assessment—will address the post-1988 waste source terms for the facility and is scheduled for submittal to DOE Headquarters in March 1998.

Site-characterization of Area 3 in 1996 focuses on completion of a 152-m (500-ft) exploratory borehole beneath subsidence crater U-3bh (a reserve low-level waste cell at the Area 3 Radioactive Waste Management Site). The primary objective of the exploratory borehole in Area 3 is to characterize the physical and hydrologic properties of the chimneys and to assess the potential for downward groundwater movement and radionuclide transport. The underground shot cavities beneath the subsidence craters and waste cells in the Area 3 Radioactive Waste Management Site are much deeper than active hydrologic surface processes (infiltration, redistribution, and evapotranspiration) operating beneath the Waste unit from the ground surface to a depth of approximately 31 m (100 ft). Current scientific models suggest that the chimney beneath the low-level waste unit does not enhance or promote vertical groundwater flow between the waste unit (subsidence crater) and the deep-shot cavity. This conceptual model was confirmed by hydrologic data obtained in 1996 from the exploratory borehole completed beneath U-3bl. Water potential data indicate that there is no groundwater movement from a 40-m to 96-m (131-ft to 315-ft) depth within the subsurface chimney (Van Cleave, 1996). Given the proximity of Area 5 to Area 23 (22 km [14 mi]) and the very similar hydrologic conditions, the defensible hydrogeologic conceptual model for Area 5 is being tested and validated for the Area 3 Radioactive Waste Management Site. Refer to Volume 1, Section 2.5.6 for more information on Performance Assessments and Composite Analysis.

Transuranic Waste Performance Assessments—Two transuranic waste performance assessments are in review or preparation stages: (1) Greater Confinement Disposal Performance Assessment within the Area 5 Radioactive Waste Management Site and (2) Transuranic Waste in Trench T04C Performance Assessment (Area 5 Radioactive Waste Management Site). Each transuranic waste performance assessment evaluates individual transuranic source-term contributions within the Area 5 Radioactive Waste Management Site facility operation based on the containment performance objective, at a minimum. The rationale for this comparison is that the containment standard is the most limiting of the three quantitative standards given in EPA regulation 40 CFR Part 191: containment, individual protection, and groundwater, described briefly as follows (Price et al., 1993):

- The containment requirement assesses the probability of cumulative releases of radionuclides to the accessible environment over 10,000 years, considering all significant processes and events that might affect the disposal system. The accessible environment consists of any point in the subsurface that is 5 km (3 mi) beyond the waste unit and any point on the ground surface. The limit on cumulative releases depends on the initial radionuclide inventory

- Individual protection requirements are designed to protect individuals for 1,000 to 10,000 years after closure of the disposal site (the compliance period is dependent on site-specific conditions). They place limits on the annual dose equivalent received by any member of the public as a result of the disposal system. These limits are 25 milliroentgen equivalent man (mrem) to the whole body and 75 mrem to any critical organ. All potential pathways from the disposal system to people must be considered

- Groundwater protection requirements are designed to protect specific aquifers in the vicinity of the disposal site by placing limits on concentrations of radionuclides in sources of groundwater. In addition, they place limits on the annual dose equivalent received by an individual as the result of drinking water from these specific aquifers. The regulatory period for evaluation is 1,000 or 10,000 years, depending on site-specific conditions.

In 1980, the DOE realized the need for developing a disposal configuration to manage a portion of low-level waste that is unsuitable for shallow land burial because of its high specific activity or potential for migration into biopathways. In 1981, the DOE began investigating the technology referred to as greater confinement disposal. This technology was also developed in light of the concern for inadvertent human intrusion into an abandoned disposal facility. Although the scenario for inadvertent intrusion was considered unlikely, this alternative disposal method was investigated to reduce the probability of occurrence. The DOE/NV began a project to determine the feasibility of burial at depths greater than are normally provided in shallow land burial. To begin the feasibility test, a 3 m (10 ft) diameter x 37 m (120 ft) deep borehole was drilled. Instrument lines were emplaced in the borehole, and other smaller diameter boreholes were drilled around the central waste shaft. The borehole was filled with high specific activity waste and then backfilled with 18 m (60 ft) of cover material. Short-term monitoring of this borehole appeared adequate, and the disposal method became a practiced disposal method at the Area 5 Radioactive Waste Management Site. Greater confinement borehole disposal practices have ceased due to the state of Nevada's implementation of EPA regulations with regard to Class 5 Injection Wells. Designs for disposal configurations at depths that minimize or eliminate environmental intrusion and that will not be defined as injection wells are currently under consideration.

<u>Greater Confinement Disposal Performance Assessments</u>—The performance of the Greater Confinement Disposal site, situated within the Area 5 Radioactive Waste Management Site, was compared to the containment standard for the disposal of transuranic waste given in EPA regulation 40 CFR Part 191. In 1991, the first iteration of this performance assessment was completed and is documented in three volumes of the Preliminary Performance Assessment (Price et al., 1993). Performance assessment under 40 CFR Part 191 is iterative, that is, repetitions of the analysis are conducted until compliance or noncompliance is demonstrated with adequate confidence, based on a sensitivity or uncertainty analysis. Subsequent characterization and analyses have refined the Preliminary Performance Assessment and are documented in the Second Performance Assessment Iteration (Baer et al., 1994). The final performance assessment iteration is currently in preparation and is scheduled for draft completion in March 1997; final report completion is expected in August 1997. Based on the second performance assessment iteration, the Greater Confinement Disposal Unit was in compliance with the containment standard for limits on cumulative releases of radiation to the accessible environment.

<u>Transuranic Waste in Trench TO4C Performance Assessment</u>—The performance of the transuranic waste in Trench T04C within the Area 5 Radioactive Waste Management Site was compared to the containment and individual protection requirements given in EPA regulation 40 CFR Part 191 in Fiscal Year 1995. The transuranic waste disposed in Trench T04C was received from Rocky Flats in 1986. Preliminary performance assessments documented by Price (1993) and Baer et al. (1994) indicated that this disposal method has not met the performance objectives as defined in 40 CFR Part 191. Further analysis is required to determine the appropriate action for transuranic wastes currently emplaced in trench T04C. Possible actions include closure in place if performance

objectives can be met, or retrieval and subsequent disposal in a system that meets the 40 CFR Part 191 performance objectives.

A.2.1 Alternative 1

Under Alternative 1, ongoing Waste Management Program activities at the NTS would continue at current levels. No significant new initiatives or projects are included under this alternative.

A.2.1.1 Area 3 Radioactive Waste Management Site. A portion of Area 3 is reserved as a low-level waste disposal site under regulatory provisions derived from the Atomic Energy Act. The area has been designated as the Area 3 Radioactive Waste Management Site and includes seven subsidence craters created from underground nuclear weapons tests. Bulk low-level waste is disposed of in these subsidence craters. Waste management facilities are described in the following manner. The most basic is the cell, which includes trenches, pits, and craters. These are grouped together to make up units, such as the 20 cell Mixed Waste Disposal Unit. Units are placed in Radioactive Waste Management Sites such as the ones in Areas 3 and 5. The Area 3 Radioactive Waste Management Site encompasses approximately 128 acres of land and two support buildings located within the allocated boundaries of the facility. Two craters (U-3ax and U-3bl) were combined into one disposal cell that is completely filled. Two other craters (U-3ah and U-3at) were also combined into one disposal cell that was approximately half-full at the beginning of Fiscal Year 1995. This disposal cell (U-3ah/at) has been operating as a low-level disposal unit since 1988. Three other craters (U-3bh, U-3az, and U-3bg) remain for use as future disposal cells if necessary.

The Area 3 Radioactive Waste Management Site serves the NTS and approved off-site generators as a bulk, low-level waste disposal facility. Disposal cell (U-3ah/at) has a remaining capacity of approximately $1.7x10^5$ cubic meters (m^3) ($6x10^6$ cubic feet [ft^3]). Under Alternative 1, this capacity is insufficient to handle forecasted waste volumes for the next 10 years; therefore, it is anticipated that one additional disposal cell (U-3bh/az) and no additional support facilities would need to be opened. The new disposal cell would have an estimated capacity of $2.8x10^5$ m^3 ($1x10^7$ ft^3) and would receive $9x10^4$ m^3 ($3.2x10^6$ ft^3) during the 10-year period. Under this alternative, it is projected that the Area 3 Radioactive Waste Management Site will receive approximately $2.6x10^5$ m^3 ($9.2x10^6$ ft^3) during the 10-year period defined for this EIS.

One disposal cell (U-3ax/bl) is filled to capacity and is required to be closed under Resource Conservation and Recovery Act and staté of Nevada hazardous waste regulations due to hazardous waste constituents known to be present. This disposal cell was operated according to the requirements of the Atomic Energy Act, prior to the NTS implementation of Resource Conservation Recovery Act regulations and has been declared a mixed waste disposal cell. The DOE/NV is developing a site-specific plan for closure activities at Area 3. This plan, part of the Integrated Closure Plan, describes a closure cap design that would take into consideration the climate, geology, surface water and regional hydrology, and waste forms. This project, part of the Integrated Closure Program, has investigated the most optimum design for closure cap integrity in the arid NTS environment. Closure performance standards, which are the minimum maintenance requirements for the protection of human health and the environment, are also under development. Minimization or elimination of contaminant release and compliance with the applicable regulations and DOE orders will be considered. Closure of disposal cell U-3ax/bl will occur in the near future upon state approval of the Resource Conservation and Recovery Act closure plan. Under Alternative 1, one additional disposal cell (U-3ah/at) will also be closed.

A.2.1.2 Area 5 Radioactive Waste Management Site. In 1961, an area northwest of Frenchman Lake was reserved as a low-level waste disposal site under regulatory provisions derived from the Atomic Energy Act. In 1977, the area was designated the Area 5 Radioactive Waste Management Site and began controlled waste management operations.

DISPOSAL OPERATIONS—Operations at the Area 5 Radioactive Waste Management Site include low-level waste and limited mixed waste disposal. The

Area 5 Radioactive Waste Management Site encompasses 732 acres of allocated land, of which 92 acres are currently being used for storage and disposal. Low-level and certain mixed wastes may be disposed via shallow land burial in pits and trenches. Trench T03U, T07C, T08C, & T09C and Pits P06U, and P05U are the landfill cells open (Fiscal Year 1995) for low-level waste disposal. Pit P03U is available for mixed waste disposal. Under this alternative, the anticipated low-level waste volume is 9.0×10^4 m³ (3.2×10^6 ft³) and the anticipated mixed waste volume is 500 m³ (18,000 ft³). The existing capacity will meet the disposal needs of low-level waste expected to be generated under this alternative. Greater confinement disposal technology would continue to be pursued for disposal of high specific activity low-level waste.

The current inventory of mixed waste disposed in Pit P03U at the Area 5 Radioactive Waste Management Site is 8,024 m³ (2.8×10^5 ft³). Pit P03U is currently operating under Resource Conservation and Recovery Act Interim status for disposal of mixed waste. This waste must meet the Resource Conservation and Recovery Act Land Disposal Restriction requirements prior to disposal. Pit P03U has 9.1×10^4 m³ (3.2×10^6 ft³) of remaining capacity available for disposal, which should meet the disposal needs of low-level mixed waste expected to be generated under this alternative. Therefore, the Mixed Waste Disposal Unit would not be expanded under Alternative 1.

The remaining capacity for the Area 5 Radioactive Waste Management Site low-level waste disposal pits and trenches is 1.1×10^6 m³ (4.0×10^7 ft³). No sanitary landfill construction or disposal activities would occur in Area 5 under this alternative.

<u>STORAGE OPERATIONS</u>—Under this alternative, the Area 5 Transuranic Waste Storage Pad and the Hazardous Waste Storage Unit would continue to be used to store waste. However, the proposed Mixed Waste Storage Pad would not be constructed, and the Hazardous Waste Storage Unit would not be expanded.

Low-level mixed waste is currently stored on the Transuranic Waste Storage Pad in accordance with requirements of the January 14, 1994, Mutual Consent Agreement between the state of Nevada and the DOE. The agreement allows for the storage of on-site generated mixed waste until it can be treated to meet the Land Disposal Restrictions for disposal. There were 76 m³ (2,698 ft³) of mixed waste stored on the Transuranic Waste Storage Pad at the beginning of Fiscal Year 1995. The Transuranic Waste Storage Pad Cover Building, Bldg. S-29, which has 1,765 m² (18,900 ft²) of usable storage space, provides protection from environmental degradation of the transuranic waste containers.

The Hazardous Waste Storage Unit is a Resource Conservation and Recovery Act-permitted facility. The Hazardous Waste Storage Unit was originally constructed as a less-than-90-day hazardous waste storage unit and consists of a 9.1 m x 30.3 m (100 x 300 ft) curbed impervious concrete pad with a cover and a maximum storage capacity of 61,625 liters (L) (16,280 gallons [gal]) of containerized waste. Hazardous waste generated on the NTS would be accepted for storage at the Hazardous Waste Storage Unit for less than one year and then shipped off site for ultimate disposition.

In Area 5, transuranic mixed waste is stored on a 2.05-ac asphalt storage pad, the Transuranic Waste Storage Pad, with a design capacity of 1,140 m³ (39,800 ft³). At the beginning of Fiscal Year 1995, there were 612 m³ (21,613 ft³) of transuranic mixed waste stored at the Area 5 Radioactive Waste Management Site. All of this waste was received from the Lawrence Livermore National Laboratory. The DOE manages the current inventory of the transuranic mixed waste in accordance with the requirements of the Settlement Agreement (June 22, 1992) between the DOE and the state of Nevada, 1992. The transuranic mixed waste would continue to be stored at the Area 5 Radioactive Waste Management Site pending development of on-site characterization capability for acceptance of the waste at a DOE-designated disposal site, when one is approved.

<u>WASTE CERTIFICATION OPERATIONS</u>—Certification activities for waste acceptance would continue under existing methods. Waste characteristics of mixed waste would be identified through generator-supplied analytical data, split

samples, and expressed acceptance of the contents of the waste package as noted in the on-site generator's report and waste manifest. No waste certification facilities would be constructed under this alternative. Waste certification activities required to meet the Waste Isolation Pilot Plant waste acceptance criteria would not be conducted, and the transuranic mixed waste would be shipped to other DOE sites for certification, handling, and disposal.

CLOSURE OPERATIONS—Area 5 currently has low-level, mixed, and classified waste disposal units filled to capacity and available for closure according to DOE and EPA regulatory requirements. Filled waste Pits P01U and P02U and Trenches T01U, T02U, T04U, T06U, and T07U contain low-level waste disposed of prior to 1987 under the requirements of the Atomic Energy Act. Because mixed waste is suspected in these landfills, the entire group would be closed in compliance with Resource Conservation and Recovery Act regulations. The greater confinement disposal boreholes, used for the disposal of highly mobile, classified, or highly radioactive waste forms, would also be closed in accordance with Resource Conservation and Recovery Act regulatory requirements. Pit P04U, opened in 1988, has received only low-level waste and needs to meet only the closure requirements of the DOE orders.

The DOE/NV is developing a site-specific design for closure of Area 5 that would take into consideration the climate, geology, surface water and regional hydrology, and waste forms. This project, the Integrated Closure Program, would investigate the most optimum design for successful closure integrity in the arid NTS environment. Closure of the existing 92-acre Area 5 facility would not occur until after the end of the active life of this area, beyond the scope of this EIS. A number of alternatives are being considered, from one large closure cap for the entire Area 5 Radioactive Waste Management Site to independent caps. Closure performance standards include minimum maintenance requirements, protection of human health and the environment, minimization or elimination of contaminant release, and compliance with the applicable federal and state regulations and DOE orders.

A.2.1.3 Area 6 Waste Management Operations. The NTS would continue to store polychlorinated biphenyl (PCB) waste, in accordance with the Toxic Substance Control Act and state of Nevada regulations. All PCB waste would continue to be disposed off site at EPA-permitted facilities.

Low-level and mixed waste effluent generated by the Nevada Environmental Management and Defense Program activities would be treated at the Liquid Waste Treatment System facilities to be located in Area 6. Initially, there would be two 1.9×10^6 L (5×10^5 gal) double-walled steel evaporation tanks for low-level wastes. However, if mixed wastes were encountered, one of the tanks would be designated as a mixed waste treatment tank. The initial phase of the site would consist of the two double-walled steel tanks, a leak detection system, yard lights, a mobile-home-type trailer to house offices and monitoring equipment, access control features, fencing, and storm water protection. If required, the facility could ultimately be expanded to handle up to1.5×10^7 L/yr (4.0×10^6 gal/yr).

The hydrocarbon landfill is a state of Nevada-permitted Class III disposal site located near the southern edge of Area 6. The landfill would continue to be used for the sole purpose of discarding hydrocarbon-burdened soil, septic sludge, and debris. Resource Conservation and Recovery Act regulated wastes are not accepted for disposal. The minimum remaining capacity of the disposal site is approximately 42,000 m^3 (1.5×10^6 ft^3). Approximately 15,290 m^3 (5.4×10^5 ft^3) of soil, sludge, and debris have been disposed of in the hydrocarbon landfill.

A.2.1.4 Area 11 Explosive Ordnance Disposal Unit. The Area 11 Explosive Ordnance Disposal Unit is a thermal treatment unit rather than a disposal unit. Explosive ordnance wastes, regulated as characteristic reactive hazardous wastes under the Resource Conservation and Recovery Act, are detonated at the Explosive Ordnance Disposal Unit. The Explosive Ordnance Disposal Unit was first used in 1965 and continues to operate as a permitted Resource Conservation and Recovery Act treatment unit. The Explosive Ordnance Disposal Unit consists of a detonation pit surrounded by an earthen pad (approximately 8 m [25 ft] x 31 m [100 ft]) and ancillary equipment, including a bunker and an electric shock box. The Explosive Ordnance Disposal Unit has a maximum operating capacity to treat 45 kg (100 lb) per hour or an annual capacity of 1,873 kg (4,100 lb). No explosive waste is received from outside Nevada. The Explosive Ordnance Disposal Unit has an unofficial buffer zone of approximately 503 acres in a circular area.

A.2.2 Alternative 2

Under this alternative, Waste Management Program activities would be shut down. After shutdown, on-site monitoring and security functions would be reduced and would become part of the sitewide monitoring activity.

A.2.2.1 Area 3 Radioactive Waste Management Site. No waste closure or disposal operations would take place. Facilities would be secured, and overall NTS monitoring would take place.

A.2.2.2 Area 5 Radioactive Waste Management Site. No waste disposal, storage, closure, or certification operations would take place. Facilities would be secured, and overall NTS monitoring would take place. No waste certification operations would take place. All activities that generate mixed waste would cease. Containerized mixed, and transuranic mixed waste would be sent to other DOE facilities for certification and treatment to meet Resource Conservation Recovery Act land disposal restriction requirements (as applicable). All operational landfill units would receive a 1.2 m (4 ft) cover of compacted native soil.

A.2.2.3 Area 6 Waste Management Operations. No waste storage or treatment operations would take place. Facilities would be secured, and overall NTS monitoring would take place.

A.2.2.4 Area 11 Explosive Ordnance Disposal Unit. No waste treatment operations would take place. Facilities would be secured, and overall NTS monitoring would take place.

A.2.3 Alternative 3

The Waste Management Program under Alternative 3 would include the activities described under Alternative 1, with an increase in scope to reflect alternatives considered in the Draft Waste Management Programmatic Environmental Impact Statement.

A.2.3.1 Area 3 Radioactive Waste Management Site. Three additional low-level waste disposal units would need to be prepared to accept a total projected bulk waste volume of 7.5×10^5 m³ (2.6×10^7 ft³). This volume increase is due to accepting waste from more off-site generators than are currently approved, as well as accepting an increased amount of NTS-generated waste from the site environmental cleanup activities anticipated under this alternative. One additional support building would be constructed to expand the existing support Building 3-302. The expanded facility would almost double the size of Building 3-302 by providing a portable, prefabricated structure, that includes electrical and water systems. This construction project would be a short-duration low-labor task.

Bulk contaminated soils and other debris would be delivered by haulers from environmental restoration sites. These haulers would need to be surveyed and might need to be cleaned to ensure they are free from radioactive contamination prior to release from the site. Depending upon the levels of contamination encountered, there could be the need to construct a truck decontamination facility so that haulers could be cleaned prior to release from the Area 3 Radioactive Waste Management Site.

In addition to the closure activity described under Alternative 1, the additional low-level waste disposal cells (U-3bh, U-3az, and U-3bg) would become filled and would then need to be closed. Increased volumes would come from additional off-site generators (including the worst-case volume from the treatment of surplus, highly enriched uranium), as well as NTS environmental cleanup operations. The total projected volume for the 10-year consideration period to be disposed of in Area 3 is 7.5×10^5 m³ (2.6×10^7 ft³). This volume would be enough to completely fill the new disposal cells, in addition to the existing capacity remaining in disposal cell U-3ah/at. Even though disposal cell U-3ax/bl is declared a mixed waste disposal cell, and disposal cells U-3ah/at and U-3bh, U-3az, and U-3bg would be radioactive only disposal cells, the same or a similarly approved closure plan would be used to protect the environment by implementing the best available technology. The performance of the disposal cell U-3ax/bl closure system would be used to consider any changes that might be necessary in the closure of cell U-3ah/at.

A.2.3.2 Area 5 Radioactive Waste Management Site. Under Alternative 3, Area 5 waste management operations would be expanded and reflect the regionalized waste management concept for the DOE complex. In addition to increasing waste capacity, facilities for the on-site treatment and certification of NTS-generated or stored wastes would be constructed.

DISPOSAL OPERATIONS—Radioactive and mixed waste disposal operations would be increased to meet the demand of the additional DOE-approved generators shipping waste to the NTS. P05U, P06U, and T03U in the Area 5 Radioactive Waste Management Site would be filled to capacity. Pit P04U, was filled to capacity during 1995. Under Alternative 3, two additional low-level waste disposal cells in the Area 5 Radioactive Management Site would be opened in the next 10 years to dispose of the projected volumes of 2.5×10^5 m^3 (8.8×10^6 ft^3). Disposal capability for low-level waste inappropriate for shallow land disposal would be expanded.

Pending the approval of a modification to the Resource Conservation and Recovery Act Part B Permit application, 20 mixed waste disposal cells would be prepared to address the projected waste volumes of 3×10^5 m^3 (1.1×10^7 ft^3) requiring disposal under this alternative in the next 10 years. The Area 5 Resource Conservation and Recovery Act Part B Permit would be revised to address the additional mixed waste disposal capacity. Owing to these projected volumes, additional facilities and infrastructure would have to be constructed. Additional facility information is described below in Storage Operations. Pit P03U would not be used for the disposal of mixed waste under Alternative 3.

STORAGE OPERATIONS—A low-level waste storage unit would be constructed under Alternative 3. The low-level waste storage would be a curbed concrete pad located at the Area 5 Radioactive Waste Management Site. Most of the pad would be covered with a roof. The uncovered portion would serve as an unloading platform and as an additional storage area for solid material. The pad would provide approximately 279 m^2 (3,000 ft^2) of storage area for waste awaiting examination prior to disposal. Storage would also be made available for the DOE sites that do not have adequate storage capacity.

The hazardous waste storage unit under Alternative 3 would be increased to 0.138 acres in size, with a capacity of 208,175 L (55,000 gal) to address the additional needs of the NTS Defense and Environmental Restoration Programs. The NTS Resource Conservation and Recovery Act Part B permit application would be modified to address the additional storage capacity.

A mixed waste storage unit is planned to be constructed pending the approval of the Resource Conservation and Recovery Act Part B Permit application. The mixed waste storage unit would be an epoxy-coated, curbed, concrete pad located inside the existing Area 5 Radioactive Waste Management Site. Most of the pad would be covered with a roof. The uncovered portion would serve as an unloading platform and as an additional storage area for solid material. The pad would provide approximately 279 m^2 (3,000 ft^2) of storage area. The pad would serve the expanded needs of the Environmental Restoration and Defense Programs activities. The unit would store mixed waste in need of technology development and facility construction that can properly reclaim, recycle, treat, or dispose of the waste. Currently, mixed waste that cannot be disposed of in Pit P03U of the Area 5 Radioactive Waste Management Site is stored on the transuranic waste storage pad in the Area 5 Radioactive Waste Management Site. This storage pad would operate under a Mutual Consent Agreement between the DOE and the state of Nevada. In addition, the pad would be available, pending approval from the State, for sites requiring emergency assistance for storage of DOE mixed waste for up to 1 year.

The NTS transuranic and transuranic mixed waste would be stored, certified, and eventually transported to the Waste Isolation Pilot Plant when it becomes operational. A transuranic waste examination facility would be constructed to handle breaching and certification of this waste before it is transported to a designated disposal facility. The Transuranic Waste Storage Pad Cover Building (Bldg. S-29) would serve as the loading facility.

TREATMENT AND CERTIFICATION OPERATIONS—A waste examination facility comprised of the waste breaching and sampling building and the real-time radiography building would be constructed. The waste breaching and sampling building would be used to conduct on-site verification and certification of mixed wastes that are accepted for disposal at the Areas 3 and 5 Radioactive Waste Management Sites. This facility would house a breaching room for opening and viewing waste, a sampling facility for the collection and preparation of samples for chemical and radiochemical analysis, and an office and shower/change room. Remote package handling and decontamination capability would be included. Waste determined to be mixed through these verification activities would be returned to the waste storage area for further disposition or, if conditions warrant, returned to the generator if unacceptable.

A real-time radiography building would be constructed at the Area 5 Radioactive Waste Management Site and operated by the DOE/NV in conjunction with the waste breaching and sampling building to conduct verification of mixed waste received at the Areas 3 and 5 Radioactive Waste Management Sites. Real-time radiography imagery is a nondestructive, noninvasive method used to provide preliminary package examination before breaching questionable packages for waste sampling. Detection of unacceptable conditions within the waste package would enable the package to be opened and the unacceptable item(s) either to be removed or other appropriate action to be taken. The facility would be designed to process approximately 2,832 m^3 (100,000 ft^3) of waste per year.

The transuranic waste certification building would be constructed to certify NTS and off-site-generated transuranic waste for shipment to a designated DOE disposal facility (i.e., Waste Isolation Pilot Plant). The facility would be used for the breaching, sampling, inspecting, and repackaging of transuranic waste containers and would process approximately 82 m^3 (2,896 ft^3) of waste annually.

A treatment facility for the solidification of the cotter concentrate waste would be constructed in Area 5. This material residue from uranium ore processing that was sent to the NTS for storage from the DOE Mound Plant in Miamisburg, Ohio, in 1987, is known to contain uranium, thorium, and protactinium. These concentrates were once considered a valuable resource for source material. This solidification facility is planned for the treatment of the 1,244 fifty-five gallon containers of cotter concentrate mixed waste currently in storage at the Area 5 Radioactive Waste Management Site. Cementation was the treatment of choice for the majority of the waste, based on criteria such as feasibility, radiation dose to personnel, and cost. Eight of the containers from population B would require incineration.

CLOSURE OPERATIONS—Filled and unnecessary mixed, and greater confinement disposal waste disposal units would be closed under Alternative 3. The Integrated Closure Program recommendations would be followed with the approval of the state of Nevada. Details described under Alternative 1 apply to this alternative. A minimum of two additional low-level waste disposal units opened to accommodate the expanded use waste volumes would not be closed unless they reach disposal capacity during this activity period covered by this EIS.

SITE IMPROVEMENTS—Because the design and load limits of the existing roads are not for the number of expected waste shipments, the following upgrades would occur under Alternative 3. Either the 5-01 road would be repaired and widened, or the 5-07 road would be modified and redirected to provide adequate access to the Area 5 Radioactive Waste Management Site. This construction would be necessary to enhance the roads and provide safe access to the disposal site.

A new controlled access building would be constructed at the Area 5 Radioactive Waste Management Site under Alternative 3. This building would provide access security and personnel accountability to the site from road 5-01, the main entrance. All NTS personnel and visitors would need to be cleared through the entrance. Identifying people through the gate would provide accountability of all personnel on site at any time and would be especially useful under emergency situations.

The equipment maintenance and storage building would include a storage area for earthmoving equipment and light-duty machinery and would provide a sheltered work area for the three workers. The facility would be built in close proximity to the existing maintenance shed. The new facility would have approximately 297 m^2 (3,200 ft^2) of space.

A water supply line that would connect the Area 5 Radioactive Waste Management Site with the main supply line near Mercury Highway would be constructed under Alternative 3. This supply line would provide the site with a constant source of water, thereby eliminating the need for daily trucking of water. The two 227-m^3 (60,000-gal) water storage tanks would remain in use to provide an emergency supply should the new line become inoperable.

A flood protection dike and channel would be constructed to protect the Area 5 Radioactive Waste Management Site. This flood diversion system is expected to be an approximately 4,725-m (15,500-ft) long horseshoe-shaped barrier around the planned mixed waste disposal unit area and the existing Radioactive Waste Management Site. Another construction project designed to assist with fire protection for the site consists of laying underground water lines with a number of regularly spaced fire hydrants. The system would encircle the existing 92 acres of the Area 5 Radioactive Waste Management Site and would be extended to encircle the area of the future mixed waste units. The existing communication system would be expanded and modified to provide enhanced coverage for the site and better capabilities for communication to link to off-site locations. The communication system expansion would ensure the Area 5 Radioactive Waste Management Site reporting capabilities in emergency situations.

A Class I or Class II sanitary landfill would be constructed in Area 5 to serve the needs of the expanded Defense and Environmental Restoration Programs activities as well as serve the needs of neighboring rural counties. This landfill would receive construction and sanitary waste, and would have an approximate capacity of 424,753 m^3 (1.5×10^7 ft^3). It is proposed that the landfill would use an existing borrow pit that is approximately one-half mile north of the Mercury Highway and adjacent to Road 5-01 (east side). The disturbed area for this site would be approximately 15 acres. Borrow pit activities have already disturbed this area.

*A.2.3.3 **Area 6 Waste Management Operations**.* The NTS would continue to store PCB waste in compliance with applicable regulations, as would occur under Alternative 1.

The liquid waste treatment system would operate as described under Alternative 1. Mobile treatment units would be used on potential mixed waste streams that require further characterization prior to deciding the appropriate treatment option. Plans and schedules for characterizing these wastes, undertaking technology assessments, and providing the required plans and schedules for developing treatment capacity would be described in accordance with the requirements of the Federal Facility Compliance Act. As the Defense and Environmental Restoration Program activities continue at the NTS, mobile treatment units that can address lead encapsulation technology would be considered, at a minimum.

*A.2.3.4 **Area 11 Explosive Ordnance Disposal Unit**.* Treatment operations under Alternative 3 would increase to a level near maximum capacity, as described under Alternative 1, for handling explosive waste.

A.2.4 Alternative 4

Waste Management Program operations and construction would include the activities described under Alternative 3, but scaled back to provide service solely for DOE/NV waste generated within Nevada.

*A.2.4.1 **Area 3 Radioactive Waste Management Site**.* Under Alternative 4, the Area 3 Radioactive Waste Management Site disposal crater (U-3ah/at) would be adequate to meet the projected Nevada-generated waste volume needs of 150,000 m^3 (5.3×10^6 ft^3). Only closure of cell U-3ax/b1 would take place under this alternative.

A.2.4.2 Area 5 Radioactive Waste Management Site. Under Alternative 4, disposal of mixed waste would continue at the NTS for only those DOE/NV waste generators within the state of Nevada. Accordingly, waste volumes would be reduced from Alternatives 1 and 3 levels to 336 m^3 (11,900 ft^3) of low-level waste and 500 m^3 (18,000 ft^3) of mixed waste. No additional mixed waste disposal cells would need to be prepared to dispose of these projected waste volumes. Waste disposal cell closure activities would be the same as those described for Alternative 3.

NTS transuranic and transuranic mixed waste would continue to be stored, pending development of transuranic waste certification capabilities in the DOE complex. When such capability is available, this waste would be shipped off site for completion of certification activities and eventual shipment to the Waste Isolation Pilot Plant. Under Alternative 4, the hazardous waste storage unit would remain at the same capacity level as described under Alternative 1. The mixed waste storage pad would not be constructed under this alternative. Mixed waste storage would continue to take place on the transuranic waste storage pad.

No waste certification facilities would be constructed under this alternative. Certification activities for waste acceptance would continue under existing methods, as described under Alternative 1. The following facility construction activities described under Alternative 3 would be conducted under Alternative 4:

- Access Control Building
- Water Supply Line
- Maintenance Building
- 5-07 Road Reconfiguration
- 500-year Flood Protection
- Fire Protection Utilities
- Communication System.

Construction and operation of the mixed waste treatment facility for solidification of cotter concentrate waste would occur as described in Alternative 3.

A.2.4.3 Area 6 Waste Management Operations. Waste management activities at Area 6 would be identical to those described under Alternatives 1 and 3.

A.2.4.4 Area 11 Explosive Ordnance Disposal Unit. Treatment operations under this alternative would decrease owing to the loss of the majority of NTS explosive waste generators.

A.3 Environmental Restoration Program

In November 1989, the Secretary of Energy established the Office of Environmental Restoration and Waste Management to improve the management of remediation, waste management, and facility decommissioning by consolidating these missions into one office. In Nevada, environmental restoration activities are under the auspices of the Environmental Restoration Division and are managed as the Nevada Environmental Restoration Project. The DOE is committed to assessing and remediating contaminated sites, complying with all applicable environmental regulations and statutes, and protecting the public and workers' health and safety.

The specific activities under the Environmental Restoration Program are identified as follows:

- Underground Test Area Project
- Soils Media Project (including portions of the Nellis Air Force Range [NAFR] Complex)
- Industrial Sites Project
- Decontamination and Decommissioning Project
- Defense Nuclear Agency industrial sites
- Tonopah Test Range industrial sites
- Central Nevada Test Area
- Project Shoal Area.

The Defense Nuclear Agency sites are being identified as part of the Environmental Restoration Program because Defense Nuclear Agency site activities entail environmental remediations. However, it should be noted that the Defense Nuclear Agency is responsible for the operations, as well as the funding. It is, in this sense, a Work for Others Program project.

A.3.1 Alternative 1

Under this alternative, the DOE/NV would continue following the current scope of environmental restoration work identified in the Nevada Environmental Restoration Cost, Schedule, and Technical Baseline, and milestones as identified in Appendix III of the Federal Facility Agreement and Consent Order.

A.3.1.1 Underground Test Area Project. The Nevada Division of Environmental Protection regulates DOE Nevada's corrective actions through the Federal Facility Agreement and Consent Order. Appendix VI of the agreement, the Corrective Action Strategy, describes the processes that will be used to complete corrective actions, including those in the Underground Test Area Project. Individual sites covered by the agreement are known as Corrective Action Sites, and they are grouped into Corrective Action Units. The Underground Test Area Project is comprised of six Corrective Action Units, generally reflecting the distinct geographic locations and geologic and hydrologic environments of the weapons testing areas.

Because of the complexity and scale of the NTS, the Underground Test Area Project Corrective Action Investigation was separated into two major phases. During Phase I, project activities have been focused on a regional investigation. During Phase II, work scope focusing on the Corrective Action Units will be conducted.

Phase I consists of assessing existing data, developing geology, groundwater flow and solute transport models, and conducting risk assessment. Field activities include the use of new and existing wells for monitoring and testing to help develop transport models. Some new wells would be installed near shot cavities to collect data about the near-field environment. A key portion of the data assessment activities is the completion of a preliminary risk assessment to provide input to a value-of-information analysis that would identify and prioritize potential future data needs. The results of Phase I would be directly used in the work scope for the weapons testing areas and in the implementation of Phase II.

Phase II activities would begin in Fiscal Year 1996 and would include the development of specific groundwater flow and solute transport modeling for the six areas previously identified. From this effort a regulatory compliance zone would be established. Field activities in each area would provide data collection in the near-field environment, including installation of monitoring wells in locations indicated by modeling results. The effort would include near-field groundwater flow and solute transport modeling; risk assessment; stake holder/regulatory concerns; and a monitoring network design.

Current monitoring assesses the extent of contamination and supports modeling efforts to establish protective boundaries around the six areas. A five-year monitoring program would determine if data is consistent with predictions. If monitoring results are satisfactory to the state, then a closure report would be prepared for Nevada Division Environmental Protection approval. Post closure monitoring would be conducted for a duration of 50 years and would be consistent with the requirements of compliance. The Underground Test Area Project is anticipated to continue on a long-term basis. Although it is identified as a part of the Environmental Restoration Program, the monitoring aspects would provide additional data concerning long-term knowledge of the impact of nuclear testing on subsurface water. Once into the monitoring phase, the annual cost per well is estimated to be $12,500 (1994 dollars). The total projected funding/cost of the project, from Fiscal Year 1996 to 2005, is estimated to be $171,500,000 (1994 dollars). It is also anticipated that contaminated material drilled from the wells would generate about 2,340 m^3 (83,200 ft^3) of low-level waste that would be disposed on the NTS at one of the Radioactive Waste Management sites.

A.3.1.2 Soils Media Project (including portions of the NAFR Complex). The Soils Media Project provides for cleanup of approximately 3,257 acres of plutonium-contaminated soils (based on a 200 pCi/g cleanup level) on the NTS, the Tonopah Test Range, and the NAFR Complex combined. Contamination was a result of safety experiments in the 1950s and 1960s to determine if nuclear weapons can reach criticality through detonation of conventional explosives. Investigation and remediation activity has been expanded to include other NTS areas containing soil contaminated by other radionuclides. These areas include cratering experiment sites, atmospheric test sites, and underground test releases of activity to the surface.

While the areal extent of contamination related to these activities is found primarily on the NTS (Figure 4–30), seven additional sites of contamination are located on parts of the NAFR Complex and Tonopah Test Range. These sites consist of the plume east of the Smallboy site (Frenchman area) and the plume north of the Schooner site located on the NAFR Complex (see Figures 4-31 and 4-32, respectively), which are extensions of sites located on the NTS. Other contaminated areas located on the NAFR Complex include the Area 13 and the Double Tracks sites, shown in Figures 4-33 and 4-34, respectively. The Double Tracks test, part of Operation Rollercoaster, was conducted on the NAFR Complex, while three others, known as Clean Slate 1, 2, and 3, were conducted on the Tonopah Test Range.

Characterization of areas of contamination has been performed in the past and would continue. Previously, radiological contamination of surface soil at the NTS and contaminated sites near the NTS were evaluated by the Radionuclide Inventory and Distribution Program and the Nevada Applied Ecology Group, respectively. The objective was to estimate the total amount and the distribution of all manmade radionuclides in surface soils at the NTS, Tonopah Test Range, and NAFR Complex.

Cleanup operations would be designed utilizing information gathered from characterization work. Remediation levels would be based on dose limits and would consider the proposed future land use. When the extent of the area and volume of the cleanup have been determined, excavation would begin. The soil would then be transported to an approved disposal site. Transportation of contaminated soil is anticipated to use both existing roadways as well as roads specifically constructed for contaminated soil haulage. The waste would be transported, handled, and disposed of in accordance with applicable regulations and orders.

Currently, completed remediation plans exist only for the Double Tracks site which is located on the NAFR Complex. Characterization activities are expected to be concluded at this site in Fiscal Year 1996. Excavation activities would be expected to begin, with approximately 1,300 m^3 (46,222 ft^3) of low-level plutonium-contaminated soil waste being generated.

The estimated funding/costs for this Project during Fiscal Years 1996 to 2005 are identified in the Baseline Environmental Management Report (DOE, 1995a) as totaling $155,500,000 (1994 dollars). Total waste generated from all activities within this Project, during the same time period, has been estimated to be 307,000 m^3 (10,800,000 ft^3) of low-level plutonium-contaminated soil.

After the contaminated soil has been removed, the area would be surveyed to document that contamination has been reduced to the cleanup criterion. Upon confirmation, long-term site stabilization activities, including potential revegetation activities, would begin.

A.3.1.3 Industrial Sites Project. The Industrial Sites Project consists of 306 Corrective Action Units which are in turn comprised of 926 Corrective Action Sites Corrective Action Units located at the NTS and Tonopah Test Range. The Corrective Action Units have been functionally grouped into source groupings. Source groupings provide an efficient mechanism to plan environmental restoration activities at Corrective Action Units with similar characteristics. The twelve source groupings are:

<u>Disposal Wells</u>—Machine drilled boreholes of various diameters for the disposal of liquid or solid waste.

Inactive Tanks—Aboveground storage tanks, underground storage tanks and the surrounding soils potentially containing petroleum products or other hazardous constituents.

Contaminated Waste Sites—Generally sites with waste piles of solid material.

Septic Tanks and Lagoons—Impoundments, sewage lagoons, or septic tanks designed to handle wastewater from a variety of facilities.

Tunnel Ponds and Muckpiles—Muckpiles are generally heterogeneous solid wastes derived from postshot activities after an underground nuclear test in a tunnel. The solid waste is placed near the entrance to the tunnel. Tunnel ponds are impoundments created to contain contaminated meteoric waters flowing from the tunnel portals.

Drains and Sumps—Informally known as "french drains," these sites are comprised of vertical borings, backfilled with gravel, and receive liquid wastes, usually from an underground pipe connected to a facility.

Ordnance Sites—A site containing hazards from unexploded ordnance.

Bunkers, Chemicals and Material Storage Sites—Generally a structure which housed hazardous or radioactive materials.

Spill Sites—An area of soil contamination not associated with a fixed facility.

Part A Sites—Comprised of the seven original Resource Conservation and Recovery Act sites listed in the hazardous waste permit for the NTS. These sites are briefly discussed later in this section.

Decontamination and Decommissioning Facilities—Mission related surplus facilities which may be contaminated from usage are generally confined to the structural boundaries of the facility (i.e., floor, walls, roof).

Miscellaneous Sites—Sites that do not fit the above categories of source groupings.

Within the context of the Federal Facility Agreement and Consent Order, activities at Corrective Action Units within the source groupings will follow the following sequence: 1) Preliminary Assessment, 2) Corrective Action Investigation, 3) Corrective Action, and 4) Closure. If enough process knowledge and data are available at a site, a Streamlined Approach For Environmental Restoration Plan would be written to streamline this process. The Streamlined Approach For Environmental Restoration Plan would replace the Preliminary Assessment and the Corrective Action Investigation Plan. This sequence does not apply to the "Part A Sites" source grouping. These sites will be closed through the traditional Resource Conservation and Recovery Act approach in accordance with separate characterization and closure plans. The status or phase of activity for each Corrective Action Units is tracked in the Appendices to the Federal Facility Agreement and Consent Order agreement which are updated quarterly. Corrective Action Units in Appendix II are awaiting the initiation of investigative activities. Appendix III contains Corrective Action Units on which activities have been initiated. Appendix IV contains Corrective Action Units that are closed. Currently, within the Industrial Sites Project, there are 217 Corrective Action Units in Appendix II, 20 Corrective Action Units in Appendix III, and 69 Corrective Action Units in Appendix IV.

Preliminary Assessment activities generally consist of historical records search, interviews with former site workers, geophysical surveys, air photo interpretation, and limited site visits or sampling activities. Corrective Action Investigations usually begin with the writing of a Corrective Action Investigation Plan. The Corrective Action Investigation Plan guides field work at the Corrective Action Units which may consist of surface soil sampling, subsurface boring sampling, or groundwater sampling. At the completion of Corrective Action Investigation activities, a Corrective Action Decision Document documents the results of the sampling activities, and explores remedial alternatives for the site. A Corrective Action begins with the writing of a Corrective Action Plan which guides the remediation of the Corrective Action Units through closure.

Three Part A sites have been closed. The five sites remaining to be characterized, remediated, and closed are the Building 650 Leach field, Area 6 Steam Cleaning Effluent Ponds, Area 6 Decontamination Pond Facility, Area 2 Bitcutter Shop and Post-shot Containment Shop Injection Wells, and Area 2 U-2bu Subsidence Crater. A brief description of each site and its associated closure strategy is presented in the remainder of this section.

BUILDING 650 LEACH FIELD—The Building 650 Leach field is a land disposal unit that was in operation from 1965 to October 1992. The site would be characterized in Fiscal Year 1997 and the probable closure alternative would be clean closure. Ground disturbance would be 0.034 acre.

AREA 6 STEAM CLEANING EFFLUENT PONDS—The Steam Cleaning Effluent Ponds were evaporation basins used for the disposal of untreated liquid effluent discharged from the Steam Cleaning Buildings 6-621, 6-623, and 6-800. The discharges to the steam cleaning effluent ponds were discontinued in June 1993. They are currently being characterized and would be scheduled for closure in Fiscal Year 97. The probable closure alternative for this site would be clean closure; clean closure requires removing the waste-impacted soils. About 0.224 acre of ground would be disturbed.

AREA 6 DECONTAMINATION POND FACILITY—The Decontamination Pond Facility was used for the disposal of untreated liquid effluent discharged from Buildings 6-605 (decontamination facility) and 6-607 (industrial laundry). The Decontamination Pond Facility is scheduled for characterization in Fiscal Year 1996 and is scheduled for closure in Fiscal Year 1997 and the probable closure alternative for this site would be closure in place. Approximately 0.0046 acre of ground would likely be disturbed.

AREA 2 SHOPS—The Bitcutter Shop (constructed in 1981) and Post-shot Containment Shop Injection Wells (constructed in 1963) in Area 2 were used to dispose of hazardous wastes from steam cleaning operations. This site is scheduled for closure in Fiscal Year 96. The proposed closure alternative would be closure in place. Approximately 1 acre of land would be disturbed.

AREA 2 U-2BU SUBSIDENCE CRATER—The U-2bu subsidence crater in Area 2 was created by an underground test in 1971 and was used as a land disposal unit from 1973 to 1988. Site characterization and closure are pending. The site would most likely be closed in place, which would consist of covering and sealing. About 1 acre of land would likely be disturbed.

All five Resource Conservation and Recovery Act industrial sites would be scheduled for closure and/or continuation of postclosure monitoring activities through Fiscal Year 2005. Approximately 2.5 acres of land would be disturbed by these activities. It is estimated that Resource Conservation and Recovery Act sites would generate about 3,720 m^3 (130,000 ft^3) of mixed waste and 310 m^3 (10,900 ft^3) of hazardous waste over the next 10 fiscal years (1996 to 2005). The total projected funding/cost of this project is estimated to be slightly over $55 million during that same time period.

A.3.1.4 Decontamination and Decommissioning Project. The decontamination and decommissioning facilities activity was established in 1978 to provide safe caretaking (surveillance and maintenance) and disposition (decommissioning) of retired, DOE-owned or -sponsored nuclear facilities that were used to support the development of nuclear power and nuclear weapons. Since 1989, the Assistant Secretary for Environmental Restoration and Waste Management has had responsibility for decontamination and decommissioning. The decontamination and decommissioning project in Nevada is part of the Nevada Environmental Restoration Project, which is administered by the DOE/NV Environmental Restoration Division.

Decontamination and decommissioning are concerned with the safe caretaking of surplus nuclear facilities until their entombment, dismantlement/segmenting and removal, or conversion to another nonnuclear reuse. Decontamination and decommissioning tasks encompass (1) surveillance and maintenance,

(2) assessment and characterization, (3) environmental review, (4) engineering design, (5) decontamination and decommissioning operations, (6) waste disposal, and (7) closeout. The inventory of surplus facilities includes reactors, laboratory facilities, and storage areas with radioactive and hazardous materials.

Currently, there are seven facilities included in the NTS decontamination and decommissioning project: (1) EPA Farm, (2) Engine Maintenance Assembly and Disassembly Facility, (3) Reactor Maintenance Assembly and Disassembly Facility, (4) Test Cell A, (5) Test Cell C, (6) Pluto Disassembly Facility, and (7) Super Kukla Reactor Facility. An eighth facility, the Jr. Hot Cell, was decommissioned in Fiscal Year 1995. It has been assumed that the structures associated with all of the facilities would be demolished to ground level after verification that radioactivity levels are below the action level. No monitoring after this verification is anticipated; however, until the demolition and disposal of the waste occurs, all monitoring and security regulations would be enforced. It should also be noted that decontamination and decommissioning apply only to structures. Soils, if contaminated, would be remediated under Environmental Restoration Program activities. Demolition and waste removal would be the principal physical activities, and it is anticipated that these seven facilities would be decontaminated and decommissioned over the 10-year timeframe covered by this EIS.

The seven decontamination and decommissioning project facilities contain approximately 12,100 m^2 (165,000 ft^2) of building area. The total projected funding/cost (1994 dollars) of these activities over the 10-year timeframe is estimated at less than \$5 million. An estimated total of 37 m^3 (1,300 ft^3) of low-level waste would be generated between Fiscal Years 1996 and 2005.

A.3.1.5 Defense Nuclear Agency Industrial Sites. The Defense Nuclear Agency operates as a tenant activity at the NTS under a Memorandum of Understanding with the DOE. The terms of the Memorandum of Understanding require that the Defense Nuclear Agency comply with all DOE environment, safety and health, and quality assurance orders (DOE Orders 5820.2A and 5400.1) that require an integrated waste management plan for the NTS. The Defense Nuclear Agency, funded by the DoD, is a Work for Others Program. All the remaining activities in the program are environmental restoration related. Consequently, the Defense Nuclear Agency project description is located in the environmental restoration section of this EIS.

The Defense Nuclear Agency primarily conducted its underground nuclear weapons effects tests in tunnels within Rainier Mesa located in the north-central portion of NTS in Area 12. Most of the approximately 100 sites included in this project are within Area 12. The 100 sites include muck piles, tunnel ponds, contaminated tunnel portal areas, drums, batteries, and lead materials that are or may be identified as the responsibility of the Defense Nuclear Agency. The Defense Nuclear Agency would be responsible for this project and costs. The activity envisioned for all sites would include characterization, remediation, and/or closure. Presently, the costs of restoration activities are estimated to be \$15 million (1994 dollars); the restoration activities would take place between Fiscal Years 1996 and 2005. Approximately 500 acres of land would be involved, and about 50,000 m^3 (1.8 x 10^6 ft^3) of low-level mixed wastes would be generated.

A.3.1.6 Tonopah Test Range. There are 43 source units (environmental restoration sites) identified within the Tonopah Test Range. All sites are on controlled-access lands. For the purpose of this EIS, potential release sites at the Tonopah Test Range were divided into seven categories: (1) underground storage tanks, (2) landfill and lagoons-01, (3) landfill and lagoons-02, (4) soil contamination sites, (5) surface and near-surface radioactive sites, (6) ordnance sites, and (7) photographic french drains.

<u>UNDERGROUND STORAGE TANKS</u>—Four potential release sites are identified under the underground storage tank category. The anticipated activity would include characterization, contaminated soil removal, and site closure. The sites are located in Area 3.

LANDFILL AND LAGOONS-01—The landfill and lagoons-01 category consists of four potential release sites. Capping and monitoring are the anticipated activities. The sites are located in Areas 3 and 9. Capping and monitoring well-installation activities are estimated to begin in 1999. Approximately 20 acres would be disturbed as a result of these activities.

LANDFILL AND LAGOONS-02—This category consists of two potential release sites. The anticipated activities include characterization, remediation, and closure of the landfill and lagoon. Approximately 5 acres within the Tonopah Test Range would be affected. Monitoring activities are not anticipated upon completion of the remediation and closure of the sites.

SOIL CONTAMINATION SITES—Twenty potential release sites are included in this category. The sites are primarily located in Areas 3 and 9. The anticipated activities include characterization, remediation, and closure. Approximately 5 acres of land would be disturbed.

SURFACE AND NEAR-SURFACE RADIOACTIVE SITES—Seven potential release sites are included in this category. The anticipated activities are characterization and remediation (soil and debris removal). The combined total of disturbed land for the 7 sites is estimated to be 50 acres.

ORDNANCE SITES—Three potential sites are included in this category; the anticipated activities include ordnance removal or detonation, characterization, remediation, and closure. The units are all located within the Tonopah Test Range. The ordnance sites are no longer in use; however, one of the sites is directly along the active Tonopah Test Range flightpath. Ordnance tests are occasionally performed along the flightpath. Activities may affect up to 1,000 acres (buffer area is 50,000 acres).

PHOTOGRAPHIC FRENCH DRAINS—This category consists of two potential release sites located in Areas 3 and 9. Approximately 0.5 acres of land may be disturbed.

Over the 10-year timeframe of this EIS, approximately 960 m^3 (33,900 ft^3) of low-level waste would be generated from this project. About 16,600 m^3 (587,300 ft^3) of hazardous waste would also be generated in the same 10-year time period.

A.3.1.7 ***Central Nevada Test Area***. The Central Nevada Test Area is located approximately 92 km (57 mi) northeast of Tonopah in south-central Nevada. Project Faultless was the only nuclear (underground) test at this site (the test occurred on January 19, 1968). The device was detonated 975 m (3,200 ft) belowground surface. No venting of particulate debris occurred during or after the explosion. Several environmental restoration sites have been identified within the Central Nevada Test Area. Some of these sites consist of abandoned mud pits that are contaminated with heavy metals and petroleum hydrocarbons. Other industrial sites are also included within the Central Nevada Test Area; these may include sewage lagoons, trash dumps, 2 emplacement holes, an uncovered 9 m (30 ft) deep hole in the ground, and a runoff ditch. The activities to be conducted are site characterization, appropriate remediation and long-term hydrologic monitoring. The deep subsurface environments would likely remain restricted for an indefinite period of time.

A.3.1.8 ***Project Shoal Area***. The Project Shoal Area is located approximately 48 km (30 mi) southeast of Fallon, Nevada and covers a 10 km^2 (4 mi^2) area. The underground nuclear test at the Project Shoal Area occurred October 26, 1963. The device was detonated 411 m (1,350 ft) below ground. No venting of particulate debris occurred during or after the explosion. Deactivation of the site commenced almost immediately with all surface equipment removed by January 31, 1964, and the site was placed on standby status. Future activities would likely include continuing the site characterization, appropriate remediation, and long-term hydrologic monitoring. The DOE's long-term strategy for the Project Shoal Area is for unrestricted use of surface land. The deep subsurface environments would likely remain restricted for an indefinite period of time.

A.3.2 Alternative 2

In Alternative 2, Environmental Restoration Program activities would be discontinued, and sites would be left abandoned as is. All reports, studies, field investigations, characterization, and decommissioning and/or decontamination would cease. Environmental monitoring would continue to the extent necessary to detect contaminant migration at compliance boundaries. All remediation projects under way would be discontinued, with the goal of progressing to a suitable conclusion within one calendar year of the decision to pursue this alternative.

A.3.3 Alternative 3

In Alternative 3, Environmental Restoration Program activities would continue as identified in Alternative 1. Most Environmental Restoration Program activities are expected to be accelerated relative to Alternative 1. Expanded uses may require cleanup level adjustment in accordance with the applicable environmental requirements.

A.3.4 Alternative 4

Environmental Restoration Program activities would continue at current or accelerated rates. Cleanup levels and/or remediation could be stricter (where applicable), based on designated land use and/or the potential return of some lands to the public domain.

A.4 Nondefense Research and Development Program

The DOE has historically supported a variety of research and development activities at the NTS in cooperation with universities, industry, and other federal agencies. The nondefense research and development projects, activities and business services evaluated in this EIS are described below.

A.4.1 Alternative 1

Under this alternative, the DOE would continue to support the ongoing Nondefense Research and Development Program operation.

*A.4.1.1 **Alternative Energy**.* Southern Nevada represents an ideal place for the research and development of a variety of alternative energy resources. Principal among these is solar-power electrical production. The abundance of this resource, coupled with the available land and existing labor forces, presents a significant opportunity for demonstration and development of large-scale solar energy systems with the potential for commercial success.

A Solar Enterprise Zone facility concept has been advanced by a consortium of federal, state and local entities along with the solar power industry. Established through an open, public process, the collective effort is to develop, finance and construct one or more solar power production plants in southern Nevada. Up to 1000 MW has been considered as a long-term goal starting with a 100 MW project solicitation. Four sites, including the NTS, are currently being considered for construction of the initial solar generation facilities. Additional sites may be considered to support the long-term goals of a Solar Enterprise Zone facility initiative.

The Corporation for Solar Technology and Renewable Resources was created in early 1995 to facilitate the mission and goals of a Solar Enterprise Zone facility. It is a non-federal corporation established specifically to implement the action plans of a Solar Enterprise Zone facility. The actual cost of construction of a solar project on one or more of the sites considered will be financed by the project developers who may have access to tax exempt bonding through the Corporation for Solar Technology and Renewable Resources. The DOE is not expected to hold equity interest in the facilities actually constructed.

*A.4.1.2 **Spill Test Facility**.* The DOE Spill Test Facility is a research and demonstration facility. It is available on a user-fee basis to private and public sector test and training sponsors who are concerned with the safety aspects of hazardous chemicals. Safety research associated with the handling, shipping, and storage of hazardous fluids and liquefied gaseous fuels is conducted within this facility. The Spill Test Facility is the only facility of its kind for either large- or small-scale testing of hazardous and toxic fluids, including wind tunnel testing, under controlled conditions. The facility consists of a control building, a wind tunnel, meteorological and camera towers, a tank farm and spill area, and a personal safety equipment building. The site is composed of four test areas.

Since 1986, the Spill Test Facility has been used for evaluating and modeling hazardous releases into the atmosphere. The facility is ideally suited for test sponsors who wish to develop verified data on prevention, mitigation, cleanup, and environmental effects of toxic and hazardous gaseous liquids. In addition to testing, the facility provides structured training for emergency spill response for most chemicals in commercial use. Performing controlled, measured releases of toxic and hazardous materials into the environment is the most reliable means of simulating the behavior of these chemicals during a full-scale accidental release. The Spill Test Facility is located on Frenchman Flat at the NTS, approximately 121 km (75 mi) northwest of Las Vegas, Nevada.

To date, six environmental assessments and associated Findings of No Significant Impact spanning 1981 to 1994 have been written to cover the testing of certain chemicals at the Spill Test Facility. Specific tests proposed to be conducted at the Spill Test Facility must be assessed by the DOE in an addendum to the *Environmental Assessment for Hazardous Materials Testing at the Liquefied Gaseous Fuels Spill Test Facility* (DOE/OFE, 1994) according to predefined exposure limits or bounds for testing. If these tests are determined to be within the bounding analysis of the aforementioned environmental assessments, the DOE issues a Findings of No Significant Impact for that specific test. The Spill Test Facility is already permitted for the release of 30 gases.

Operations would continue at the Spill Test Facility at its present level of testing. Through the enactment of the Clean Air Act Amendments of 1990, Congress has directed the EPA and the DOE to oversee experimental research and to develop a list of chemicals and a schedule for testing at the Spill Test Facility. Specifically, Section 103(f) of the Clean Air Act specifies that a minimum of two chemicals per year should be field tested at the facility, with priority given to chemicals presenting the greatest potential risk to human health. The Act requires the DOE to make the facility available to interested persons, including other federal agencies wanting to conduct related research and activities.

A.4.1.3 Alternative Fuels Demonstration Projects. Executive Orders 12759 and 12856, the Energy Policy Act of 1992, and the Clean Air Act mandate the general requirements for using alternative fuels in the federal and private sectors and establish baseline conversion tables and procurement schedules for new alternative-fueled vehicles.

Although the NTS does not have the refueling infrastructure to support alternative-fueled vehicles, the DOE has converted 16 of its vehicles to compressed natural gas. These vehicles would be stationed in Las Vegas and shuttle between the Nevada Operations Office and the NTS. This initiative used Fiscal Year 1994 funding; additional funding is anticipated once the costs for procurement and conversion of original-equipment-manufacturer vehicles is developed in a formal proposal. It is anticipated that initial refueling requirements to support future compressed natural gas conversions at the NTS might consist of tanker refueling deliveries until the demand establishes the need for permanent facilities.

Without future funding availability for refueling infrastructure, further conversion activity for the remaining vehicle fleet would be unlikely. The intent is to build the infrastructure, convert the original fleet, and further develop partnerships geared to study other alternative fuel and energy sources, including, but not limited to, fuel-cell research and development, exotic-fuels development, additive research, and electric-automobile development and use.

Under Alternative 1, the DOE would continue to support the 16 DOE-owned vehicles already converted to compressed natural gas. The DOE would also continue developing a formal proposal for the conversion of the original-equipment-manufacturer vehicles fleet. However, no conversion would take place beyond the development of a formal proposal.

A.4.1.4 Environmental Management and Technology Development Project. The DOE is committed to improving the effectiveness of all of its programs and organizations. In support of this commitment, the Office of Environmental Management Program, in cooperation with other DOE research organizations, will use the best science and technology available to solve the most challenging set of environmental problems in the world. This approach will build upon existing programs and will seek continual improvement of all environmental management operations and processes.

The goal of environmental management and the Technology Development Office is to conduct a research and technology development program that is focused on overcoming major obstacles to progress in cleaning up the DOE sites and that involves the best talent in the DOE and the international science communities.

The focus of the Technology Development Project is on five major remediation and waste management areas:

- Contaminant Plume Control and Remediation
- Mixed Waste Characterization, Treatment, and Disposal
- High-Level Tank Remediation
- Landfill Stabilization
- Facility Transitioning, Decommissioning, and Final Disposition.

Implementation of this program is through the following teams:

- Management Team
- Implementation Team
- Focus Area Review Group
- Site Technology Coordination Groups (DOE).

The implementation of this program at the DOE/NV is through the development of a Site Technology Coordination Group and participation in national focus area groups. The Site Technology Coordination Group is made up of personnel from the various DOE programs and includes the involvement of stakeholders and regulators. The environmental management activities at the DOE/NV are the responsibility of the assistant manager for Environmental Restoration and Waste Management Division.

The DOE/NV goals related to technology development are to participate in the demonstration of technologies at the NTS and other DOE sites. Examples of current activities include development and:

- Field demonstration of the associated particle imaging system, a nonintrusive technology for three-dimensional, elemental characterization of sealed, or inaccessible, containers and structures. This system would be used for decontamination and decommissioning activities

- Field demonstration of airborne and hand-held, laser-induced fluorescence systems for decontamination and decommissioning application. This system is particularly useful for characterizing depleted uranium contamination, as well as for petroleum products

- Implementation of improved techniques for integrating remote sensing data into geographic information systems.

The current funding level for these activities is about $2 million, of which $1.7 million is operating budget and $300,000 is capital equipment.

A variety of other projects has been proposed for the DOE/NV, including refinement of landfill monitoring technologies, demonstration of waste treatment and management techniques, applications of remote sensing technologies, and soil sorting and washing techniques.

A.4.1.5 Environmental Research Park. The National Environmental Research Park Program was started in 1972 by the DOE in response to recommendations by citizens, scientists, and members of Congress to set aside land for ecosystem preservation and study. Seven such ecosystem sanctuaries have been established, the latest of which is the NTS in 1992.

Under a cooperative agreement between the DOE/NV, the University of Nevada and the University of Nevada, Las Vegas, the DOE/NV Office of the Assistant Manager for Environmental Restoration and Waste Management is providing financial assistance to the University of Nevada, and the University of Nevada, Las Vegas, to conduct scientific research projects unique to the NTS Environmental Research Park. Areas of research include, but are not limited to, habitat reclamation, hydrogeologic systems, radionuclide transport, ecological change, waste management, monitoring processes, remediation, and characterization. Projects are selected by the park director from annually submitted proposals.

Existing projects and new projects will be conducted in accordance with this agreement. The number of projects conducted is commensurate with the available budget, the infrastructure, and the functions in place to support the projects. In addition, scientific research projects conducted by parties other than those in the above-mentioned agreement are being conducted, and more are anticipated. These parties are funded from sources other than the DOE/NV. The number of projects is limited only by the infrastructure and functions in place to support the projects. The current infrastructure and facilities operable at the NTS, and perhaps even in a reduced capacity, are sufficient to support the park.

A.4.2 Alternative 2

Under this Alternative, the DOE would discontinue support of ongoing program operations.

A.4.3 Alternative 3

Under Alternative 3, the DOE would continue to support the ongoing activities described under Alternative 1 and pursue new initiatives.

*A.4.3.1 **Alternative Energy***. A Solar Enterprise Zone facility concept is being advanced by a consortium of federal, state, and local entities along with the solar power industry. Established through an open, public process, the intent of this effort is to develop, finance, and construct one or more solar power production plants in southern Nevada. The Corporation for Solar Technology and Renewable Resources has headed this effort and was created in early 1995 to facilitate the mission and goals of a Solar Enterprise Zone facility.

The actual cost of constructing a solar power project on one or more of the sites considered will be financed by the project developers who may have access to the tax exempt bonding through the Corporation for Solar Technology and Renewable Resources. Costs or profits generated from the development of solar technologies will be realized by the project developers, and the Corporation for Solar Technology and Renewable Resources, not the DOE.

Impact analyses for Solar Enterprise Zone facility activities presented in this EIS were based on the worst case scenario which maximized disturbed land and water use. The worst case scenario analyzed was one which assumed a single 1,000-MW facility disturbing 2,400 acres of land, and using solar technology which required 5,550 acre-feet/year of water. Also included in the land disturbance analysis was the construction of additional power lines and natural gas pipe lines required for the facilities. Power lines and pipe lines to Las Vegas were assumed to disturb 2,182 acres of land for a six-month period. It is important to note, however, that specific sites and/or technologies have not yet been chosen and may affect this scenario.

Additional National Environmental Policy Act documentation may be required before the construction of Solar Enterprise Zone facilities begins. The documentation will contain the latest pertinent data to provide decisionmakers with up-to-date information regarding the Solar Enterprise Zone facilities initiative, including possible disturbances resulting from the installation of power lines or pipe lines. The private corporation implementing the solar technology(ies) would bear the burden of performing the additional analysis and of mitigating any adverse effects realized by these activities.

Photovoltaic systems convert solar radiation to direct-current electricity without moving parts or thermal energy sources. The solar cell contains a semiconductor material, the most common of which is silicon, that typically produces about 100 watts of direct current power per square meter. Commercial solar modules convert between 11 to 13 percent of incident sunlight into electricity unless mounted on a tracking system that can increase output by 20 percent or more.

Parabolic-trough solar thermal systems use parabolic mirrors shaped to concentrate insolation on a receiver tube along the focal line of the trough. The heat generated by the concentrated sunlight is transferred to a working fluid, which is transferred through insulated pipes to a heat transfer device used to raise steam. The steam is then used to power a steam turbine and produce electricity. This technology also incorporates the use of natural gas as a back-up system.

Power tower systems consist of fields of heliostats that focus solar radiation on a power tower. The receiver absorbs the heat energy and transfers it to a circulating fluid that can either be stored or used directly to produce power.

Parabolic dish systems are point-focus devices that use a parabolic mirror to focus solar energy on a single receiver located at the focal point of the dish. The heat is then absorbed in a fluid, which can then be converted to electricity via a generator system located at the focal point of the dish or be piped to a central location for electricity generation or thermal applications. Systems coupled with engine generators at the focal point have the greatest potential to produce electrical energy.

The location of a large-scale solar-power production facility at the NTS would require upgrades to the existing transmission infrastructure. The NTS power transmission system could support 100 MW of capacity with no additional investment in upgrading the system; approximately 30 MW is used by the NTS, and the remaining 70 MW would be available for export. In order to handle the planned 1,000 MW capacity, power transmission lines would have to be upgraded to between 345 kilowatts (kW) and 500 kW from the NTS to Southwest Intertie or Eldorado Valley near Las Vegas. Other infrastructure upgrades required for the siting of the solar production facility at the NTS may be a natural gas line and/or water system improvements, as determined by the type of technology used.

Alternatively, other sites may be used in conjunction with the NTS to support a Solar Enterprise Zone facility initiative to minimize infrastructure improvement requirements and improve access to power markets. Additional sites in southern Nevada have been proposed for deployment of a Solar Enterprise Zone facility. The Eldorado Valley, south of Boulder City, the Dry Lake Valley (Apex/Harry Allen) site, and the Coyote Spring Valley in Lincoln County, are alternative southern Nevada locations being considered for a Solar Enterprise Zone facility development.

Six thousand acres of land in Eldorado Valley recently annexed by the city of Boulder City has been designated for the purpose of renewable resource development. Eldorado Valley lies in the center of the southwestern power transmission system that links the power markets of Arizona, Utah, southern Nevada, and southern California, providing unparalleled access to transmission and utility markets. Consequently, Eldorado Valley is the most likely marketing location for power generated at any of the sites being considered for a Solar Enterprise Zone facility development. Natural gas and water transmission systems would need to be developed before this area could employ hybrid solar technologies or any solar-energy production systems requiring water. Two natural gas pipe lines transect this area, and depending on the siting of solar facilities in this area, the gas line could be from 2 to 10 km (1 to 6 mi) away. There is very little groundwater in this area; however, the city of Boulder City has indicated an interest in making available up to 3.7×10^6 m^3/yr (3,000 ac ft/yr) of treated effluent to support solar development of this area. This amount of water would be sufficient to support a 300 MW solar-powered steam facility.

The Nevada Power Company's Harry Allen site is located about 32 km (20 mi) northwest of Las Vegas, just north of Interstate 15 in the Apex industrial area. Nevada Power Company has identified 3,600 acres for development of renewable energy supply. Currently, the area has a power transmission capacity of 305 MW, but plans of the Nevada Power Company to site 280 MW of gas combustion turbines would seriously limit the transmission availability for development of solar power. Infrastructure improvements being considered for the area include the termination of a major line for Idaho and completion of the Sunrise Corridor project, which could expand the transmission capability of the Harry Allen site. Also, a natural gas pipe line is currently being arranged between the Nevada Power Company and gas pipe line companies. These improvements could be completed in time for Solar Enterprise Zone facility development. Water supply is very limited in this area, and there are no plans to construct a permanent water supply line to this area; Nevada Power plans to truck water to support its combustive turbines.

The Coyote Spring Valley site is located approximately 93 km (58 mi) north of Las Vegas. Site boundaries fall within both Clark and Lincoln counties and have 3,200 acres of land available for solar power development. The property is currently owned by Aerojet Investments, Ltd. The Lincoln County Power District owns and operates the existing transmission system, which runs along the western border of the Aerojet property. The existing system is capable of accommodating 35 MW of solar generated power. Providing water to a solar facility on site would require either drilling or a new well or transporting water from an off site location. The closest supply of natural gas is 47 km (29 mi) to the east where a Southwest Gas pipe line is located.

A.4.3.2 Spill Test Facility. Activities would be similar to those described under Alternative 1, but the level of activity would be increased.

A.4.3.3 Alternative Fuel Demonstration Projects. Activities would be the same as those described under Alternative 1, with two exceptions. Under Alternative 3, the DOE would construct a compressed natural gas fueling facility for compressed natural gas vehicles at the NTS. In addition, the DOE would further develop partnerships geared to study other alternative fuel and energy sources.

A.4.3.4 Environmental Management and Technology Development Program. Under Alternative 3, the technology development activities would increase in all areas. Those activities listed as proposed under Alternative 1 would be implemented. As a national resource for the management of mixed waste, the DOE/NV would develop and refine waste-management monitoring methods.

In Alternative 1, the DOE would convert vehicles to and use compressed natural gas. Under Alternative 3, any vehicle or fueled equipment associated with DOE/NV work activities may be evaluated as to their potential conversion to alternate fuels. In addition, alternate fuels and associated technologies other than compressed gas may be evaluated, tested and demonstrated. Alternate fuel systems that may be considered include electric vehicles (powered by fuel cells or batteries), superconducting magnetic levitation vehicles, and vehicles with internal combustion engines running with alcohol-based fuels (methanol and ethanol), gaseous fuels (compressed or liquefied natural gas and liquefied petroleum gas), and non-conventional fuel mixtures (such as hydrogen and oxygen).

In February 1996, the DOE initiated a joint team with NTS Development Corporation, a DOE community re-use organization, and Kistler Aerospace Corporation. The DOE supports, as part of the increase in technology development activities at the NTS, the Kistler Aerospace Corporation's proposal for a commercial satellite delivery service as a potential future activity under this program. The DOE considers this activity compatible with the existing and future uses of the NTS.

Kistler identified in the public comment process on the Draft NTS EIS their proposal to manufacture and operate an aerospace vehicle for the delivery of communications satellites to low earth orbit at the NTS. Specific activities may include the fabrication of composite structures, vehicle assembly, processing, fueling, and recovery. Kistler anticipates conducting three suborbital test flights and three orbital test flights in the first year of operation, followed by an anticipated two operational flights per month after the test phase.

A.4.3.5 Environmental Research Park. Activities would be the same as those described under Alternative 1.

A.4.4 Alternative 4

In some cases under this alternative, activities would be the same as those described under Alternative 1. In other cases, activities would be the same as those described under Alternative 3.

A.4.4.1 Alternative Energy. Activities would be the same as those described under Alternative 3.

A.4.4.2 Spill Test Facility. Activities would be the same as those described under Alternative 1.

A.4.4.3 Alternative Fuels Demonstration Projects. Activities would be the same as those described under Alternative 1.

A.4.4.4 Environmental Management and Technology Development Program. Activities would be the same as those described under Alternative 3.

A.4.4.5 Environmental Research Park. Activities would be the same as those described under Alternative 1.

A.5 Work for Others Program

The Work for Others Program is hosted by the DOE and includes the shared use of certain NTS and Tonopah Test Range facilities and resources with other federal agencies, such as the DoD for various military training exercises and research and development projects.

A.5.1 Alternative 1. Under Alternative 1, the DOE would continue to host the projects and activities of other federal agencies at activity levels not exceeding those of the past 3 to 5 years.

A.5.1.1 Treaty Verification. Activities at the NTS and NTS support facilities throughout Nevada, including the Tonopah Test Range, have been, and will continue to be, impacted by implementation of current and future international arms control treaties. Principal responsibility for implementing and coordinating the DOE/NV arms control activities is assigned to the Emergency Management and Nonproliferation Division. The DOE/NV Safeguards and Security Division shares responsibility and may actually take the lead for those activities that are principally overflights or walk-through inspections of short duration and are nonoperational in nature. Treaties currently in effect or under negotiation and the relevant rights granted under those treaties are discussed below.

The negotiation of a Comprehensive Test Ban Treaty is underway at the Conference on Disarmament in Geneva, Switzerland. The DOE/NV is conducting various projects for the DOE Headquarters to help develop a strong, verifiable treaty that will deter proliferant activities.

A.5.1.1.1 Threshold Test Ban Treaty—The Threshold Test Ban Treaty permits Russian scientists and engineers to conduct an inspection of one nuclear test per calendar year if tests were conducted. The purpose of the inspection is to verify that the United States is in compliance with treaty limits.

A.5.1.1.2 Peaceful Nuclear Explosion Treaty—Russian scientists and engineers would conduct inspections and geophysical measurements of any peaceful nuclear explosions at the NTS. However, the United States has no plans to conduct peaceful nuclear explosions, so this treaty would have no effect on the NTS related sites or facilities.

A.5.1.1.3 Chemical Weapons Convention—The Chemical Weapons Convention Treaty provides for on-site inspections of the United States' facilities capable of manufacturing or storing chemical weapons. Although the NTS has not been used for the production or storage of treaty-limited chemical agents, the presence of operations, such as the Spill Test Facility, may be sufficient justification to trigger challenge inspections under terms of the Chemical Weapons Convention.

A.5.1.1.4 The Treaty on Open Skies—In an effort to promote openness and to facilitate monitoring of arms control treaties, the Treaty on Open Skies provides for aerial inspections by foreign observers of virtually any site in the United States, including those sites that might be engaged in the production, testing, or storage of treaty-limited weapons systems. Periodic inspections of the NTS facilities are expected as this treaty is implemented.

A.5.1.2 Nonproliferation. The policy of the United States is to resist the proliferation of weapons of mass destruction. These weapons cause indiscriminate, widespread destruction and include nuclear, biological, and chemical weapons. Nonproliferation can be defined as the use of the full range of political, economic, and military tools to prevent proliferation, reverse it diplomatically, or protect the United States' interests against an opponent armed with weapons of mass destruction should that prove necessary. Nonproliferation tools include intelligence, global nonproliferation norms and agreements, diplomacy, export controls, security assurances, defenses, and the application of military force.

The NTS and Tonopah Test Range continue to provide critical support for the United States' nonproliferation goals and objectives, particularly in the areas of research and technology development. In the past, seismic signatures and ground disturbances produced from underground nuclear weapons tests at the NTS have been analyzed to develop techniques and methods for detecting and evaluating underground nuclear tests worldwide. Additional nonproliferation-related experiments are currently using the unique capabilities of the Spill Test Facility for the development, characterization, and testing of remote sensors of chemical effluent.

A.5.1.3 Counterproliferation Research And Development. Counterproliferation refers to the DoD efforts to combat the international proliferation of weapons of mass destruction. As with nonproliferation, these efforts include the full range of political, economic, and military tools available. However, since facilities for developing, producing, and storing weapons of mass destruction are likely to be located belowground, a considerable amount of counterproliferation research and development involves the detection, monitoring, and neutralization of buried targets.

The tunnels and bunkers at the NTS provide ideal testing environments for a variety of counterproliferation research and development experiments. Experiments that use various remote imagery and sensory applications in conjunction with NTS bunkers and tunnels are conducted to develop techniques and methods to detect, characterize, and monitor buried objects. Such experiments involve both land-based and airborne operations. Experiments to develop various techniques for destroying or neutralizing weapons of mass destruction and buried objects, such as bunkers and tunnels, are also performed. These experiments involve the surface and belowground detonation of conventional explosives in the immediate vicinity of the NTS and Tonopah Test Range bunkers and tunnels.

The NTS could become the center for a national counterproliferation program. This program would integrate the Nevada-based military and U.S. Bureau of Land Management ranges into a national counterproliferation test bed, with the NTS at its center. This test bed would be used for a variety of research and technology development experiments aimed at countering the proliferation of weapons of mass destruction.

The Big Explosives Experimental Facility was specifically designed as a hydrodynamic testing facility for the research, development, and testing of counterproliferation technologies. Modern United States nuclear weapons contain sophisticated safety features and are small in size relative to the first nuclear weapons, making their disablement straightforward and certain. Proliferant countries and terrorist organizations, on the other hand, are likely to produce nuclear weapons that are unstable and, therefore, difficult to render safe with certainty. Several promising technologies have been proposed and are under development to counter the special problems associated with this more primitive class of nuclear device. In order for these technologies to be successfully developed, a facility must be available to test the hydrodynamic functioning of simulated nuclear devices containing large amounts of conventional high explosives. The Big Explosives Experimental Facility is crucial for this task given the absence of underground nuclear testing. This is the main purpose of Big Explosives Experimental Facility (see Appendix F).

The Dipole Hail Project involves a series of tests to evaluate the effectiveness of various techniques and munitions in damaging tunnels and thereby impairing nuclear weapons development operations in those tunnels. The Cut and Cover Project involves using unattended ground sensors to identify and distinguish remotely between various types of equipment being operated in bunkers.

A.5.1.4 Conventional Weapons Demilitarization. By the year 2000, it is expected that the United States government will need to dispose of over 4.5×10^7 kg

($1.0x10^8$ lb) of solid rocket motors. In addition, the United States government is currently the custodian of over 200,000 tons of obsolete conventional munitions and pyrotechnics (Joint Ordnance Commanders Group, 1995a). There is a definite need to disposition these obsolete munitions and ordnance in a safe, environmentally sound, and economical manner.

The demilitarization activity proposed for the NTS is a demonstration of potential technologies used to destroy obsolete conventional munitions, pyrotechnics, and solid rocket motors by testing the technologies. Any future, large-scale activity involving the demilitarization of obsolete munitions would require additional National Environmental Policy Act Review and would be subject to all other applicable federal, state, and county regulations as well as permitting requirements.

The existing underground tunnels and facilities at the NTS offer a unique opportunity to demonstrate environmentally sound methods of destruction/treatment of solid rocket motors, pyrotechnics, and other non-nuclear energetic materials by using specially designed pollution abatement systems that remove the gaseous combustion products from the air prior to atmospheric release and provide for containment/treatment of residual debris. The Spill Test Facility in Area 5 would suffice for the demonstration of the thermal treatment technologies for pyrotechnics, and a tunnel environment at the NTS would suffice for the demonstration technologies involving solid rocket motors and other conventional munitions. Using an NTS tunnel takes advantage of a known geologic cavern as well as the expertise of the NTS workforce in tunnel handling and firing of high explosives and in monitoring explosives in a contained environment.

Research indicates that X tunnel would suffice for demonstration projects involving destruction/treatment of solid rocket motors and conventional munitions. Calculations would be made to determine pressure and temperature, as well as other effects, which would then be applied to design basis documentation and a test plan. The tunnel would be modified with containment plugs, monitoring instrumentation, containment valves, and scrubbing and sampling outlets. All environmental requirements would be met, and all environmental, safety, and health protection precautions would be taken.

The demonstration would consist of transporting a solid rocket motor or conventional munition from off site to an underground cavern. The plugs and bulkheads would be closed, and with instrumentation fully established and calibrated, the solid rocket motor or conventional munition would be detonated from a remote location. Gases would be sampled before and after scrubbing in preparation for ventilation. The goals of the technologies are to develop "...an optimized demilitarization research and development demonstration capability at the NTS, a set of fully characterized demonstrations of environmentally benign destruction or resource recovery and recycling processes, and final design packages for innovative processes" (Joint Ordnance Commanders Group, 1995b).

The construction and installation phases would include facility preparation, tunnel modification, excavation, grouting, sealing, and foundation work, as well as equipment installation, startup and shakedown of equipment and procedures, and personnel training. It is estimated that the planning, design, construction, and installation phases of this activity would require the services of approximately 15 workers for 3 years, while the demonstration phase would require the services of approximately 20 workers for approximately 0.5 years. Total cost of the project is estimated at nearly $5 million.

A.5.1.5 Defense-Related Research and Development. In the past, defense-related research and development activities have included tests and training exercises employing weaponry, such as small arms, artillery, guns, aircraft, armored vehicles, demolitions, rockets, bazookas, and air-dropped armaments, as well as a variety of electronic, imagery, and sensory technologies, including, but not limited to, infrared, lasers, and radar. Table A-1 lists examples of recent defense-related research and development projects conducted at the NTS. It is expected that additional experiments and tests similar to those mentioned in Table A-1, but not yet identified, would take place at the NTS.

Table A-1. Recent defense-related research and development projects conducted at the NTS

Project	Organization	Description	NEPA Documentation/Year
Captive Flight Tether Test	Lawrence Livermore National Laboratory	Captive flight test at the BREN tower of a small, maneuverable, rocket-powered, laser-equipped prototype vehicle designed to detect, track, and intercept ballistic missiles.	Environmental Assessment/1992
Mine Detection	Lawrence Livermore National Laboratory	Evaluation of ground-based and airborne technologies, including infrared imaging, laser-based optical imagery, and ground-penetrating radar for detection of buried objects such as mines and simulated hazardous waste containers.	Categorical Exclusion/1993
Advanced Infrared Imaging	Lawrence Livermore National Laboratory	Use of the BREN tower for development of technology and measurement techniques for advanced infrared imaging from satellites.	Categorical Exclusion/1994
Theater Missile Defense Experiment	U.S. Army Space and Strategic Defense Command	The release of 200 kg (441 lb) of nontoxic soda lime glass beads, ranging in size from 40 to 200 microns, at a specific altitude at or above 6,096 m (20,000 ft) over the NTS to obtain data for use in validating and evaluating atmospheric transport and diffusion models and computer codes.	Categorical Exclusion/1994
Depleted Uranium Testing	U.S. Army Ballistics Research Laboratory	Various tests including controlled burns and live firings of depleted uranium munitions to determine appropriate hazard classifications.	Environmental Assessment/1992
Re-entry Body Impact Fuse Flights	Sandia National Laboratories	Flight impact tests would be conducted to develop the techniques required for the accurate delivery of reentry body test units at extremely high impact velocities.	Categorical Exclusion/1995

NOTE: NEPA = National Environmental Policy Act
BREN = Bare Reactor Experiment Nevada

A.5.2 Alternative 2

No Work for Others Program activities would occur at the NTS under Alternative 2 with one exception. Those activities described under treaty verification for the Treaty on Open Skies and the Comprehensive Test Ban Treaty would be the same as those described for Alternative 1.

Activities at the Tonopah Test Range would be the same as those described for Alternative 1.

A.5.3 Alternative 3

Activities at the NTS and the Tonopah Test Range would be the same as those described under Alternative 1, with certain activities having a greater number of experiments to conduct, resulting in an expanded scope.

A.5.4 Alternative 4

Activities at the NTS would be the same as those described under Alternative 2. Additionally, there would be an increased use of the NTS airspace by the U.S. Air Force.

Activities at the Tonopah Test Range would be the same as those described under Alternative 1.

A.6 Site-Support Activities at the NTS

Section A.6 describes the existing infrastructure and support facilities present at the NTS and supporting facilities in Clark County, Nevada. These facilities include the utilities, communications, and transportation systems, as well as the existing support facilities, both on and off site. The current and planned infrastructure projects are also described.

The NTS-related employment has always depended on programmatic requirements; consequently, wide fluctuations in employee numbers can be tracked throughout the history of the NTS. Over the past 20 years, civilian personnel have numbered as many as 10,000 and as few as 4,900.

The DOE/NV reported 6,576 NTS-related employees (DOE, laboratory, and contractor) in July 1995. Approximately 27 percent (1,794) of the employees work in the forward areas of the NTS, 18 percent (1,153) are based at Mercury, and 55 percent (3,629) work in Las Vegas and North Las Vegas. These figures include personnel assigned to the Yucca Mountain Project at the NTS and in Las Vegas. Currently, the Yucca Mountain Project employs 1,912 or 29 percent of the NTS-related workforce.

More than half the Mercury-based workers are administrative, clerical, professional, and technical. The NTS has room accommodations for approximately 1,700 people and parking for approximately 60 recreational vehicles; however, because the majority of workers commute from Las Vegas and other communities, the number of accommodations is adequate for the present.

If nuclear testing is halted completely, the number of contractor personnel would not drop to zero. Continuing activities that must be performed would require that many personnel be retained. However, personnel idled by a complete testing halt would include the experienced and skilled scientists and technicians who drill and mine emplacement holes, emplace devices, design and install data-gathering systems, and collect and analyze test data. If this large block of talent were lost, it would take at least 3 years to locate, train, and activate a comparable test-support organization. The DOE/NV provides sites and facilities on the NTS for underground weapons testing and numerous advanced research and development projects that support the Defense Program. For off-site safety, the EPA carries out extensive radiation monitoring and dosimetry programs in areas surrounding the NTS. Projects for other federal programs are fielded on a cost-reimbursable basis. A Maintenance and Operating contractor currently operates all user-occupied facilities. Operations include construction and maintenance. The DOE/NV Nevada Test Site Office provides operations oversight of the Maintenance and Operating Contractor.

The NTS is not a production facility; therefore, there are no quantities of production to report. The site work load fluctuates with the mission and depends on the funding received. Resources are periodically redistributed to maintain productivity and efficiency. Both resources and facilities are fully used by design.

The NTS is used to test research and development efforts undertaken by three DOE national laboratories. Two of these laboratories, Los Alamos National Laboratory and Lawrence Livermore National Laboratory, conduct nuclear device tests.

The third organization, Sandia National Laboratories, is responsible for tests of non-nuclear elements of nuclear weaponry. Other users include the U.S. Air Force, the DoD, and the Defense Nuclear Agency. These groups conduct programs that include nuclear and non-nuclear weapons-effects tests and weapons-development tests.

Nonweapons users include the Yucca Mountain Site Characterization Office and the Nuclear Emergency Search Team.

Support of the underground testing program requires a drilling and mining operation. The DOE/NV contractors are directly involved in these operations. The DOE/NV contractors also provide security, guard force services, operation and management of the DOE/NV centralized computer system, and auditing.

The following agencies assist the DOE/NV with its testing and public safety programs:

- The U.S. Bureau of Mines conducts mine and well inspections before and after underground tests
- The U.S. Geological Survey conducts hydrological studies, including flow paths of groundwater
- The National Weather Service correlates test-area weather data with national weather information to make local preshot forecasts
- The EPA performs radiological health and safety services, including determining background radiation levels, determining extent of radiation in connection with accidental release of radioactivity, and preparing for emergency action.

Other contractors that assist in the safety programs at the NTS include the following agency:

- The University of Nevada's Desert Research Institute calculates groundwater migration of radioactive material resulting from underground nuclear testing.

Facilities at the NTS generally consist of permanent or temporary, low-rise, industrial-type structures. Land use in the camps is low to medium density.

The distribution, assignment, use, and planning of space at the NTS follow the requirements of the Federal Property Management Regulations. For office space, the objective is to achieve an overall space usage rate of 11 m^2 (120 ft^2) or less per person. Although allocations for other types of spaces (e.g., laboratories and shops) are less precise, reasonable measures are taken to ensure the use of the minimum space necessary to perform the required function.

The site support of the NTS supports all activities that occur at the NTS. This includes utilities, transportation, communication, and on-site and off-site support. Each of these five subjects is described in detail in this section, along with the current and future infrastructure construction projects.

Construction projects with proposed starting dates beginning in Fiscal Years 1995 through 2001, as well as prior-year projects scheduled to be completed during and beyond Fiscal Year 1994, are described in their appropriate programmatic area in this appendix.

A.6.1 Alternative 1

Existing infrastructure at the NTS and supporting facilities in Clark County are described under this alternative. This information has been obtained from the *Fiscal Year 1994 Nevada Test Site Technical Site Information* (RSN, 1994a) and the *Fiscal Year 1996 Capital Asset Management Process Report* (RSN, 1994b).

A.6.1.1 Utilities. Utilities include electrical power, natural gas, water supply and wastewater, and industrial wastes. It also includes the related distribution, transmission, treatment, and disposal systems, as appropriate, for these utilities. The personnel that maintain these utilities comprise a group of approximately 68 full-time employees at the NTS. This includes approximately 45 personnel in the electrical power group, 17 in the water and steam group, and 6 in the sanitary/solid waste group (excluding hazardous, radioactive, and mixed waste).

A.6.1.1.1 Electrical Power—Electrical power at the NTS includes off-site and on-site power transmission systems, on-site subtransmissions, existing and projected subtransmissions, and NTS area transmission.

OFF-SITE POWER TRANSMISSION—In September 1993, Raytheon Services Nevada completed an updated load-flow study, to modify the results of a 1991 load-flow study. The update was required because of the Yucca Mountain Project load reduction and program changes at the NTS. Projected loads had been reduced significantly from 71 MW to 52 MW. The proposal of a new 138 kV line from the Nevada Power Company was withdrawn; however, the addition of capacitor banks at the NTS is still necessary to provide voltage support if the Yucca Mountain Site Characterization project reaches 15 MW.

ON-SITE POWER TRANSMISSION—The existing on-site power transmission system at the NTS is similar to that of a municipality. Power is procured at 138 kV at the Mercury switch station and the Jackass Flats substation and is metered at both locations by the Nevada Power Company. The option also exists to purchase power from Valley Electric Association, Inc., through transmission lines supplying 138 kV to the Jackass Flats Switching Station. The on-site power system is operated and maintained by Bechtel Nevada. The total disturbed area of the on-site power system is $1.3x10^6 m^2$ ($1.4x10^7 ft^2$) as shown in Table A-2.

Power at the NTS is transmitted through a 161-km (100-mi)-long, 138 kV transmission loop that supplies eight major substations and one 138 kV radial transmission line. The subtransmission of power is via an extensive 34.5 kV system and two small 69-kV systems. The 138, 69, and 34.5 kV systems provide distribution voltages of 4.16 kV and 12.47 kV at various substations. The 34.5 kV subtransmission system is also used as a distribution voltage at several remote sites. Distribution voltages are transformed to both 480/277-volt (V) and 208/120-V three-phase systems for most NTS loads with a few single-phase, 120 V services.

The basic load centers served at the NTS are Mercury (Area 23) and Areas 2, 3, 6, 12, and 25. The 138 V transmission system loop runs from the Mercury (Area 23) switching station, north to Frenchman Flat substation (Area 5), extends to Yucca Flat substation (Area 3), then to the Tap Structure/Valley Substation (Area 2). The main loop continues to Rainier Mesa substation (Area 12), then 19km (12 mi) southwest to Stockade Wash substation where a radial 69 kV line taps off the main loop via an autotransformer and is extended to Pahute Mesa substation (Area 19). Taps off the 69 kV line are made at Castle Rock substation and Echo Peak substation. The main 138 kV loop then runs 56 km (35 mi) south from Stockade Wash substation to both Canyon and Jackass Flats substations.

The Jackass Flats substation (Area 25) bus ties to the Mercury switching station via a 138 kV Nevada Power Company tie line, which is an integral part of the NTS 138 kV transmission loop. At Canyon substation and Jackass Flats substation, voltage is stepped down to 69 kV by autotransformers, and a subtransmission loop ties the Jackass Flats and Canyon substations together at the 69 kV level. Another 138 kV tie line between the Frenchman Flat and Jackass Flats substations is now permanently out of service. Mercury substation in Area 23 is fed from a 138 kV tap out of the Mercury switching station.

A system analysis evaluated load-flow conditions under normal conditions, as well as several emergency outage scenarios, to determine voltage levels under adverse conditions. The lowest voltage levels at the NTS are always at Valley Tap. Opening the 138-kV loop at any point does not drop voltages below 97 percent under projected NTS loads.

Losing a source of power from the Nevada Power Company or Valley Electric Association causes severe voltage drops at the NTS Valley Tap under existing loads and causes the system to go down using projected loads, specifically the Yucca Mountain Project projected load of approximately 15 MW.

Table A-2. Utilities table

Location	Utilities - Total Disturbance Area in m^2 and ft^2						
NTS Area Designation	Power	Water		Wastewater		Sanitary Waste	
		m^2	ft^2	m^2	ft^2	m^2	ft^2
1 & 2	No area total	2,109	22,701	2,439	26,253	0	0
3	No area total	4,085	43,971	1,626	17,502	112,409	1,209,960
5	No area total	7,689	82,764	70	754	0	0
6	No area total	12,079	130,017	37,044	398,738	44,592	479,984
7 & 11	No area total	42	452	0	0	0	0
12	No area total	1,586	17,072	30,657	329,989	0	0
10 & 15	No area total	1,417	15,253	0	0	69,675	749,975
16, 17, & 18	No area total	1,935	20,828	0	0	0	0
19 & 20	No area total	18,733	201,640	9,406	101,245	7,432	79,997
23	No area total	1,394	15,005	15,560	167,486	44,592	479,984
25	No area total	4,408	47,447	5,574	59,998	0	0
26	No area total	465	5,005	2,439	26,253	0	0
27	No area total	84	904	518	5,576	0	0
Total (m^2) Total (ft^2)	1,299,899 m^2 (13,992,000 ft^2)[a]	56,026 m^2 (603,059 ft^2)[b]		105,333 m^2 (1,133,794 ft^2)		278,700 m^2 (2,999,900 ft^2)	

a Land disturbance for the power utilities is based on an estimated 427 km (265 mi) of primary and secondary supply lines times a 3-m (10-ft) wide emplacement/maintenance path

b This total does not include an estimated 161 km (100 mi) of water supply lines which would include an emplacement path that would average 2 m (5 ft) wide (approximately one-half of the 3-m (10-ft) wide water supply line ground disturbance already covered by the power supply line path).

The analysis showed that capacitor banks are necessary at Stockade Wash substation to provide adequate voltage on the 138 kV loop when Yucca Mountain Project loads reach approximately 15 MW. Under outage conditions that cause a loss of either power source, the projected system loads cannot be maintained without load-shedding or using the existing generation plant as a back-up power source.

With the addition of capacitor banks at Stockade Wash substation, the existing 138 kV transmission system is adequate for projected loads at the NTS through approximately 1997 to 1998.

ON-SITE SUBTRANSMISSION—At most of the 138 kV substations, voltage is stepped down from 138 kV to 34.5 kV. Other 138 kV substations convert from 138- to 69 kV, 12.5, and 4.16 kV levels.

The 34.5 kV network is made up of a backbone circuit that extends from Frenchman Flat substation to Rainier Mesa substation, with switched connections to circuits out of Yucca Flat and Valley substations. By using sectionalizing switches, this circuit may be operated from various 34.5 kV feeders out of various substations.

In addition to this circuit, other 34.5 kV radial feeders spread out from the major 138/34.5 kV substations to cover the area from Frenchman Flat into Rainier Mesa. Radial 34.5 kV circuits originating at Castle Rock and Pahute Mesa substations feed power to Area 18 and Pahute Mesa, respectively. Area 25 has its own network made up of 34.5, 12.5, and 4.16 kV lines. The Mercury substation provides seven 4.16 kV circuits for the base camp and one 12.5 kV circuit for Army Well 1.

EXISTING AND PROJECTED SUBTRANSMISSION LOADS—Programmatic changes at the NTS, along with consolidations of facilities and abandonment of other facilities, have changed the loading from each substation, making all power studies prior to 1991 obsolete. Recent power system studies performed by Raytheon Services Nevada, including the Tiger Team study for protective device coordination, have evaluated new loadings at all main substations.

138-kV/34.5-kV Substations—A review of substation loading indicates that all 138 kV/34.5 kV substations have adequate reserve capacity.

Representative Subtransmission Lines—The capacity of the existing lines is maintained and is adequate for the reduced load in these areas for the next several years. Any new programs with significant loads requiring capacity from the existing 34.5 kV system would require individual evaluations to determine their impacts upon the existing system.

NTS AREA TRANSMISSION—Area 1 is fed by a 34.5 kV transmission line from the Yucca Flat substation. This line also feeds a well pump (Well UE-16d), the abandoned Area 16 tunnel, and several communications stations. The subtransmission line feeding Area 1 is a #2/0 aluminum-conductor, steel-reinforced with a capacity of 266 amperes (amps) at 34.5 kV. Circuit analysis has determined that additional future loads from new and relocated facilities would not adversely affect this line. Area 2 is fed by a 34.5 kV subtransmission line from the Valley substation. This line also feeds Areas 8 and 15. The #2/0 aluminum-conductor, steel-reenforced transmission line feeding Area 2 has a capacity of 266 amps. The existing lines are more than adequate for current loads. Analysis indicates that the subtransmission line feeding Area 2 from the Valley substation has adequate capacity and that the transformer and feeder lines from the substations also have adequate capacity.

Electrical power for Area 3 is provided by the 1,000 kV substation 3-3, which is fed by the existing 34.5 kV overhead line (DAE) from the Yucca Flat substation. Line DAE, which also feeds Area 1, is connected to this substation by the north branch. The subtransmission line feeding Area 3 is #4/0 aluminum-conductor, steel-reinforced, with a capacity of 300 amps and has adequate capacity for the existing loads.

The existing electrical distribution system, which originated with testing in the Los Alamos National Laboratory test areas, is an underground system operating at 4.16 kV. Previously, this system was modified to reflect changes in testing requirements that were necessary due to deterioration of the system and the ground shock caused by testing. The 34.5 kV line, which parallels Orange Blossom Road, extends into Area 9 and supplies the east side of Yucca Flat. This line is adequate for projected power requirements.

The 34.5 kV line from the Valley Tap/Substation, which supplied the EPA Farm and the Pile Driver/Climax stock, has adequate power for these facilities. In addition, the 138 kV line tap from the Valley Tap/Substation extends through Areas 8 and 15 to a test area 27 km (17 mi) away in the northeast corner of the NTS.

The existing 4.16 kV power distribution overhead and underground lines are supplied from the Frenchman Flat substation by way of the 34.5 kV north feeder and from the Yucca Flat substation by way of the 34.5 kV south feeder. The Yucca Flat substation is fed by a 138 kV line running north from the Mercury substation. The subtransmission lines feeding Area 6 are #4/0 aluminum-conductor, steel-reinforced, with a capacity of 300 amps.

Area 12 is fed by a 34.5 kV subtransmission line from the Valley substation to substation 12-1. The 4.16 kV distribution line feeding the camp is a #2/0 steel-reinforced aluminum conductor. The cable has a capacity of 266 amps. A review of loading indicate that the Rainier Mesa substation has adequate capacity.

There are no facilities in Area 14. Facilities at the High-Explosive Simulation Test site have been abandoned or removed. The area is not serviced by any utilities other than power. The existing power distribution consists of 64 kV and 138 kV lines that parallel the southern boundary of Area 14 and a

34.5 kV line that crosses the northwestern corner of the area.

The distributed communications repeater network for the NTS is located at Shoshone Peak in Area 29. A telemetry and microwave station was installed nearby and currently is maintained by the U.S. Air Force. Originally, it was installed for data collection and relay during the flights of the X-15 experimental aircraft from Edwards Air Force Base in California. Currently, this station is used as part of the U.S. Air Force communications network.

Existing power to Area 29 consists of a 34.5 kV line crossing Area 14 from the Yucca Flat substation. Substation 29-1 supplies power to the Shoshone receiver station and the Shoshone Mountain transmitter. In addition, a 138 kV line runs through Area 29 from the Jackass Flats Substation to the Stockade Wash substation. A portion of the 138 kV NTS power loop passes through Areas 17, 18, and 30. This portion of the loop connects the Stockade Wash substation in the northeast corner of Area 18 to the Rainier Mesa substation in Area 12 and extends south to the Canyon substation in Area 25. A 69 kV radial extends from the Stockade Wash substation up to the Castle Rock, Echo Peak, and Pahute Mesa substations in Area 19. At the Pahute Mesa substation, the voltage is stepped down to 34.5 kV, and the line splits to the far north and west. Other existing power lines and signal cables used for specific test events in the past are still visible. Power for Pahute Mesa (Areas 19 and 20) is presently fed by a 34.5 kV subtransmission line from the Pahute Mesa substation. This substation is tied into the NTS 138 kV loop at the Stockade Wash substation. The transmission line from the Pahute Mesa substation is a #4/0 steel-reinforced aluminum conductor. This cable has a capacity of 340 amps. The radial, single-thread system traverses mountainous terrain and is frequently downed by severe winds and winter storms. A downed line in this area is difficult to repair and can cause prolonged loss of commercial power on Pahute Mesa. The condition of the power lines, insulators, and poles is poor and needs to be upgraded.

Area 23 is fed by 4.16 kV, overhead power distribution lines from the Mercury substation. Some of these lines also feed sites outside Area 23. The Mercury substation has a total of 11 circuits that feed Area 23. Two of these circuits (3 and 7) are spares, and one circuit (10) is boosted from 4.16 kV to 12.4 kV by means of transformers. Circuits 4, 6, 8, 9, and 11 are fed with a #2/0 steel-reinforced aluminum conductor. This cable has a capacity of 266 amps. Circuits 1 and 5 are fed with #2 aluminum steel-reinforced conductor, with a capacity of 179 amps. Circuit 10 is fed with #2 copper wire with a capacity of 233 amps. Circuit 2 is a dedicated circuit to Building 300. It is a #6 copper wire with a capacity of 135 amps. It has been determined by circuit analysis that additional future loads will not adversely affect this line.

Power to Area 25 is supplied from the Jackass Flats substation 1 via the 138 kV line from Las Vegas. Auxiliary power sources consist of diesel engine-driven generators at the Control Point.

Area 27 facilities are fed by a 34.5 kV subtransmission system. The work sites are fed by 4.16 kV lines stepped down by transformers as required from substation 11.

A.6.1.1.2 Natural Gas—Currently, the NTS does not use piped natural gas and has no supply line for furnishing it on site. Any project(s) requiring natural gas (other than propane, which can be supplied via truck) would have to construct a pipe line to the project site to meet its needs.

A.6.1.1.3 Water Supply—The NTS is served by a water system comprising 11 operating wells for potable water, one well for nonpotable water, 27 utilized storage tanks, 13 usable construction water sumps, and 6 water transmission systems (with 5 permitted water distribution systems currently being used). The wells are not being used to their full capacity and are capable of producing much more water if needed. Additional wells are available or may be drilled and developed if increased water production is required. Wells, sumps, and storage tanks are used as required to support construction or operational activities. Five water storage tanks are currently under construction at the NTS. A variety of domestic, construction, and fire-protection water uses are served by this system. The water system disturbs 56,026 m^2 (603,059 ft^2) of land on the NTS as shown in Table A-2.

This evaluation focuses on major operating water systems at the NTS; descriptions of abandoned water wells have been excluded. Temporary aboveground pipe lines serving drilling locations in Areas 19 and 20 have also been excluded because their configurations change frequently.

For purposes of this evaluation, the NTS water system has been divided into four water service areas (A, B, C, and D), according to the location of the water system and support facilities.

System capabilities within water service area A are limited. This water system can only transfer water from Area 19 to Area 20. Water cannot be transferred between construction sumps. To prevent freezing, a continuous flow of water must be maintained within the aboveground, 15 cm (6-in.) victaulic pipe line (piping connected together with a circular clamp) that parallels Pahute Mesa Road. Currently, the line has been drained.

Water Well 19c and Well 20 can supply nonpotable construction water in water service area A. Well 19c pumps to some drilling locations in Area 20. Although relatively high fluoride concentrations have been detected at Well 19c, water from this well is soft and of good quality. Well 19c can pump to the Area 20 sump to augment the Well 20 supply. The pump for Well 20 has failed and funding/program cutbacks preclude its being replaced. However, when it was functioning, Well 20 could only supply the Area 20 camp sump and could not supplement the Well 19c supply for Area 19.

Three sumps can provide construction water storage within Areas 19 and 20. When in service, water can be delivered to these sumps from Well 19c by a 15 cm (6-in.) aboveground pipe line that parallels Pahute Mesa Road. Booster pumps at the Well 19c road sump and the Area 20 camp sump delivered water to remote drilling locations through temporary aboveground pipe lines.

Truck-fill stands at these sumps provided water for other construction applications. The control panels at the sump pumps and the fill stand pumps cannot be used until they are upgraded to meet the required electrical codes; however, these upgrades have not been planned due to funding restrictions and program changes. All potable water must be trucked to the Area 20 support facilities.

All other water wells in water service area A have been abandoned due to casing damage. All wells that are no longer functional or when the water is unusable are capped prior to being abandoned.

Well 2 is not operating, and no plans have been made to repair it due to funding restrictions and program changes. Well 2 served construction and drilling water needs. The Well 2 sump and reservoir provide construction water storage.

Well 8 serves construction, fire protection, and potable water uses at Area 2 support facilities and at the Area 12 camp and provides construction water for Area 2. Well 8 produces the highest quality water at the NTS.

Water from Well 8 is pumped from the Pahute Mesa pumping station into four storage tanks in Area 12. The water is pumped through the 20 cm (8-in.) pipe line and the old 10 cm (4-in.) pipe line that parallels Stockade Wash Road. System head losses limit the flow rate through this pipe line; however, the flow rate is adequate.

Water is delivered to the Area 2 support facilities by a 25-cm (10-in.), reinforced thermosetting resin pipe or composite fiberglass pipe line from the Area 12 reservoirs (storage tanks).

Two reservoirs and a construction sump provide on-site water storage near Well 8, but the sump is not operational. Another construction sump is located at the former Pahute Control Point. The Area 2 sump provides construction water storage at the Area 2 support facilities.

Well UE-16d serves construction water requirements at Area 1 support facilities. It also provides potable water through a chlorine injector that is also located in Area 1. The concentration of total dissolved solids in water from Well UE-16d exceeds the maximum containment level specified by the Safe Drinking Water Act.

Water from Well UE-16d is delivered to Area 1 support facilities through a 31-cm (12-in.) polyvinylchloride water line that parallels Pahute Mesa Road. Construction water storage is provided at the storage tank in Area 16.

Well UE-15d served construction and potable water needs at the EPA complex in Area 15 prior to abandonment of the complex. This well is not operating due to funding restrictions. A reservoir and construction water sump still provide water storage capabilities near Well UE-15d. Concentrations of iron and of total dissolved solids in water from this well exceed maximum contaminant level standards.

Seven wells serve water uses within water service area C. Wells C, C-1, 4, and 4a also provide water services for facilities in Area 6 (the Well 3 area, the Yucca Lake area, and the Control Point). Nitrate concentrations in water from Well A periodically exceed maximum contaminant level. Iron, total dissolved solids, and hardness concentrations in water from Well C significantly exceed the maximum contaminant level. Water from Well C-1 is high in color. The underground construction water pipe line that connects Well C and the C-1 sump to the Well A sump and to the Well 3 sump is badly deteriorated. Lack of funds prevents the many constant leaks from being repaired until they become bad enough to stop the flow of water through the pipe line.

Wells 5b and 5c and Army Well 1 serve construction, fire protection, and potable water uses for Area 5 and Mercury. Well UE-5c served water uses at Area 5 support facilities before the facilities were abandoned. Well UE-5c is only used for environmental sampling. Well F, originally developed as an exploratory well, is not operational, and there are no plans to use it in the future. Total dissolved solids and hardness concentrations in water from Well F exceed maximum contaminant level.

NORTHERN HALF—A major portion of the Area 3 water supply serving construction and fire protection purposes is delivered by the deteriorated 20-cm (8-in.) water line that originates at the Well C sump. This sump is currently supplied by Wells C, C-1, 4, and A. There is no potable water available in Area 3, and the temporary storage tank is out of service and needs repairs. A large sump provides nonpotable water storage at the Area 3 camp.

Fire protection water for the Well 3 yard is provided by the Well 3 sump. This well originally satisfied nonpotable water requirements in this location; however, it was abandoned owing to low yield. The Well 3 yard does not have a reservoir, and separate potable and nonpotable water systems preclude provision of a water system loop within the Well 3 area.

Both the Control Point and the Yucca Flat facilities in Area 6 receive fire protection and potable water service from the Control Point reservoir. These facilities are supplied by an 20-cm (8-in.) water line originating at the Well C/C-1 forebay tank. Pressure-reducing stations at points on the water distribution system serving the Control Point, Yucca Flat, and the Well 3 area maintain acceptable system operating pressures. A large sump located at Well C serves construction water demands within the area.

The underground asbestos-cement water pipe in the Area 6 distribution system is very old and needs to be replaced. The pipes have become soft and waterlogged and have ruptured in several locations because new pipe was coupled to the older pipe. The pressure created by coupling the new and old pipe causes the additional ruptures.

Well 4 and a water transmission line extension to the Well C/C-1 forebay tank were recently completed to provide a better source of potable water for Area 6 facilities, which include the Device Assembly Facility, the Control Point, the Yucca Flat facilities, and the Well 3 yard. The water quality analyses for Well 4 indicate that this attempt has been reasonably successful; however, the relatively low-quality water from Wells C and C-1 is still the source of potable water because it is the only water that can be softened to the desired 0 to 15 milligrams per liter (mg/L) (0 to 15 ppm) quality needed.

Well 4a is part of the system serving Area 6, which includes the Control Point, Yucca Flat, and the Well 3 yard. During normal operations, Well 4a provides water to the Well C booster that connects to the Control Point. The water is no longer softened at the Well C booster; point-of-use softeners have been installed instead. Wells C and C-1 provide redundancy and construction water.

Truck-fill stands at the Area 3 support facilities, Well 3, and Well C served event-related construction activity in the northern half of Water Service Area C.

A potable truck-fill stand in Area 6 provides construction water.

SOUTHERN HALF—Construction, fire protection, and potable water demands in the southern half of Water Service Area C are served by Wells 5b, 5c, and Army Well 1. Construction water in Area 5 is provided by the Well 5b sump. Wells 5b and 5c and a booster pump station provide a portion of the potable water for Mercury. Water is delivered to a large storage reservoir near Mercury by an 20-cm (8-in.) water line. A portion of this water line provides construction water to the aggregate pit. The potable water reservoir at Mercury is also fed by Army Well 1 through an existing 20-cm (8-in.) water line. Some potable water storage is provided at Army Well 1 by a small forebay tank.

The water distribution system at Mercury serves potable, fire protection, and construction water requirements. Truck-fill stands at Well 5b and in Mercury currently serve construction water needs within the area.

Water is currently hauled into Areas 26 and 27 by truck. Four reservoirs in Area 26 store construction water and potable water. One reservoir in Area 27 stores fire protection and potable water.

The current water distribution systems NTS revitalization project will add the redundancy, reliability, and operational flexibility that has not existed in the past. However, this project will also add operational complexity to the system. This type of complexity would be better controlled with the aid of a supervisory controlled and data acquisition system, which is not currently included in the scope of the revitalization project.

The water service area D system is a network of water lines interconnected with 11 water-storage reservoirs. This system serves construction, fire protection, and potable water needs in Area 25 and is serviced by Wells J-12 and J-13. A third well, J-11, was abandoned due to low yield, poor water quality, and a collapsed casing. Changes in Area 25 test program objectives within the past decade have reduced water demands in water service area D.

The Area 25 water system is fed by Wells J-12 and J-13. Fluoride and nitrate concentrations in the Well J-12 water exceed the maximum contaminant level and the water is high in color. Fluoride, nitrate, and iron concentrations in the Well J-13 water exceed maximum contaminant level.

All operable water storage reservoirs in Area 25 have been converted to potable water storage. Five of the 11 existing water-storage reservoirs are elevated structures. The other six reservoirs are ground-level structures.

The overflow and drain lines for the reactor control point tank in Area 25 no longer drain away from the nearby buildings and structures because of the addition of a helicopter pad. The overflow and drain lines for the Well J-11 and Well J-12 tanks do not meet state regulations because the pipes terminate under the sump water level. An air gap of 12 degree-inches is required.

Construction water storage in Area 25 is provided by a construction sump located near Well J-11. Two additional construction sumps are located near the former MX facilities.

Current water needs for the Yucca Mountain Project site are serviced by Wells J-12 and J-13. These wells produce soft water from permeable fractured-tuff and alluvial aquifers. Well J-11, which had poorer-quality water, has been abandoned primarily due to a collapsed casing. The underground pipe lines in Area 25, which are in very poor condition, include a line from Well J-12 to Well J-13, from Well J-11 to the Engine Test Stand facility, and a line from Well J-12 to Well J-11.

Water for the Area 1 complex is supplied by Well UE-16d, which has a current pumping capacity of 734 liters per minute (L/min) (194 gallons per minute [gal/min]). The water is pumped from the well to an adjacent 189,265-L (50,000-gal) storage tank and then to the facilities through a 31-cm (12-in.) line. Although not potable, this water is usable for industrial needs. A chlorine injector in Area 1 makes the water potable when necessary.

A.6.1.1.4 Nonhazardous and Nonradioactive Wastes—Domestic and industrial wastewater is transported through the sewage systems into sewage lagoons or septic systems located in the base camps throughout the NTS. Sewage waste treatment is an interim process before final disposal. Treatment operations are normally handled by sewage lagoons or septic tanks. Liquid wastes are treated through evaporation. Other nonhazardous solid waste is disposed of in sanitary landfills in Areas 9 and 23 of the NTS. A landfill in Area 6 is reserved for petroleum-contaminated soil and debris. Other unneeded materials are sold as scrap (metal and vehicles) or recycled (lead bricks and batteries). The land disturbance resulting from wastewater systems and sanitary waste landfills is $3.8x10^5$ m^2 ($4.1x10^6$ ft^2) at the NTS as shown in Table A-2.

Wastewater System

Area 1—The drilling operations, drilling subdock, and coal tar/epoxy building are connected to an underground leachfield. Portable sanitary units are provided at other facilities.

Area 2—On the west side of Rainier Mesa Road, the Area 2 camp is served by one septic tank/leachfield system fed by an underground gravity-flow collection network. On the east side of Rainier Mesa Road, the Area 2 camp discharges waste into two sewage lagoons. Each lagoon contains 511 m^2 (5,501 ft^2) of surface area and is 2 m (8 ft) deep. These lagoons are presently not used.

Area 3—Several facilities are serviced by underground collection systems, which feed three separate septic tank/leachfields.

Area 5—Support areas have or will soon have sanitary sewer capacity that is sufficient for proposed expansion in this area.

Area 6—Support areas have or will soon have sanitary sewer capacity that is sufficient for proposed expansion in this area.

Control Point—The facilities on the south side of the Control Point have a sewage lagoon disposal system, including four ponds that have been taken out of service. These facilities are connected via the Yucca Lake Sewage Lagoon System. Based on the total anticipated discharge and present capacity of the lagoons, the system is adequate.

Yucca Lake—There are two existing sewage systems at the Yucca Lake complex. One lagoon handles sewage from the shop areas; the other two lagoons handle the effluent from two steam-cleaning facilities. A separate system handles only radioactive waste from the decontamination facility and the decontamination laundry building.

Warehousing and Staging Area—The sewage system at the warehousing and staging area north of the Control Point consists of a new, 15-cm (6-in.) underground sewer pipe system that is connected to the Yucca Lake sewage lagoons.

Area 12—The existing sewage facility serving the Area 12 camp was replaced by a new system of eight sewage lagoons designed to meet present and future requirements. A 10-in-diameter cast-iron pipe feeds sewage effluent from the camp into the ponds.

The abandonment of inactive sewer lines has been completed. The inactive lines within the system have been isolated at manholes, cleanouts, and diversion boxes to reduce considerably the chance of future blockages and unauthorized discharges.

Areas 19 and 20—The existing sanitary systems in Areas 19 and 20 are limited. The abandoned Area 19 camp has no permanent provision for a sewer system. The Area 20 camp is serviced by an underground collector line connected to a septic tank/leachfield system, which only serves a first-aid-station trailer and a small Lawrence Livermore National Laboratory trailer.

Mercury, Area 23—Support areas have or will soon have sanitary sewer capacity that is sufficient for proposed expansion in this area.

The existing sewer system is a network of underground collectors leading to a sewage lagoon system. In the past, a sewage treatment plant southwest of the main camp was adequate to handle wastewater. However, mechanical problems required that this plant be abandoned and replaced. Currently, a lagoon system and evaporative ponds are used to treat waste.

Area 27—The Able and Baker sites are served by underground gravity-flow sewer systems, which empty into a septic tank/leachfield. The construction compound and Super Kukla sites are served by portable septic tanks.

A.6.1.2 Communications. The communications section of the infrastructure at the NTS employs approximately 119 NTS workers. Additional support personnel are located in Las Vegas because the majority of communications take place between the NTS and various Las Vegas facilities.

A.6.1.2.1 Telephone Service—The DOE/NV's facility on Highland Avenue in Las Vegas, Nevada, houses a central switching center employing a stored program-controlled host to provide the DOE/NV and its contractors with telephone communications. The system backbone is interconnected with major telephone systems by fiber-optic cable, copper cable, and microwave links through T-1 carriers.

All internal switching functions and interconnect microwave services are in digital format. All key components are redundant for service protection, and all satellite locations for the DOE/NV are EPABX and remote/peripheral switching centers. The DOE/NV uses a five-digit dialing plan within the system, and all locations have a uniform access arrangement for any calls placed outside the system.

This system also includes transportable microwave radio systems capable of extending telephone services from any switching location to a distance of 32 km (20 miles). These systems enable quick and efficient service for programs at remote areas within the boundaries of the NTS.

The central switch at the DOE/NV facility is a Northern Telecom SL-100 Digital Switch. Telephone service within the building is provided by direct connection to the switch. All other DOE operations in Las Vegas and the NTS are slaved from this switch, which serves as the gateway for all telephone services within the DOE community. All trunking to outside telephone services are provided at this hub location. This switch also serves as the gateway for local commercial service, radio paging service access, local commercial outdial service, Wide Area Telephone Service and Federal Telecommunications Service. In the near future, this switch will provide the tie line to the Emergency Operations Center.

The basic system, along with the Remote Line Connector Modules at the DOE/NV facility, the North Las Vegas complex, and Echo Peak, were upgraded to Electromagnetic Module Interference-protected status in September 1987. Remote switching concentrators at Mercury, Area 6, and Area 12 of the NTS were also upgraded to EMI-protected status in September 1987. The SL-1M at the Tonopah Test Range was upgraded to an SL-1NT in April 1990.

SL-1s have been added to the system through a T-1 carrier at the following locations:

- SL-1NT, release 17 (Yucca Mountain Project Office) 09/87
- SL-1NT, release 13 (Remote Sensing Laboratory) 10/89
- Meridian option 61, release 16 (Device Assembly Facility) 10/91
- Meridian option 61, release 17 (IT Corporation) 04/92
- Meridian option 61, release 17 (Summerlin) 11/92.

Six DS-3 fiber-optic circuits, leased from Nevada Bell, provide service between the DOE/NV facility in Las Vegas and CP-18 (Smokey Jr.) in Area 6 of the NTS. Two DOE-owned fiber-optic routes are in service between Building CP-18 and Building CP-42 in Area 6 of the NTS and between Checkpoint Pass in Area 5 and Building 725 in Area 23 (Mercury).

The microwave tower and equipment shelter located at the rear of the DOE/NV facility provide redundant service for all facilities at the NTS through Angel Peak located on Mt. Charleston in the Spring Mountain Range and Building CP-18 in Area 6 of the NTS. Two parallel paths, each capable of supporting 84 T-1 digital carrier systems, are provided. Interconnection to the NTS SL-1 PBXs is provided over leased fiber-optic circuits and a microwave system.

Circuits from the central switch are routed over the Bechtel Nevada backbone microwave system. The microwave terminal and its associated analog multiplex system is located in the shelter behind the DOE/NV building. Emergency back-up alternate routing for specific telephones is provided as follows:

- 12 circuits, Control Point, Area 6
- 11 circuits, Mercury, Area 23
- 2 circuits, Area 12.

Foreign exchange lines from the Sprint Central Telephone-Nevada, South Five Facility, are connected to the DOE/NV terminal for the NTS. The signals from intrusion-detection alarm systems at the NTS are transmitted via outside cable distribution system-provided circuits. These circuits are routed through various main distribution frames on the NTS, depending on the location of the alarm system.

The Octel Maximum Voice Mail System, located at the DOE/NV facility, is networked to four Aspen voice mail systems located at the Yucca Mountain Project Office, the Remote Sensing Laboratory, the Tonopah Test Range, and the Summerlin building. Total storage for the complete voice mail system is 88 hours.

There are numerous radio remote-control units located throughout the NTS. These radio remote-control units allow operators to communicate via radio net(s) to other remotes, mobile units, and/or base stations. The radio remote-control units use telephone radio order lines connected to local transceivers. The routing is dependent upon the location of the radio remote-control unit in relation to the nearest Base Station Site or Reynolds Electrical and Engineering Co., Inc., backbone microwave system terminal.

Telephone service for Area 6 is provided by digital carrier service from Control Point-18 over outside distribution cable via the main distribution frame located at Control Point-40. Telephone service to Area 3 is also provided by this remote switching connector by back-feeding digital carrier on the outside distribution cable to CP-18 and then via microwave to the main distribution frame in Area 3.

The remote switching connector will allow local communications in the event of any disruption of service from the SL-100 in Las Vegas. The remote switching connector is equipped with emergency trunking that provides limited service to Areas 12 and 23 and access to the host switch via microwave.

Off-premise service is also provided from the Area 6 remote switching connector to systems construction.

Checkpoint Pass in Area 5 serves as a substation location with a microwave path to Skull Mountain in Area 25. Cable digital carrier on the outside cable distribution system provides service to the remote switching connector at Mercury, which provides the telephone service for Mercury and Area 5. Digital cable carrier is backfed to Checkpoint Pass where microwave carries the signal to Skull Mountain and then to the Area 27 main distribution frame to provide telephone service for that area. Two off-premise lines are provided to Indian Springs Air Force Base from the Mercury remote switching connector.

Intrasite trunking routes provide telephone service between Areas 6, 12, and 23 when in an emergency switching access mode, which would occur with the loss of the host switch located in Las Vegas.

Direct digital microwave service is provided from Control Point-18 to Area 12. The Area 12 remote switching connector provides service to the local area and to the tunnel portals at Rainier Mesa. Alternate trunking to other areas is a part of the emergency switching access mode for this remote switching connector.

The Echo Peak remote line concentrator module provides service for Areas 19 and 20, and direct digital carrier to the Tonopah Test Range, which is served by a Northern Telecom SL-1 digital switch. The Echo Peak Remote line concentrator module uses both the outside cable distribution system and mobile microwave systems with digital multiplex to provide telephone service for Areas 19 and 20.

In addition to the fixed and mobile microwave systems, a solar-powered mobile telephone microwave provides service to the Yucca Mountain Project Office and to Crater Flat to support drilling activities.

A.6.1.2.2 Microwave System—Voice, data, security and alarm, mobile radio communications, and event video are primarily provided by three separate microwave systems. A limited amount of fiber-optic and copper cable exists between the microwave sites and adjacent areas. The primary network for all voice, most data communications, and security and safety alarm systems is provided by a digital microwave system.

The mobile radio backbone system, some limited back-up telephone services, a number of security- and safety-related alarm systems, and a small number of data circuits use an analog microwave system. In addition to these two systems, a third event-related video system can carry services between the NTS and Las Vegas.

A.6.1.2.3 Data Communications—The Department of Energy Communications Network provides data, video, and voice communication links for the DOE/NV, laboratories, contractors, and the DOE Headquarters. The network provides data service in 1,200-baud (Bd) increments, beginning at a bandwidth of 1,200 Bd to full T-1 and is managed by the DOE/NV network operations center located in Las Vegas or the network operations center located in the Washington, DC, area. If either site were disabled, the other site could continue to monitor and manage the network.

The Department of Energy Communications Network can be accessed through the network operations center located in the DOE/NV facility. This operation will relocate to the new DOE/NV facility in the North Las Vegas complex when it is completed.

A.6.1.2.4 Video Communications— Currently, the DOE/NV, its contractors, and the laboratories have several video and related systems being used to support activities ranging from general administration to special project-related activities. Some of these systems parallel each other, although this type of back-up system is not necessary.

There are several video systems that support activities ranging from physical security to event-related activities.

A.6.1.2.5 Video Teleconferencing—In addition to the three conferencing systems that have been installed in Las Vegas and on the NTS, a multichannel conference unit has been installed for the purpose of configuring multipoint conferences. This system is currently equipped with cryptographic equipment, which will allow for secured multipoint conferences.

A.6.1.2.6 Radio—Central monitoring of the NTS radio nets is maintained at Station 900, which serves as the NTS radio-net coordination point. This station primarily functions as the reporting point for all emergency telephone and radio calls. It also provides for access of up to 30 radio nets for the purpose of coordination, all-net keying, voice countdown, telephone-to-radio patching, net-to-net patching, and net maintenance.

The Station 900 facility is manned 24 hours a day. Station 900 can be called by telephone by dialing 911 or 123 or on radio nets by using the international distress call "Mayday." By means of a hotline telephone system, the 900 operator connects the calling party to the Bechtel Nevada Medical, Fire, and Safety Departments; the Nye County Sheriff; Operational Control Center; and other essential units. The calling party can then communicate directly with the organization that responds to the emergency. This method of direct communications prevents misunderstanding that might occur if a relay system were used.

A special public safety network identified as Net 12 provides radio coverage throughout most of Nevada and neighboring parts of California and Utah through its 12-repeater system. The hub of Net 12 is located at the DOE station on Rainier Mesa, and the other 11 repeaters are at off-site locations ranging from Potosi Mountain near Las Vegas in the south to Mount Lewis near Battle Mountain, Nevada, to the north. These repeaters are linked by a VHF/UHF network and provide half-duplex operation. A completely solar-powered site is located at Hayford Peak, north of Las Vegas, to provide improved coverage of strategically important areas northeast of the NTS.

To meet operations security, three digital-encryption-standard simulcast UHF radio nets have been installed. A fourth trunking-capable simulcast UHF net that will be operated in a nondigital-encryption standard mode is being installed to support the Yucca Mountain Project.

A.6.1.2.7 Mail—A small United States Post Office is maintained in Mercury. It is run by four full-time employees. In addition to the post office, an internal mail system has been developed that connects various DOE and DOE contractor facilities in Las Vegas, as well as various facilities at the NTS. At these facilities, the mail is picked up, taken to a mail room, and sorted. It is then transported and delivered between various buildings on the NTS and in Las Vegas.

A.6.1.3 Transportation Systems. The NTS transportation system is composed of land, air, and rail facilities. A 1,127-km (700-mi) network of primary and secondary roadways serves land transportation needs, while three air strips and nine helicopter pads serve authorized aircraft. Two on-site rail systems in Areas 25 and 26 were previously used to transport heavy, oversized, and hazardous payloads between facilities. A total of 176 full-time employees is included in this portion of the NTS infrastructure.

A.6.1.3.1 Roads—The main access road to the NTS (Mercury highway) originates at U.S. Highway 95, approximately 105 km (65 mi) north of Las Vegas. Both the NTS and the Yucca Mountain Project area have restricted access from Amargosa Valley on U.S. Highway 95. Other existing roadways, although unpaved, could provide access or exit routes in case of emergency.

The on-site road network consists of 644 km (400 mi) of paved roads and over 483 km (300 mi) of unpaved roads. Additionally, the NTS contains numerous event-related unpaved roads, which are no longer used after a test has been conducted.

NORTHERN ROAD NETWORK—The primary paved roads in the northern part of the NTS are Pahute Mesa Road, Buckboard Mesa Road, and Tippipah Highway. The areas served by these roads are Buckboard Mesa, Pahute Mesa, and Rainier Mesa. Pahute Mesa Road from Yucca Flat to the Area 20 camp is typical of hot-mix paved roads on the NTS. At the higher elevations, the road is winding and crosses rugged terrain that is extremely hazardous under winter conditions. Chains or snow tires are essential when these conditions prevail. From the Area 20 camp to the intersection of Buckboard Mesa Road, the road consists of graded gravel.

Tippipah Highway is an adequately drained, all-weather highway that bypasses areas where testing has damaged Mercury Highway. This 8-m (26-ft) wide road has 2-m (8-ft) compacted shoulders and was constructed with 8-cm (3-in.), hot-mix asphalt over a 31-cm (12-in.) gravel base.

Rainier Mesa Road, one of the first gravel roads on the NTS, was hastily constructed with little planning for its long-range use. Currently, this narrow oil-and-chip road with no shoulders receives minimum maintenance.

In Yucca Flat, the segment of Mercury highway from the intersection of Rainier Mesa Road and Mercury Highway north to Sedan Crater is not passable for normal traffic due to damage from numerous local underground nuclear weapons events. Although there are many detours and bypasses from Sedan Crater to Guard Station 700, the 6-m (20-ft) wide roadway is in good condition.

Stockade Wash Road from Area 12 camp to Pahute Mesa Road is a hot-mix asphalt road in good condition; however, the mountain pass section through Eleana Ridge requires maintenance due to weathering.

Buckboard Mesa Road from Road 18-03 north to Pahute Mesa Road is a relatively new 18-km (11-mi)-long paved road providing convenient access to the mesa testing areas.

Orange Road, which was constructed during the early development of the NTS, was abandoned in favor of Tippipah Highway. Since this road has not been maintained for a number of years, most of the paving has deteriorated and crumbled.

SOUTHERN ROAD NETWORK—The primary paved roads in the southern part of the NTS include Mercury Highway, Jackass Flats Road, Cane Spring Road, and Lathrop Wells Road.

Mercury Highway is the primary route to the NTS from the interchange at U.S. Highway 95. Most of this road is 8-m (26-ft) wide (the same width as the Tippipah Highway); however, the shoulders are variable from 1 to 2-m (4 to 6-ft) wide.

The Mercury Bypass is well-constructed and runs from just north of Gate 100 to north of Mercury. This 8-m (26-ft) wide road was built to enable the rerouting of all traffic with a forward-area destination.

Jackass Flats Road from Mercury to the Area 25 support area is a hot-mix asphalt road that is in fair condition. Currently, some repair work is needed to meet passing standards. The road system in Area 25 is made up of 7-m (22-ft) wide roadways with 5-m (2-in.) hot-mix asphalt surfaces. This roadway provides the principal access to the Yucca Mountain Project area. Recycling this roadway with a plant mix would save it from deteriorating.

The Lathrop Wells Road provides access to the Yucca Mountain Project and the southwestern NTS from U.S. Highway 95. This plant-mix oil-and-chip road with no shoulders extends to Guard Station 500 (east of the Area 25 support region) where it becomes Cane Spring Road. Cane Spring Road extends east to Mercury Highway where it terminates. It is also an oil-and-chip road, except for an asphalt-overlaid section 3 km (2 mi) west of Mercury Highway.

Road 28-03 in Area 27 is a cold-mix, low-traffic road. Owing to the nature of security in that area, the road is adequately maintained. Tweezer, Angle, and Orange Blossom roads are narrow, secondary, oil-and-chip roads with no shoulders. These roads require periodic maintenance. Orange Blossom Road has been abandoned, and signs have been posted warning drivers to use at their own risk.

Major access to Area 29 is by Mine Mountain Road from Tippipah Highway. Secondary roads to Area 29 include Fortymile Canyon Road and Shoshone Mountain Road. All access roads to Area 29 are unpaved.

The remainder of the roadway network is composed of graded gravel roads and jeep trails. Gravel roads to event sites are maintained as requirements dictate. Gravel roads that remain in good condition include the Mine Mountain and Mid-Valley/Saddle Mountain Roads.

POTENTIAL HAZARDS

Northern Areas—Unique conditions at the NTS often preclude the use of conventional planning methods. Roadways have always been subject to extensive damage by localized seismic movements during underground nuclear tests. This type of damage has presented a unique challenge in road maintenance, especially around Mercury Highway in Areas 1, 2, 3, 7, 9, and 10. More detours or a more stable, efficient access to the northeastern area of the NTS might be required if further damage occurs to this roadway.

Significant traffic delays have occurred on Pahute Mesa Road during movement of heavy and oversized loads from the base of the mesa (elevation 1,219 m [4,000 ft]) to its summit (elevation 2.134 m [7,000 ft]). If this area is selected for any future projects or programs, traffic loads would also increase.

Southern Areas—Urban design standards for streets and roads must be modified to serve the particular needs of the NTS. Practical standards should be used to evaluate transportation needs in Mercury and the forward camps so that accident-risk areas within the traffic-flow patterns are minimized.

Traffic flow through Mercury is impeded by numerous intersections and the speed-reduction restrictions. Feeder traffic from Mercury Highway into the administrative and housing areas east of the highway and the industrial district west of the highway causes congestion during early morning and evening hours. This congestion is also a result of diverse and uncontrolled types of traffic, such as passenger vehicles, trucks, and buses.

Paved local-traffic streets at Mercury are approximately 6 m (18 ft) wide, which is sufficient for the projected traffic loads if parking is prohibited. However, streets do not have curbs and gutters, and surface drainage is carried in ditches parallel with streets.

In addition to vehicular traffic, pedestrian traffic in Mercury could become a problem because Mercury has an incomplete sidewalk system. Crosswalks at major Mercury Highway intersections do provide adequate safety at those points.

Project areas are initially accessed by graded gravel or dirt roads. If the projects become long term, these roads will require upgrading to all-weather oil-and-chip seal coats which are 8 m (26 ft) wide, with 2-m (8-ft) compacted shoulders.

*A.6.1.3.2 **Related Facilities***—Transportation facilities related to the roadway network include bus parking and commuter-vehicle parking areas. Commuter buses provide regular and express passenger service daily to the NTS from Las Vegas and Pahrump by way of U.S. Highway 95. The number of buses entering the NTS can vary daily, depending upon the on-site activities in progress. The bulk of traffic accesses the NTS from Guard Station 100 near Mercury. Bus service is also provided between Mercury and the forward areas. Paved areas are provided for the commuter buses at the support facilities within Areas 6, 23 (Mercury), 12 and 25. Limited bus parking is also available at other support facilities on the NTS.

*A.6.1.3.3 **Railroads***—The closest mainline railroad to the NTS, the Union Pacific, which runs through Las Vegas, is 80 km (50 mi) away from Mercury. This line connects southern California with points east, but does not connect with the NTS.

There is a 14 km (9 mi), standard-gauge railroad within Area 25. The former nuclear rocket development station facility employed a remotely operated train engine to move specially designed/equipped flatbed cars carrying extremely heavy, large, and highly radioactive materials. At the engine maintenance and disassembly facility, the railroad was used on site to transfer radioactive storage casks into heater holes.

A shorter, similar line was located at the Area 26 disassembly and test bunker sites. This line is abandoned, and much of the trackage and equipment has been removed.

*A.6.1.3.4 **Air Facilities***—Air facilities include helipads and several unused airstrips in the northern and southern areas of the NTS.

NORTHERN AREA—The only airstrip in the north is the Buckboard Mesa/Pahute airstrip in Area 18. Classified as a secondary support facility for authorized aircraft at the NTS, Buckboard Mesa/Pahute airstrip has had minimal use in the last few years. Its primary purpose was as a landing strip for aircraft carrying supplies and personnel to Pahute Mesa sites. Occasional helicopters and approximately 10, fixed-wing aircraft per year landed at the strip when the mesa was in use. Permission to use the strip had to be prearranged and was restricted to daylight hours, since no runway lighting exists. The runway is relatively short, and its surface was unable to withstand the impact from high-speed takeoffs and landings of jet aircraft when it was in peak condition. The largest aircraft that could be accommodated was the prop-driven C-130. At the present time, the Buckboard Mesa/Pahute airstrip is unusable. The runway contains many potholes, as well as severe depressions in the center of its surface.

Helipads are located at the Buckboard Mesa/Pahute airstrip, the Area 12 camp, and the abandoned Pahute Mesa Control Point (Area 18).

SOUTHERN AREA—The southern area of the NTS is served by the Desert Rock and Yucca Lake airports.

Desert Rock Airport is the primary aircraft support facility at the NTS. Existing features at Desert Rock Airport include a paved runway, an administration/control building, a fireman standby trailer, an aircraft unloading pad, aircraft parking tie-down spurs, two lighted windsocks, and radio-activated runway lights. Additionally, the airport has a landing-arrester cable system for use in the recovery of damaged aircraft that require emergency landing facilities. Desert Rock Airport is no longer manned, and no services are available because of funding and program cutbacks. However, Desert Rock Airport is still operational, and the use of this airstrip is controlled by the DOE.

Yucca Lake Airport is a secondary NTS support facility for authorized aircraft, but is currently not used. Features at this facility include an unpaved runway, an abandoned terminal building, and an aircraft refueling station. The runway is subject to flooding following local storms.

Helipads, equipped with windsocks, fire extinguishers, and painted markings, are located in the following places:

- Area 5, Radioactive Waste Management Site (Inactive)
- Area 6, east of Mercury Highway across from the Control Point
- Area 6, east side of Yucca Lake (Aerial Response Team facility)
- Area 22, Desert Rock Airport
- Area 23, adjacent to the Bechtel Nevada medical facility
- Area 25, west of the administration building in the Central Support Area
- Area 29, on Shoshone Peak.

A.6.1.3.5 Pathways—There is no real pathway system at the NTS. Pedestrians walk along the side of the roads and streets or through open lots.

A.6.1.3.6 Parking—Transportation facilities related to the roadway network include bus, government vehicle, and commuter vehicle parking areas. Paved areas are provided for the commuter buses at the support facilities within Areas 6, 12, 23 (Mercury), and 25. Limited bus parking is also available at other support facilities on the NTS. Approximately 3 km^2 (1 mi^2) have been paved and are available for parking at the NTS. Parking for government and private commuter vehicles is available at most buildings on the NTS.

A.6.1.4 Facilities and Services. The on-site support is comprised of various groups of personnel conducting many diverse functions. These groups include medical, fire protection, Nye County Sheriff's Department, security, housing/ janitorial/food services, administration, analytical services, information systems, quality assurance, engineering, environmental compliance, health protection, recreation, maintenance, National Oceanic and Atmospheric Administration, and the DOE. This on-site support includes 1,099 employees. These people are located in numerous facilities throughout the NTS.

A.6.1.5 Off-Site Support. Off-site support includes many of the support functions similar or related to the on-site support functions and is also comprised of diverse groups. These groups include medical, security, administration, information systems, quality assurance, engineering, facilities/maintenance, communications, utilities, transportation, Desert Research Institute, EPA, National Oceanic and Atmospheric Administration, and the DOE. These groups are located in Clark County, Nevada (Las Vegas and North Las Vegas), in various facilities and employ 1,639 people.

A.6.1.6 Landlord-Related Construction and Maintenance Projects. The majority of the facilities at the NTS were constructed 30 to 35 years ago as temporary structures; less than 10 percent have been constructed in the last 15 years. The DOE/NV did not have a line-item construction project from 1970 to 1980, and all building additions and modifications were accomplished with General Plant Project funds. This funding has been insufficient to meet programmatic needs and offset deterioration. Although the previous $1,200,000 cost cap on individual General Plant projects was raised to $2,000,000 as of November 1993, this ceiling will not enable the DOE/NV to replace any large facilities. The revitalization project has funded only 18 projects since its inception in 1984. Two of these projects were major capital equipment purchases, and six others were located in North Las Vegas or Nellis Air Force Base; consequently, only 10 major projects have been constructed for the NTS under revitalization. A number of the facilities at the NTS are also currently inadequate in one or more of the structural, mechanical, or electrical categories. In many instances, refurbishing these units only extends their useful lives by 5 to 10 years each. Additionally, the cost of refurbishment often exceeds the cost of replacement. The following projects are shown in the NTS Five-Year Construction Plan as underway or planned and are needed to maintain the NTS infrastructure (Table A-3). These are funded by the Defense Program as the responsible NTS landlord. The ability of the NTS to accept new missions relies on maintaining this infrastructure with sustained levels of funding and projects, such as those noted below. If, as indicated in Alternative 4, Defense Program activities are eliminated, these responsibilities would need to be underwritten by another program in order to retain NTS capabilities.

A.6.2 Alternative 2

The current level of infrastructure support regarding utilities, communications, transportation, on-site support, and off-site support would still be available under Alternative 2, but used commensurate with the ongoing site-related activities. With the reduction of site-related activities identified under Alternative 2, there would be no landlord-related construction or maintenance projects.

A.6.3 Alternative 3

The current level of infrastructure support in regard to utilities, communications, transportation, on-site support, and off-site support would still be available under Alternative 3, but used and expanded commensurate with Alternative 3 activities on site. With the increase of site-related activities identified under Alternative 3, the landlord-related construction or maintenance projects would be undertaken as circumstances dictate.

A.6.4 Alternative 4

The current level of infrastructure support in regard to utilities, communications, transportation, on-site support, and off-site support would still be available under Alternative 4, but used commensurate with the ongoing site-related activities. With the reduction of site-related activities identified under Alternative 4, there would be no landlord-related construction or maintenance projects.

Table A-3. Currently active or planned site-support projects (Page 1 of 4)

Fiscal Year 1992 currently active site-support projects

Project Overview		Summary Description
Title:	Valley Substation Upgrade, Area 2	Upgrade Valley substation to install a second feeder circuit to provide backup to the Rainier substation.
Sponsor:	Defense Program	
Funding:	GPP TEC: $244,000	
Begin:	FY 1992 End: FY 1995	

Fiscal Year 1993 currently active site-support projects

Project Overview		Summary Description
Title:	Remodel the NTS Badge Office, Building 1000, Area 23	Remodel the current facility to expand the waiting area, construct interview rooms; remodel restrooms to accommodate the handicapped, and upgrade the utilities.
Sponsor:	Defense Program	
Funding:	GPP TEC: $491,000	
Begin:	FY 1993 End: FY 1995	
Title:	Control Point-1 Cafeteria Renovations, Area 6	Renovate the cafeteria that is serving the Control Point compound, Area 6, and adjacent areas.
Sponsor:	Defense Program	
Funding:	GPP TEC: $654,000	
Begin:	FY 1993 End: FY 1995	
Title:	Mercury Cafeteria Renovations, Building 300, Area 23	Renovate Mercury, Area 23, cafeteria by increasing the fire sprinkler system coverage; remodel the restrooms and the entrance; upgrade the sanitation sewer system.
Sponsor:	Defense Program	
Funding:	GPP TEC: $983,000	
Begin:	FY 1993 End: FY 1995	
Title:	Water Distribution Systems, NTS	Provide necessary upgrades, modifications, and expansions to accommodate weapons testing program needs in seven prioritized phases serving Areas 5, 6, 16, and 23.
Sponsor:	Defense Program	
Funding:	RP TEC: $8,860,000	
Begin:	FY 1993 End: FY 1995	
Title:	Nevada Support Facility, North Las Vegas	Design and construct a two-story multifunction office building (17,930 m^2 [193,000 ft^2]) with associated site improvements on an 11-acre area.
Sponsor:	Defense Program	
Funding:	LIP TEC: $38,650,000	
Begin:	FY 1993 End: FY 1996	

Table A-3. Currently active or planned site-support projects (Page 2 of 4)

Fiscal Year 1994 currently active site-support projects

Project Overview	Summary Description
Title: Sewer Main Installation, Control Point to Yucca Lake, Area 6 Sponsor: Defense Program Funding: GPP TEC: $336,000 Begin: FY 1994 End: FY 1995	Provide for a gravity sewer main in Area 6 at Control Point to close two sewage lagoon facilities and eliminate the costs for operation, maintenance, and permit compliance at both sites.
Title: Expansion of Office Bldg. 117, Area 23 Sponsor: Defense Program Funding: GPP TEC: $350,000 Begin: FY 1994 End: FY 1995	Provide an addition to the Raytheon Services Nevada NTS division Building 117 to accommodate changes from an engineering to a multifunctional building, consolidating functions from four other buildings.
Title: Mercury Gas Station Upgrades, Area 23 Sponsor: Defense Program Funding: GPP TEC: $669,000 Begin: FY 1994 End: FY 1995	Locate and repair underground fuel leaks; upgrade tank overfill protections; install fuel inventory control system improvements; and install two new aboveground tanks.

Fiscal Year 1995 currently active site-support projects

Project Overview	Summary Description
Title: Bulk Fuel Storage Facility Upgrade, Area 5 Sponsor: Defense Program Funding: GPP TEC: $225,000 Begin: FY 1995 End: FY 1995	Clean and install a double-wall epoxy liner and a floating lid vapor recovery system in the 1.8×10^6 L (500,000-gal) gasoline tank in Area 23.
Title: Paging Terminal and Controller Replacement, NTS Sponsor: Defense Program Funding: OP/GPP TEC: $305,000 Begin: FY 1995 End: FY 1995	Replace the system with the most state-of-the-art equipment possible to ensure the longest system life (10 to 15 years) possible.
Title: Differential Global Positioning System, NTS Sponsor: Defense Program Funding: OP/GPP TEC: $310,000 Begin: FY 1995 End: FY 1995	Introduce system to provide several new mobile radio communication technologies to enhance surveying, intruder interdiction, fleet maintenance, and vehicle tracking services.

Table A-3. Currently active or planned site-support projects (Page 3 of 4)

Fiscal Year 1995 currently active site-support projects (continued)

Project Overview				Summary Description
Title:	Class III Landfill Construction, Area 5			Design and construct a new 191,139 m^3 (250,000 yd^3) capacity landfill for the disposal of inert construction and demolition debris.
Sponsor:	Defense Program			
Funding:	GPP	TEC:	$663,000	
Begin:	FY 1995	End:	FY 1995	
Title:	New Records Management Center, Area 23			Construct a one-story facility consisting of 790 m^2 (8,500 ft^2), including restroom facilities.
Sponsor:	Defense Program			
Funding:	GPP	TEC:	$1,578,000	
Begin:	FY 1995	End:	FY 1998	
Title:	Administration Office Addition, Bldg. 650, Area 23			Renovate and modify building 650 to provide office/administrative space for 25 full-time employees plus two classrooms; restrooms; and mechanical and electrical systems.
Sponsor:	Defense Program			
Funding:	LIP	TEC:	$1,883,000	
Begin:	FY 1995	End:	FY 1998	
Title:	Road 5-01 Reconstruction (or Cane Spring Extension), Area 5			Provide for the reconstruction of Road 5-01 (or the construction of an eastward extension of the Cane Spring Road) into an all-weather, paved access road for both heavy- and light-vehicular traffic to the Area 5 Radioactive Waste Management Site. Design for H-20 highway wheel-loading and employ drainage controls for the 100-year flood.
Sponsor:	EM Program			
Funding:	LIP	TEC:	$5,005,000	
Begin:	FY 1995	End:	FY 1996	

Fiscal Year 1996 planned site support projects

Project Overview				Summary Description
Title:	900 Operations Consolidation, NTS			Provide consolidation of other locations; provide greater access to equipment for maintenance purposes.
Sponsor:	Defense Program			
Funding:	OP/LIP	TEC:	$452,000	
Begin:	FY 1996	End:	FY 1996	
Title:	Microwave Radio Replacement, NTS			Replace existing Wiltel, REECo, EG&G/EM, and other miscellaneous microwave and communication systems needed in support of NTS activities.
Sponsor:	Defense Program			
Funding:	OP/LIP	TEC:	$8,000,000	
Begin:	FY 1996	End:	FY 1998	
Title:	IRAC Radio Replacement, NTS			Replace approximately 60 radio systems, 3,500 mobile radios and transmitters, consoles, and related equipment with a digitally trunked mobile radio system.
Sponsor:	Defense Program			
Funding:	OP/LIP	TEC:	$15,000,000	
Begin:	FY 1996	End:	FY 1998	

Table A-3. Currently active or planned site-support projects (Page 4 of 4)

Fiscal Year 1997 planned site-support projects

Project Overview	Summary Description
Title: Net 12 Upgrade, NTS Sponsor: Defense Program Funding: OP/LIP TEC: $3,000,000 Begin: FY 1997 End: FY 1998	Upgrade current NTS radio system.
Title: Renovate Existing Roadways, NTS Sponsor: Defense Program Funding: RP TEC: $10,170,000 Begin: FY 1997 End: FY 1998	Provide 52 km (32 mi) of Mercury Highway from the southern boundary of the NTS to the intersection of Road 6-09 at the Well 3 yard in Area 6.
Title: 138-kV Substation Modernization, NTS Sponsor: Defense Program Funding: RP TEC: $21,004,000 Begin: FY 1997 End: FY 2001	Replace one major substation, one switching center, and one switching station on the 138-kV transmission system loop at the NTS.

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 1 of 9)

		Alternative 1						
k-ft^3 - 1,000 ft^3		Alternative 1 Totals	Defense	Waste Management	Environmental Restoration	Nondefense R&D	Work for Others	Site Support
Waste Generated								
Hazardous	(kg/yr)	380,101	709	0	377,767	503	503	619
LLW	(k-ft^3)	5,355	10	0	5,322	7	7	9
	(m^3)	149,999	280	0	149,079	198	198	244
MW	(k-ft^3)	18	0	0	18	0	0	0
	(m^3)	501	1	0	497	1	1	1
Domestic (Class 1-Solid)	(k-ft^3/yr)	756	169	29	45	22	40	451
	(m^3/yr)	21,200	4,740	810	1,250	620	1,130	12,650
Waste Stored/Disposed								
Additional LLW	(k-ft^3)	12,495		12,495				
	(m^3)	350,000		350,000				
Additional MW	(k-ft^3)	18		18				
	(m^3)	500		500				
PCB	(k-ft^3)	22		22				
	(m^3)	612		612				
New Cotter Waste	(k-gal)	0						
	(k-l^3)	0						
Off-site Waste Shipments[a]								
Hazardous	(Shipments/yr)	20	4	1	1	1	1	12
LLW	(Shipments/yr)	700		700				
MW	(Shipments/yr)	0		0				
Area Disturbed								
Average Month	Acres	75	2	19	52	0	0	2
Total	Acres	9,905	30	34	9,823	0	0	18
Water Demand								
Air Quality Mitigation	(acre-ft/yr)	24	0	6	17	0	0	1
Consumptive Use	(acre-ft/yr)	1,699	380	65	100	49	91	1,014
Employment	(FTE)	6,576	1,472	250	389	191	350	3,924
Fuel Use	(gal/mo)	187,000	41,846	7,114	11,051	5,440	9,959	111,590
Expenditures	($k/yr)	$670,312	$150,000	$25,500	$39,612	$19,500	$35,700	$400,000

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 2 of 9)

k-ft³ - 1,000 ft³		Alternative 2 Totals	Defense	Waste Management	Environmental Restoration	Nondefense R&D	Work for Others	Site Support
		Alternative 2						
Waste Generated								
Hazardous	(kg/yr)	4,962	0	0	0	0	0	4,962
LLW	(k-ft³)							
	(m³)							
MW	(k-ft³)							
	(m³)							
Domestic (Class 1-Solid)	(k-ft³/yr)	10	0	0	0	0	0	10
	(m³/yr)	300	0	0	0	0	0	300
Waste Stored/Disposed								
Additional LLW	(k-ft³)	0						
	(m³)	0						
Additional MW	(k-ft³)	0						
	(m³)	0						
PCB	(k-ft³)							
	(m³)							
New Cotter Waste	(k-gal)	0						
	(k-l³)	0						
Off-site Waste Shipments[a]								
Hazardous	(Shipments/yr)	1	0	0	0	0	0	1
LLW	(Shipments/yr)							
MW	(Shipments/yr)							
Area Disturbed								
Average Month	Acres	0	0	0	0	0	0	0
Total	Acres	0	0	0	0	0	0	0
Water Demand								
Air Quality Mitigation	(acre-ft/yr)	0	0	0	0	0	0	0
Consumptive Use	(acre-ft/yr)	22	0	0	0	0	0	22
Employment	(FTE)	86	0	0	0	0	0	86
Fuel Use	(gal/mo)	2,441						2,441
Expenditures	($k/yr)	$8,750	$0	$0	$0	$0	$0	$8,750

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 3 of 9)

		Alternative 3					
$k\text{-}ft^3$ - 1,000 ft^3	Alternative 3 Totals	Defense	Waste Management	Environmental Restoration	Nondefense R&D	Work for Others	Site Support
Waste Generated							
Hazardous (kg/yr)	768,402	1,433	0	763,685	1,017	1,017	1,250
LLW ($k\text{-}ft^3$)	5,355	10	0	5,322	7	7	9
LLW (m^3)	149,999	280	0	149,079	198	198	244
MW ($k\text{-}ft^3$)	18	0	0	18	0	0	0
MW (m^3)	501	1	0	497	1	1	1
Domestic (Class 1-Solid) ($k\text{-}ft^3$/yr)	1,526	342	58	90	44	81	911
Domestic (Class 1-Solid) (m^3/yr)	42,810	9,580	1,630	2,530	1,250	2,280	25,540
Waste Stored/Disposed							
Additional LLW ($k\text{-}ft^3$)	32,130		32,130				
Additional LLW (m^3)	1,000,000		1,000,000				
Additional MW ($k\text{-}ft^3$)	10,710		10,710				
Additional MW (m^3)	300,500		300,500				
PCB ($k\text{-}ft^3$)	22		22				
PCB (m^3)	623		623				
New Cotter Waste (k-gal)	68		68				
New Cotter Waste ($k\text{-}l^3$)	259		259				
Off-site Waste Shipments[a]							
Hazardous (Shipments/yr)	40	9	2	2	1	2	24
LLW (Shipments/yr)	2,460		2,460				
MW (Shipments/yr)	1,540		1,540				
Area Disturbed							
Average Month Acres	448	50	115	52	229	0	2
Total Acres	15,632	1,000	209	9,823	4,582	0	18
Water Demand							
Air Quality Mitigation (acre-ft/yr)	144	16	37	17	73	0	1
Consumptive Use (acre-ft/yr)	8,986	789	210	203	5,641	92	2,051
Employment (FTE)	13,294	3,052	813	786	352	358	7,933
Fuel Use (gal/mo)	378,035	84,595	14,381	22,340	10,997	20,134	225,588
Expenditures ($k/yr)	$1,355,089	$311,114	$82,911	$80,079	$35,850	$36,453	$808,682

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 4 of 9)

k-ft³ - 1,000 ft³		Alternative 4 Totals	Defense	Waste Management	Environmental Restoration	Nondefense R&D	Work for Others	Site Support
Waste Generated								
Hazardous	(kg/yr)	221,326	0	11,646	18,091	8,906	0	182,683
LLW	(k-ft³)	5,355	10	0	5,322	7	7	9
	(m³)	149,999	280	0	149,079	198	198	244
MW	(k-ft³)	18	0	0	18	0	0	0
	(m³)	501	1	0	497	1	1	1
Domestic (Class 1-Solid)	(k-ft³/yr)	440	0	23	36	18	0	363
	(m³/yr)	12,299	0	647	1,005	495	0	10,152
Waste Stored/Disposed								
Additional LLW	(k-ft³)	6,783		6,783				
	(m³)	150,000		150,000				
Additional MW	(k-ft³)	179		179				
	(m³)	500		500				
PCB	(k-ft³)	22		22				
	(m³)	623		623				
New Cotter Waste	(k-gal)	68		68				
	(k-l)	259		259				
Off-site Waste Shipments[a]								
Hazardous	(Shipments/yr)	12	0	1	1	0	0	10
LLW	(Shipments/yr)	0		0				
MW	(Shipments/yr)	0		0				
Area Disturbed								
Average Month	Acres	289	0	6	52	229	0	2
Total	Acres	14,434	0	11	9,823	4,582	0	18
Water Demand								
Air Quality Mitigation	(acre-ft/yr)	93	0	2	17	73	0	1
Consumptive Use	(acre-ft/yr)	6,539	0	105	203	5,641	0	590
Employment	(FTE)	3,829	0	407	786	352	0	2,284
Fuel Use	(gal/mo)	108,887	0	5,730	8,900	4,381	0	89,876
Expenditures	($k/yr)	$390,213	$0	$41,456	$80,079	$35,850	$0	$232,828

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 5 of 9)

General Assumptions	1) Any underground nuclear test would be conducted in existing downhole locations. This would result in no further impacts from land disturbances, infrastructures support, etc. 2) All NTS EIS resource estimates were prepared to cover the 10-year analysis period. 3) Water use for dust control. 50% control = 285 gal/acre/day (8,700 gal/acre/month)[b]. This is valid of areas of active construction prior to soil stabilization. 4) Disposal of low-level waste in Alternatives 1 & 3 will be divided between Areas 3 & 5. Seventy-five percent (75%) will be placed in facilities in Area 3 while twenty-five percent (25%) will be placed in Area 5 disposal facilities. Disposal of low-level waste in Alternative 4 will be exclusively in Area 3. Disposal of all mixed low-level waste will be in Area 5.
Resource Specific Assumptions	
TOTAL EXPENDITURES	***Alternative 1.*** The annual total expenditures in 1995 was provided by the DOE/NV Office of the Chief Financial Officer. The allocation of employment by program was determined in the NTS EIS fact sheet meeting in mid-September 1995. ***Alternatives 2, 3, & 4.*** Projected expenditures for each alternative and program within each alternative was estimated by using the Alternative 1 expenditures and adding project funding requirements for each program as identified in the original NTS EIS data sheets.
EMPLOYMENT	***Alternative 1.*** Total employment (FTEs) in 1995 was provided in the September 14, 1995 "Report on NTS-related and Other NV-related Employment." The allocation of employment by program was determined in the NTS EIS fact sheet meeting in mid-September 1995. ***Alternatives 2, 3, & 4.*** Projected employment for each alternative and program within each alternative was estimated by the ratio of total alternative (or program) expenditures to a similar ratio of employment and expenditures from Alternative 1.
WATER USE	***Alternative 1.*** Total water demand in 1995 was 1,700 acre-feet/year. Water use by program was determined in the NTS EIS fact sheet meeting in mid-September 1995. ***Alternatives 2,3 & 4.*** Projected water demand for each alternative and program within each alternative was estimated by the ratio of total alternative (or program) expenditures to a similar ratio of water demand and expenditures from Alternative 1. Solar Enterprise Zone water demand[c] was added to the Non-Defense Research & Development Program projects in Alternatives 3 & 4.
DISTURBED AREA	Disturbed areas are those values provided by each program for new land disturbance activities in Appendix A. Disturbance was assumed to continue throughout the full ten-year period. Disturbed areas associated with new buildings were estimated at 2 times the building interior area. Total current disturbed area = 58,729 acres.

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 6 of 9)

DISTURBED AREA (Cont'd)	***Alternative 1***. Defense Programs: Big Explosives Experimental Facility would disturb 30 acres. Active ground disturbance would be expected for up to 6 months. Waste Management: Area 3: Current disposal volume = 10,650,000 ft^3 of low-level waste. Current disposal area is on approximately 20 acres. Therefore, the current practice results in the disposal of 532,500 ft^3/acre or 14,900 m^3/acre. Seventy-five percent (75%) of low-level waste disposal volume= (.75 X 350,000) = 262,500 m^3. Projected area to be disturbed = 262,500 m^3/14,900 m^3 acre = 18 acres. Approximately 55% of the area would be in active operation at any time. Area 5: Current disposal area = 30 acres, current volume = 6,344,700 ft^3. Therefore, the current practice results in the disposal of 211,500 ft^3/acre or 5,900 m^3 /acre. Projected area to be disturbed = 500 m^3/5,900 m^3/acre = less than 1 acre. Twenty-five percent (25%) of low-level waste disposal volume = (.25 X 350,000) = 87,000 m^3. Projected area to be disturbed = 87,500 m^3/5,900 m^3/acre = 15 acres. Total area disturbed = 16 acres. Approximately fifty-five percent (55%) of the area would be in active operation at any time. Environmental Restoration: Total area to be disturbed over the 10-year period from Appendix A = [3520 + 2510 + 30 + 2.5 + (165000/43560) + 500] = 10,086 acres. Bulk materials remediation activities (Plutonium contaminated soil media corrective actions, contaminated waste sites within Industrial Sites corrective actions and Defense Nuclear Agency sites) are assumed to be sequential actions and are estimated to have active construction on approximately 55 acres/month. Soil stabilization actions (the application of soil stabilizers and other revegetation activities) are assumed to be implemented immediately and at a rate equal to that of active construction. Inactive tank remediation is expected to have active construction followed by soil stabilization on 1 acre/month for a 30-month duration. Soil disturbance on the eight decontamination and decommissioning sites is assumed to be approximately 1 acre/site for 2 months. Results: 55 acre disturbance for 114 months for bulk materials (55 X 114) = 6270 acre-months 1 acre disturbance for 1 month for inactive tanks (1 acre-month) 1 acre disturbance for 2 months for decontamination and decommissioning (2 acre-months) Annual Average = 52.25 acres (6273 acre-month/120 months) of disturbance for 10 years of environmental restoration activities Nondefense research and development: Solar Enterprise Zone, listed in ALT 1 (section 3.1.1.4), does not appear on maps and does not include construction or other land disturbance; therefore, no disturbance. Work-for-Others: No disturbance. Site Support: Roadway Improvements for Road 5-01. 18 acres. Active construction would extend for up to one year. ***Alternative 2***: No disturbance.

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 7 of 9)

DISTURBED AREA (Cont'd)	***Alternative 3.*** Defense Programs: Facility improvements (including the National Ignition Facility , Plutonium, and Highly-Enriched Uranium, Device Assembly Facility modification and the large, heavy industrial facility) = 1000 acres. Active ground disturbance would be expected for up to 6 months. Waste Management: low-level waste volume = 1,000,000 m^3. Mixed low-level waste Volume = 300,500 m^3. Area 3 = 750,000 m^3/ 14,900 m^3/acres = 51 acres Area 5 = 300,500 m^3/ 5,900 m^3/ acres + 250,000 m^3/ acres = 94 acres Flood control dike: 15,500' long x 100' wide = 35 acres Class I Landfill: 15 acres Area 6: New liquid waste treatment facility = 14 acres Total Area Disturbed = 209 acres. Approximately fifty-five percent (55%) of the area would be in active operation at any time. Environmental Restoration: Same as Alternative 1. Nondefense Research and Development: Solar Enterprise Zone: 2,400 acres of disturbance is estimated for the development of up to 1,000 MW of generating capacity. This disturbance could be distributed among each site. Infrastructure improvement requirements are bounded by the power line and natural gas pipeline from the NTS to Las Vegas assumed to be 60 mi x 150 ft (each) = 2,182 acres. Active ground disturbance would be expected for up to 6 months. Work-for-Others: No disturbance. Site Support: Roadway improvements for Road 5-01. 18 acres. Active construction would extend for up to one year. ***Alternative 4.*** Defense Programs: No disturbance. Waste Management: Area 3 = 150,000 m^3/14,900 m^3 = 10 acres Area 5 = 500 m^3/5,900 m^3/acre = less than 1 acre Approximately 55% of the area would be in active operation at any time. Environmental Restoration: Same as Alternative 1. Nondefense Research and Development: Same as Alternative 3.

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 8 of 9)

FUEL USE	***Alternative 1.*** Estimated total fuel use was based on information supplied by the liquid propane supplier, Southwest Gas, by a program which was determined in the NTS EIS fact sheet meeting in mid-September 1995. ***Alternatives 2, 3, & 4.*** Projected fuel use for each alternative and program within each alternative was estimated by the ratio of the total alternative (or program) expenditures to a similar ratio of fuel use and expenditures from Alternative 1.
IMPORTED AND NTS-GENERATED LOW LEVEL WASTE, MIXED LOW LEVEL WASTE, AND TRANSURANIC WASTE	***Alternative 1.*** Low-level waste and mixed low-level waste figures were estimated from the existing, approved off-site waste generators. Totals were derived from DOE/NV Lifetime Generator Reports, 1995 Draft Baseline Environmental Management Report for Nevada for on-site generation (principally from environmental restoration activities) and projection from the 1993 Integrated Data Base for recently approved generators. ***Alternative 2.*** Low-level waste and mixed low-level waste generation from decommissioning activities is assumed to be sufficiently small to be discounted. ***Alternative 3.*** Low-level waste estimates were based on information from the 1993 Integrated Data Base expanded to the 10-year time frame. Environmental restoration-derived low-level figures from the NTS were estimated from the Baseline Environmental Management Report. Mixed low-level figures were estimated from the DOE Headquarters Mixed Waste Inventory Report and the Baseline Environmental Management Report. ***Alternative 4.*** Low-level waste and mixed low-level figures were estimated from the Baseline Environmental Management Report and the Lifetime Generator Reports. ***TRU All Alternatives.*** Constant for all alternatives based on the existing amount stored on the Transuranic Storage Pad within the NTS Area 5 Radioactive Waste Management Site.
OFF-SITE WASTE TRUCK TRIPS	***All Alternatives.*** Low-level waste and mixed low-level waste truck "load" calculated by dividing the total waste volume by the average capacity of each truck. Historic data of shipments from Rocky Flats to the NTS indicates that each shipment was composed of approximately 7m^3 (250 ft^3) of either low-level waste or mixed low-level waste, Shipments from other DOE sites contained approximately 37.5 m^3 (12 containers, each containing 112 ft^3 of material (4 ft x 4 ft x 7 ft, Total capacity = 1,344 ft^3) of either low-level waste or mixed low-level waste. Shipments were rounded to the nearest 10 shipments/year. Hazardous waste truck transport estimated to be 20/year, based on the REECo Hazardous Waste Collection Summary and EG&G waste information.

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 9 of 9)

SOLID WASTE GENERATION	*Alternative 1.* Total domestic solid waste was based on the August 1995 "Final Environmental Assessment for Solid Waste Disposal," Nevada Test Site. The reported value is 7,630 tons/year. Conversion to ft^3 was derived following consultation with NTS staff responsible for management of solid wastes. Approximately ninety-one percent (91%) of the wastes are disposed at 500 lbs/yd^3. The remaining nine percent (9%) is disposed at 100 lbs/yd^3. Therefore, the composite is disposed at 20.2 lbs/ft^3. Distribution of this waste among the programs was based on the relative contribution of program expenditures to the total. Additional amounts were added for environmental restoration-derived wastes (from Appendix A). *Alternatives 2 and 4.* Total and program derived solid wastes were estimated by the ratio of total alternative (or program) expenditures to a similar ratio of solid waste generation and expenditures from Alternative 1. *Alternative 3.* Same as Alternatives 2 and 4. An additional 644 m^3 (23,000 ft^3) of waste is added to the NTS Waste Management Program (and the Alternative Total) to account for the development and operation of the regional landfill for the adjacent rural counties.
HAZARDOUS WASTE GENERATION	*Alternative 1.* Total hazardous waste generated was derived from the NTS Annual Reports for hazardous waste shipments. Shipped mass for 1993, 1994 and 1995 was averaged to generate the 280,100 kg/yr (616,220 lb/yr) estimate. Program estimates were derived from discussions with the operators of the Explosive Ordnance Disposal Unit and Hazardous Waste Operations. *Alternatives 2,3, and 4.* Total and program derived hazardous wastes were estimated by the ratio of total alternative (or program) expenditures to a similar ratio of waste generation and expenditures from Alternative 1.

[a] Does not include internally generated waste
[b] Using EPA-450/3-88-008
[c] 5,550 acre feet/year

A.7 References

REGULATION, ORDER, LAW

40 CFR Part 191	U.S. Environmental Protection Agency (EPA), "Protection of the Environment: Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised July 1, 1992.
40 CFR Part 261	EPA, "Protection of the Environment: Identification and Listing of Hazardous Waste," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, July 1, 1993.
40 CFR Part 268	EPA, "Protection of Environment: Land Disposal Restrictions," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised July 1, 1992.
DOE Order 5400.1	U.S. Department of Energy (DOE), "General Environmental Protection Program," Washington, DC, November 9, 1988.
DOE Order 5530.2	DOE, "Nuclear Emergency Search Team," Washington, DC, September 20, 1991.
DOE Order 5530.5	DOE, "Federal Radiological Monitoring and Assessment Center," Washington, DC, July 10, 1992.
DOE Order 5530.4	DOE, "Aerial Measuring System," Washington, DC, September 20, 1991.
DOE Order 5530.1A	DOE, "Accident Response Group," Washington, DC, September 20, 1991.
DOE Order 5530.3	DOE, "Radiological Assistance Program," Washington, DC, January 14, 1992.
DOE Order 5820.2A	DOE, "Radioactive Waste Management," Washington, DC, September 26, 1988.

GENERAL

Baer et al., 1994	Baer, T.A., L.J. Price, J.N. Emery and N.E. Olague, *Second Performance Assessment Iteration of the Greater Confinement Disposal Facility of the Nevada Test Site*, SAND 93-0089, Sandia National Laboratories, Albuquerque, NM, 1994.
Battelle, 1994	Battelle-Pacific Northwest Laboratory, *Final Report of Vitrification Development Studies for Fernald CRU-4 Silo Wastes*, Richland, WA, April 1994.

DOE, 1992	U.S. Department of Energy (DOE), *Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements,* NVO-325 (Rev.1), prepared by DOE Nevada Field Office and Reynolds Electrical & Engineering Co., Inc.'s Waste Management Department, Las Vegas, NV, 1992.
DOE, 1993	DOE, *Operable Unit 4 Treatability Study Report for the Vitrification of Residues from Silos 1, 2, and 3,* Fernald Environmental Management Project, Fernald, OH, May 1993.
DOE, 1994	DOE, *Integrated Data Base Report - 1994: U.S. Spent Nuclear Fuel and Radioactive Waste Inventories, Projections, and Characteristics,* DOE/RW-0006, Rev. 9, prepared by Oak Ridge National Laboratory, 1994.
DOE, 1994a	DOE, *Environmental Restoration Sites Inventory, 1994 Annual Status Report, Draft,* DOE/NV-UC700, Vols, I, II, III, and IV, Las Vegas, NV, 1994.
DOE, 1995a	DOE, *Estimating the Cold War Mortgage: The 1995 Baseline Environmental Management Report, Vol 1, 11, and Executive Summary,* DOE/EM-0232, Las Vegas, NV, 1995.
DOE, 1995b	DOE, *Draft Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste,* DOE/EIS-0200-D, Office of Environmental Management, Washington, DC, 1995.
DOE, 1995c	DOE, *Implementation Plan, Defense Nuclear Facilities Safety Board Recommendation 94-2, Conformance with Safety Standards at Department of Energy Low-Level Nuclear Waste and Disposal Sites,* Washington, DC, 1995.
DOE/OFE, 1994	DOE/Office of Fossil Energy (OFE), *Environmental Assessment for Hazardous Materials Testing at the Liquefied Gaseous Fuels Spill Test Facility, Frenchman Flat, Nevada Test Site,* DOE-EA-0864, Washington, DC, 1994.
EO 12759	Executive Order (EO), Office of the President, "Federal Energy Management," U.S. Government Printing Office, Washington, DC, April 17, 1991.
EO 12856	EO, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements," Office of the President, Washington, DC.
Joint Ordnance Commanders Group, 1995a	Joint Ordnance Commanders Group, *Joint Demil Integration,* Demilitarization and Disposal Group, Demil Technology Office, 1995.
Joint Ordnance Commanders Group, 1995b	Joint Ordnance Commanders Group, memorandum from J.Q. Wheeler to J.K. Magruder, Nevada Operations Office, on "Joint Demilitarization Technology (JDT) Program," February 21, 1995.

| Olsen, 1993 | | Olsen, Clifford W., "Site Selection and Containment Evaluation for LLNL | Nuclear Events" in *7th Symposium on Containment of Underground Nuclear | Explosions Vol. I,* Lawrence Livermore National Laboratory CONF-9309103- | Vol. I, Pp. 85-119, 1993.

| Price et al., 1993 | | Price, L.L., S.H. Conrad, D.A. Zimmerman, N.E. Olague, K.C. Gaither, W.B. | Cop, J.T. McCord, and C.P. Harlan, *Preliminary Performance Assessment of the* | *Greater Confinement Disposal Facility at the Nevada Test Site*, Vols. 1, 2, and 3, | SAND 91-0047, Sandia National Laboratories, Albuquerque, NM, 1993.

| RSN, 1994a | | Raytheon Services Nevada (RSN), *Nevada Test Site Technical Site* | *Information,* prepared for the DOE/NV, Las Vegas, NV 1994.

| RSN, 1994b | | RSN, *FY 1996 Capital Asset Management Process Report,* Department of | Energy Nevada Operations Office, Las Vegas, NV, 1994.

| Shott et al., 1995 | | Shott, G.G., C.J. Muller, L.E. Barker, D.E. Cawlfield, F.T. Lindstrom, D.G. | Linkenheil, M.J. Sully, D.J. Thorne, and L. McDowell-Boyer, *Performance* | *Assessment for the Area 5 Radioactive Waste Management Site at the Nevada* | *Test Site, Nye County, Nevada*, Reynolds Electrical & Engineering Co., Inc., | Las Vegas, NV, 1995.

| State of Nevada, 1992 | | State of Nevada, *Settlement Agreement for Transuranic (TRU) Mixed Waste* | *Storage Issues at the Nevada Test Site (NTS),* State of Nevada, Division of | Environmental Protection, Carson City, NV, 1992.

| Van Cleave, 1996 | | Van Cleave, K.K., letter report to Stephen A. Mellington, Acting Director for | the Nevada Operations Waste Management Division, regarding the potential | for groundwater recharge below UE3ax/bl, Las Vegas, NV, 1996.

Appendix B

Federal Register Notice
(Volume 59, Number 153, Wednesday, August 10, 1994)
[59 FR 40897]

[FR Doc. 94–19532 Filed 8–9–94; 8:45 am]
BILLING CODE 6450-01-P

Preparation of an Environmental Impact Statement for the Nevada Test Site and Other Off-Site Test Locations Within the State of Nevada

AGENCY: U.S. Department of Energy (DOE).

ACTION: Notice of Intent.

SUMMARY: In accordance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*), the Council on Environmental Quality regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500–1508), and the Department's Implementing Procedures (10 CFR Part 1021), the DOE announces its intent to prepare a Site-wide Environmental Impact Statement (EIS) for the Nevada Test Site and other off-site test locations within the State of Nevada. The purpose of this Notice is to invite the participation of Federal, state, and local agencies, affected Indian tribes, and other interested persons in the process that DOE will follow to comply with NEPA, and to solicit public comments on the proposed scope and content of the Nevada Test Site EIS.

In order to meet present and potential future mission responsibilities at the Nevada Test Site, the Department proposes to evaluate resource management alternatives for the Nevada Test Site which would support current and future defense related missions, research and development, waste management, environmental restoration, infrastructure maintenance, and facility upgrades and alternative uses over the next 5–10 years. This Site-wide EIS will address numerous issues, including, without limitation: (1) environmental restoration and other Departmental activities at the Nevada Test Site and at off-site locations in the State of Nevada where DOE conducted nuclear experiments, which include the Project Shoal Area, Central Nevada Test Area, Tonopah Test Range, and portions of the Nellis Air Force Range; and (2) transportation and disposal of wastes, which are generated on and off-site of the Nevada Test Site.

DATES: DOE invites and encourages the general public, other government agencies, and all other interested parties to comment on the appropriate scope and content of the EIS for the Nevada Test Site and off-site locations within the State of Nevada to ensure that all relevant environmental issues and alternatives are addressed. Public scoping meetings are discussed below in the SUPPLEMENTARY INFORMATION section. The public scoping period will continue until September 30, 1994. All comments and suggestions received or postmarked by that date, whether written, oral, submitted directly to the Department, or presented during a scoping meeting, will be given equal consideration in defining the scope of this Site-wide EIS and the issues to be discussed. Comments received or postmarked after September 30, 1994, will be considered to the extent practicable. In addition, the Department is committed to providing opportunities for the involvement of interested individuals and groups in this and other Department planning activities outside of the formal scoping process on this EIS.

ADDRESSES: Written comments on the scope of the Site-wide EIS should be directed to: Donald R. Elle, Director, Environmental Protection Division, U.S. Department of Energy, Nevada Operations Office, P.O. Box 14459, Las Vegas, NV 89114.

Copies of written comments, transcripts of oral comments, and copies of the EIS Implementation Plan will be prepared and retained by the Department for inspection by the public at the following locations:

1. DOE Public Reading Room, 2753 S. Highland Ave., Las Vegas, NV 89109
2. Las Vegas Public Library, 833 N. Las Vegas Blvd., Las Vegas, NV 89101
3. Carson City Public Library, 900 N. Roop St., Carson City, NV 89701
4. Tonopah Public Library, 171 Central Street, Tonopah, NV 89049
5. Doris Shirkey Library, 2101 E. Calvada Blvd., Pahrump, NV 89041
6. Caliente Branch Library, 100 Depot Avenue, Caliente, NV 89008
7. University of Nevada, Reno, Noble H. Getchell Library, Reno, NV 89557
8. University of Nevada, Las Vegas, James Dickenson Library, 4505 S. Maryland Parkway, Las Vegas, NV 89154
9. Freedom of Information Reading Room, Forrestal Bldg, 1000 Independence Ave, S.W., Washington, DC 20585
10. Fallon Public Library, Churchill County Library, 553 S. Main, Fallon, NV 89406-3387
11. Washington County Library, 50 S. Main, St. George, UT 84770

FOR FURTHER INFORMATION CONTACT: For further information please contact: Donald R. Elle, Director, Environmental Protection Division, U.S. Department of Energy, P.O. Box 14459, Las Vegas, Nevada 89114, (702) 794-1550.

For information on the Department's NEPA process, please contact: Ms. Carol Borgstrom, Director, Office of NEPA Oversight, U.S. Department of Energy, 1000 Independence Avenue, S.W., Washington, DC 20585, (202) 586-4600 or leave a message at (800) 472-2756.

SUPPLEMENTARY INFORMATION:

Background

The Nevada Test Site, near Las Vegas, Nevada, is the site at which the Department's Nevada Operations Office fulfills its primary responsibilities to:

• Maintain a state of readiness to conduct underground nuclear testing.

• Fulfill those activities to maintain the nation's stockpile of nuclear weapons in a safe and secure manner and fulfill other national security related missions.

• Provide an ongoing waste management program covering all wastes generated both on-site and from other DOE-approved facilities across the U.S.

• Perform site characterization and environmental restoration activities required to minimize or eliminate the impacts of past operations.

• Supervise operations of non-DOE entities at the Liquefied Gaseous Fuels Spill Test Facility to perform research and demonstrations related to the safety aspects of hazardous chemicals and liquefied gaseous fuels.

• Serve as an outdoor laboratory where scientists and students can conduct research on environmental issues as part of the DOE National Environmental Research Park Network.

• Support the Threshold Test Ban Treaty and the Peaceful Nuclear Explosives Treaty verification mission along with an expanding role in supporting the ongoing Comprehensive Test Ban Treaty negotiations.

• Provide the capability to respond to nuclear emergencies, including use of radiation detection systems for search and identification of lost or stolen nuclear weapons and special nuclear materials; exercises related to nuclear bomb threats and to radiation dispersal threats.

• Demonstrate the capability to provide alternative energy sources to meet power needs for the Southwestern United States. This would include research activities in solar and other alternative energy source technologies.

The Department's responsibilities are mandated by statute, Presidential direction, and Congressional authorization and appropriation. Other activities may be directed by regulatory mandates identified in compliance agreements or orders or other enforceable documents.

The Nevada Test Site occupies 1,350 square miles in southern Nevada, and is located approximately 65 miles northwest of Las Vegas. The Nevada Test Site is bordered to the north, west, and east by the Nellis Air Force Range, and on the south by Bureau of Land Management-administered lands. To the east, the Nevada Test Site shares a nearly contiguous border with lands managed by the U.S. Fish and Wildlife Service for the Desert Game Range. The western half of the Game Range is also used by the U.S. Air Force, which shares a contiguous boundary with the Nevada Test Site. The Nevada Test Site is a remote, secure facility for conducting underground testing of nuclear weapons and for evaluating the effects of nuclear weapons on military communications systems, electronics, satellites, sensors, and other materials. Since the signing of the Threshold Test Ban Treaty in 1974, it has been the only site used by the United States for underground nuclear weapons testing. In September 1992, Congress, within the framework of the Threshold Test Ban Treaty, imposed a nine-month moratorium on underground nuclear testing. President Clinton extended the moratorium in July 1993 for an additional 15 months and subsequently, in March 1994, extended the moratorium through September 1995.

Existing land use on the Nevada Test Site falls into four general categories: Testing Areas; Reserved Areas; Industrial/Research Areas; and Waste Management Areas. Most of the work on the Nevada Test Site has been and continues to be related to national defense, with a growing emphasis on environmental restoration and waste management programs. Changing world conditions and national policies have reduced the need for testing programs, and other DOE and non-DOE activities are now being considered for siting at the Nevada Test Site. A map showing existing land use at the Nevada Test Site and the locations of the off-site tests is available on request to Donald R. Elle at the above address.

The Nevada Test Site is a unique facility. It is a large remote area with tightly controlled access, with a substantial infrastructure, and the capability to conduct tests with hazardous and radioactive materials. The southwest region of the Nevada Test Site provides support for nonweapons and nonnuclear weapons programs and for short term activities such as the nuclear weapons accident exercises conducted by the Nuclear Emergency Search Team. In 1993, DOE designated the Nevada Test Site as a National Environmental Research Park. The Research Park is available for use by the scientific community as an outdoor laboratory for research on the effects of human activities on the desert ecosystem. Land not used for mission or other purposes has been designated as reserved areas, available for future development. The northern part of the Nevada Test Site is reserved as an underground nuclear weapons testing area. Nuclear test locations are at Yucca Flat, Pahute Mesa, Rainer Mesa, and Buckboard Mesa.

Waste management activities have been ongoing at the Nevada Test Site since 1952. For ease of identification, the Nevada Test Site has been divided into numbered geographic "Areas". Waste Operations are conducted in several areas. Sanitary and solid waste are disposed of in Areas 23 and 9. Hydrocarbon-contaminated soils are disposed of in a permitted landfill in

Federal Register / Vol. 59, No. 153 / Wednesday, August 10, 1994 / Notices 40899

Area 6. Radioactive waste management sites are located in Areas 3 and 5. Area 5 is also the location of a 90-day hazardous waste accumulation site. Waste streams continue to be generated, stored, and disposed of at the Nevada Test Site. Radioactive wastes are also shipped to the Nevada Test Site for disposal from other Department and Department-authorized sites. Waste management operations at Nevada Test Site include: Accumulation of hazardous waste; disposal of low-level radioactive waste including some classified waste; management of mixed radioactive and hazardous waste; storage of mixed transuranic waste; and disposal of sanitary waste.

Mixed transuranic waste is stored on a pad at Area 5 under conditions set forth in the July 1992 Settlement Agreement between DOE and the State of Nevada. A consent agreement signed by DOE and the Nevada Division of Environmental Protection in 1994 allows storage at Area 5 of mixed waste generated during characterization activities.

Through 1994 there have been 1054 nuclear tests conducted by the United States, 928 of which were conducted on the Nevada Test Site. Defense research and weapons test verification activities were conducted at other test locations in Nevada. Nuclear devices were detonated underground at the Project Shoal Area and the Central Nevada Test Area. From 1957 to 1963, many safety tests using special nuclear materials and chemical explosives were conducted at sites on the Nevada Test Site, Nellis Air Force Range, and Tonopah Test Range to test the safety of nuclear weapons in accident situations. These tests have resulted in the release of radioactive materials and surface contamination over large areas.

The Yucca Mountain site is located on the southwestern boundary of the Nevada Test Site. In the 1987 amendments to the Nuclear Waste Policy Act (NWPA), Congress directed DOE to characterize the Yucca Mountain site for possible development of a geologic repository for disposal of spent nuclear fuel and high level nuclear waste. Prior to passage of the 1987 amendments, DOE had prepared an environmental assessment (EA) which included an analysis of the effects of site characterization activities at Yucca Mountain (DOE/RW–0073, May 1986). If DOE ultimately recommends approval of the Yucca Mountain site to the President, that recommendation must be accompanied by an EIS prepared under the specific provisions of the NWPA. All activities regarding the characterization of the Yucca Mountain site, and any eventual construction and operation of a repository, including environmental review, are regulated by the process prescribed in the NWPA. Therefore, the Nevada Test Site EIS will address ongoing Yucca Mountain site characterization activities only as they relate to the cumulative impacts of activities on the Nevada Test Site during the period covered by the EIS, using the Yucca Mountain EA as a baseline.

Public lands administered by the Bureau of Land Management surround the Nevada Test Site and Nellis Air Force Range on all sides. The Tonopah Test Range is located in the northwestern portion of the Nellis Air Force Range, and is operated by Sandia National Laboratories, under contract with the DOE Albuquerque Operations Office, and through a Memorandum of Agreement between the Department of Energy's Albuquerque and Nevada Operations Offices. The Central Nevada Test Area is located approximately 60 miles east of Tonopah between Warm Springs and Currant (approximately 160 miles north of Las Vegas), and the Project Shoal Area is located approximately 30 miles southeast of Fallon (approximately 90 miles east of Reno and 285 miles northwest of Las Vegas).

The Nevada Test Site, Nellis Air Force Range, and Tonopah Test Range each have restricted-access areas that are not open to the public for purposes such as agriculture, mining, land disposal of wastes, or mineral leasing. With the exception of very limited special hunting access to a portion of the Nellis Air Force Range, these sites are not open for recreational use. The Project Shoal Area and the Central Nevada Test Area are not restricted-access areas and are open for general public uses including grazing and recreation, but not to mining.

Public roads link the Project Shoal Area and the Central Nevada Test Area with the Nevada Test Site and these may be used to ship wastes to the Nevada Test Site. In addition, some public roads may be used to transport waste from Nellis Air Force Range and Tonopah Test Range to the waste management locations on the Nevada Test Site or elsewhere. Public roads are also used to ship low level radioactive waste from other DOE sites to the Nevada Test Site and to ship hazardous waste from the Nevada Test Site to permitted disposal facilities.

Preliminary Identification of Alternatives

The proposed action is to develop a resource management plan for the Nevada Test Site. The Department of Energy needs a site resource management plan that would allow it to continue its missions in a way that minimizes or avoids environmental impacts. A preliminary set of resource management alternatives for evaluation in the EIS has been identified below. The final set of alternatives and issues to be considered in the EIS will reflect consideration of the public input received during the scoping period.

No Action

Under the no action alternative, existing missions and operations would continue at the present level. Environmental restoration activities would continue at the Nevada Test Site and at off-site test locations within the State of Nevada. Off-site test location activities would be consistent with the applicable land use plans of the controlling agency. This alternative includes the potential to resume underground nuclear testing and conducting other nuclear weapon related experiments at the Nevada Test Site. Expanded use of the Nevada Test Site for defense-related experiments, alternative energy source technology development, non- or counter-proliferation research and development and environmental technology development would not be pursued. Waste management activities would continue to support existing DOE missions and operations in the same manner and degree as at present and in the recent past. Continuing activities at the Area 3 and 5 radioactive waste management sites include: the disposal of low-level radioactive wastes generated from both on-site activities and off-site DOE and Department of Defense facilities such as the Fernald Field Office near Cincinnati, Ohio; the Rocky Flats Environmental Technology Site (formerly the Rocky Flats Plant), Golden, Colorado; the Amarillo Area Office (Pantex), Amarillo, Texas; and the Aberdeen Proving Grounds, Aberdeen, Maryland. Other continuing activities include storage of transuranic and other wastes, accumulation of hazardous wastes prior to off-site shipment for disposal, and disposal of on-site generated mixed waste that meets the Resource Conservation and Recovery Act (RCRA) land disposal restriction criteria. Groundwater characterization would continue with the associated waste management activities. This alternative is intended to encompass current operations, including waste management and technology development operations without the improvements or expansion which would occur under the expanded use alternative.

Expanded Use

Under this alternative, maximum use would be made of the Nevada Test Site in support of national pr... of both a defense and non-defense nature. National Defense activities could include a resumption of underground nuclear testing with the required support activities; conducting other nuclear weapons related experiments; the construction and operation of various types of simulator facilities and other experimental test facilities; tritium production; plutonium storage and disposition; nuclear weapons storage and disassembly and similar activities that could be best conducted at a remote site. The site could also be used for various exercises and technology development aimed at countering nuclear terrorism or proliferation activities. Non-defense programs could include the study of alternative energy sources including the construction and operation of various solar energy facilities that would demonstrate the effectiveness of the technologies; expanded use of the Liquefied Gaseous Fuels Spill Test Facility; and increased use of the site as an Environmental Research Park.

This alternative would include continuation of on-going waste management activities, planned waste management and environmental restoration activities, and enhanced usage of the Site for waste management activities. In addition to on-going activities, planned waste management activities proposed for the Area 5 radioactive waste management site include construction and operation of: certification facilities for various types of waste, expanded mixed waste disposal facilities for on- and off-site generated mixed waste, increased capacity for hazardous and mixed waste storage, waste treatment facilities, closure barriers or caps, and infrastructure improvements.

Enhanced usage would include, for example, options to utilize the Nevada Test Site as specified in other DOE and Department of Defense NEPA documents (such as the Environmental Restoration and Waste Management Programmatic EIS which, among other things, addresses a programmatic alternative under which all DOE low-level radioactive wastes would be disposed of at the Nevada Test Site); regional treatment of mixed waste in accordance with the Federal Facility Compliance Act; and disposal of mixed and transuranic wastes.

Other Alternatives

The Department will consider other resource management alternatives, i.e., variations of the no action alternative that would involve no new projects or a phased reduction in current operations, and no shipments or reduced shipments of off-site waste to the Nevada Test Site. The Department invites public comment on the above, and suggestions regarding other resource management alternatives that should be considered.

Preliminary Identification of Environmental Issues

The following issues have been tentatively identified for analysis in this EIS. This list is intended to facilitate public comment on the scope of the EIS. It is not intended to be all-inclusive, nor is it intended to be a predetermination of impacts.

1. Potential effects on the public and on-site workers from releases of radiological and hazardous materials during normal operations and from reasonably foreseeable accidents.
2. Potential effects on air and water quality and other environmental consequences of normal operations and reasonable foreseeable accidents.
3. Potential cumulative effects from proposed actions and other past, present and reasonably foreseeable future actions.
4. Potential environmental effects, including human health, economic and social effects on surrounding communities, including minority communities and low-income communities.
5. Potential effects on sensitive species, economically and recreationally important species, floodplains, wetlands, and historic and archaeological resources, including paleontological sites and Native American resources.
6. Potential environmental effects of future Nevada Test Site facility decontamination and decommissioning activities.
7. Potential effects of near- and long-term waste management of off-site generated waste, and environmental restoration activities.
8. Potential unavoidable adverse environmental impacts.
9. Short-term uses of the environment versus long-term productivity.
10. Potential irretrievable and irreversible commitments of resources.

Related Documentation

The Department will prepare transcripts of the oral comments received during the scoping workshops. The records of all comments, both oral and written, received during the scoping period will be made available for public review in the reading rooms listed above. Additional background documents and references identified as pertinent during the EIS process will also be made available in the reading rooms.

The following is a list of forthcoming NEPA documentation related to this EIS that have the potential for affecting its scope by inclusion of the Nevada Test Site as an alternative site for the action being considered:

(a) Reconfiguration Programmatic EIS—On July 23, 1993, the Department published a revised Notice of Intent (56 FR 39528) to prepare a Programmatic EIS for reconfiguration of its nuclear weapons complex due to nuclear weapons stockpile reductions. The Department currently is considering how the scope of this Programmatic EIS should be revised further to reflect more recent budget and stockpile reduction decisions. The Nevada Test Site is a potential alternative site in this EIS.

(b) The Fissile Materials Storage and Disposition Programmatic EIS will address the long-term storage of all fissile nuclear materials and disposition of surplus fissile nuclear materials. The Notice of Intent announcing the preparation of this EIS was published in the Federal Register (59 FR 31985), on June 21, 1994.

(c) The Environmental Restoration and Waste Management Programmatic EIS will address waste management alternatives for existing and proposed actions and DOE complex-wide issues associated with long-term waste management policies and practices. In this Programmatic EIS, the Department is evaluating the Nevada Test Site as an alternative site for managing DOE wastes. An Implementation Plan for this Programmatic EIS was issued in January 1994. The final Programmatic EIS is scheduled to be issued in 1995.

(d) The Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs EIS analyzes the potential environmental consequences of alternatives to the transportation, receipt, processing, and storage of the Department's spent nuclear fuel. The Nevada Test Site is being evaluated as a potential spent nuclear fuel management site in this analysis, but the Department has stated that the Nevada Test Site is not the preferred alternative;

(e) The Proposed Policy for the Acceptance of United States Origin Foreign Research Reactor Spent Nuclear

Federal Register / Vol. 59, No. 153 / Wednesday, August 10, 1994 / Notices 40901

Fuel EIS will address the potential environmental impacts of the proposed policy renewal and its implementation. Under a renewed policy, the United States could accept up to 15,000 foreign research reactor spent fuel elements over a 10 to 15 year period. The Nevada Test Site is a potential storage site in this EIS.

(f) The Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapons Components EIS will address the potential environmental impacts of the continued operation of the Pantex Plant. These include near- to mid-term foreseeable activities and the nuclear component storage activities at other Department sites associated with nuclear weapon disassembly at the Pantex Plant, over the next 5 to 10 years. The Nevada Test Site is being considered as a potential site under the relocation of operations alternative.

(g) The environmental restoration program at the Fernald Environmental Management project is divided into five operable units. For each operable unit, a feasibility study/proposed plan is being prepared to provide a detailed evaluation of the leading remedial alternative for each area of contamination. Nevada Test Site may be identified as the preferred candidate disposal site for portions of the low level waste generated during cleanup activities for each operable unit. The current schedule for the Department to submit the feasibility study/proposed plans to the U.S. Environmental Protection Agency for approval is as follows: Operable Unit 1 (Waste Pits), submitted July 1994; Operable Unit 2 (Solid Waste Units), to be submitted August 1994; Operable Unit 3 (Production Area), to be submitted November 1996; Operable Unit 4 (Silos), submitted December 1993; and Operable Unit 5 (Environmental Media), to be submitted in February 1995.

Cooperating Agencies

The preparation of this Site-wide EIS will require the participation of several Federal agencies, some of which may be identified as cooperating agencies under the NEPA process. These include the Air Force, Department of the Interior (Bureau of Land Management and Fish and Wildlife Service), and the Defense Nuclear Agency.

Public Scoping Meetings

Public scoping meetings to provide and discuss information, and receive oral comments on the scope of the EIS will be held in the States of Nevada and Utah at locations near the Nevada Test Site which may be affected by potential decisions and implementation.

The dates and locations for the public scoping meetings are listed below. All meetings are scheduled to begin at 6:30 p.m.

September 7, 1994
Fallon Convention Center
100 Campus Way
Fallon, Nevada

September 8, 1994
Carson City Community Center
851 East William Street
Carson City, Nevada

September 13, 1994
Dixie Center Convention Facilities
425 South 700 East
St. George, Utah

September 15, 1994
Tonopah Convention Center
301 Brougher
Tonopah, Nevada

September 20, 1994
Cashman Field Convention Center
850 Las Vegas Blvd, North
Las Vegas, Nevada

September 21, 1994
Bob Ruud Community Center
150 North Highway 160
Pahrump, Nevada

September 22, 1994
Caliente Youth Center
Highway 93
Caliente, Nevada

Oral Comments

All interested parties are invited to record their comments or suggestions concerning this EIS or their request to be placed on the distribution list by calling the Nevada Test Site EIS Hotline at 1-800-405-1140 or 702-794-1550. The hotline will give instructions on how to record comments or requests.

Written Comments

Written comments or suggestions to assist the Department in identifying significant environmental issues and the appropriate scope of the EIS, questions concerning the Nevada Test Site or other involved Department sites, requests for speaking times, requests for copies of the EIS Implementation Plan, and requests to be placed on the distribution list should be directed to: Donald R. Elle, Director, Environmental Protection Division, U.S. Department of Energy, Environmental Impact Statement, P.O. Box 14459, Las Vegas, NV 89114.

Public Meetings Registration and Format

Oral and written comments may be presented at the public scoping meetings. Persons desiring to speak at any of these meetings should register by calling the Nevada Test Site EIS Hotline by 3:00 p.m., Pacific Time, two working days in advance of the scoping meeting; or by writing to the Director of the Environmental Protection Division at the above address. Persons wishing to speak that have not registered in advance may register at the entrance of the meeting room. Individuals speaking on behalf of an organization should identify the organization represented.

In order to solicit individual viewpoints and facilitate interactive communication between participants and representatives of the Department, opportunities will be provided at the scoping meetings for questions and informal discussions regarding the issues to be addressed in this EIS.

Subsequent Document Preparation

After the completion of the public scoping process, the Department will prepare an EIS Implementation Plan and make it available to the public upon request and place it in the public reading rooms. The Plan will record the results of the scoping process and define the alternatives and issues that the Department will evaluate in this EIS. The Plan will also include a schedule for completing the Draft EIS. Availability of the Draft EIS will be announced in the Federal Register. The Department will solicit comments from the public, organizations, and other agencies on the Draft EIS, and will consider all comments in its preparation of the Final EIS.

Issued in Washington, DC this 4th day of August, 1994.

Peter N. Brush,

Acting Assistant Secretary, Environment, Safety and Health.

[FR Doc. 94-19531 Filed 8-9-94; 8:45 am]

BILLING CODE 6450-01-P

This Page Intentionally Left Blank

Appendix C

RELEVANT REGULATORY REQUIREMENTS

APPENDIX C
RELEVANT REGULATORY REQUIREMENTS

This appendix identifies and summarizes the major federal and state laws, regulations, executive orders, and U.S. Department of Energy (DOE) orders that may apply to the proposed action and alternatives at the Nevada Test Site (NTS). This appendix also provides information concerning the status of permits and regulatory compliances at the NTS and the off-site locations in Nevada.

Consultations with the Nevada State Historic Preservation Officer would continue on a project-specific basis for any of the alternatives considered. Consultations with the Fish and Wildlife Service pursuant to Section 7 of the Endangered Species Act are in progress and described in Chapter 8. Consultations with American Indian tribes are described in Chapter 8 and detailed in Appendix G of this Environmental Impact Statement.

Under Alternative 1, the permits identified in Section C.5 would be maintained and updated as necessary. Additional actions necessary to acquire a Resource Conservation and Recovery Act permit from the Nevada Division of Environmental Protection for the disposal of off-site generated low-level mixed waste that meet land disposal restrictions would be pursued.

Under Alternative 1, the DOE would also continue its consultations with the U.S. Bureau of Land Management and begin consultations with the U.S. Department of the Interior to define the appropriate actions to address administrative issues related to the NTS and other land withdrawals.

Under Alternative 2, no permitting actions would be required. This alternative would result in noncompliance with the requirements of the Resource Conservation and Recovery Act.

Under Alternative 3, the permits identified in Section C.5 would be maintained and updated as necessary, and additional local permits required for construction would be obtained. Additional actions necessary to acquire Resource Conservation and Recovery Act permits from the Nevada Division of Environmental Protection for a mixed waste disposal unit, a mixed waste storage unit, and a mixed waste treatment unit would be pursued.

Under Alternative 3, the DOE would also continue its consultations with the U.S. Bureau of Land Management and begin consultations with the U.S. Department of the Interior to define the appropriate actions to address administrative issues related to the NTS and other land withdrawals.

Under Alternative 4, existing permits would be maintained. Consultations with the U.S. Bureau of Land Management would continue and consultations would begin with the U.S. Department of the Interior to define and implement the appropriate actions to address issues associated with the NTS and other land withdrawals.

C.1 Federal Environmental Statutes and Regulations

Listed below are the significant federal laws, rules, regulations, and guidelines that are applicable at the NTS and the off-site locations in Nevada.

National Environmental Policy Act of 1969, 42 United States Code (U.S.C.) 4321, enacted by Public Law (Pub. L.) No. 91-190 as amended.

> The National Environmental Policy Act of 1969 establishes a policy promoting awareness of the environmental consequences of major federal activities on the environment and consideration of the environmental impacts during the planning and decisionmaking stages of a project. The National Environmental Policy Act requires all agencies of the federal government to prepare a detailed statement on the environmental effects of proposed major federal actions that may significantly affect the quality of the human environment.
>
> The Council on Environmental Quality and the DOE have proclaimed regulations for

implementing the National Environmental Policy Act (40 Code of Federal Regulations [CFR] Parts 1500-1508 and 10 CFR Part 1021). The Council on Environmental Quality and DOE regulations require the preparation of this EIS in two stages: draft and final. The Draft and Final EISs must contain discussions of the purpose and need for the proposed action; reasonable alternatives to the proposed action, including the "no action" alternative; the environment potentially affected by the proposed action and the alternatives; and the environmental consequences of the proposed action and alternatives (40 CFR Part 1502.10 and 10 CFR Part 1021.315).

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, enacted by Pub. L. No. 94-580 as amended.

The Resource Conservation and Recovery Act was enacted to ensure the safe and environmentally responsible management of hazardous and nonhazardous solid waste, and to promote resource recovery techniques to minimize waste volumes. Regulations issued by the U.S. Environmental Protection Agency (EPA) under the Resource Conservation and Recovery Act set forth a comprehensive program to provide "cradle to grave" control of hazardous waste by requiring generators and transporters of hazardous waste, as well as owners and operators of treatment, storage, and disposal facilities, to meet specific standards and procedures. Hazardous waste is defined under the Resource Conservation and Recovery Act as a waste that poses a potential hazard to human health or the environment when improperly treated, stored, or disposed of.

The Resource Conservation and Recovery Act regulations include requirements for locating and operating treatment, storage, and disposal facilities. The Resource Conservation and Recovery Act also requires the EPA to issue land disposal restrictions that require the use of the best demonstrated available technologies to treat certain hazardous waste and other waste containing certain hazardous components. The land disposal restrictions also prohibit storing waste that requires treatment, except to facilitate proper recovery, treatment, or disposal. Much of the DOE's waste that is currently stored, as well as some waste that will be generated in the future, is hazardous waste or contains hazardous components that are subject to the Resource Conservation and Recovery Act requirements, including land disposal restrictions.

Hazardous Waste and Solid Waste Amendments Act of 1984, 42 U.S.C. 6901, enacted by Pub. L. No. 98-616.

The Hazardous Waste and Solid Waste Amendments Act of 1984 are amendments to the Resource Conservation and Recovery Act that authorize regulations or require that regulations be promulgated on waste minimization, land disposal of hazardous wastes, and underground storage tanks.

Federal Facility Compliance Act of 1992, 42 U.S.C. 6961, enacted by Pub. L. No. 102-386.

The Federal Facility Compliance Act of 1992 waives sovereign immunity for fines and penalties for Resource Conservation and Recovery Act violations at federal facilities. However, a provision postpones fines and penalties after three years for mixed waste storage prohibition violations at DOE sites and requires the DOE to prepare plans for developing the required treatment capacity for mixed waste stored or generated at each facility. Each plan must be approved by the host state or the EPA, after consultation with other affected states, and a consent order must be issued by the regulator requiring compliance with the plan. The Federal Facility Compliance Act further provides that the DOE will not be subject to fines and penalties for land disposal restrictions storage prohibition violations for mixed waste as long as it is in compliance with such an approved plan and consent order and meets all other applicable regulations.

Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. 9601, enacted by Pub. L. No. 96-510, also known as Superfund: Amended in 1986 by the Superfund Amendments and Reauthorization Act, Pub. L. No. 99-499.

The Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, provides a statutory framework for the cleanup of waste sites containing hazardous substances and, as amended by the Superfund Amendments and Reauthorization Act, provides an emergency response program in the event of a release (or threat of a release) of a hazardous substance to the environment. The Comprehensive Environmental Response, Compensation and Liability Act's goal is to provide for response and remediation of environmental problems that are not adequately covered by permit programs of other environmental laws, such as the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act, and the Atomic Energy Act.

Emergency Planning and Community Right-to-Know Act of 1986, 42 U.S.C. 11001, enacted by Pub. L. No. 99-499.

This act was included as Title III of the Superfund Amendments and Reauthorization Act. Under Subtitle A of this Act, federal facilities, including those owned by the DOE, provide various information, such as inventories of specific chemicals used or stored and releases that occur from these sites, to the State Emergency Response Commission and to the Local Emergency Planning Committee to ensure that emergency plans are sufficient to respond to unplanned releases of hazardous substances. The DOE also requires compliance with Title III as a matter of agency policy.

In addition, under Subtitle B of the Act, material safety data sheet reports, emergency and hazardous chemical inventory reports, and toxic chemical release inventory reports must be provided to appropriate state, local, national, and federal authorities.

Atomic Energy Act, 42 U.S.C. 2011, enacted by Pub. L. No. 83-703.

The Atomic Energy Act ensures proper management, production, possession, and use of radioactive materials. The Act also provides the DOE with authority for developing generally applicable standards for protecting the environment from radioactive materials. Pursuant to the Atomic Energy Act, the DOE has established a system of standards and requirements issued as DOE orders. The Act also authorizes the Formerly Utilized Sites Remedial Action Program, under which the DOE is responsible for cleaning up privately owned sites previously used and contaminated as a result of nuclear weapons production.

Clean Air Act, 42 U.S.C. 7401, enacted by Pub. L. No. 90-148 as amended.

The Clean Air Act, as amended, is intended to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." Section 118 of the Clean Air Act, as amended, requires that each federal agency with jurisdiction over any property or facility that might discharge air pollutants, such as the DOE, comply with "all federal, state, interstate, and local requirements" with regard to the control and abatement of air pollution.

The law requires the EPA to establish national primary and secondary ambient air quality standards as necessary to protect public health, with an adequate margin of safety, from any known or anticipated adverse effects of a regulated pollutant (42 U.S.C. 7409). The Clean Air Act also requires establishment of (a) national standards of performance for new stationary sources of atmospheric pollutants; (b) emissions limitations for any new or modified building, structure, facility, or installation that emits or may emit an air pollutant (42 U.S.C. 7411); and (c) standards for emission of hazardous air pollutants (42 U.S.C. 7412). In addition, the Clean Air Act requires specific emission increases to be evaluated so as to prevent a significant deterioration in air quality (42 U.S.C. 7470).

To comply with these requirements, the EPA issued (a) New Source Performance Standards with respect to stationary sources, which impose emission or discharge limitations on new pollution sources (40 CFR Part 60); (b) National Emission Standards for Hazardous Air Pollutants which establishes limits of materials such as radioactivity, asbestos, beryllium, mercury, etc., that may be emitted into the atmosphere (40 CFR Part 61); and (c) Prevention of Significant Deterioration which contains measures which should be considered and/or implemented to minimize the deterioration of air quality at locations where air quality is already cleaner than the ambient standards (40 CFR Part 81).

The Clean Air Act requires each state to develop implementation plans to control air pollution and air quality in that state and submit them for approval to the EPA . Under EPA regulations, Nevada has been delegated authority under the Clean Air Act to maintain the Primary and Secondary National Ambient Air Quality Standards (40 CFR Part 52, Subpart N), to issue permits under the Prevention of Significant Deteriorations (40 CFR Part 52.683), and to enforce performance standards for new stationary sources. To date, the state of Nevada does not have authority to administer the National Emission Standards for Hazardous Air Pollutants Program regulating emissions of radionuclides at DOE facilities. Therefore, National Emission Standards for Hazardous Air Pollutants approvals authorizing release of radionuclides are obtained from the EPA Region 9.

Clean Water Act of 1977, 42 U.S.C. 1251, et seq. enacted by Pub. L. No. 95-917 [amendments to the Federal Water Pollution Control Act of 1972].

The Clean Water Act of 1977, which amended the Federal Water Pollution Control Act, was enacted to "restore and maintain the chemical, physical, and biological integrity of the Nation's water." The Clean Water Act prohibits the "discharge of toxic pollutants in toxic amounts" to navigable waters of the United States. Section 313 of the Clean Water Act, as amended, requires all branches of the federal government engaged in any activity that might result in a discharge or runoff of pollutants to surface waters to comply with federal, state, interstate, and local requirements.

In addition to setting water quality standards for the nation's waterways, the Clean Water Act supplies guidelines and limitations for effluent discharges from point-source discharges, and provides authority for the EPA to implement the National Pollutant Discharge Elimination System permitting program. The National Pollutant Discharge Elimination System Program is administered by the Water Management Division of the EPA pursuant to regulations in 40 CFR Part 122 et seq. Nevada has not applied for National Pollutant Discharge Elimination System authority from the EPA. Thus, all National Pollutant Discharge Elimination System permits required for the NTS would be obtained by the DOE through the EPA Region 9 (40 CFR Part 122 et seq.).

Sections 401 and 405 of the Water Quality Act of 1987 added Section 402(p) to the Clean Water Act. Section 402(p) requires that the EPA establish regulations for issuing permits for storm water discharges associated with industrial activity. Although any storm water discharge associated with industrial activity requires a National Pollutant Discharge Elimination System permit application, regulations implementing a separate storm water permit application process have not yet been adopted by the EPA.

Safe Drinking Water Act of 1974, 42 U.S.C. 300f, et seq., enacted by Pub. L. No. 93-523 as amended.

The Safe Drinking Water Act's primary objective is to protect the quality of public water supplies and all sources of drinking water. The state of Nevada, with the EPA's authorization, regulates public drinking water supplies by establishing and enforcing drinking water standards and by developing and implementing aquifer and water source protection regulations. These regulations proclaim maximum contaminant levels, including those for radioactivity in community water systems, which are defined as public water systems that serve at least 15 service connections used by year-round residents or regularly serve at least 24 year-round residents. Other programs established by the Safe Drinking Water Act include the Sole Source Aquifer Program, the Wellhead Protection Program, the Underground Injection Control Program, and Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Radioactive Wastes.

Hazardous and Radioactive Materials Transportation Regulations.

Transport of hazardous and radioactive materials, substances, and wastes are governed by U.S. Department of Transportation, U.S. Nuclear Regulatory Commission, and EPA regulations. These regulations may be found in 49 CFR Parts 100-178, 10 CFR Part 71, and 40 CFR Part 262, respectively.

U.S. Department of Transportation regulations contain requirements for identification of a material as hazardous or radioactive. These regulations may hand off to the U.S. Nuclear Regulatory Commission or EPA regulations for identification of material. However, U.S. Department of Transportation hazardous material regulations govern the hazard communication (for example, marking, hazard labeling, vehicle placarding, and emergency response telephone number) and transport requirements (such as required entries on shipping papers or on the EPA waste manifest).

U.S. Nuclear Regulatory Commission regulations applicable to radioactive materials transportation are found in 10 CFR Part 71 and detail packaging design requirements, including the testing required for package certification.

The EPA regulations pertaining to hazardous waste transportation are found in 40 CFR Part 262. These regulations deal with the use of the EPA waste manifest, which is the shipping paper used when transporting Resource Conservation and Recovery Act hazardous waste.

National Historic Preservation Act of 1966, 16 U.S.C. 470, et seq., enacted by Pub. L. No. 04-422 as amended.

The National Historic Preservation Act of 1966, as amended, provides that sites with significant national historic value be placed on the National Register of Historic Places. If a federal activity may impact a historic property resource, a required consultation with the Advisory Council on Historic Preservation will usually generate a memorandum of agreement, including stipulations that must be followed to minimize adverse impacts. Coordinations with the State Historic Preservation Officer are also undertaken to ensure that potentially significant sites are properly identified and appropriate mitigative actions implemented.

Archaeological Resources Protection Act of 1979, 16 U.S.C. 470aa-470ll, enacted by Pub. L. No. 96-95 as amended.

The Archaeological Resources Protection Act of 1979 protects archaeological resources located on U.S. public lands and American Indian lands, including sites under the DOE's control. The requirements concerning protection of archaeological resources contained in the Archaeological Resources Protection Act should be addressed prior to site disturbances by consultation with the Department of Interior Advisory Council on Historic Preservation and the State Historic Preservation Officer.

Archaeological and Historic Preservation Act of 1974, 16 U.S.C. 469, enacted by Pub. L. No. 86-532 as amended.

The Archaeological and Historic Preservation Act of 1974 protects sites that have historic and prehistoric importance.

Endangered Species Act of 1973, 16 U.S.C. 1531-1543, enacted by Pub. L. No. 93-205 as amended.

The Endangered Species Act of 1973, as amended, is intended to prevent the further decline of endangered and threatened species and to restore these species and their habitats. The Act is jointly administered by the U.S. Departments of Commerce and Interior. Section 7 of the Act requires consultation to determine whether endangered and threatened species are known to have critical habitats onsite or in the vicinity of the proposed action.

Fish and Wildlife Conservation Act of 1980, 16 U.S.C. 2901, enacted by Pub. L. No. 96-366 as amended.

The Fish and Wildlife Conservation Act of 1980 encourages all federal entities (in cooperation with the public) to protect and conserve the nation's fish and wildlife.

Fish and Wildlife Coordination Act, 16 U.S.C. 661, 48 Stat. 401 as amended.

The Fish and Wildlife Coordination Act promotes more effectual planning and cooperation between federal, state, public, and private agencies for the conservation and rehabilitation of the nation's fish and wildlife and authorizes the U.S. Department of Interior to provide assistance.

National Wildlife Refuge System Administration Act of 1966, 42 U.S.C. 668dd, enacted by Pub. L. No. 91-135 as amended.

The National Wildlife Refuge System Administration Act of 1966 provides guidelines and directives for the administration and management of all lands within the system, including "wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, or waterfowl production areas." The Secretary of the Interior is authorized to permit by regulations the use of any area within the system provided "such uses are compatible with the major purposes for which such areas were established."

Migratory Bird Treaty Act of 1918, 16 U.S.C. 703, et seq., 40 Stat. 755.

The Migratory Bird Treaty Act of 1918 governs the taking, killing, or possession of migratory birds. The Act states that it is unlawful to take, pursue, molest, or disturb bald (American) and golden eagles, their nests, or their eggs anywhere in the United States.

Bald Eagle Protection Act of 1940, 16 U.S.C. 668, enacted by 54 Stat. 250.

The Bald Eagle Protection Act of 1940 protects bald and golden eagles by prohibiting the taking, possession, and commerce of such birds and establishes civil penalties for violation of this Act.

Noise Control Act of 1972, 42 U.S.C. 4901-4918, enacted by Pub. L. 92-574 as amended.

The Noise Control Act of 1972, as amended, directs all federal agencies to carry out, "to the fullest extent within their authority," programs within their jurisdictions in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health and welfare.

Toxic Substances Control Act of 1976, 15 U.S.C. 2601, et seq., enacted by Pub. L. No. 94-469 as amended.

The Toxic Substances Control Act of 1976 provides the EPA with the authority to require testing of both new and old chemical substances entering the environment and to regulate them where necessary. The Act also regulates the treatment, storage, and disposal of certain toxic substances not regulated by the Resource Conservation and Recovery Act or other statutes, particularly polychlorinated biphenyls (PCB), chlorofluorocarbons, and asbestos.

American Indian Religious Freedom Act of 1978, 42 U.S.C. 1996 et seq., enacted by Pub. L. No. 95-341.

The American Indian Religious Freedom Act of 1978 is a policy statement intended to reaffirm American Indian rights regarding religious freedom. The purpose of the Act is to ensure that American Indians have access to and protection of physical locations and resources that are sacred and sometimes required for the practice of American Indian religious rites and ceremonies.

Native American Graves Protection and Repatriation Act of 1990, 25 U.S.C. 3001, enacted by Pub. L. No. 101-601.

The Native American Graves Protection and Repatriation Act of 1990 governs ownership or control of American Indian remains and cultural items which are excavated or discovered on federal or tribal lands.

Nuclear Waste Policy Act of 1982, 42 U.S.C. 10101, enacted as Pub. L. No. 97-425 and as amended.

The Nuclear Waste Policy Act of 1982 provides for the development of repositories for the disposal of high-level radioactive waste and spent fuel and for the establishment of a program of research, development, and demonstration regarding the disposal of high-level waste and spent fuel. The Act provides for development (by the EPA and the Nuclear Regulatory Commission) of generally applicable standards for protection of the environment and technical criteria for management and disposal of spent nuclear fuel and high-level radioactive wastes in a repository.

Occupational Safety and Health Act of 1970, 29 U.S.C. 657, et seq., enacted by Pub. L. 91-596.

The Occupational Safety and Health Act of 1970 establishes the authority for assuring, so far as possible, safe and healthful working conditions for employees. The Occupational Safety and Health Act regulations establish specific standards telling employers what must be done to achieve a safe and healthful working environment. The DOE places emphasis on compliance with these regulations at DOE facilities and prescribes through DOE orders the Occupational Safety and Health Act standards that contractors shall meet as applicable to work at government-owned, contractor-operated facilities.

Antiquities Act of 1906, 16 U.S.C. 431, et seq., enacted by Pub. L. No. 59-209.

The Antiquities Act of 1906 protects historic and prehistoric ruins, monuments, and antiquities, including paleontological resources, on federally controlled lands.

Asbestos Hazard Emergency Response Act of 1986, 15 U.S.C. 2641, enacted by Pub. L. No. 99-519.

The Asbestos Hazard Emergency Response Act of 1986 requires studies to determine the extent of danger to human health from asbestos in public and commercial buildings.

Department of Energy Organization Act, 42 U.S.C. 7101, enacted as Pub. L. No. 95-91.

The DOE Organization Act establishes the statutory responsibility of the DOE to (1) ensure incorporation of national environmental protection goals in the formulation of energy programs; and (2) to advance the goal of restoring, protecting, and enhancing environmental quality, as well as assuring public health and safety.

Energy Reorganization Act of 1974, 42 U.S.C. 5801, enacted by Pub. L. No. 93-438.

The Energy Reorganization Act of 1974 was established to improve government operations and carry out the performance of other functions including, but not limited to, the Atomic Energy Commission's military production and research activities.

Federal Insecticide, Fungicide, and Rodenticide Act of 1972, 7 U.S.C. 136, enacted by Pub. L. No. 92-516 as amended.

The Federal Insecticide, Fungicide, and Rodenticide Act of 1972 governs the storage, use, and disposal of pesticides through product labeling, registration, and user certification.

Federal Land Policy and Management Act of 1976, 43 U.S.C. 1701-1784, enacted by Pub. L. No. 94-579.

The Federal Land Policy and Management Act of 1976 governs the use of federal lands which may be overseen by several agencies and establishes the procedure for applying to the U.S. Bureau of Land Management for land withdrawals and right-of-ways.

Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1251, enacted by Pub. L. No. 92-500.

The Federal Water Pollution Control Act Amendments of 1972 is the predecessor federal statute to the Clean Water Act of 1977.

Public Lands - Wild Horses and Burros, 85 Stat. 649, enacted by Pub. L. No. 92-195.

The Public Lands - Wild Horses and Burros Act requires the protection, management, and control of wild free-roaming horses and burros on public lands. As a stated policy, free-roaming horses and burros are prohibited from capture, branding, harassment, or death and they are to be considered an integral part of the natural system of the public lands.

Withdrawal of Public Lands for Military Purposes, 16 U.S.C. 460 ff, enacted by Pub. L. No. 99-606 (Military Lands Withdrawal Act of 1986).

The Withdrawal of Public Lands for Military Purposes Act provides authority for withdrawal of nearly 3 million acres of land in Clark, Lincoln, and Nye counties for exclusive use by the U.S. Secretary of the Air Force. Comprised of the NAFR Complex (of which the NTS was once a part), such lands are reserved for high-hazard testing along with other stated purposes.

This law mandates that EISs be prepared and include evaluations of the cumulative effects (resulting from the use of these lands) on the environment and population of Nevada. Evaluations are made of possible measures to mitigate the cumulative effects of the land withdrawals. In addition, a continuing program of decontamination is necessary.

Historic Sites, Buildings, and Antiquities Act of 1965, 16 U.S.C. 1461, enacted by Pub. L. No. 89–249.

The Historic Sites, Buildings, and Antiquities Act of 1965 sets national policy to preserve historic sites, buildings, and antiquities for the inspiration and benefit of the people of the United States.

Materials Act of 1947, 30 U.S.C. 601-603, enacted by Pub. L. No. 80-291.

The Materials Act of 1947 provides for the management of minerals, timber, and other construction resource materials on public lands.

Pollution Prevention Act of 1990, 42 U.S.C. 13101, enacted by Pub. L. 101-508.

The Pollution Prevention Act of 1990 establishes the authority to prevent or reduce pollution at the source whenever feasible. Pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible. Disposal or other release of pollution into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.

C.2 Executive Orders

Listed below are the significant executive orders that are applicable at the NTS and the off-site locations in Nevada.

Executive Order 11593 (May 13, 1971) (National Historic Preservation).

This order directs all federal agencies to (1) make an inventory of their holdings and nominate, in cooperation with the state liaison officer for historic preservation, all sites, buildings, districts, and objects that appear to qualify for listing on the National Register of Historic Places, a file of cultural resources of national, regional, state, or local significance kept by the U.S. Department of the Interior's National Park Service; and (2) assure that no site, etc., which might qualify for the National Register is sold, demolished, or substantially altered.

Executive Order 12088 [Federal Compliance with Pollution Control Standards (October 13, 1978), as amended by Executive Order 12580 (January 23, 1987)].

Federal Compliance with Pollution Control Standards requires federal agencies, including the DOE, to comply with applicable administrative and procedural pollution control standards established by, but not limited to, the Clean Air Act, the Noise Control Act, the Clean Water Act, the Safe Drinking Water Act, the Toxic Substances Control Act, and the Resource Conservation and Recovery Act.

Executive Order 11514 (National Environmental Policy Act).

This order requires federal agencies to continually monitor and control their activities to protect and enhance the quality of the environment. The order also requires federal agencies to develop procedures to (1) ensure that the public is informed and understands the federal plans and programs with potential environmental impact and (2) obtain the views of interested parties. The DOE has issued regulations (10 CFR Part 1021) and DOE Order 451.1 for compliance with this Executive Order.

Executive Order 12580 (Superfund Implementation).

This order delegates to the heads of executive departments and agencies the responsibility for undertaking remedial actions for releases, or threatened releases, that are not on the National Priority List. This order also delegates the responsibility of removal actions, other than emergencies where the release is from any facility under the jurisdiction or control of executive departments and agencies, to the heads of executive departments and agencies.

Executive Order 11988 (Floodplain Management).

This order requires federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for actions undertaken in a floodplain. It also requires that floodplain impacts be avoided to the extent practicable.

Executive Order 11990 (Protection of Wetlands).

This order requires governmental agencies to avoid, to the extent practicable, any short- and long-term adverse impacts on wetlands wherever there is a practicable alternative.

Executive Order 12898 (Environmental Justice).

This order directs federal agencies to achieve Environmental Justice by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions. The order creates an Interagency Working Group on Environmental Justice and directs each federal agency to develop strategies within prescribed time limits to identify and address Environmental Justice concerns.

Executive Order 12856 (Right-to-Know Laws and Pollution Prevention Requirements).

This order requires all federal agencies to reduce and report toxic chemicals entering any waste stream; improve emergency planning, response, and accident notification; and encourage clean technologies and testing of innovative prevention technologies. The order also provides that federal agencies are persons for purposes of the Emergency Planning and Community Right-to-Know (Superfund Amendments and Reauthorization Act Title III), which obliges agencies to meet the requirements of the Act.

C.3 U.S. Department of Energy Regulations and Orders and Policies

Through the authority of the Atomic Energy Act, the DOE is responsible for establishing a comprehensive health, safety, and environmental program for its facilities. The regulatory mechanisms through which the DOE manages its facilities are the promulgation of regulations and the issuance of DOE orders. DOE orders generally set forth policy and the programs and procedures for implementing that policy. Listed below are the significant DOE regulations and orders that are applicable at the NTS and the off-site locations in Nevada.

DOE Land and Facility Use Policy.

This policy governs the DOE management of its land and facilities as valuable national resources, based on the principles of ecosystem management and sustainable development.

DOE Order 430.1, Life-Cycle Asset Management.

This order governs the planning, acquisition, operation, maintenance, and disposition of physical assets as valuable national resources.

DOE Order 451.1, National Environmental Policy Act.

This order establishes responsibilities and sets forth procedures necessary for implementing the National Environmental Policy Act of 1969, as amended, to operate each of its facilities in full compliance with the letter and spirit of the Act.

DOE Order 5000.3B, Occurrence Reporting and Processing of Operations Information.

This order establishes the requirements for reporting and processing occurrences relating to safety, health, security, property, operations, and environment up to and including emergencies.

DOE Order 5480.1B, Environment, Safety, and Health Program for Department of Energy Operations.

This order establishes the Environment, Safety, and Health Program for the DOE operations.

DOE Order 5480.3, Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes.

This order provides DOE policy, sets forth requirements, and assigns responsibilities for the safe transport of hazardous materials, hazardous substances, hazardous wastes, and radioactive materials.

DOE Order 5480.9A, Construction Project Safety and Health Management.

This order establishes procedures and provides guidelines for the protection of the DOE and DOE contractor employees engaged in construction activities, protection of the general public from hazards in connection with the DOE construction activities, protection of adjacent property from damage, and prevention of delay or interruption of the programs due to accident or fires.

DOE Order 5483.1A, Occupational Safety and Health Program for the DOE Contractor Employees at Government-Owned Contractor-Operated Facilities.

This order establishes requirements and procedures to assure that occupational safety and health standards prescribed pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, and the DOE Organization Act of 1977 provide occupational safety and health protection for DOE contractor employees in government-owned, contractor-operated facilities that are consistent with the protection afforded private industry employees by the occupational safety and health standards promulgated under the Occupational Safety and Health Act of 1970.

DOE Order 5700.6C, Quality Assurance.

This order provides DOE policy, sets forth requirements, and assigns responsibilities for establishing, implementing, and maintaining plans and actions to assure quality achievement in the DOE programs.

DOE Order 5820.2A, Radioactive Waste Management.

This order establishes policies and guidelines by which the DOE manages its radioactive waste, waste by-products, and radioactively contaminated surplus facilities.

DOE Order 5400.1, General Environmental Protection Program.

This order establishes environmental protection program requirements, authorities, and responsibilities for DOE operations to assure compliance with applicable federal, state, and local environmental protection laws and regulations as well as with internal DOE policies.

DOE Order 5400.5, Radiation Protection of the Public and the Environment.

This order establishes standards and requirements for operation of the DOE and DOE contractors with respect to protection of members of the public and the environment against undue risk from radiation.

DOE Order 5480.4, Environmental Protection, Safety, and Health Protection Standards.

This order specifies and provides requirements for the application of the mandatory environmental, safety, and health standards applicable to all the DOE and DOE contractor operations.

DOE Order 5480.10, Contractor Industrial Hygiene Program.

This order establishes the requirements and guidelines applicable to the DOE contractor operations for maintaining an effective industrial hygiene program to preserve employee health and well-being.

DOE Order 5480.11, Radiation Protection for Occupational Workers.

This order establishes radiation protection standards and program requirements for the DOE and DOE contractor operations with respect to the protection of the worker from ionizing radiation.

DOE Order 5484.1, Environmental Protection, Safety, and Health Protection Information Reporting Requirements.

This order establishes the requirements and procedures for the reporting of information having environmental protection, safety, or health protection significance for DOE operations.

C.4 State of Nevada Laws

Listed below, by category, are the significant State of Nevada laws, rules, regulations, and guidelines that are known to be applicable to the NTS and the off-site locations in Nevada:

Air Pollution:

Nevada Administrative Code: Chapter 445B, Water Controls; Air Pollution:

Sections 287-366, Permits to Construct and Operating Permits

Sections 339-351, Toxic or Hazardous Air Contaminants

Sections 354-357, Visible Emissions

Sections 360-367, Emissions of Particulate Matter

Sections 381-395, Miscellaneous (includes open and incinerator burning)

These regulations (1) implement both state and federal (EPA) clean air statutes, and (2) identify the requirements for permits for each air pollution source (unless it is specifically exempted) as well as ongoing monitoring requirements.

Drinking Water:

Nevada Administrative Code: Chapter 445A, Water Controls; Air Pollution:

Sections 450-682, Public Water Systems

Sections 810-925, Underground Injection Control

These regulations (1) set the standards for drinking water, specifications for certification, and control of variances/exemptions; (2) set standards and requirements for the construction of wells and other water supply systems; and (3) establish the different classes of wells (Class I through V), aquifer exemptions, prohibited wells, operation, monitoring, etc., as well as plugging and abandonment activities.

Hazardous Waste:

Nevada Administrative Code: Chapter 444, Sanitation:

Sections 842-8746, Facilities for the Management of Hazardous Waste

Sections 8752-8788, Program for Reduction of Hazardous Waste

Sections 940-9555, Polychlorinated Biphenyl

Section 960, Limitations on Issuance of Permits

Sections 965-976, Disposal of Asbestos

These regulations establish fees, variances, restrictions, and permits and adopt 40 CFR Parts 2, 124, and 260 to 270, I inclusive, as a part of the Nevada Administrative Code.

Public Waters:

Nevada Revised Statutes: Chapter 533, Adjudication of Vested Water Rights; Appropriation of Public Waters:

Section 325, Application to State Engineer for Permit

Section 335, Application for Permit to Appropriate Water: Contents

Section 4373, Application for Environmental Permit: Contents

These statutes set forth the requirements, procedures, and process of acquiring a permit for the appropriation of public waters in Nevada. These statutes also establish the fees associated with the processing and issuing of permits and sets forth the environmental requirements. Note: The Legislative Counsel Bureau, Carson City, Nevada, has not published a corresponding chapter in the Nevada Administrative Code covering the implementation of Nevada Revised Statutes, Chapter 533.

Sewage Disposal:

Nevada Administrative Code: Chapter 444, Sanitation:

Sections 750-840, Sewage Disposal

This regulation establishes the standards, regulations, permits, and requirements for septic tanks and other sewage disposal systems for single-family dwellings, communities, and commercial buildings.

Solid Waste:

Nevada Administrative Code: Chapter 444, Sanitation:

Sections 570-748, Solid Waste Disposal

This regulation sets forth the definitions, methods of disposal, special requirements for hazardous waste, collection and transportation standards, and classification of landfills.

Underground Water, Wells, and Related Drilling Regulations:

Nevada Administrative Code: Chapter 534, Underground Water and Wells:

Sections 280-298, License to Drill Well
Sections 300-450, Drilling, Construction, and Plugging of Wells

These regulations establish the ownership of underground waters within the State and the appropriation for beneficial use and specify the conditions, requirements, and rules for acquiring such water. The regulations also set forth the license requirements of well drillers; the requirements of drilling, construction, and plugging of wells; and the protection of the aquifers from pollution and waste.

Vegetation:

Nevada Administrative Code: Chapter 527, Protection and Preservation of Timbered Lands, Trees, and Flora.

This regulation provides for the broad protection of the indigenous flora of the State. Those plants, declared to be threatened with extinction, are placed on the state of Nevada's list of fully protected species.

Water Pollution:

Nevada Administrative Code: Chapter 445A, Water Controls; Air Pollution:

Sections 070-348, Water Pollution Control

This regulation classifies the waters of the State, establishes standards for water quality of all waters in the State, and specifies discharge permit requirements and notification requirements.

Wildlife:

Nevada Administrative Code, Chapter 503, Hunting, Fishing, and Trapping; Miscellaneous Protective Measures:

Sections 010-104, General Provisions

This regulation specifies the classification of wildlife and also specifies protected and unprotected wildlife.

C.5 Permits

Current Operating Permits for the NTS and surrounding areas are presented in Table C-1.

C.6 Pollution Prevention and Waste Minimization

Introduction

The DOE is committed to preventing pollution and reducing waste generation at the NTS. This is accomplished through establishing partnerships with private industry and complying with federal, state, and local regulations. The elements of the DOE/NV Waste Minimization/Pollution Prevention Program address reporting requirements, compliance costs, reduction costs, employee concerns, environmental liability, training, and the reduction, recycle, and reuse of commodities. These actions provide a safer environment for future generations, a more cost-effective operation, and a safer working environment. The preparation of the DOE contractor's Waste Minimization and Pollution Prevention Awareness Implementation Plan reflects the objectives and milestones identified in the DOE/NV Waste Minimization and Pollution Prevention Awareness Plan; the 1994 DOE guidance document, "Guidance For Preparation of Waste Minimization/Pollution Prevention Awareness Plan"; and the DOE/Headquarters Defense Program and the Environmental Management guidelines. The Pollution Prevention Awareness Program as identified in DOE Order 5400.1 has also been incorporated into the DOE/NV Waste Minimization Program.

Table C-1. Operating permits (Page 1 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
Not Numbered	NTS General	Water Hauling Agreement	Water Hauling	Temporary	State of Nevada Safe Drinking Water Act	Regular sampling and monthly reporting.
13-95-0034-X	NTS General	Hazardous Materials Storage	General	12/31/95	State of Nevada Fire Marshall	
95-12	NTS General	Air Quality Operating Permit	Open Burning for Training	10/02/95	State of Nevada Clean Air Act	Annual report by 11/01/95 of fire exercises and telephone notification to the State before each training with Class A flammables.
95-21	NTS, LLNL Area 27	Air Quality Operating Permit	Open Burn	01/23/96	State of Nevada Clean Air Act	Telephone notification to the State every time there is a burn, followed by telephone or written communication within 5 days.
AP9711-0549	NTS, Area 1 All stationary emission units	Air Quality Operating Permit	Shaker Plant; Rotary Dryer; Aggregate Plant; Concrete Batch Plant; Sandbagging Operation with Ancillary Systems	03/21/00	State of Nevada Clean Air Act	Annual report of yearly production and operation hours to be submitted to the State on 02/01.
AP9711-0554	NTS, Area 6 All stationary emission units	Air Quality Operating Permit	32 Storage Silos; 3 Scale Tanks; 1 Decontamination Boiler; 1 Diesel Fuel Storage Tank; 1 Gasoline Storage Tank; 1 Portable Slant Screen	11/21/99	State of Nevada Clean Air Act	Annual report of yearly production and operation hours to be submitted to the State on 02/01.

Table C-1. Operating permits (Page 2 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
AP9711-0555	NTS, Area 23 All stationary emission units	Air Quality Operating Permit	3 Boilers; 1 Incinerator; 1 Gasoline Storage Tank; 1 Diesel Fuel Storage Tank; 1 Portable Slant Screen; 1 Surface Disturbance for NTS-wide activities	12/04/99	State of Nevada Clean Air Act	Annual report of yearly production and operation hours to be submitted to the State on 02/01.
GNEV93001	NTS, Area 2; Area 6, DAF; Area 12; Areas 22 and 23; Area 25; CP, LANL, RSN, Yucca	Sewage System Permit	Sewage Treatment Facility	01/31/99	State of Nevada Clean Air Act	An Operations &Maintenance Manual has been submitted and approved by the State. An acceptable method of groundwater protection is required prior to expiration of permit.
NV2890010521	NTS, Area 27 Explosive Ordnance Disposal Facility	Lawrence Livermore National Laboratory Resource Conservation and Recovery Act Part A Permit Application	Explosive Ordnance	10/01/92 Renewal request submitted; denied by state EPA.	State of Nevada Resource Conservation and Recovery Act	Annual reporting. Site closed 09/94.
NV3890090001 NEV-HW-009	NTS General Area 5 Hazardous Waste Storage Unit; Area 11 Explosive Ordnance Disposal Unit	Notification of Hazardous Waste Activities	Resource Conservation and Recovery Act Part B Permit for storage and treatment of Hazardous Waste	5/2000	State of Nevada Resource Conservation and Recovery Act	Annual reporting of waste generation to the DOE. Report to state EPA due biannually (1996 for 1994-1995).
NV3890090001	NTS General	Resource Conservation and Recovery Act Part B Permit Application	Mixed Waste Disposal, Mixed Waste Storage (TRU)	Not Applicable	State of Nevada Resource Conservation and Recovery Act	Annual reporting of waste disposal to the DOE. Report to state EPA due biannually (1996 for 1994-1995).
NVG-PCB-006	NTS General	PCB Generator Notification	PCB Generation	Indefinite	State of Nevada Toxic Substance Control Act	Annual reporting of PCB status to the DOE and state EPA.

Table C-1. Operating permits (Page 3 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
NY-17-03310	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No. E-104866)	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NV-17-03311	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No. E-104573)	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NY-17-03312	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No. E-104364)	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NY-17-03313	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No. E-105293)	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NY-17-03314	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No.E-105299)	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NY-17-03315	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No. E-105919)	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NY-17-03317	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No. E-105918)	11/30/95	State of Nevada Clean Water Act	Install automatic shutoff valves on discharge hoses.

Table C-1. **Operating permits** (Page 4 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
NY-17-03318	NTS General	Septage Hauling Permit	Septic Tank Pumping Contractor	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NY-360-12C	NTS, Area 23	Public Water System Permit	Public Water System	09/30/95	State of Nevada Safe Drinking Water Act	Monthly bacteria sampling to the State laboratory.
NY-3076-DJR	NTS General	Permit to Construct	Public Water System	Not Applicable	State of Nevada Safe Drinking Water Act	Application awaiting construction of the system.
NY-835-12 NCNT NY-836-12 NCNT NY-841-12 NCNT	NTS General	Public Water System Permit	Water-Hauling Truck	09/30/95	State of Nevada Safe Drinking Water Act	
NY-4098-12 NCNT	NTS, Area 25	Public Water System Permit	Public Water System	09/30/95	State of Nevada Safe Drinking Water Act	Monthly bacteria sampling to the State laboratory.
NY-4099-12C	NTS, Areas 2-12	Public Water System Permit	Public Water System	09/30/95	State of Nevada Safe Drinking Water Act	Monthly bacteria sampling to the State laboratory.
NY-5000-12 NCNT	NTS, Area 6	Public Water System Permit	Public Water System	09/30/95	State of Nevada Safe Drinking Water Act	Monthly bacteria sampling to the State laboratory.
NY-5024-12NC	NTS, Area 1	Public Water System Permit	Public Water System	09/30/95	State of Nevada Safe Drinking Water Act	Monthly bacteria sampling to the State laboratory.
OP1975	NTS, Area 2, Lawrence Livermore National Laboratory Portable Stemming System	Air Quality Operating Permit	Stemming Facility with Atlas Conveyors (2)	12/04/94 (Renewal request sent to the State; still pending.)	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15.

Table C-1. Operating permits (Page 5 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
OP1976	NTS, Area 2, Lawrence Livermore National Laboratory Portable Stemming System	Air Quality Operating Permit	Barber-Green Conveyor; Atlas Conveyor; Nordberg Conveyor	12/04/94 (Renewal request sent to the State; still pending.)	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15.
OP2625	NTS, EG&G Energy Measurements Area 5, Spill Test Facility	Air Quality Operating Permit	Controlled Release Operations and Monitoring of Hazardous Chemicals	11/02/97	State of Nevada Clean Air Act	Reporting to the State 30 days before testing and a final report after testing.
OP2744	NTS, Area 12, Cafeteria	Air Quality Operating Permit	Ajax Boiler No. SOXFD-4500; S/N 73-269-79	03/23/98	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15.
OP2849	NTS, Area 12, Concrete Batch Plant	Air Quality Operating Permit	Ideal Mfg. Co. Concrete Batch Plant	12/02/98	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15. Operating hours increased from 296 to 550 annually.
OP2850	NTS, Portable	Air Quality Operating Permit	Field Storage Cement Bins	12/02/98	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15. Operating hours increased from 296 to 550 annually.
PC2988	NTS, Area 3	Permit to Construct	Two-Part Epoxy Batch Plant	Variable (pending formal state inspection)	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15.
PC3246	NTS, Area 3, Mud Plant	Air Quality Permit to Construct	6 Storage Silos; 1 Pressure Tank; 2 Weigh Hoppers	10/19/97	State of Nevada Clean Air Act	Notify the State of commencement of construction, completion of construction, and commencement of operations.
PC3774	NTS General, Portable Stemming System	Air Quality Permit to Construct	Stemming System	Variable (pending formal state inspection)	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15.
AP9711-0578	NTS, Area 5, Portable Slant Screen	Air Quality Permit to Construct	Slant Screen	05/05/00	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15.

Table C-1. Operating permits (Page 6 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
S12888	NTS General and Specific (W. Kent Ostler)	Scientific Collection of Wildlife Samples	Scientific Collection of Wildlife Samples	12/31/96	State of Nevada Nevada Administrative Code Chapter 503	Annual report by 01/31/96.
************************************* TTR *************************************						
NEV20001	TTR, TIADS Mancamp Industrial Area	Sewage System Permit		08/20/92[a]	State of Nevada Clean Water Act	Submit quarterly report of production and hours of operation to the state of Nevada. Permit transferred back to the U.S. Air Force.
NV1890011991	TTR, EPA Waste ID Number TTR	Notification of Hazardous Waste Activities		N/A	State of Nevada Resource Conservation and Recovery Act	Submit annual report of production and hours of operation to the state of Nevada. Permit transferred back to the U.S. Air Force.
NY-3014-12NC	TTR, SNL Compound	Public Water System Permit	Well 6	09/30/93	State of Nevada Safe Drinking Water Act	Submit monthly report of production and hours of operation to the state of Nevada. Permit transferred back to the U.S. Air Force.
NY-4068-12C	TTR, Mancamp Area	Public Water System Permit	Well 1A BLM Well	09/30/93	State of Nevada Safe Drinking Water Act	Submit monthly report of production and hours of operation to the state of Nevada. Permit transferred back to the U.S. Air Force.

[a] NPDES permit renewal application has been transmitted to the State. The State is presently renewing the application and design modification. Expected renewal date is unknown.

Table C-1. Operating permits (Page 7 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
NY-5001-12NC	TTR, Industrial Area	Public Water System Permit	Well A, Well B, Well EH-2	09/30/93	State of Nevada Safe Drinking Water Act	Submit monthly report of production and hours of operation to the state of Nevada. Permit transferred back to the U.S. Air Force.
NY-5002-12NC	TTR, TEAR	Public Water System Permit	(O&M) Well	09/30/93	State of Nevada Safe Drinking Water Act	Submit monthly report of production and hours of operation to the state of Nevada. Permit transferred back to the U.S. Air Force.
OP1661	TTR, Petro Storage	Air Quality Operating Permit	Diesel #1	09/15/93 (in process of being renewed)	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2229	TTR, Concrete Batch Plant	Air Quality Operating Permit	Ross Concrete Batch Plant, S/N 1317	02/12/96	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2231	TTR, Concrete Batch Plant	Air Quality Operating Permit	C.S. Johnson Batch Plant, S/N 64079-1	02/19/96	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2445	TTR, Petro Storage	Air Quality Operating Permit	Diesel #1	03/26/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2446	TTR, Petro Storage	Air Quality Operating Permit	JP-4	03/26/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2447	TTR, Petro Storage	Air Quality Operating Permit	JP-4	03/26/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2448	TTR, Petro Storage	Air Quality Operating Permit	JP-4	03/26/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2449	TTR, Petro Storage	Air Quality Operating Permit	JP-4	03/26/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.

Table C-1. Operating permits (Page 8 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
OP2450	TTR, Incinerator	Air Quality Operating Permit	MDL 500CA	03/26/98	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2455	TTR, Screen	Air Quality Operating Permit	Cedarapids Double Deck Screen (with Roll Crusher)	04/17/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2456	TTR, Crusher	Air Quality Operating Permit	Cedarapids Roll Crusher	04/17/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2457	TTR, Crusher	Air Quality Operating Permit	Cedarapids Jaw Crusher	04/17/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2844	TTR, General	Air Quality Operating Permit	Surface Disturbance	09/15/98	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP3172	TTR, Vapor Extraction	Air Quality Permit to Construct	Extraction Unit	03/26/98	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.

Background

The National Environmental Policy Act emphasizes minimizing the impacts that result from federal activities. The National Environmental Policy Act's original purpose was to "promote efforts which will prevent or eliminate damage to the environment." This is complemented by both the Pollution Prevention Act of 1990 and the Hazardous and Solid Waste Amendments of 1984. These acts enable federal agencies to develop and implement waste minimization/pollution prevention programs. This relationship was further strengthened in a 1993 memorandum from the Council on Environmental Quality, which recommended that federal agencies incorporate pollution prevention principles, techniques, and mechanisms throughout the National Environmental Policy Act planning and decisionmaking processes (58 FR 18).

To help facilities meet regulatory requirements, the EPA has published strategies and guidelines on waste minimization/pollution prevention. The Pollution Prevention Act of 1990 establishes an environmental protection hierarchy, with pollution prevention/source reduction as the most desirable environmental management option. If pollution cannot be prevented, then, in descending order of preference, environmentally sound recycling, treatment, and disposal are listed as alternative waste management options.

Waste minimization centers on source reduction or recycling of solid wastes regulated by the Resource Conservation and Recovery Act. Pollution prevention complements the concept of waste minimization by focusing on the following: source reduction and other practices that reduce or eliminate pollutants through increased efficiency in the use of raw materials, energy, water, or other resources or protection of natural resources by conservation. Waste minimization is an implied element of the pollution prevention process.

The DOE has developed an overall pollution prevention strategy and framework that is consistent with EPA's recommendations and other requirements (e.g., Executive Order 12856) around which its facilities must structure their own programs. DOE Orders 5400.1 and 5820.2A establish policy requirements for environmental protection and waste management. This framework is the basis of the NTS's strategy to implement waste minimization/pollution prevention elements and techniques in all operations. The DOE/NV Pollution Prevention Program establishes commitments to use available technology to reduce waste generation, monitor operations to encourage sound practices that discourage waste generation, develop an awareness of environmental concerns and practices, and comply with existing laws governing environmental protection.

DOE/NV Waste Minimization/Pollution Prevention Program

The DOE/NV Waste Minimization/Pollution Prevention Program is consistent with the DOE and other legal requirements.

The DOE/NV provides services and support for the NTS operations. These responsibilities included waste minimization, pollution prevention, recycling, waste management, environmental restoration, and technology transfer.

The DOE/NV has adopted Emergency Planning and Community Right-to-Know Act and sitewide goals. The Waste Minimization/Pollution Prevention Program establishes the following three levels of goals:

- Program goals for reducing the number of releases and offsite transfers of Emergency Planning and Community Right-To-Know Act, Section 313, Priority Pollutants, as specified in Executive Order 12856 and the DOE 1994 Waste Minimization/Pollution Prevention Crosscut Plan
- Sitewide goals for minimization of wastes and pollutants not covered by Executive Order 12856
- Generator-specific goals for minimization of wastes and pollutants covered by Executive Order 12856.

Emergency Planning and Community Right-To-Know

The Emergency Planning and Community Right-to-Know goals are specified by Executive Order 12856 and the 1994 DOE Waste Minimization Pollution Prevention Crosscut Plan. The goals are to reduce the release and offsite transfer of pollutant chemicals from the Section 313 toxic chemicals list by December 31, 1999. To the maximum extent practicable, these reductions shall be achieved by implementation of source reduction practices. The DOE/NV has adopted these goals as contained in Executive Order 12856.

The baseline for measuring the 50-percent reduction goal shall be the first year in which toxic chemical releases to the environment and off-site transfers of such chemicals for treatment and disposal were publicly reported by the DOE. The baseline amount (1992 figures) is the aggregate amount of toxic chemicals reported in the baseline year for all of the company's operations that meet the threshold applicability requirements.

Pollution Prevention Opportunity Assessments

Generation of all forms of waste; i.e. sanitary, hazardous, radioactive, and mixed, is reviewed to determine where waste minimization/pollution prevention opportunities exist. One method of examining waste generation is through conducting Pollution Prevention Opportunity Assessments. The Pollution Prevention Opportunity Assessments take place using a graded approach. A Level I Assessment establishes the site's baseline operational information. Level II Assessments are used to develop and screen waste minimization/pollution prevention opportunities and to recommend viable options for the implementation of those opportunities. The objective of a Level III Assessment is to conduct a detailed analysis of the process for waste minimization/pollution prevention opportunities and to document the result of the process evaluation in a written report, as defined in the DOE/NV Pollution Prevention Opportunity Assessment Plan and the DOE/NV Waste Minimization and Pollution Prevention Awareness Plan.

Assessments identify, screen, and analyze waste minimization options to reduce or eliminate the generation of waste. These assessments provide a summary of hazardous materials used during production and also provide for the identification of processes and operations that can and need to be improved or replaced to promote waste minimization. The Pollution Prevention Opportunity Assessments serve as a tool for prioritizing waste minimization efforts and ensure the proper setting of baseline goals.

Pollution Prevention Opportunity Assessments are carried out by designated teams comprised of personnel who are trained in the assessment process and have an understanding of relevant environmental regulations; waste minimization concepts; principles, techniques, and quality assurance requirements; purchasing; material control and inventory; and operational line functions. In identifying waste minimization options, the Pollution Prevention Opportunity Assessment teams concentrate on process modifications resulting in source reduction, followed by recycling opportunities.

Waste Evaluation/Assessments

Hazardous and industrial wastes are continually being evaluated by generators. These evaluations provide information regarding product substitution, cross-contamination control, use of on-site treatment by existing equipment, and potential treatment using commercially available equipment. Pending resource availability, Pollution Prevention Opportunity Assessments will be conducted by multidiscipline teams.

Waste Stream Identification/Waste Tracking

The waste minimization goals are the elimination and reduction of the generation, volume, or toxicity of wastes. Prioritization is based on the presence of hazardous waste constituents, including the probability of constituent occurrence, and on the volume generated. Low-level waste is listed according to how the waste generated compares to the environmental and health risks associated with the other waste categories.

Hazardous waste generated at the NTS are tracked through several processes and databases. All waste-generating locations at the NTS are identified by utilization of a Satellite Accumulation Area designation. This is in conjunction with a waste stream identification number, which is then used as a cross verification of on-site manifested wastes to the off-site hazardous waste manifests. These manifests are available in both hard copies and databases.

Solid Waste

Solid waste such as paper, cardboard, and aluminum cans are currently being recycled through a subcontractor as well as food waste from cafeterias.

Procurement Controls

Purchase requisitions for the procurement of materials purchased outside the "Just-in-Time" system are reviewed as they are generated. If the waste generated by these materials has the potential to be regulated under Comprehensive Environmental Response, Compensation, and Liability Act/Resource Conservation and Recovery Act, or as a potential of causing harm to individuals or the environment, the reviewers will only approve their purchase if there is no approved substitute for the product and the use for the product cannot be discontinued by process modification. If the material is approved for purchase, the personnel administering the "Just-in-Time" system preapprove the material and enter it into the "Just-in-Time" system for purchase.

Waste Minimization and Pollution Prevention Awareness

The Pollution Prevention Awareness Program required by DOE Order 5400.1 and others has been incorporated in the company's training program. The purpose of the Pollution Prevention Awareness Program is to foster the philosophy that prevention is superior to remediation. The goal of the program is to incorporate pollution prevention into the decisionmaking process at all levels. The Pollution Prevention Awareness Program has the following objectives:

- Make employees aware of general environmental activities and hazards, plus Waste Minimization Program requirements, goals, and accomplishments
- Inform employees of specific environmental issues
- Train employees on their responsibilities in pollution prevention
- Recognize employees for their efforts to improve environmental conditions through pollution prevention
- Encourage employees to participate in pollution prevention activities
- Publicize success stories.

Through company publications, topics are published with the intent of increasing the employees' awareness of environmental issues and their role in improving the environmental conditions in the workplace and community.

Training

Through DOE/NV guidance, management and affected employees are routinely instructed in waste minimization and pollution prevention policies and procedures. Environmental awareness training is presented to both management and employees.

Technology Transfer

Minimization technologies are limited to commercially available product substitutes and recycling or treatment equipment. Because the DOE/NV generates small quantities of numerous waste types, significant reductions resulting from individual actions will not occur. In most cases, recycling is cost prohibitive because of the small volume of recyclable waste generated at each operation compared to equipment costs.

C.7 References

REGULATION, ORDER, LAW

58 FR 18 — Council on Environmental Quality, "Memorandum to Head of Federal Departments and Agencies Regarding Pollution Prevention and the National Environmental Policy Act," Federal Register, Washington, DC, pp. 6478-6481, 1993.

DOE Order 5400.1 — U.S. Department of Energy (DOE), "General Environmental Protection," Washington, DC, 1988.

DOE Order 5820.2A — DOE, "Radioactive Waste Management," Washington, DC, 1988.

EO 12856 — Executive Order, "Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements," Office of the President, Washington, DC.

GENERAL

BN, 1996 — Bechtel Nevada, "DOE/Nevada Operations Office Waste Minimization and Pollution Prevention Awareness Plan," 1996.

DOE, 1993 — DOE, "Guidance for the Preparation of the Waste Minimization and Pollution Prevention Awareness Plan," Washington, DC, 1993.

DOE, 1994 — DOE, "Waste Minimization/Pollution Prevention Crosscut Plan," Washington, DC, 1994.

DOE/NV 1994 — DOE/NV, "Pollution Prevention Opportunity Assessment Plan," Las Vegas, NV, 1994.

This Page Intentionally Left Blank

Appendix D

DISTRIBUTION LIST

Federal Government

Freedom of Information
Reading Room
Washington, DC

Public Reading Room, Nevada
Operations Office
U.S. Department of Energy

Lab of Structural Biology &
Molecular Med, University of California
Los Angeles

Theodore Angle
U.S. Department of the Interior

John Baie
HQ USAF/Pentagon

David Bedsun
Defense Nuclear Agency

Stephen D. Belew
U.S. Bureau of Reclamation

William L. Belke
U.S. Nuclear Regulatory Commission

Major Andrew M. Bourland
Air Warfare Center

James P. Campe
Nellis AFB

Greg Czajkowski
U.S. Environmental Protection Agency

Mary Jo Elpers
U.S. Fish & Wildlife Service

George M. Essington
U.S. National Park Service

J. Mark Fair
U.S. Department of Commerce

Anne Garner
U.S. Bureau of Reclamation

Joan Glickman
U.S. Department of Energy

Betty Hallway
U.S. Department of Energy

Jed Harrison
U.S. Environmental Protection Agency

Shelley Haynie
U.S. Department of Energy

Jim Holland
U.S. National Park Service

Eloisa Hopper
Environmental Management
Nellis AFB

David M. Howell
U.S. Department of Energy

Lee Jesse
U.S. Department of Energy

Helene Klump
U.S. Environmental Protection Agency

Nicholas Lailan
U.S. Environmental Protection Agency

Milton Lammering
U.S. Environmental Protection Agency

Earl Leming
TDEC/U.S. Department of Energy

U.S. Environmental Protection Agency
San Francisco

Director, Office of Radiation Programs
U.S. Environmental Protection Agency

Julie Madden
U.S. Department of Energy

Federal Government

Wayne Marchant
U.S. Environmental Protection Agency

Felicia Marcus
U.S. Environmental Protection Agency

Nancy J. Marvel
U.S. Environmental Protection Agency

Nora McGee
U.S. Environmental Protection Agency

Carlos Mendoza
U.S. Fish & Wildlife Service

John Miesner
U.S. Fish & Wildlife Service

Dan Morgan
U.S. Department of the Interior

William Q. Nelson
U.S. Environmental Protection Agency

Michael D. Noah
Office of U.S. Navy's Commander of Fleet Activities

Alan O'Neill
U.S. Department of the Interior

George E. Ramsey
U.S. Bureau of Apprenticeship & Training

District Ranger
U.S. Department of Agriculture

Ernest L. Ray
U.S. Department of the Interior

Gary M. Russell
U.S. Geological Survey

Gary Ryan
U.S. Department of the Interior

Ronald S. Sadora
U.S. Department of Defense

Kathleen Shimmin
U.S. Environmental Protection Agency

Steven W. Slaten
U.S. Department of Energy

James F. Small
U.S. Department of Labor

Alexis Strauss
U.S. Environmental Protection Agency

James Tallerico
U.S. Department of Agriculture

Douglas A. Trudeau
U.S. Geological Survey

Howard J. Vaughn
Federal Aviation Administration

Kenneth Voget
U.S. Department of the Interior

Paul J. Weeden
U.S. Environmental Protection Agency

Dr. Y. Weiler
U.S. Atomic Energy Commission

Deanna M. Wieman
U.S. Environmental Protection Agency

Col. John Wilcox
United States Air Force
Nellis AFB

Laura K. Yoshi
U.S. Environmental Protection Agency

Dianna L. Young
U.S. Environmental Protection Agency

Congressional

Sarah Besser
Office of the Honorable Richard R. Bryan

Honorable Richard R. Bryan
U.S. Senate

Joan Dimmitt
Office of the
Honorable Barbara F. Vucanovich

Honorable Robert Dornan
U.S. House of Representatives

Honorable John Ensign
U.S. House of Representatives

L. J. Ferderber
Office of the Honorable Harry Reid

Hugh Ferree
Office of the Honorable Harry Reid

Jerry Gideon
Office of the Honorable Robert Dorman

Sonia Joya
Office of the Honorable John Ensign

Honorable Jesse Helms
U.S. Senate

Honorable Harry Reid
U. S. Senate

David Sullivan
Office of the Honorable Jesse Helms

Honorable Barbara F. Vucanovich
U.S. House of Representatives

State Government

Administrator, Department of Business & Industry, State of Nevada

Chairman, Public Service Commission
State of Nevada

Commissioner, Indian Commission
State of Nevada

Honorable Dennis Allard
Nevada State Assembly

Honorable Morse Arberry, Jr.
Nevada State Assembly

Honorable Kathy Augustine
Nevada State Senate

Honorable Douglas Albert Bache
Nevada State Assembly

Karen Baggett
Commission on Economic Development

Honorable Max Bennett
Nevada State Assembly

Honorable Deanna Braunlin
Nevada State Assembly

Honorable Maureen E. Brower
Nevada State Assembly

Honorable Barbara E. Buckley
Nevada State Assembly

Julie A. Butler
State of Nevada Clearinghouse

Honorable Vonne Chowning
Nevada State Assembly

Honorable Jack D. Close
Nevada State Assembly

Honorable Bob Coffin
Nevada State Senate

Michael K. Cox
Nevada Wildlife Division

Charlotte Crawford
Department of Human Resources

Honorable Frankie Sue Del Papa
Office of the Attorney General

Lewis H. Dodgion
U.S. Environmental Protection Agency

Jeanne L. Douglas
State of Nevada

William F. Durbin
Minerals Division

Robert E. Erickson
Legislative Counsel Bureau

Jimmie Garrett
Industrial Relations Division

Honorable Chris Giunchigliani
Nevada State Assembly

Honorable David Goldwater
Nevada State Assembly

James F. Goodfellow
Emergency Management Office

Heather G. Gray
Nevada State Wildlife Division

Donald H. Haight
Office of the Deputy Attorney General

Honorable Lonnie L. Hammergren
Lieutenant Governor of Nevada

State Government

Honorable William Z. Harrington
Nevada State Assembly

James P. Hawke
Emergency Management Office

Honorable Dean A. Heller
Office of the Secretary of State

Liliam Hickey
Board of Education

Douglas E. Hunt
Wildlife Division

Honorable Mark A. James
Nevada State Senate

Patricia Krajcech
Board of Education

Saundra Krenzer
Nevada State Assembly

Cheryl Lau
Environmental Protection Office

Paul J. Liebendorfer
Environmental Protection Office

Walter S. Lombardo
Minerals Division

Robert Loux
Nuclear Waste Projects Director

Honorable Sue Lowden
Nevada State Senate

D. Keith Maki
Nevada Department of Transportation,
Planning Division

Loren J. Malkiewich
Legislative Council Bureau, Director

Honorable Mark Manendo
Nevada State Assembly

Stanley R. Marshall
Bureau of Health Protection Services
Radiological Health Section

Robert K. Martinez
Division of Water Resources

Honorable Donald J. Mello
Nevada State Assembly

John F. Mendoza
Public Service Commission Chairman

Honorable Bob Miller
Governor of Nevada

Honorable Jan Monaghan
Nevada State Assembly

Susan C. Moore
Emergency Management Office

Peter G. Morros
Conservation and Natural Resources Director

Honorable Joseph M. Neal, Jr.
Nevada State Senate

Honorable Dennis Nolan
Nevada State Assembly

Honorable Ann O'Connell
Nevada State Senate

Honorable William R. O'Donnell
Nevada State Senate

Honorable Genie Ohrenschall
Nevada State Assembly

Deeann Parsons
Nevada State Energy Office

State Government

Honorable Richard Perkins
Nevada State Assembly

Honorable Jon C. Porter
Nevada State Senate

Honorable Robert Price
Nevada State Assembly

Joseph A. Quinn
Emergency Management Division

G .W. (Bill) Quinn
Water Resources, Chief Engineer

Honorable Raymond D. Rawson
Nevada State Senate

Honorable John B. Regan
Nevada State Senate

John E. Reichelt
Nevada Highway Patrol

Honorable Mike Schneider
Nevada State Assembly

James Scott
Small Business Administration

Honorable Gene W. Segerblom
Nevada State Assembly

Honorable Raymond C. Shaffer
Nevada State Senate

Gerald J. Sieren
Environmental Protection Office Manager

Honorable Dianne Steel
Nevada State Assembly

Thomas E. Stephens
State of Nevada

Joseph C. Strolin
Nuclear Project Agency

Honorable Jeannine Stroth-Coward
Nevada State Assembly

Suzanne E. Sturtevant
Environmental Protection Division

Harry W. Swainston
Nevada Agency for Nuclear Projects

Ronald C. Swirczek
Industrial Relations Division

Yvonne S. Sylva
Board of Health

Honorable Sandra Tiffany
Nevada State Assembly

Honorable Dina Titus
Nevada State Senate

John B. Walker
Nuclear Waste Project Office

Diana L. Weigmann
Office of the Governor

Honorable Wendell P. Williams
Nevada State Assembly

Nicholas Williams
State of Nevada

Local Government

Executive Director
Boulder City Chamber of Commerce

Manager
City of Beatty Town Board

Planning and Development
City of Needles, CA

Planning and Economic Development
City of North Las Vegas

Office of the Mayor
City of St. George, UT

Chairman
Clark County Commission

Office of Emergency Management
Clark County

Clerk's Office
Churchill County Commission

Clerk's Office
Esmeralda County

Chairman
Eureka County Commission

Planning Commission
Lincoln County

Chairman
Lincoln County Commission

Clerk's Office
Mineral County Commission

Chairman
Mineral County Commission

County Clerk
White Pine County

Executive Director
Henderson Chamber of Commerce

Administrative Assistant
Lander County Commission

Arnie Adamsen
City of Las Vegas

Christina Aguilera
Clark County

Robert J. Andrews
Clark County Office of Emergency Management

Jim Andrus
City of Mesquite Council

Yvonne Atkinson-Gates
Clark County Commissioner

John L. Avery
City of Caliente

Phillip D. Bannett
Woodfords Community Council

Ann Barron
Director, Dept. of Economic Development
City of Henderson

Larry K. Barton
City Manager of Las Vegas Community Services

Wade M. Barton
Esmeralda County Commission

Dennis A. Bechtel
Clark County Nuclear Waste Division

Bob Beckett
Nye County

Vicki G. Bergdale
Boulder City

Local Government

Honorable Jay D. Bingham
Clark County Commission

Honorable Iris Bletsch
Boulder City Council

Phillip A. Blount
Clark County Nuclear Waste Division

David Boyd
Amargosa Valley Planning Board
City of Amargosa

Les Bradshaw
Nye County Nuclear Waste

Lawrence A. Bray
City of Amargosa Advisory Council

Irene Bulton
Owens Valley Board of Trustees

Honorable Matthew Q. Callister
Las Vegas City Council

Wayne M. Cameron
White Pine County Board of Commissioners

Ken Carter, Mayor
City of Mesquite

Richard Carver
Nye County

Alan Chamberlain
Lincoln County

Honorable Paul J. Christensen
Clark County Commissioners

Pat Christensen
Nye County

Jack Clark
City of Henderson

Ira "Red" Copass
Nye County

Bill Copeland
Amargosa Valley Planning Board

Dr. Brian Cram, Superintendent
Clark County School District

Robert H. Cullins, Jr.
Las Vegas Fire Department

Peter Cummings
City of Las Vegas

Amanda Cyphers
City of Henderson

Michael S. Cyphers
Clark County Fire Department

Albert C. Douglas
City of Las Vegas

Michael Dyal
City of North Las Vegas

Donald B. Eppley
City of Boulder City

Jack Finney
Coordinator of Emergency Management
City of Henderson

George Forbes
City of Boulder City

Dr. Don Francom
Superintendent of Schools
Lincoln County

Theron Goynes
City of North Las Vegas

Honorable Robert Groesbeck, Mayor
City of Henderson

Local Government

Andy Hafen
City of Henderson

Phyliss A. Hargrove
Las Vegas Department of Community
Planning and Development

Paul Henderson, City Manager
City of Mesquite

Vaughn Higbee
Lincoln County School District

Juanita Hoffman
Esmeralda County

Richard B. Holmes
Clark County

Lorraine Hunt
Clark County Commissioner

Honorable Erin Kenny
Clark County Commissioner

Donna Kristaponis
City of Las Vegas

Honorable Jan Laverty-Jones, Mayor
City of Las Vegas

Jeffery K. Leake
Economic Development Officer
City of Henderson

Honorable James L. Ley
Clark County Commissioner

Leslie Long
Department of Public Works
City of North Las Vegas

Honorable Eric Lundgaard, Mayor
City of Boulder City

Florindo Mariani
White Pine County

The Honorable Daniel McArthur
City of St. George, UT

Honorable Michael J. Mc Donald
City of Las Vegas

Nancy Mc Neill
City of North Las Vegas

Honorable Cameron McRae
Nye County Commissioner

Bernie Merlino
Nye County Assessor

Brad R. Mettam
Inyo County Planning Department

Dean Molburg
Boulder City Fire Department

Robert S. Nelson
Nye County Office of Emergency Management

Honorable Robert Nolen
Las Vegas City Councilman

Russel W. Peacock
White Pine County Emergency Management

Mary Key Peck
City of Henderson

W. Wayne Perkins
Nye County

Honorable Kevin Phillips, Mayor
City of Caliente

Local Government

Jason Pitts
Nuclear Waste Project Office
Lincoln County

Garland Price
City of Pahrump Town Board

Honorable Gary Reese
City of Las Vegas Councilman

Arte Robb
Nye County

Honorable William E. Robinson, Councilman
City of North Las Vegas

Bernie Romer
White Pine County Sheriff

Honorable James K. Seastrand, Mayor
City of North Las Vegas

Ralph Shackelford
General Services Director
City of Las Vegas

Daryls Smith
Nye and Esmeralda Counties

Robert Sorenson, Town Manager
City of Tonopah

Philip D. Speight, Manager
City of Henderson

John Sullard
City of Boulder City

Glen Van Roekel
Director of Community Development
City of Caliente

Englebret von Tiesenhausen
Dept. of Comp. Planning
Nuclear Waste Division
Clark County

Robert Weber, Building Director
Clark County

Paul K. Wilkins
Building and Safety Director
City of Las Vegas

Honorable Myra Williams
Clark County Commissioner

David Wood
City of Henderson

Honorable Bruce L. Woodbury
Clark County Commissioner

American Indian

Gerald W. Allen
Nevada Indian Commission

Genial Anderson, Chairperson
Paiute Indian Tribe of Utah

Cheryl Andreas, Chairperson
Big Pine Paiute Tribe

Richard W. Arnold
Pahrump Paiute Tribe Executive Director
Las Vegas Indian Center

Rose Marie Bahe
Benton Paiute Tribe

Darryl Bahe, Representative
Benton Paiute Tribe

Gloria Benson
Kaibab Paiute Tribe and Southern
Paiute Indian Tribe Association

James Birchim, Chairperson
Yomba Shoshone Tribe

Angie Boland, Acting Chairperson
Timbisha Shoshone Tribe

Robert Boyt, Chairperson
Las Vegas Indian Center

Angelita Bulletts
Official Tribal Contact Representative
Kaibab Paiute Tribe

James C. Burton
Nevada Indian Environmental Coalition

Leslie Button
Official Tribal Contact Representative
Lone Pine Paiute Tribe

Irene Button
Owens Valley Board of Trustees

Darlene G. Byrd
Lovelock Paiute Tribal Council

Eldene Cervantes
Shivwitts Band of Southern Paiutes

Jerry Charles
Ely Shoshone Tribe

Lee Chavez
Official Tribal Contact Representative
Bishop Paiute Tribe

Donald Cloquet
Official Tribal Contact Representative
Las Vegas Indian Center

Betty Cornelius
Official Tribal Contact Representative
Colorado River Indian Tribes

Charlotte Domingo
Shivwitts Band of Southern Paiutes

Donna Duckey
Official Tribal Contact Representative
Big Pine Paiute Tribe

Wayne Dyer
Yomba Shoshone Tribe

Daniel Eddy, Jr.
Colorado River Indian Tribes

Pauline Esteves
Official Tribal Contact Representative
Timbisha Shoshone Tribe

Maurice Frank
Official Tribal Contact Representative
Yomba Shoshone Tribe

Grace Goad
Official Tribal Contact Representative
Timbisha Shoshone Tribe

American Indian

Boyd Graham
Duckwater Shoshone Indian Tribe

Janie Harper
Official Tribal Contact Representative
Chemehuevi Paiute Tribe

Eleanor Hemphill
Fort Independence Paiute Tribe

Gloria Hernandez
Official Tribal Contact Representative
Las Vegas Paiute Tribe

Raymond A. Hoferer
Walker River Paiute Tribal Council

Keith Honaker
Duckwater Shoshone Indian Tribe

Levi Hooper
Official Tribal Contact Representative
Yomba Shoshone Tribe

Glenn Hooper
Yomba Shoshone Tribe

Roy Kennedy
Timbisha Shoshone Tribe

Lawanda Laffoon
Official Tribal Contact Representative
Colorado River Indian Tribes

Mathew Leivas
Chemehuevi Paiute Tribe

Cynthia Lynch
Official Tribal Contact Representative
Pahrump Paiute Tribe

Sally Marks
Ely Shoshone Indian Tribe

Marion Mc Fee
Official Tribal Contact Representative
Shivwits Band of Southern Paiutes

Calvin Meyers
Official Tribal Contact Representative
Moapa Band of Paiutes

Rosalyn Mike
Moapa Band of Paiutes

Vernon Miller
Official Tribal Contact Representative
Fort Independence Paiute Tribe

Alfreda Mitre
Las Vegas Paiute Indian Tribe

Gaylene Moose
Official Tribal Contact Representative
Big Pine Paiute Tribe

Alvin Moyle
Fallon Paiute/Shoshone Tribal Council

Priscilla Naylor
Official Tribal Contact Representative
Fort Independence Paiute Tribe

Neddeen Naylor
Official Tribal Contact Representative
Lone Pine Paiute Tribe

Eunice Ohte
Official Tribal Contact Representative
Moapa Band of Paiutes

Cynthia Osife
Kaibab Paiute Tribe

Michelle Saulque
Official Tribal Contact Representative
Benton Paiute Tribe

American Indian

Gevene Savala
Official Tribal Contact Representative
Kaibab Paiute Tribe

Alex Shepherd
Paiute Tribe of Southern Utah

Allen Summers
Bishop Paiute Tribe

Peggy Vega
Official Tribal Contact Representative
Bishop Paiute Tribe

Merril Wall
Official Tribal Contact Representative
Shivwits Southern Band of Paiute

Donald Walters
Chemehuevi Paiute Tribe

Richard Wilder
Fort Independence Paiute Tribe

Patrick T. Williams
Bureau of Indian Affairs

Sandra Yonge
Lone Pine Paiute/Shoshone Tribe

Raymond Yowell, Council Chief
Western Shoshone National Council

Other Interested Parties

Concerned Citizens Committee

Dyer Public Library

East Las Vegas Library

Friends of Nevada Wilderness

Nevada Black Chamber of Commerce

Executive Director
Nevada Nuclear Waste Task Force

Stephen Alastuey
Citizens Alert

William Andrews
University of Nevada, Las Vegas

Nick Aquilina

Clint Arnoldus
First Interstate Bank of Nevada

John Bangerter
Army of Israel

Joseph Blackburn
The Alliance of Atomic Veterans

Vernon Brechin
Tri Valley Care's

Chris Brown
Community Advisory Board (CAB) Member

Jerry Brown
We the People

David Buer
Nevada Desert Experience

Nilak Butler
Greenpeace

Tim Carlson
NTS Development Corporation

Mary Kaye Cashman
Cashman Equipment Company

Dick Conner
North Las Vegas Chamber of Commerce

Diane Cravotta
Community Advisory Board Member

James Dalton, Ph.D
Army of Israel

Mary Lee Dazey
Citizens Alert

Robert Deegan
Sierra Club Nuclear Waste Task Force

Gale Dupree
Nevada Wildlife Federation, Inc.

Marvin Einerwold
Nevada Wildlife Commission

Joseph N. Fiore
Community Advisory Board Member

Dale Foust
TRW Environmental Safety Systems

John Gardner II
Nevada Black Chamber of Commerce

Jo Anne Garrett
Citizens Alert

John Goolsby
The Howard Hughes Corporation

Marilynn Hall
Community Advisory Board Member

Other Interested Parties

Maria Heaton
Boulder City Chamber of Commerce

James Henderson
Community Advisory Board Member

Daniel Hirsch
Committee to Bridge the Gap

Somer Hollingsworth
Nevada Development Authority

Roger L. Jacobson, Ph.D
Desert Research Institute

Dianne Jett
Sprint Central Telephone

Melinda Kassen
Environmental Defense Fund

Keith Kerner
Town of Beatty Advisory Board

Robert Kessler
Physicians for Social Responsibility

Gerald Kmetz
Int'l Brotherhood of Painters

Joella Krall
Oak Ridge National Laboratory

Dawn Lappin
Wild Horse Organized Assistance

Stephanie Lynnette Lawton
Community Advisory Board Member

Larry Litchfield
Associated Builders/Contractors

Marilyn J. Littlepage
Community College of Southern Nevada

Doug Lombardi
Oak Ridge National Laboratory

James M. Long
Int'l Association of Sheet Metal Workers

Thomas Lorinez
Southern Nevada Federal Community Advisory Board

Mike Maffie
Southwest Gas Corporation

Robert Maichle
Nevada Wildlife Federation

Charles Malone
Environmental Consultant

Bill Martin
Pioneer Citizens Bank

Ben Martinez
Defense Nuclear Agency

Alice Martz
Henderson Chamber of Commerce

Lathia Mc Daniels
MAC/JAG Tech., Inc.

W. Curt McGee
Bechtel Nevada Corporation

Joe McGee
Western Tech

Rose McKinney-James
Corporation for Solar Tech/Renewable Resource

Georgia McDonald
League of Women Voters of Nevada

Brian Meacham
Utah Peace Test

Other Interested Parties

Otto Merida
Latin Chamber of Commerce

Richard Nocilla
Desert West Realty

Robert Norris
Natural Resources Defense Council

Mary O'Brien
Community Advisory Board Member

John O'Reilly
Las Vegas Chamber of Commerce

Margaret Quinn
League of Women Voters of Nevada

Ed Richardson
Bechtel Nevada Corporation

E. Paul Richitt, Jr.
University of Nevada, Las Vegas

A. C. Robison
Robison Seidler, Inc.

Mimi Rodden
Cultural Resource

Wanda Rosenbaum
Boulder City Peace and Social Justice

William Rosse, Sr.
Western Shoshone

Shashi Sathisan
University of Nevada, Las Vegas

Randy Schaefer
Southern Nevada Homebuilders

Dale Schutte
Community Advisory Board Member

Connie Simkins
Lincoln County Record

Stanley Sims
Nye County

Dave Smith
First Security Bank of Nevada

Dave Smith
Lawrence Livermore National Laboratory

Roger Smith
SANDIA/TTR

Vernon F. Sousa
National Association of Atomic Veterans

Joanne S. Stockill
Community Advisory Board Member

Candace Stowell
Comprehensive Planning

Ken Struthers
Nevada Wildlife Federation, Inc.

Shari Thomas
Sprint Central Telephone

Frank Tussing
Community Advisory Board Member

Jeff Van Ee
Sierra Club

William L. Vasconi
Intl Brotherhood of Electrical Workers

Johnny Vaught
Environment Property Services

Troy E. Wade
Nevada Alliance for Defense
Energy & Business

Other Interested Parties

Rebecca Wamsley
Nevada Nuclear Waste

Cari Wells
North Las Vegas Chamber of Commerce

Mike Wolicki
United Transportation Union

Fred Wright
United Brotherhood of Carpenters/Joiners

Robert Young
Asian Chamber of Commerce

Katherine Yuracko
Yuracko and Associates

AHC Enterprises

Science Editor
Arizona Republic

Bureau Chief
Associated Press

Beatty Community Library

Boulder City Library

Director, Land Operations Office
Bureau of Indian Affairs

Business Today

Business Week

Caliente Branch Library

Caliente Library

Carpenters Union Local 1780

Carson City Public Library

Casa Grande Dispatch

Cedar City Spectrum

Churchill County Library

Director
Citizens Alert

Citizens Voice

Citizens Hall

Nevada Appeal

Clark County Library

Community College of Southern Nevada Library

Daily Sentinel

Defense Nuclear Agency

Denver Post

Deseret News

Donald Zhark Associates

Doris Shirkey Library

Douglas Daily Dispatch

El Mundo

Elko County Library

Environmental News Network

Churchill County Library

Fallon Public Library

Floor Coverer Glaziers Allied Trades

Fraternity of the Desert Bighorn

Gateway Gazette

Other Interested Parties

Gloworm Gazette

Goldfield Library

Green Valley Library

Community College of Southern Nevada
Henderson Campus

Editor
Henderson Home News

High Country News

Humboldt County Library

Impact Assessment, Inc.

Business Agent, Local Union No 433
Int'l Assoc Bridge Structural Workers

Int'l Energy Systems

Public Affairs
KCEP

News Director
KDXU Radio

News Director
KELY Radio

Public Affairs
KEYV

Public Affairs
KFMS

Public Affairs
KGLE

Public Affairs
KGYM

Public Affairs
KILA

News Director
KIOQ FM Radio

Public Affairs
KIZS

Public Affairs
KJUL Radio

Director, Public Affairs
KKMR

News Director
KLAS-TV Channel 8

Public Affairs
KLAV

Kleinfelder, Inc.

Public Affairs
KLTN

News Director
KMZQ Radio

Public Affairs
KODS

Public Affairs
KOMP

Public Affairs
KORK

News Director
KOWL

Public Affairs
KPLY

Public Affairs
KPTL

Public Affairs
KRCK 91 FM

Other Interested Parties

Public Affairs
KREC

Public Affairs
KRJC

Public Affairs
KRLT

Public Affairs
KRLV

Public Affairs
KMO

News Director
KROW/KBUL News

Public Affairs
KRRI

Public Affairs
KRXV

News Director, Public Affairs
KRZQ

Public Affairs
KTHO

KTNW Radio

News Director
KTVN-TV

News Director
KUDA-FM

Public Affairs
KUNR

Public Affairs
KUNV

News Director
KVBC-TV Channel 3

News Director
KVLV

Public Affairs
KXEQ

Public Affairs
KXPT

Public Affairs
KZAK

Lake Tahoe Branch Library

Las Vegas Branch Library

Lincoln County Library

Lincoln County Record

Logan Herald Journal

National Desk
Los Angeles Times

News Bureau
McGraw-Hill, Inc.

Mechanical Contractors Association

Mesa Tribune

Mineral County Library

Moapa Valley Library

General Manager
Moapa Valley Water District

National Electrical Contractors Association

National Maritime Union

National Public Radio

Other Interested Parties

Field Director
National Wild Horse Association

Native Nevadan

Nevada Desert Experience

Nevada Government Today

Nevada Highway Patrol

Nevada Senior World Newspaper

Chairman, Economic Adjustment Task Force
Nevada Test Site

Nevada Wildlife Federation, Inc.

North Lake Tahoe Bonanza

Look North
North Las Vegas Chamber of Commerce

North Las Vegas Public Library

Nuclear Waste News

Ogden Standard-Examiner

Oil and Gas Journal

Peavine Branch Library

Petroleum Information

Phoenix Gazette

Plasters and Cement Masons

Director
Pro Video

Prospector/Pennysaver

Rangley Times

Red Rock Audubon Society

Review-Miner

Salt Lake Tribune

Science News

Scottsdale Progress

Senior Citizens Library

Senior Life

Silver Peak Library

Chairman, Environmental
Soroptimist Int'l of Greater Las Vegas

South Fork Band

Sparks Tribune

The Desert Echo Newspaper

The News

The Quest Group/ICF

The Spectrum

Science Writer
The Washington Post

Time-Standard

Tonopah Public Library

Science Writer
Tri-City Herald

Tucson Star

Tulsa World

Other Interested Parties

Bureau Chief
United Press International

Local Union No. 5282
United Steel Workers of America

Noble H Getchell Library
University of Nevada Reno

James Dickinson
Library
University of Nevada, Reno

Valley Times

Washington County Library

Washoe County Library

Community College of Southern Nevada Library
West Charleston Campus

Western Oil Reporter

White Pine Library

Wyoming Eagle-Tribune

Yuma Daily Sun

Dennis Abernathy

Joseph Aceto

Mickey J. Adams

William Albright

Walter Alderson

Kenneth Alkema

Peter Allan

Duane Allen

Jane Allen

Alan Allred

Brian Amme

Rita Anderson

Marina Anderson

Mathew Anderson

Richard Anderson

Tim Anderson

Andy Anderson

Jed Angus

Gary Arbuckle

Maria Ardila-Coulson

Rick Arial

Jake Armor

James R. Arnold

Laurence J. Ashbaugh

Cindy Ashley

Keith Ashworth

Ed Atchison

Steven Atkinson

Bob Bailey

Mark Balen

Randy Balice

Other Interested Parties

Bill and Rose Barber
Donald Barber
Charles R. Barrett
Max Barrett
Susan Barrow
Jon Barth
Yosef Bartov, Ph.D.
Mike Baughman
Michael Bauser
Mary Bayer
Ben Beaty
Chris Beck
Donna Becker
Dee Beckstead
Kathy Behling
Roger Bell
Herb Bentley
Thomas V. Bentz
Frank Bergwall
Bill Berkey
Robert Bigelow
James Biggs
Randy Black
Cecil Black
Linda Blanco
George Blankenship
Jim and Barbara Blumer
Charles R. Boardman
Paul Bolton
Angelo J. Bomasuto
E. J. Bonano
Lisa Bond
Tony Bonnici
Lou Borghi
John Bowles
Ted Bowling
Kim Bowman
Jim Boyd
Audrie Bradbury
Jim Bradham
Steve Bradhurst
Henry Brean
Sonja Breen
Kevin Brennan
Richard Brennen
Ron Briggs

Other Interested Parties

Rose Bringhurst
Kelly Bringhurst
Kathie Brinkerhoff
Scott J. Broberg
Susan Brockus
Dr. James Broon
Bonita Brown
Suzanne Brown
Jeff Brown
Joseph and Susan Brown
Marcus B. Brown
Betty Brown
Joe Brown
Paula Brown
Lana Buehrer
Grace Bukowski
Saralyn Bunett
Leon Burger
Diane Burger
Ray Burke
Lonnie Burns
Jim Busch
Ward Bushee

Jim Butler
Frank Caine
Judy Calder
Glenn Campbell
Bob Campbell
Michael Cancellier
Andrew Caputo
Christi Carpenter
Luther Carter
Gwen Carter-Bogh
Darlene M. Cartier
Connie M. Carville
Melody Cawthon
David Chanin
Ed Chapuis
David L. Chavez
Dr. S. Y. Chen
Bill Cheshire
Ann Marie Choephel
Jon Christensen
Marlin Christensen
Christopher Christie
Bruce W. Church

Other Interested Parties

Jerry Claborn
Lucille Clark
Chris Clements
Frank Clifford
Erica Cline
Jack Coffey
Eric Cole
Crystal Collier
Keith Collins
Mary Collins-Shepard
Steve Comer
Michael Conroy
Joseph Consolo
Sherry Cook
Michael P. Cool
Matthew Coolidge
Dallas Coonrod
Nate Cooper
Harry Copeland
Carol Corbett
Patrick Corbett
Byron W. Cork
Manny Cortez

Dale Costich
Norvin "Pete" Cox
Dave Cox
Bill Craig
Elvin Cramer
Larry Crim
Martha Crossland
Eve Culverwell
Leslie Cusick
Richard Cuthrell
Ryan Cy
Noralea Dalkin
Jack Dallman
Richard Dalson
Paul and Wendy Dame
Christine Datian
John L. Davis
Patricia Dawson
Jacque De Marquess
James De Meo
Gregory De Sart
Pat De Vore
Dr. James Deacon

Other Interested Parties

Gerry Decker

Gusieppe Del Corto

Jim Denier

Sally Devlin

Dick Dewitt

Dennis Deziel

Dennis Dezwiet

Russell Di Bartolo

Carl Di Bella

Commissioner Don Dills

Ned E. Dillwith

Patricia Dimartini

Ken Divich

Earle Dixon

Jim Doenges

Dr. John F. Doherty

Geeoff Doman

Cheryl Drossneer

Dick Duffey

Bob Duncan

Lori Duncan

Melynda Dunn

Dick Dunning

Rusty Durante

Femi Durosinmi

Joe Dykes

Brian Dykstra

Delyle Eastwood, Ph.D.

Meinrad Eberle

Merik Edgel

Peter Ediger

Johnnie H. Edwards, Jr.

Greg Elle

Jean Elle

Atef Elzeftawy

Jessie Emmett

Priscilla Empey

Jerry D. Ennis

James H. Enstrom

Tom Enyeart

Dr. John Epps

Ed Eschner

Heidi Eskew

Marvin R. Esmund

Heather Estes

Claude Evans

Other Interested Parties

J. Erich Evered
Dawn Everett
Francina Everett
Ron Faich
Jerry Fate
Bill Fawcett, Ph.D.
Joe Fedor
Pat Feivish
Ray Fenster
Herman Ferdinando
Jon Ferguson
Sandy Ferrell
Ralph Figueroa
John and Carolyn Finan
Diann Fiore
Leonard Fiorenzi
Adam Fire
Jeanne Fobes
Michael G. Foley, Ph.D.
Jerry Frederickson
Sherman R. Fredricks
Christopher K. Freeman
Bryan D. Friedman
Shirley Frush
Kevin Fuller
Bob Furtek
Vern Gabbard, Jr.
Alan J. Gaddy
Pam Gannon
Tom Gardner
David Gay
Dot Gayton
Cliff Gentry
Keith Steward Geofon
Gail Gerstner-Miller
Tim Gesner
Richard Getschman
Fred Gibson, Jr.
Lori Gilbert
Maureen Gilgan
Al Gionnotti
Ernest Goitein
C. Carlos Gonzales
David Gonzales
Sydney J. Gordon
Nancy Gosing

Other Interested Parties

Nancy Gott
Robert Goudge
Fred Gowers
T. J. Grady
Terry Graves
Susan Greene
Brian L. Greenspun
Wendy Griffin
Jane Gross
James Grosscurth
Clara Groves
Frank Grunstead
Mary Ann Gubler
Dr. Kenny C. Guinn
Rex Gunderson
Becky Gurka
Augie Gurrola
Denny Haas
Scott Hacking
John Hadder
Robert S. Hadfield
Joni S. Hall
Ken Hall
Don Ham
Lawrence F. Hancock
Carolyn Hansen
Glen Hanson
Kevin Harbert
Christopher J. Harbin
Bill Harbour
Andy Hare
Kent Harper
Jack Harpster
Heidi Harr
Billy Harrell
Joan M. Harris
Tom Hart
Randy Hartwig
Larry Hatfield
Jerry Hawe
Mason Hayes
John Hayes
Anthony Hechanova
Clyde Hedin
Doug Henderson
Roger Henning

Other Interested Parties

Paul Henry

David A. Hicks

Jean Higgens

Kurt Hildebrand

Nick Himaras

Richard L. Hinckley

Joe Hinds

Elaine Hiruo

Bill Hoehn

John Hogan

Mary Holland

John E. Holman

India Holmes

Jeannine Holt

Dalton L. Hooks

Rick Hoover

Marcia Housel

Mark Howard

Dave Howard

Constance K. Howard

Danilie Howe

Patricia Hrrin

Liang Chi Hsu

Eric Hulnick

Stephen Humphries

Richard B. Hunter

Ken Hunter

Dr. Liang-chi Hus

Leonard Hvesties

Carol Infranca

Diane Isbell

Brent Israelsen

Anthony Jackson

Jim Jackson

Nicholas Jahr

Clifford Jarman

Dr. Richard Jarvis

Andrew Jenkins

Jeff Jennings

William S. Jewett

T. W. John

Abby Johnson

Janice Johnson

Harold Johnson

Linda Johnson-Henderson

Ralph Johnston

Other Interested Parties

Steve Jones
Bruce Jones
Robert Jones
Adrian Jueschke
Keith Julian
Mike Kahle
Hank Kahn
Asha Kalia
Alan Kalt
Don Kaminski
Bob Katson
Robert Kaufmann
Andy Kaye
David Kearney
Bill Kelly
Harry Kelman
Robert Kemp
Matt Kennedy
Joan G. Kerschner
Charles R. Kessler
Hank Khan
Mike Kidder
Ginger King
Robert Kinsler
Shirley Kinsler
Mary Kirby
Daniel J. Klaich
Janice Klein
Robert Knudson
Beverly Kohfield
Charles Kondrack
Robin Kosseff
John Kramer
Konrad Krauskopf
Francis Kremer
Peter A. Krenkel
Larry Krenzien
Kimberly Kuehne
Prof. P.K. Kuroda
Susan Lacy
Scott Ladd
Steve Ladnier
Karen Lane
Martin Lane
Larry Lane
Rick Lange

Other Interested Parties

William Larson
Raymond Lashure
Dardara Leader
Lavo D. Leavitt
Dave Lechel
Andrew Leduc
Arnold Leibovit
Jerry Lein
Ted Lempart
Chuck Lenzie
Fred Leonard
Joseph Leone
Marcel Levy
Karen Lewis
Ruth Lindahl
George Lobsenz
Dave Loomis
Johnny Lopez
Larry Lopez
Elwood Lowery
Dan Lowery
Robert Lowes
Ronald C. Lozito

Frankie Lukasko
Karen Lynne
Martin Mackay
Robert Macy
Joseph Mader
John D. Madole
Tom Mahood
H. W. Mallery
James Malone III
Jacelyn Mandell
Elisabeth Manning
Mary Manning
Tammy Manzini
Marisa Mardoc
Blair Martha
Joe Martillotti
Charles Martin
John Martin
Lou Martino
Rex Massey
Lloyd Matheson
John R. Mathews
Patricia Mauro

Other Interested Parties

Mike Mazon
Earl McGhee
Ed McCann
Bob McClone
Georgia McDonald
Paul McGinnis
Chandler McPherson
Jack McCloskey
Kerry McCombs
Tricia McCracken
Warren L. McCullough
Tom McGowan
John and Alice McGrath
Dee McGuinnes
Claudine McKay
Dennis McKay
Patricia McKinney
Paul McKinney
Judy McMurty
Mary McNabb
Terry McRight
Dr. Paul Meacham
John Meder

Pamela Meidell
Lillian Mendoca
Paul Mercier
Pete Merlin
Dr. Edward P. Michalewicz
William "Bill" Middleton
Christine Milburn
Wanda Mitchell
Dennis Mitchell
William Moffitt
Tiffany Molock
William J. Monahan, Jr.
Fred Monette
Susan Moore
Gilbert Moore
Kim Morgan
Kurt T. Morishige
Philip Moskowitz
David Mullen
J. P. Muntal
Allan Murray
Ronald Myers
Fina Myers

Other Interested Parties

Albert Narath
Robert Nard
John Nash
Robert Nay
Wilma Nay
Paul Newell
Anne Newhouse
Raymond Newman
Robert Nicholsen
Phillip Niedzielski
Rick Nielsen
Robert Nilson
Keiko Nishimoto
Quentin Nisson
John Noneman
John Norberg
Pete Nygard
Kathe Nylen
Thomas O'Conner
Maggie O'Donnell
Tom O'Farrell
Larry E. O'Leary
Layton O'Neill
Rosemary O'Neill
Ed Oakes
Cheryl Oar
Vickie Occhipinti
Peter Ochabauer
Ted Olsen
Robert Orefice
Marilyn Pagan
Muhilan Pandian
Pat Pape
Emelinda Parentela
Richard Parizek
Joe Parolini
Ramesh Patel
Mike Patrick
Dasha Pavel
John Pawlak
Dr. Jacob Paz
Anne Pendergrass
Edwin Pentecost
Lew Pepper
Chuck Pergler
Anne Pershing

Other Interested Parties

Claudia Peterson
Dan J. Peterson
Kathleen Peterson
Prakash N. Phalke
Goldie M. Piatt
Alex Pietsch
Patti Pietsch
Bob Piper
Mark Plum
Eric A. Podaca
James Poles
John E. Pollet
Bill Possidente
Richard H. Powell
Trisha Powell
Dana Pratt
Ramon and Barbara Prestwich
B. Max Price
Jonathan Price
Ken Priest
Elaine K. Prisbrey
Scott Prisbrey
Michael Pullen

Sue Purushotham
Randal Putnam
Connie Putnam
E. Quarterson
Barbara Quinn
Saimk Qureshy
Jeff Rabbins
Darryl Randerson
Michael J. Rapovy
Denny Rasmussen
John Rasmussen
Crissty Ratliff
Kurt Rautenstrauch
Dr. Otto Ravenholt
Marty Rawson
R. G. Reddy
Eric Redland
Nick Reeves
John B. Regan
Kenneth Reim
Clare Reis
Dennis Reis
Diane Remington

Other Interested Parties

Vaughn and Sandra Reuther
M. Rice
Myrle Rice
John Richardson
Dean Richmond
N. R. Ricks
William Roberts
James Robertson
Robert Robinson
Van Robinson
Ace Robinson
John G. Robison
Michelle Rochelle
Carmen Rodriquez
Pete Roesner
Janice Rogenstic
Hal Rogers
Keith Rogers
Verge Rose
Tamara Rosta
Joseph Roth
Linda Rothstein
Roxie Roundy
John Roux
Jeff Rowe
David Roznovsky
Craig A. Ruark
Dr. Mark Rudin
Joseph Ruggieri
Dan Rusnak
Michael J. Russell
J. R. Russell
John L. Russell
James Russell
Mike Russo
Paul Ruttan
Dick Ryan
Timothy Ryan
Margaret Ryanfur
Diana Salisbury
Steve Salyer
David Sanford
Renetta Scacchitti
Allen Scatena
Lewis Scerry
S. J. Schechter

Other Interested Parties

Frederick Schoemehl
Jesse Schoolcraft
Nona Schorzman
Jerry Schroy
Steven Scoggin
Rick Scott
Robert Sears
David Seidel
Scott Seidenstricker
Paul Seidler
Miguel Sepulveda
Karen Sewell
Lisa Seymore
Mohsen Sharirli
Sherman Shell
Anne Shereshersky
Kerry Sherman
David Shifflett
Mary Shope
Daniel Sicart
William H. Silcox
Mel Silverberg
Roland Simmons

Vicki Singleton
Gail Sinobio
Pam Siri
Vic Skaar
Lewis Skerry
Dean W. Smeaton
David Smith
Keith and Mary Ann Smith
Tom Smith
Gerald Smith
Ron Smith
Susan Smith
Fred Smith
Steve Smith
Kenneth D. Smith
David K. Smith
Robert Smith
Chris Smith
Larry Sommerfield
Dan Sorenson
Patrick Spencer
Lea Rae Spendlove
Jan Sphar

Other Interested Parties

John Spitznen
Larry Spohn
Deb Spring
David Stahl
Alan Stahler
Paul Standish
T. J. Stapleton
John Stearns
Rex Steninger
Dick Stephans
Jamie Stewart
Lisa Stiller
Ed Stock
Jim Stoltz
Debbie Stout
James Stubler
Chris Stubs
Leslie Summer
Nell Swan
Craig Swengle
Leonard S. Sygitowicz
Dr. Lynn R. Sykes
Monte Symmonds

Paul Szydelko
Curtis Taipale
Russ Taylor
Ellen Taylor
Dick Telfer
Laura Tennant
Iain Thistle
Michelle Thomas
Jennifer Thompson
Richard Thompson
Richard Thurlow
David Tillson
Ed Tilzey
Dax Tobin
Charlene Toomer
Robert R. Trenkel
Doug Trenner
David Tscheetar
Dan Tuckness
George Tuttle
Jeff and Christy Tyler
Cindy Tyler
Richard Urey

Other Interested Parties

Elgan Usrey
Jim Utton
Virginia Valentine
Fernando Valentine
Kent Van Leeuwen
Robert Van Neyhos
Darlene Vanroekel
Rueben Vasquez
Thad Vavret
Cathy Vining
Adriano Vivolo
Michael Voegek
William C. Waggoner
John Wagner
Krishan Wahi
Mary Jane Walsh
Paul Wang
Laura Wang
Victor Warren
Gwen Washburn
Thoam Wasson
Tetsuya Watanabe
Eddie L. Watson
Stuart Waymire
William R. Webb
Loren Webb
Dr. David Weide
William Weigard
Jonathen Weisman
Peter Weiss
Stan Werlin
Michael West
Bob West
Roberta West
Chris West
Sandra Jean Westman
Faye and David Wheeler
John Whitaker
Don Whitmire
Lu Whitmire
Ched Whitney
Lelwin F. Wilkinson
Cory Wilkinson
Darla Williams
Glyn Williams
Ross Williams

Other Interested Parties

James Williams

Holly Williams

Howard G. Wilshire

Howard Wilshire

Laura Wingard

Lee Winston

Janet Witt

Kara Wittstock

Buck Wong

Jim Woolf

Willy Wright

Dana Wruble

Christine Wunderlin

Jana Wyld

John Yatave

Charles Young

Bobbi Youngblood

Karen Younsh

Maria Zaldivar-Vaught

Peter Zavattaro

Edwardine Zawacki

Joseph Zawacki

Christopher Zguris

Jan Ziegler

Ann Zorn

Appendix E

IMPACT ASSESSMENT METHODS

APPENDIX E
IMPACT ASSESSMENT METHODS

E.1 Introduction

Appendix E contains the description of the methods used in preparing the Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (NTS EIS). These methods were designed and implemented to evaluate the potential environmental impacts of the four alternatives addressed in this document. The various analysis methods used to develop this EIS are summarized by resource. Further detail is included in the Technical Resource Document section of the Administrative Record.

E.2 Methods and Assumptions of Analysis

The following sections describe the methods and assumptions used in preparing this EIS. The methods were designed and implemented to evaluate the potential impacts resulting from the four alternatives. The various analysis methods used to develop this EIS are summarized here by resource.

E.2.1 Land Use

The region of influence includes the NTS and land immediately adjacent to the NTS, portions of the Nellis Air Force Range (NAFR) Complex, the Tonopah Test Range, the Project Shoal Area, the Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.

An analysis was conducted to determine the effects of each of the four alternatives on land resources at the NTS and affected portions of the NAFR Complex. Changes in land resource areas resulting from each alternative were compared to existing conditions of the affected environment, and potential impacts were determined. Direct impacts resulting from project-related activities during implementation and operation phases, and indirect impacts resulting from project-related population growth or decline were considered. Impacts were considered negative, and possibly significant, if there was insufficient land available under the U.S. Department of Energy (DOE) control for a proposed activity. Additionally, conflicts with established safety standards; adjacent public or private recreation, religious, or institutional facilities or sites; or local, regional, state, or federal land-use plans, policies, or controls would be considered negative impacts that could be determined as significant. Impacts could be considered beneficial if a proposed project resulted in providing additional land available for use, or if a proposed change resulted in a higher and better use of land resources. Potential mitigation measures have been identified for adverse land-use impacts. Appendix A of the Final NTS EIS provides related land-use information.

E.2.1.1 NTS Site-Support Activities.

This section summarizes the methods of analysis used to assess the potential impacts to site-support activities resulting from the four alternatives presented in this EIS.

E.2.1.1.1 Alternative 1—The methods used for Alternative 1 were based on the assumption that activities and facilities, including the consumption of resources, would continue at the current level. The analysis of environmental conditions was based on the following information and assumptions:

- The availability of usable water at the NTS is adequate and has not exhibited any notable decline
- The current use (pumping from wells) is approximately 20 percent of the maximum capacity
- Existing land capacities for the disposal of solid sanitary waste are available and suitable
- Existing land capacities for the disposal of low-level waste and mixed waste are available and suitable.

Operational assumptions include the following:

- The NTS site-support activities will remain at approximately the existing level for personnel and resources
- Routine maintenance will be provided to keep the existing equipment and utilities functional
- Major construction activities will not occur under Alternative 1.

Operational activities will continue indefinitely under Alternative 1. The total estimated cost for the NTS site-support activities includes the annual cost for operations and maintenance, including labor, utilities, materials, maintenance, and contingency. Ground disturbance for the site-support activities includes equipment, facility and administration buildings, and the parking lots and adjacent roads leading up to the facilities.

It is assumed that 25 percent of the entire NTS will continue to be unused and will provide a buffer zone, as noted in the Fiscal Year 1994 NTS Technical Site Information (RSN, 1994).

The total number of personnel required to operate and manage the NTS site-support activities is based on the number of contractors represented in organizational charts of the U.S. Department of Energy/Nevada Operations Office (DOE/NV) and the August 1994 Report of NTS-Related and Other Nevada-Related Employment.

Building activities are not applicable to this alternative for site-support activities. The water consumption estimate is based on, and related to, the number of personnel needed to operate and manage the site-support activities. The power consumption estimate is also based on, and related to, the number of personnel needed to operate and manage the site-support activities.

The fuel consumption estimate is based on, and related to, the number of personnel needed to operate and manage the site-support activities. The fuel consumption estimate is also based on the estimated number of vehicles to transport communication workers and supervisory personnel to individual site locations (one per day) and back to the originating location (one per day). The originating location for most personnel is Mercury, Nevada. The estimate and impact do not specifically include impacts as a result of personnel travel in Las Vegas.

No industrial wastewater is generated as a result of the site-support operations. No known radiological waste was known to be generated by activities associated with site support. The hazardous materials estimate is based on, and related to, the number of personnel needed to operate and manage the site-support activities.

E.2.1.1.2 Alternative 2—NTS site-support activities would be almost entirely abandoned under this alternative. Only minimal resources would be provided for the monitoring and security functions which would continue at the NTS under this alternative. It was assumed that for this alternative, the remaining monitoring and security functions would be reduced from the Alternative 1 levels by approximately 95 percent. Off-site support would not exist under this alternative.

E.2.1.1.3 Alternative 3—Under Alternative 3, the NTS site-support activities would be modernized and expanded to the extent necessary to provide support for existing activities and the new projects and activities not previously performed at the NTS. In the past, the facilities at the NTS have been capable of supporting a workforce much larger than currently exists, and it is assumed that this capability is mostly intact. Therefore, increases in site-support resource use for Alternative 3 were based on project-specific additions and not on a percentage increase.

E.2.1.1.4 Alternative 4—The NTS site-support activities would be reduced under this alternative. The primary areas of site-support activity reduction would occur in on-site and off-site support. With Environmental Restoration and Waste Management Program activities as the primary focus, a workforce reduction would be anticipated. In reality, this estimate would fluctuate depending on the addition of potential turn-back programs that could be pursued; however, it was assumed that these functions would be run by commercial organizations.

E.2.1.2 Airspace. Airspace is a finite resource that can be defined vertically, horizontally, and temporally for aviation purposes. As such, airspace must be managed and used in a manner that best serves the competing needs of commercial, general, military, and other agency aviation interests. As the primary agency responsible for the management of airspace, the Federal Aviation Administration reviews all airspace user requirements and establishes designated areas based on the degree of protection needed to support these requirements. Rules of flight and air traffic control procedures have been established to govern if and how different segments of the aviation community may operate within each type of designated airspace.

When changes to designated airspace use are planned and/or proposed by the controlling agency, such as increased or reduced operations, mission or flight profile changes, etc., further study is needed to determine if such changes will (1) require modifications to the airspace structure or air traffic control systems/services, or (2) restrict, limit, or impinge in any manner on other aircraft within or adjacent to the airspace under review.

The airspace analysis for this study assesses potential impacts that actions occurring under each of the four alternatives may have on current use of the different airspaces within the region of influence. The region of influence includes the Nevada Test Site, the NAFR Complex (including the Tonopah Test Range), the Las Vegas Class B airspace overlying the Dry Lake and Eldorado Valleys, the Fallon Naval Air Station restricted airspace over the Project Shoal Area in northwestern Nevada, and the uncontrolled airspace over the Central Nevada Test Area. To the extent that data was available, this analysis considered the type and level of activities projected for each alternative and their potential effect on each airspace area. Current and projected use of this airspace by the U.S. Department of Defense (DoD), as part of the NAFR Complex training mission, was also considered. Based on review of cumulative uses under each alternative, a determination was made on the potential impact of these projected uses on each affected airspace area within the region of influence. Any added potentially significant impacts of U.S. Department of Energy/U.S. Department of Defense (DOE/DoD) operations on civil aviation under any one of the alternatives would ultimately require review and action by the Federal Aviation Administration.

E.2.2 Transportation

The methods and assumptions used to analyze transportation risk impacts resulting from the four alternatives are presented in Appendix I, Transportation Study. Analysis results and Nevada route risk comparisons are also presented in the Transportation Study. The following discusses methodologies for on-site and off-site traffic, and transportation of materials and waste.

E.2.2.1 On-Site Traffic. The use-related effects on traffic for the on-site roadway network were assessed by estimating the average number of daily trips generated by each land use, project, or activity for each of DOE's primary programs: Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. These trip generation rates were estimated by considering employee distribution, visitors, residents, service vehicles associated with construction, and all other on-site activities for each of the proposed alternatives. An on-site "trip"[1] has both its origin and destination on the NTS, and can be counted as traffic on more than one roadway segment depending on the route traveled. For the purpose of this report, it was assumed that all on-site trips would be uniformly distributed throughout the day, and have an endpoint in Mercury, Nevada. This assumption provides a worst-case situation by focusing the traffic volume on the roadways around Mercury, Nevada. It should be noted that traffic levels on the site would also be subject to many event-related projects and activities which are unique to the NTS.

The on-site traffic analysis used the standard techniques of trip generation, trip distribution, and traffic assignment. The daily trips generated under each alternative were distributed to the areas of the NTS that were most likely to be affected by each of the programs. The traffic was then assigned to the

[1] A "trip" is defined to be a one-way vehicle movement from an origin to a destination; a round-trip would therefore be considered as two trips.

major roadways according to this distribution. To determine how well a section of roadway facilitates vehicular traffic, the operating capacity is generally compared to the volume of traffic carried by the section. The traffic volumes that are used in this report are defined as average daily traffic, the total two-way traffic averaged daily. Traffic effects for the on-site roadways were determined based on a comparison of average daily traffic to the capacity of each key roadway segment on the NTS. Analyses were conducted for each alternative including Alternative 1.

This report presents the estimated number of daily trips that would be generated by each program under each alternative, and provides the deviation from Alternative 1, in order to assess action-related effects on traffic. The contribution by each program to the average daily traffic of each key roadway segment is also provided as an indication of the level of congestion.

E.2.2.2 Off-Site Traffic. The transportation network in the region of influence includes principal road networks leading to the NTS and off-site project locations, with emphasis on the area surrounding each site. Existing travel characteristics for the DOE employees were determined using existing employee survey data, site visits, and existing reports. Historical data on traffic volumes and road capacities were obtained from the Nevada Department of Transportation Annual Traffic Report.

The region of influence includes the access roads and regional highways leading to the NTS, NAFR Complex, Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, and the Solar Enterprise Zones.

The effects on roadway traffic for all alternatives were assessed by estimating the number of trips generated by each program-related activity, considering employees, visitors, residents, and service and delivery vehicles associated with construction and operations. These trips were then assigned to key roadway segments as established in Chapter 4.

The general unit of measure for traffic on a highway is the average daily traffic. Traffic volumes during peak hours better reflect the operating conditions. In general, the thirtieth highest hourly volume of the year is used to represent the daily peak hour and is used for this analysis. On the average, the thirtieth highest hourly volume is about 15 percent of average daily traffic on rural arterials and 8 to 12 percent of average daily traffic in urban areas. On rural highways, when there is unusual or highly seasonal fluctuation in traffic flow and a high percentage of traffic in one direction during the peak hours, the directional distribution of traffic should be considered. This is known as the directional design hourly volume. For example, if the thirtieth highest hourly volume is 15 percent of the average daily traffic, and the directional distribution at that hour is 60:40, the directional design hourly volume is 0.15 x 0.60 x average daily traffic, or 9 percent of the average daily traffic. The key roadway segments analyzed exist in rural and urban areas and generally experience seasonal variations. The Nevada Department of Transportation 1993 Annual Traffic Report (NDOT, 1993) was the source for the thirtieth highest hourly volume used.

The analysis is based on the peak-hour trips, data on roadway capacities, traffic volumes, and standards established by federal, state, and local transportation agencies, and uses the standard analysis techniques of trip generation, trip distribution, and traffic assignment. The vehicle trip generation rate per employee was determined from the number of vehicles observed at the access highway leading to the main entrance to the NTS and correlated to the number of on-site employees. In 1993, the average daily traffic recorded at the main entrance to the NTS was 1,375 vehicles in both directions, or 1,375 vehicle trip ends. During the same period, 2,948 employees worked on site. Therefore, the daily vehicle trip rate was approximately 0.50 vehicle trip ends per on-site employee. This rate accounts for commuters, visitors, trucks, and service vehicles, and it is assumed to remain constant throughout the period of analysis. Typically, the vehicle trip generation rate for office and light industrial land uses is in the range of 3 to 6 vehicle trip ends per employee (ITE, 1991). However, because bus ridership among NTS employees is relatively high (approximately 70 percent of on-site employees use the bus and 30 percent drive their cars or carpool), this rate is only 0.50 vehicle trip ends per on-site employee. This analysis assumes the continuation of the current travel mode choice.

The distribution of trips to and from the site is based on the number and location of access points to the site, the existing travel patterns (mainly for commuters), and the locations of employee residences. It was assumed that the residential choices of project-related employees would correspond to those of the current on-site personnel. The resulting vehicle trips generated by the project during the peak hour analyzed were then added to the peak hour of nonproject-generated traffic (background traffic) projected under Alternative 1. Future traffic volumes on key roadways were projected using previous trends for each segment obtained from available average daily traffic from 1983 to 1993. Currently, NTS employees enter the site from guard station 100 by way of the site access road (State Route 433), which connects U.S. Highway 95 at the Mercury, Nevada interchange. On a daily basis, U.S. Highway 95 east (to the Las Vegas area) carries 98 percent of employee vehicle trips; U.S. Highway 95 west handles the remaining 2 percent (Tetra Tech, Inc., 1995).

Traffic impacts were determined based on level of service changes for each of the key roads analyzed. A summary of average daily vehicle trips generated by each program activity for the years 1996, 2000, and 2005 was generated, and the level of service change was determined. Based on American Association of State Highway and Transportation Officials (AASHTO) standards, level of service B is appropriate for freeways and arterials and rural highways (level or rolling terrain). Level of service C is appropriate for rural (mountainous), urban, and suburban highways. For local roads, level of service D is appropriate in all terrain (AASHTO, 1990).

E.2.2.3 Transportation of Materials and Waste. The methods and assumptions used to analyze impacts for transportation of materials and waste resulting from the four alternatives are presented in Appendix I, Transportation Study. Analysis results and Nevada route risk comparisons are also presented in the Transportation Study.

E.2.3 Socioeconomics

A region of influence is defined as the area in which the principal, direct, and secondary socioeconomic effects of site actions are likely to occur and are expected to be of the most consequence for local jurisdictions. The economic activity information presented contains current conditions in a region of influence comprised of Nye and Clark counties, Nevada. This region of influence includes 97 percent of the residential distribution of the employees of the DOE, its contractor personnel, and supporting government agencies. In addition, the region of influence encompasses the probable location of future off-site contractor operations and indirect economic activities.

The regions of influence addressed in this section may vary, as appropriate, from one socioeconomic issue to another. The public finance region of influence includes the cities of Las Vegas and North Las Vegas, the towns of Tonopah and Pahrump, the counties of Clark and Nye, the Clark County School District and the Nye County School District. The pertinent region of influence for different public services also differ. For example, with public education, the region of influence is the Clark County School District and the Nye County School District.

The socioeconomic analysis discusses the potential socioeconomic effects associated with each alternative examined in the NTS EIS. The purpose of the study is to identify and analyze the major socioeconomic issues related to each possible future activity at the sites and to compare the effects of these alternatives with each other. All changes associated with proposed alternatives were considered effects. Alternative 1 was considered equivalent to future baseline conditions without new activities.

Socioeconomic analysis involves two major steps: (1) the characterization and projection of existing social and economic conditions surrounding each of the candidate sites (i.e., the affected environment); and (2) the evaluation of potential changes in socioeconomic conditions that could result from the construction of and operation associated with each alternative.

The description of socioeconomic conditions includes economic indicators (population, civilian labor force, employment, unemployment rate, and income) that provide a basis for comparing regional socioeconomic conditions of the sites with all alternatives. In addition, public finance and public services (public education, police and fire protection, and health) are also described.

The socioeconomic analysis addresses the timing of effects associated with each alternative for future reuses. The analysis covers a period extending 10 fiscal years beyond 1996. Results are usually presented for each alternative for the benchmark years of 1996, 2000, and 2005.

Of particular importance in this analysis are alternative effects, which are the differences of each alternative from Alternative 1. These effects include both direct on-site and indirect secondary effects for each alternative. Direct on-site effects are the changes immediately associated with an alternative, such as employment at a facility. Secondary effects include the indirect and induced changes that may occur either on site or off site. The actual location of secondary effects depends primarily on personal and organizational purchasing choices (i.e., locational decisions). Fiscal effects to local jurisdictions were evaluated based on changes in employment, population, and income and their effects on revenues and expenditures. Effects to key local public services were determined by the change in demand for personnel and facilities arising from project implementation.

The affected environment includes recent socioeconomic trends in Clark and Nye counties. Trends were analyzed for economic activity, population, housing, public finance, and public services. Data were examined for the 1970, 1980, and 1990 census years, as well as the most recent 5-year period for which data were available.

Site-related effects, defined as program-related economic activity, population, housing, public finance, and public services were also discussed. The most recent data were used to determine the trend of site-related effects.

E.2.3.1 Economic Activity, Population, and Housing. A 1994 survey of the NTS worker residential distribution reveals that 90 percent of the workforce lives in Clark County, 7 percent live in Nye County, and the remaining 3 percent reside in other counties or states. Within Clark County, most employees of the DOE/NV reside in the Las Vegas area (DOE, 1994). The Clark and Nye counties' regions of influence were identified based on the distribution of residents for current DOE and contractor personnel working at the sites described in this EIS (DOE, 1994). The region of influence was determined to be the area in which approximately 97 percent of current DOE and contractor employees reside. It was estimated that future distribution of direct workers associated with the proposed alternatives would follow the same trend. For the purpose of this analysis, the county data projections are accomplished separately. Because of the differences in size, economies, and contributions to the NTS, a misleading analysis would be produced if Clark and Nye counties were analyzed as one aggregate area of impact.

Labor force and employment by place of residence were obtained from the Nevada Employment Security Department. Income data and employment by place of work were obtained from the U.S. Bureau of Economic Analysis Regional Economic Information Systems (DOC, 1992). Historical personal income and per capita income values were converted to constant 1994 dollars using the current U.S. Department of Commerce national income deflator index. Constant dollars are used as a gauge in adjusting the dollars of other years to ascertain actual purchasing power. Historical and current populations for Clark County were obtained from the Center of Business and Economic Research, University of Nevada, Las Vegas (Schwer, 1995). Population figures for Nye County were obtained from the *Baseline Economic and Demographic Projections: 1990-2010 Nye County and Nye County Communities* (Nye County Board of Commissioners, 1993). Baseline housing needs are based on housing unit and population data obtained from the 1990 Census of Population and Housing.

Effects to key local public services are determined by the change in demand for personnel. The ability to accommodate increased demand, or to respond to decreases in demand while maintaining accustomed levels of local public service, is examined based on potential changes in demand for services. Direct effects on public services would arise from changes in levels of employment and corresponding population changes.

Current levels of service discussed in the Public Services section in Chapter 4 were used as standards of service. Potential effects were determined by either the necessary addition or reduction of public service employees needed to serve the alternative-related population increases or decreases.

The public service impacts of all other alternatives can be determined by subtracting total personnel required from the Alternative 1 future baseline. The addition or reduction in personnel required would be the specific impact associated with that alternative.

The future baseline (Alternative 1) was established from the total employment projected for each of the sites at the end of Fiscal Year 1995. These proposed Fiscal Year 1995 employment estimates are believed to best reflect the staffing levels needed as a result of recent stockpile requirement reductions.

For the Environmental Restoration Program, it was assumed that regulatory requirements would be at the same levels as any Federal National Priority List site, and the most stringent level of analysis and cleanup would be employed. The Remedial Action Cost Engineering and Requirements System, which is used with projects of a similar magnitude and with the same regulatory requirements, shows that salaries for activities to support the remedial investigation/feasibility study phase and remedial design/remedial action range from $120 to $150 per hour. These salaries include other direct costs and more specialized labor categories such as registered chemists. It was assumed that with the size of the sites and their different locations, rental and mobilization costs would be high or the program would require teams to work simultaneously throughout the sites.

Historical trends were determined. Growth projections for Clark County population, labor force, employment, and income were based on projections from the Center of Business and Economic Research, University of Nevada, Las Vegas. The growth projections for Nye County were based on those found in *Baseline Economic and Demographic Projection: 1990-2010 Nye County and Nye County Communities* (1993).

The socioeconomic impact analysis applied total output multipliers for the region of influence, obtained from the U.S. Department of Commerce, Bureau of Economic Analysis Regional Interindustry Multiplier System. These interindustry multipliers were estimated using the United States input/output table in combination with the most recent region-specific information describing the relationship of the regional economy to the national economy. The Regional Interindustry Multiplier System model is based on research by Cartwright et al. (1981). The model includes the following four major components for the analysis:

- A regional interindustry component that produces a regional input/output table and output multipliers for each specified sector of the economy for each economic study area
- A direct-effects component that produces a matrix of final demands (estimated changes in industry and household spending due to project activities) on the basis of direct employment and procurement associated with the alternative
- An employment impact component that calculates regional indirect output, earnings, and employment estimates
- A macroeconomics impact component that calculates regional population impacts on changes in unemployment, the share of the labor force with the necessary skills to take direct project jobs, and the portion of the direct employment that would flow to the region of influence.

Future housing units needed for cities and counties in each region of influence were developed by estimating the household size from the current population and housing unit ratios. The household size-to-population ratios were then applied to the estimated future population trends to obtain the number of housing units needed to accommodate the projected population for the Alternative 1 future baseline.

*E.2.3.2 **Public Finance.*** The financial characteristics of potentially affected local jurisdictions were examined. The local jurisdictions include Clark County, the cities of Las Vegas and North Las Vegas, Clark County School District, Nye County, the towns of Tonopah and Pahrump, and the Nye County School District.

Governmental funds discussed in this EIS are those which fund most governmental functions of the jurisdiction. Governmental fund types include general, special revenues, debt service, and capital projects funds. The general fund accounts are for financial transactions related to revenues and expenditures of services not accounted for in other funds. Special revenues are those funds accounted for in the proceeds of specific revenue sources that are legally restricted for specified purposes. Debt service funds account for the accumulation of resources for, and the payment of, interest and principal on general long-term debt. Capital projects funds are used to account for financial resources for the acquisition or construction of major capital facilities. The fiscal year for all Nevada jurisdictions is the 12-month period from July 1 to June 30.

For many jurisdictions discussed, ad valorem taxes are a major source of revenue. These are taxes which are levied on the assessed valuation of real property. Assessed valuation is a basis for levying real estate taxes. Thirty-five percent of the taxable value of real property is used as the basis for levying property taxes in most Nevada jurisdictions.

The fund balance, as a percentage of current expense, depicts how much reserves would be used if current (due within a year) expenses had to be paid without considering revenues. The lower the percentage, the less is available to pay off current expenses.

Fiscal effects include incremental property tax revenue and associated increases in services. Particular emphasis is placed on changes in revenues and expenditures based on increases and decreases in population, employment, and income. All revenues and expenditures are a combined total of general, special, debt service, and capital project funds.

Generally, the growth or decline of revenues and expenditures experienced in the past five years is expected to continue in the future based on expected population, employment, and income projections. To predict different items in the income statement of each jurisdiction, appropriate methodologies were used depending on the item.

Population levels were used to forecast an item that is generally population-dependent, such as ad valorem taxes. A per capita figure was used based on Fiscal Year 1994. As population levels increased or decreased, the ad valorem taxes reflected this increase or decrease proportionately. Licenses and permits were figured in the same way, using personal income as a benchmark. Employment was used to predict items such as fines and forfeitures.

For some items such as miscellaneous transfers to and from other funds, proceeds from bonds and loans, and transfers to refunding bond escrow agents, a moving average was used. Moving averages are used to compute an average of the most recent data values in a time series. This average is then used as the forecast for each successive period.

For most expenditures, a fixed cost percentage was determined. Regardless of the population increase or decrease, certain fixed costs must be maintained. Variable costs above that percentage are tied to population. The more or less population there is, the greater or fewer corresponding services are required.

With school districts, most revenues and expenditures were correlated with levels of enrollment, which, in turn, corresponded to the population in the particular school district. For the Clark County School District, enrollment was assumed to be 14.74 percent of the population; for the Nye County School District, enrollment was assumed to be 36.91 percent of the population. Both percentages represent the Fiscal Year 1994 enrollment.

Finally, the income statements were tallied, resulting in total revenues and expenditures for Fiscal Year 1995 to Fiscal Year 2005. Projected debt service, current expense, and the fund balance as a percentage of current expense were tallied.

E.2.3.3 ***Public Services.*** The key public services examined in this analysis are public education, police and fire protection, and health care. Providers of these services in the region of influence are public school districts, police and fire departments, and hospitals and clinics. Existing conditions for each major public service focus on the providers that are geographically close to the sites and/or maintain the closest relations to the sites. The level of general public service is determined by student-to-teacher ratios at primary and secondary public schools and by the ratio of employees (sworn officers, professional firefighters, and health care personnel) to service population.

Under Nevada law, a single public school district serves each county and is responsible for educating students from kindergarten through twelfth grade. The NTS EIS analysis highlights the Clark County and Nye County School Districts in terms of numbers of students and teachers and the student-to-teacher ratio.

Police protection in the region of influence is provided by the Las Vegas Metropolitan Police Department, North Las Vegas Police Department, and Nye County Sheriff's Office with stations at Tonopah, Pahrump, Beatty, Mercury, and Amargosa Valley. Each provides law enforcement services in conjunction with other law enforcement agencies, including the Nevada Highway Patrol.

No universal standards can be employed to determine proper patrol size considering the duties the patrol force is expected to perform, such as responding to calls for service, conducting preventive patrol, and performing miscellaneous administrative tasks. The amount of time devoted to each of these three broad areas is largely a policy decision that is made locally, based on past experience. Once an acceptable patrol-staffing level has been determined, it is necessary to devise a plan that will provide for the most efficient use of officers' time and the most productive geographic distribution (ICMA, 1982). The NTS EIS describes sworn officer or deputy levels of service per 1,000 population, the number of vehicles, and the number and capacity of holding facilities.

Fire protection for the region of influence is provided by the Clark County Fire Department, Las Vegas Fire Department, North Las Vegas Fire Department, and several volunteer fire departments in Nye County (including Tonopah, Pahrump, Beatty, and Amargosa Valley).

In evaluating the adequacy of fire protection levels in any given area, major consideration must be given to a fire department's ability to handle efficiently any reasonably anticipated workload. This requires an evaluation of the possibility of several simultaneous working fires, weather factors that may contribute to the spread of fire, the delay in response or the possibility of slow operation at the scene, and other demographic or geographic conditions that might affect the frequency of fire occurrence and the response time of initial firefighting units (NFPA, 1986). The NTS EIS discusses the current number of fire stations, level of service per 1,000 population, number of firefighters, and types of equipment.

Health care was analyzed for Clark and Nye counties. Health care levels of service were determined by the number of medical doctors and registered nurses per 1,000 population who are registered to practice in each county.

E.2.4 Geology and Soils

For each alternative being considered, adverse impacts to the geology will be assessed using the systematic approach of (1) identification of credible adverse impacts, (2) identification of factors responsible for these impacts, (3) analysis of the risk (the probability of these factors causing an impact and the consequence of such an impact), and (4) analysis of measures to mitigate determined risk. Potential credible adverse impacts related to the geology of the areas being considered are:

- Contamination of surface deposits
- Contamination of subsurface deposits
- Accelerated erosion

- Accelerated deposition
- Induced seismicity and faulting
- Ground fracturing
- Ground subsidence
- Ground folding
- Ground instability
- Isolation of natural resources
- Exploration for natural resources
- Exploitation of natural resources.

Because the alternatives being considered involve continued use of the areas in a manner more, less, or the same as the present, identification of factors responsible for these impacts was largely through analysis of affected changes associated with past-to-present activities. Impacts under the more-or less-use alternatives were extrapolated. Analyses included review of literature, review of data currently being collected in the many ongoing studies related to geology, and discussions with experts in the field. Risk was analyzed through standard published methodologies. Mitigating measures will be based on the effect of measures taken in the past, in addition to new concepts.

E.2.5 Hydrology

The main source of water is groundwater. Therefore, the methods used to evaluate water resources are presented in the groundwater section. Because the alternatives being considered involve continued use of the areas in a matter more, less, or the same as the present, the factors responsible for impacts were identified largely through analysis of affected changes associated with past-to-present activities. Impacts under Alternatives 2 and 3 were extrapolated. Analyses included review of literature, review of data currently being collected in the many ongoing studies related to hydrology, and discussions with experts in the field. Risk was analyzed through standard published methodologies. Mitigating measures were based on the effect of measures taken in the past, in addition to new concepts.

E.2.5.1 Surface Hydrology. For each alternative being considered, adverse impacts to the surface hydrology were assessed using the systematic approach of (1) identification of credible adverse impacts, (2) identification of factors responsible for these impacts, (3) analysis of the risk (the probability of these factors causing an impact and the consequence of such an impact), and (4) analysis of measures to mitigate determined risk. The potential credible adverse impacts related to the surface hydrology of the areas being considered are:

- Stoppage of surface water flow
- Diversion of surface water flow
- Concentration of surface water flow
- Impoundment of surface water
- Flooding
- Contamination of surface water
- Stoppage or reduction of spring discharge.

E.2.5.2 Water Resources. The potential credible adverse impacts related to the groundwater of the areas being considered are:

- Change in infiltration
- Change in recharge
- Change in the water table
- Change in groundwater flow
- Change in groundwater yield
- Exploration for groundwater
- Exploitation of groundwater
- Contamination of groundwater.

Information needed for impact evaluation was obtained from existing agency files and published data sources. Data were compiled on static and pumping water levels, well and aquifer mechanics, potentially impacted water right owners, environmentally sensitive areas, and documented boundary conditions.

The legal water availability was established through the review of records on file with the Nevada Division of Water Resources. Basin water right abstracts were requested from the Nevada Division of Water Resources and were used to determine the perennial yield, committed water resources, and estimated water use for each hydrographic basin under construction.

Phased water-demand estimates for the Solar Enterprise Zone have already been prepared. For other alternative actions, water demand was either based on conceptual designs or historic water use. For activities for which no water-use estimates are available, independent estimates were through development of a unit resource requirements table. Resource requirement tables were submitted to the DOE for review and concurrence before they were used in impact estimates.

The groundwater resources for a given hydrographic basin were assessed through the use of analytical solutions-solving for the drawdown of hypothetical well fields. Strack's (1989) two-dimensional analytical solutions for steady-state flow were used to calculate discharge potential.

Discharge potentials were computed using Strack's (1989) analytical solutions as they are incorporated into the groundwater flow model, Quickflow (Geraghty and Miller, Inc., 1991). Quickflow uses several of Strack's (1989) solutions to calculate the discharge potential at any given point. Two of these solutions were used in this modeling effort. The first equation modeled discharge potential created as a function of the regional gradient. The second equation modeled discharge potential as a function of stress created by one or more pumped wells. The solutions of the two equations were summed at any given point and then converted to head.

E.2.5.3 Assumptions and Limitations. Several assumptions are inherent in Strack's solutions: aquifers have infinite extent; are homogeneous; isotropic; have a constant thickness with the underlying, completely horizontal, impermeable basement; uniform regional hydraulic gradient; horizontal laminar flow; and are fully penetrated by wells. All of the results for this modeling effort must be qualified by these assumptions. During modeling, these assumptions were translated into the following boundary conditions: regional flow is uniform and unhampered by boundary conditions between and within each basin; recharge from precipitation does not occur; vertical flow does not occur; and leakage between aquifers and aquitards does not occur. The intent of this model is to determine if an idealized version of the most productive formation in each hydrographic basin is capable of sustaining groundwater production under steady-state conditions at rates specified by Nevada's Division of Water Resources State Engineer's Office. It is not to determine the overall groundwater budget for any given basin. Any such attempt would require additional data collection and a much more intensive modeling effort using finite-difference or finite-element models.

The impacts of groundwater withdrawals were estimated through the use of standard hydrologic techniques, specifically the Theis nonequilibrium equation, distance drawdown graphs, and image well analyses. A simple two-dimensional analytical model (King, 1984) was used to perform the calculations, and a standard spreadsheet was used to generate the distance drawdown graphs. Where input data were lacking, reasonable values were selected that led to a reasonable worst-case evaluation and sensitivity analyses were performed to determine a range of impacts rather than a single value.

E.2.6 Biological Resources

Impacts of the DOE activities on biological resources were assessed qualitatively. Because of the large number of projects and sites being evaluated, a systematic method was used to conduct and document this assessment. This process was adapted from Wright and Greene (1987), and was performed by a team of biologists familiar with the biota (local plants and animals) of the affected areas.

Step 1. Identify the Geographic and Temporal Scope of the Evaluation. Biologists first established boundaries to the scope of the evaluation so analyses from all programs and alternatives would be consistent.

Step 2. Identify Potential Impacts of the DOE Activities. The second step taken was to examine project descriptions to determine and categorize the ways that DOE actions might impact biological resources. All phases (e.g., construction, operation, transportation, decommissioning) of each project that would occur over the 10-year timeframe covered by this EIS (1996 to 2005) were evaluated. To ensure that all species were considered and that economically important or rare species and habitats were given special consideration, potential impacts were evaluated on three receptors: habitat, plant, and animal populations (with emphasis given to economics); recreationally important species and candidate species, and individual threatened or endangered species, golden eagles, or migratory birds, and natural springs and their associated biotic communities (the only rare habitat or community in the region). All potential impacts were considered unless they were obviously trivial (e.g., redisturbance of disturbed ground along road shoulders).

Step 3. Classify Significance of Impacts. The third step was to classify the significance of the potential impacts identified in the second step. The following were considered when classifying impacts: direct and indirect effects; cumulative effects; impacts to individuals, populations, communities, and ecosystems; magnitude of the effects (e.g., proportion of the population affected); spatial pattern of effects; duration of effects; probability that effects would occur; human perception of effects; and mitigation possibilities. Impacts were regarded as significant only if they were likely to have substantial, permanent effects on the resource.

To evaluate effects on habitat, the total amount of habitat lost or gained through reclamation of disturbed areas was quantified for each project. To evaluate effects on the other three receptors, the following criteria were established to identify impacts of sufficient significance to warrant discussion in the NTS EIS and the development of mitigation actions. These criteria were defined and used as standards to facilitate comparisons of potential impacts among the many different activities, programs, and alternatives.

Effects on plant and animal populations. An activity was considered to have a significant impact if it was (1) likely to either reduce or increase the viability of any plant or animal population (i.e., the ability of the population to persist through time) or (2) cause a change in the abundance of a plant or animal population that would lead to an increase or decrease in economic or recreational opportunities. The first criterion was chosen to ensure that impacts would be identified and considered if they might increase the risk of extinction of any species, including the most vulnerable of species, such as candidates for listing under the Endangered Species Act. Quantitative population viability analyses were not conducted. The following factors were qualitatively evaluated to determine changes in viability: change in generic diversity, population size and population demographics; changes in size and population demographics; changes in the ecosystem processes required by a species; and barriers to dispersal or other important movements, such as travel to breeding or wintering areas. The second criteria was chosen to ensure that all losses and gains in economic or recreational opportunities would be considered.

Effects on protected species. Individuals of species protected under the Endangered Species Act, Bald Eagle Protection Act, and Migratory Bird Treaty Act received consideration over and above that given to other species. An activity was considered to have a significant negative impact if it was likely to kill or injure protected species. This level was chosen to identify those activities that might result in "take" of the species. Positive effects to these species were considered at the habitat and population scale as defined previously.

Effects on springs. An activity was considered to have a significant impact if it would influence the persistence of springs or their associated biotic communities by causing a change in water quantity or quality or by modifying the ecosystem on which these communities depend. All projects were classified as having one of the following levels of impacts: potential to cause a (1) significant negative impact, (2) nonsignificant negative impact (i.e., having an action identified in Step 2 as potentially impacting biological resources but not meeting the significance criteria identified in Step 3), (3) significant positive impact,

(4) nonsignificant positive impact, or (5) no impact (i.e., having no actions identified in Step 2 that may impact biological resources).

E.2.6.1 List of species names. The common and scientific names of plants and animals mentioned in text and tables of the NTS EIS are provided in Table E-1.

Step 4. Determine if Significant Negative Impacts Could be Mitigated and Propose Mitigation. Biologists attempted to identify mitigation recommendations for each significant negative impact. If mitigation was identified that would reduce the impact to less than significant, the impact was reclassified as a significant negative, but mitigable, impact.

Step 5. Combine Impacts at the Project Level to Facilitate Comparisons Across Alternatives. Following an examination of impacts on a project-by-project basis, the biologists, working as a group, summarized effects of DOE activities across all projects, within each alternative, to facilitate comparisons among alternatives.

E.2.7 Air Quality and Climate

Climatologic and meteorologic information for the region surrounding the NTS was derived from secondary sources. Ambient air quality information for the Nevada Intrastate Air Quality Control Region 147, which contains the NTS, the NAFR Complex, the Project Shoal Area, and the Central Nevada Test Area, were obtained from the State of Nevada Department of Conservation and Natural Resources, Division of Environmental Protection. This information was compared to applicable National Ambient Air Quality Standards and Nevada Ambient Air Quality Standards. With the exception of radionuclides, ambient air quality at the NTS is not currently monitored for criteria pollutants. However, temporary monitoring stations were in operation in August and September of 1990, and results of this monitoring were used to determine an estimated ambient concentration contribution of criteria pollutants from existing sources at the NTS.

Each of the four alternatives was analyzed to discover the potential effects that the five programs and the site-support activities of the NTS may have on regional air quality. In particular, the results of assessments on the impacts of construction and operation of facilities associated with each program in terms of expected pollutant emissions and concentration levels were analyzed. The types of emissions assessed are the criteria pollutants (carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and respirable particulate matter when the particulate diameter is equal to or less than 10 micrometers [PM_{10}]). Volatile organic compounds, which can lead to the formation of ozone, are also assessed. The categories of sources assessed include stationary sources (such as stacks and vents), fugitive sources (such as construction and demolition activities), and mobile sources (such as vehicles) associated with NTS activities. The assessments focus on conditions or impacts, that might result at off-site locations from the release of contaminants from various categories of sources.

The impacts of existing and proposed sources of fugitive dust from construction activities were estimated using the U.S. Environmental Protection Agency (EPA) emission factor of 1.2 tons per acre per month. The particulate matter, PM_{10} was assumed to be 50 percent of the total dust loading. It was also assumed that the application of water reduces PM_{10} emissions by 50 percent. Pollutant emissions resulting from NTS bus fleet operations, NTS fleet light- and heavy-duty vehicles, privately owned vehicles, and heavy-duty commercial vehicles servicing the NTS site facilities were quantitatively predicted using emission factors obtained from the EPA Mobile Source Emission Factor Model, MOBILE 5a. The ambient air quality assessment did not include methods for quantifying impacts related to ozone formation because (1) emissions of volatile organic compounds (which are precursors of ozone formation) are below the significance level designated by the state of Nevada, (2) no simple defined method exists to assess ozone formation potentials, and (3) ozone is not recognized as a problem in the region. The region of influence for this air quality analysis includes Nye and Clark counties, Nevada, where the impacts of the project would likely occur.

E.2.8 Noise

Noise is defined as sound that is undesirable because it interferes with speech communication

Table E-1. Common and scientific names of plants and animals mentioned in text and tables (Page 1 of 4)

Common Name	Scientific Name
Plants	
acacia, catclaw	*Acacia greggii*
baccharis, Emory	*Baccharis emoryi*
bear poppy, golden	*Arctomecon Californica*
blackbrush	*Coleogyne ramosissima*
brome, red	*Bromus rubens*
bursage, white	*Ambrosia dumosa*
budsage	*Artemisia spinescens*
cactus, beavertail, pricklypear	*Opuntia basilaris*
cattail	*Typha spp.*
cheatgrass	*Bromus tectorum*
cheesebush	*Hymenoclea salsola*
cholla Blue Diamond	*Opuatia Whipplei var. Multigeniculata*
creosote bush	*Larrea tridentata*
egg-vetch, Clokey's	*Astragalus oopherus var clokeyanus*
ephedra, green	*Ephedra viridis*
ephedra, Nevada	*Ephedra nevadensis*
filaree, red-stemmed	*Erodium cicutarium*
galleta grass	*Hilaria jamesii*
globemallow, desert	*Sphaeralcea ambigua*
goosefoot	*Chenopodium spp.*
greasewood	*Sarcobatus vermiculatus*
green molly	*Kochia americana*
halogeton	*Halogeton glomeratus*
hopsage	*Grayia spinosa*
horsebrush	*Tetradymia glabrata*
indigo bush, Fremont	*Psorothamnus fremontii*
indigo bush, glandular	*Psorothamnus polyadenius*
juniper, Utah	*Juniperus osteosperma*

Table E-1. Common and scientific names of plants and animals mentioned in text and tables (Page 2 of 4)

Common Name	Scientific Name
menodora, spiny	*Menodora spinescens*
milkvetch, Beatley	*Astagalus beatleyae*
milkvetch, Geyer	*Astragalus geyeri var. triquetrus*
milkvetch, Needle Mountains	*Astragalus eurylobus*
pine, pinyon	*Pinus monophylla*
prince's plume, desert	*Stanleya pinnata*
rabbitbrush, punctate	*Chrysothamnus paniculatus*
ratany, range	*Krameria parvifolia*
ricegrass, Indian	*Oryzophsis hymenoides*
rushes	*Juncus spp.*
sagebrush	*Artemisia spp.*
sagebrush, big	*A. tridentata*
sagebrush, black	*A. nova*
saltbush, four-winged	*Atriplex canescens*
saltcedar	*Tamarix ramosissima*
saltgrass	*Distichlis spicata*
sedges	*Carex spp.*
seep weed	*Suaeda torreyana*
shadscale	*Atriplex confertifolia*
snowberry	*Symphoricarpos spp.*
tansy mustard	*Descurainia spp.*
thistle, Russian	*Salsola tragus*
willow, desert	*Chilopsis linearis*
winterfat	*Ceratoides lanata*
wolfberry	*Lycium andersonii, L. pallidum, and L.*
yucca	*Yucca spp.*
yucca, Mohave	*Yucca schidigera*

Table E-1. Common and scientific names of plants and animals mentioned in text and tables (Page 3 of 4)

Common Name	Scientific Name
Birds	
chukar	*Alectoris chukar*
dove, mourning	*Zenaida macrura*
eagle, bald	*Haliaeetus leucocephalus*
falcon, peregrine	*Falco peregruinus*
flicker, northern	*Colaptes auratus*
hawk, red-tailed	*Buteo jamaicensis*
ibis, white-faced	*Plegadis chihi*
jay, scrub	*Aphelocoma coerulescens*
kingbird, western	*Tyrannus verticalis*
lark, horned	*Eremophila alpestris*
owl, western burrowing	*Athene cunicularia Lypugea*
phoebe, Say's	*Sayornis saya*
plover, mountain	*Charadrius montanus*
quail, Gambel's	*Callipepla gambelii*
raven, common	*Corvus corax*
shrike, loggerhead	*Lanius ludovicianus*
sparrow, black-throated	*Amphispiza bilineata*
sparrow, Brewer's	*Spizella breweri*
Fishes	
dace, Oasis Valley speckled	*Rhinichthys asculus ssp.*
pupfish, Devils Hole	*Cyprinodon diabolis*
Mammals	
bobcat	*Felis rufus*
chipmunk, cliff	*Eutamias dorsalis*
cottontail, desert	*Sylvilagus audubonii*
cottontail, Nuttall's	*S. Nuttallii*
coyote	*Canis latrans*
deer, mule	*Odocoileus hemionus*

Table E-1. Common and scientific names of plants and animals mentioned in text and tables (Page 4 of 4)

Common Name	Scientific Name
fox, kit	*Vulpes velox*
horse, wild	*Equus caballus*
jackrabbit, black-tailed	*Lepus californicus*
kangaroo mouse, dark	*Microdipodops megacephalus*
kangaroo rat, chisel-toothed	*Dipodomys microps*
kangaroo rat, desert	*Dipodomys deserti*
kangaroo rat, Merriam's	*Dipodomys merriami*
lion, mountain	*Felis concolor*
pocket mouse, Great Basin	*Perognathus parvus*
pocket mouse, long tailed	*Perognathus formosus*
pronghorn	*Antilocapra americana*
sheep, bighorn	*Ovis canadensis*
squirrel, white-tailed antelope	*Ammospermophilus leucurus*
woodrat, desert	*Neotoma lepida*
Reptiles	
chuckwalla	*Sauromalus obesus*
gila monster, banded	*Heloderma suspectum cinctum*
lizard, desert horned	*Phrynosoma platyrhinos*
lizard, desert night	*Xantusia vigilis*
lizard, side-blotched	*Uta stansburiana*
lizard, western fence	*Sceloporus occidentalis*
rattlesnake, speckled	*Crotalus mitchellii*
sidewinder	*Crotalus cerastes*
snake, gopher	*Pituophis melanoleucus*
snake, western shovelnose	*Chionactis occipitalis*
toad, Amargosa	*Bufo nelsoni*
tortoise, desert	*Gopherus agassizii*
whipsnake, striped	*Masticophis taeniatus*

and hearing, is intense enough to damage hearing, or is otherwise annoying. The characteristics of sound include parameters such as amplitude, frequency, and duration. Noise levels often change with time; therefore, to compare levels over different time periods, several descriptors were developed that account for time variance. These descriptors are used to assess and correlate the various effects of noise on man, including land-use compatibility, sleep and speech interference, annoyance, hearing loss, and startle effects.

The decibel (DB), a logarithmic unit that accounts for the large variations in amplitude, is the accepted standard unit measurement of sound.

When measuring sound to determine its effects on the human population, A-weighted sound levels (dBA) are typically used to account for the response of the human ear (ANSI/ASME, 1983). Human response to sounds are lowest at low and high frequency levels and greatest in the middle frequency level. A-weighted sound levels represent adjustments to sound levels that are made according to the frequency content of the sound.

The day-night average sound level was developed to evaluate the total community noise environment. The day-night average sound level is the average A-weighted sound level during a 24-hour period with 10 DB added to nighttime levels (between 10 p.m. and 7 a.m.). This adjustment is added to account for the increased sensitivity of nighttime noise events. The day-night average sound level was endorsed by the EPA and is mandated by the U.S. Department of Housing and Urban Development, the Federal Aviation Administration, and the DoD for land-use assessments. The day-night average sound level is sometimes supplemented with the equivalent sound level. The equivalent sound level is the dBA level of a steady-state sound, which has the same dBA sound energy as that contained in the time-varying sound being measured over a specific time period.

The region of influence includes the NTS, portions of the NAFR Complex, the Tonopah Test Range, the Project Shoal Area, the Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, Coyote Spring Valley, and the regions surrounding these sites. Special attention was paid to sensitive receptors that are near the boundaries of these sites.

The impact analysis section discusses the potential effects of the five programs and site-support activities on noise at all sites and in the surrounding area. Impacts of noise on workers are discussed in the occupational and public health and safety sections.

Because of its large size, 3,496 square kilometers (km^2) (1,350 square miles [mi^2]), noise generated on the NTS site does not propagate offsite at audible levels. The closest sensitive receptors to the site boundary are residences located 1.3 miles to the south in the unincorporated town of Amargosa Valley. Noise generation was estimated for construction and operational activities through the year 2005.

The calculation of noise levels at various distances from construction equipment sources assumed noise levels decreased with distance according to the inverse square law of noise propagation. Noise levels produced by various types of construction equipment at a reference distance of 15 meters (m) (50 feet [ft]) were obtained from the EPA document entitled *Noise Construction Equipment and Operation Building Equipment and Home Appliance* (EPA, 1971).

Railroad and aircraft noise were considered. Infrequent helicopter and small fixed-wing aircraft operations occur on the site. Supersonic aircraft operating from Nellis Air Force Base may overfly the site, producing sonic booms. Subsonic low-level flights may also create significant noise patterns over the site during training exercises.

The Central Nevada Test Area is located in Hot Creek Valley, north of U.S. Highway 6, approximately 129 km (80 mi) east of Tonopah. There are no sensitive receptors close to the site.

E.2.9 Visual Resources

A description of the existing visual resource conditions was prepared based on existing information, field visits, and photographs.

The affected environment visual resources evaluation was based on the U.S. Bureau of Land

Management Visual Resource Management Program. Visual resources include the natural and manmade physical features that give a particular landscape its character and value as an environmental factor. The physical feature categories which form the overall impression a viewer receives of an area include landform, vegetation, water, color, adjacent scenery, scarcity, and manmade (cultural) modification (BLM, 1980). Criteria used in the analysis of visual resources include scenic quality, visual sensitivity, and distance/visibility zones from key public viewpoints.

There are three scenic quality classes. Class A includes areas that combine the most outstanding characteristics of each physical feature category. Class B includes areas in which there is a combination of some outstanding characteristics and some that are fairly common to the region. Class C includes areas in which the characteristics are fairly common to the region.

Visual sensitivity for this analysis was based solely on the volume of travel on public highways, since this provides the only key public viewpoint of the study areas. Volume of travel was obtained from the Nevada Department of Transportation (NDOT, 1993). Study areas that are visible from highways with 3,000 or more average annual daily traffic were assigned a high sensitivity level. Study areas that are visible from highways with 1,000 to 2,999 average annual daily traffic were assigned a medium sensitivity level. Study areas that are visible from highways with average annual daily traffic below 1,000 were assigned a low visual sensitivity level.

Visual quality and sensitivity may be magnified or diminished by the distance or visibility of the landscape from key viewpoints (BLM, 1980). The landscape scene can be divided into three basic distance zones: foreground, from 0 to 0.8 km (0.5 mi); middleground, from 0.8 km (0.5 mi) to 8 km (5 mi); and background or seldom-seen views, from 8 km (5 mi) to infinity. Seldom-seen views also include those portions of the landscape that cannot be seen from a key viewpoint because the viewer's line of sight is blocked by terrain, vegetation, or some other physical feature.

The region of influence chosen for the visual resources analysis includes the NTS, portions of the NAFR Complex, the Tonopah Test Range, the Project Shoal Area, the Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley. Of particular consideration are the portions of these sites that can be viewed from key public viewpoints, usually public highways.

An analysis of impacts was conducted to determine the effects of each of the four alternatives on visual resources. Visual impacts were assessed on the potential of each alternative to alter or conflict with the existing landscape character. The significance of visual impacts was determined by assessing scenic quality (Class A = outstanding features, Class B = a mix of outstanding and common features, and Class C = common features); the degree of visual contrast that the proposed project-related activities would create during implementation and operation phases; and whether the activities would be seen from low, medium, or high visually sensitive viewpoints that would be accessible to the public. These viewpoints would include areas such as public roadways, recreation areas, and residential areas. An impact to visual resources would be considered adverse and potentially significant if the combination of scenic quality, contrasts, and sensitivity levels of the viewpoints was unacceptably high. Potential mitigation measures have been identified for significant adverse visual impacts. Land-use sections and Appendix A provide related information regarding proposed facilities and activities that would impact visual resources.

E.2.10 Cultural Resources

This section summarizes the methods of analysis used to provide an assessment of potential impacts to the cultural resources considered in this EIS. Cultural resources generally consist of three types: (1) archaeological sites, (2) historic sites and structures, and (3) American Indian traditional cultural properties. Archaeological and historical sites contain artifacts and/or features that resulted from past human activities on the landscape. These sites are prehistoric, historic, or multicomponent. These categories refer to time. Prehistoric sites were formed before written records and historic sites date to times when written records were kept.

Multicomponent sites have both historic and prehistoric components. American Indian traditional cultural properties can include these sites as well as other areas and materials that are important to American Indians for religious, historical, or cultural reasons. Traditional resources are areas, features, habitats, plants, animals, minerals, or archaeological sites that contemporary American Indians consider valuable for the continuation of their traditional culture and religion. Cultural resources of primary concern include properties that are eligible for or listed on the National Register of Historic Places and are sacred American Indian sites and areas.

Considerable legislation has been enacted over the years which delineate federal agencies' obligations for cultural resources. Those most pertinent to this EIS include, but are not limited to:

- The Antiquities Act of 1906 (Public Law 59-209)
- The National Historic Preservation Act of 1966 (Public Law 89-665 as amended)
- The National Environmental Protection Act of 1969 (Public Law 91-190)
- The Archaeological and Historic Preservation Act of 1974 (Public Law 94-291 as amended)
- The American Indian Religious Freedom Act of 1978 (Public Law 95-341)
- The Archaeological Resources Protection Act of 1979 (Public Law 96-95)
- The Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601).

These laws can be divided into three categories. First are the laws which regulate who can conduct archaeological studies and the penalties for people who do not abide by these laws. The Antiquities Act of 1906 was the first law to require that archaeological work on federal land be conducted by professional archaeologists, who are obliged to obtain permits to undertake fieldwork. The law also sanctioned people who conducted illicit undertakings. While this law established a federal policy towards archaeological remains, it was not strong enough to curtail the looting of archaeological sites. The Archaeological Resources Protection Act of 1979 along with its regulations (43 CFR Part 7) instituted a stronger permitting system for archaeological work on federal land, standards for the conduct of archaeological investigations, and established the framework as well as substantial penalties for violation of the law. Therefore, it ensures that only qualified archaeologists will conduct work on federal land and that their work must meet the guidelines provided by the Secretary of the Interior.

Second are the laws which require federal agencies to understand and plan for the effects of their actions on cultural resources. These laws are the National Historic Preservation Act of 1966 (as amended), the National Environmental Policy Act of 1969, and the Archaeological and Historic Preservation Act of 1974. The National Historic Preservation Act is a landmark legislation which requires federal agencies to identify significant resources and mitigate adverse effects to the cultural resources which are eligible to be listed or are listed on the National Register of Historic Places. The National Environmental Policy Act of 1969 requires federal agencies to prepare a detailed statement on the environmental effects of proposed major federal actions that may significantly affect the quality of the human environment. This legislation usually results in the generation of an EIS, which defines the impacts of such planned actions.

Sections 106 and 110 of the National Historic Preservation Act are the main drivers. Section 106 requires agencies to establish procedures for identifying cultural resources, evaluate their significance based on National Register of Historic Places criteria, assess effects, preserve or mitigate affected National Register of Historic Places or National Register of Historic Places-eligible resources, and coordinate and consult with the State Historic Preservation Office and the Advisory Council on Historic Preservation. Section 110, on the other hand, is intended to ensure that historic preservation is fully integrated into the ongoing programs and missions of federal agencies. The Archaeological and Historic Preservation Act of 1974 followed the National Historic Preservation

Act with similar requirements and has a specific focus on projects related to dam construction.

Third are the laws which are directed toward ensuring the rights of American Indians. The American Indian Religious Freedom Act protects the rights of American Indians to practice traditional religions. It ensures the right to access sites, to use and possess sacred objects, and to initiate ceremonials and traditional rites. The Native American Grave Protection and Repatriation Act responded to concerns of American Indians regarding the custody and disposition of American Indian remains and American Indian cultural objects. This Act requires federal agencies and museums to prepare inventories and summaries of various kinds of cultural materials in order to initiate a repatriation process. Items affected by the Act include human remains and associated funerary objects, sacred objects, and objects of cultural patrimony.

The DOE has conducted surveys for the identification of cultural resources on a sustained basis since 1978 with the recording of over 2,000 sites in the area under its jurisdiction. Since 1988, the DOE has consulted with concerned American Indians in an effort to determine cultural resources that they believe are important. These consultations involve members from 17 different groups, representing three federally recognized tribes. These include the Southern Paiute, the Western Shoshone, and the Owens Valley Paiute whose membership encompasses parts of Nevada, California, Utah, and Arizona. These groups were identified as having prehistoric or historic ties to lands within and in the vicinity of the NTS. Consultations resulted in the publication of two documents that focus on the Yucca Mountain Site Characterization Project area (Stoffle et al., 1990) and on Pahute and Rainier Mesas (Stoffle et al., 1994). The DOE currently is in the process of conducting consultations with American Indians regarding the Native American Grave Protection and Repatriation Act.

The data used to compile information on these resources were obtained from the database which the Desert Research Institute maintains for the DOE. This database contains a complete set of files, maps, and computerized information which summarizes all of the work completed on the NTS since 1978. This is the most complete set of documentation in existence for the NTS, and was consulted for each hydrographic region within the DOE jurisdiction. These files document areas that have been surveyed and list the number and location of sites discovered during each survey. They also identify areas where no sites were located during archaeological survey and therefore may have a lower archaeological sensitivity.

For those areas outside of the DOE jurisdiction, a Class I literature review was conducted at the Harry Reid Center and Marjorie Barrick Museum of Natural History at the University of Nevada, Las Vegas. A Class I review involves a professional study of existing data that includes a compilation, analysis, and interpretation of all available archaeological, historic, and paleoenvironmental data (BLM, 1990). The Harry Reid Center is the official state repository for site records, reports, and maps that document cultural resources found in Clark, Lincoln, Nye, and Esmeralda counties. This review involved examination of all records pertinent to identification of previously recorded cultural resources. These records provide locations of previous surveys, identify negative surveys, and characterize archaeological sites recorded for each area. Additional information was obtained from published sources.

Consultations with American Indians are an integral part of the NTS EIS process. All 17 tribal groups have been consulted, and their concerns and comments are included in this document. This information was obtained through ethnographic work, as well as meetings and discussions between the DOE and the tribal representatives.

This EIS contains the most up-to-date information on the importance of cultural resources within the areas addressed by the NTS EIS. Cultural resources site data were compiled based on existing records and summarized by site type and eligibility for the National Register of Historic Places as determined through consultation with the State Historic Preservation Officer (SHPO). Cultural resources recorded prior to 1980 have not been formally evaluated through SHPO consultation. The eligibility of these sites is based on recommendations of the project archaeologists.

According to the National Register of Historic Places criteria (36 CFR Part 60.4), the quality of significance is present in districts, sites, buildings, structures, and objects that:

- Are associated with events that have made a significant contribution to the broad patterns of history
- Are associated with the lives of persons significant in the past
- Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; possess high artistic value; or represent a significant and distinguishable entity whose components may lack individual distinction
- Have yielded, or may be likely to yield, information important in prehistory or history.

To be listed in or considered eligible for listing in the National Register of Historic Places, a cultural resource must meet at least one of the above criteria and must also possess integrity of location, design, setting, materials, workmanship, feeling, and association. Integrity is defined as the authenticity of a property's historic identity, as evidenced by the survival of physical characteristics that existed during the property's historic or prehistoric occupation or use. If a resource retains the physical characteristics it possessed in the past, it has the capacity to convey information about a culture or people, historic patterns, or architectural or engineering design and technology.

These criteria result in determination of eligibility for listing on the National Register of Historic Places. Applicable research domains in Nevada which establish eligibility for prehistoric sites are defined in documents published by the state of Nevada (Lyneis, 1982) and U.S. Bureau of Land Management (BLM, 1990). Similarly, research domains for historic sites are identified (White et al., 1991).

Compliance with requirements of cultural resource laws and regulations ideally involves four basic steps: (1) identification of cultural resources that could be affected by the proposed action and alternatives, (2) assessment of the impacts or effects of these actions, (3) determination of significance of potential historic properties, and (4) development and implementation of measures to eliminate or reduce adverse impacts. The latter is usually achieved through the establishment of a site-specific data recovery program.

Adverse effects that may occur are those that have a negative impact on characteristics that make a resource eligible for listing on the National Register of Historic Places. Actions that can diminish the integrity, research potential, or other important characteristics of historic property include the following (36 CFR Part 800.9):

- Physical destruction, damage, or alteration of all or part of the property
- Isolating the property from its setting or altering the character of the property's setting when that character contributes to the property's qualification of the National Register of Historic Places
- Introduction of visual or auditory elements that are out of character with the property or that alter its setting
- Transfer or sale of a federally owned property without adequate condition or restriction regarding its preservation, maintenance, or use
- Neglect of a property, resulting in its deterioration or destruction.

Regulations for implementing Section 106 of the National Historic Preservation Act indicate that the transfer, conveyance, lease, or sale of a historic property are procedurally considered to be adverse effects, thereby ensuring full regulatory consideration in federal project planning and execution. However, effects of a project that would otherwise be found to be adverse may not be considered adverse if one of the following conditions exists:

- When the historic property is of value only for its potential contribution to archaeological, historical, or architectural research, and when such value can be substantially preserved through the conduct of appropriate research, and such research is conducted in accordance with applicable professional standards and guidelines

- When the undertaking is limited to the rehabilitation of buildings and structures and is conducted in a manner that preserves the historical and architectural value of the affected historic property through conformance with the Secretary of Interior's Standards for Rehabilitation and Guidelines for Rehabilitation of Historic Buildings

- When the undertaking is limited to the transfer, conveyance, lease, or sale of a historic property, and adequate restrictions of conditions are included to ensure preservation of the property's significant features.

This EIS assumes that site-specific cultural resource evaluations will be conducted for future actions. However, for the purposes of this EIS, probable mitigative actions are summarized for both archaeological and architectural manifestations and are based on standard data recovery procedures established for the NTS.

Both direct and indirect adverse impacts are likely to result from current and proposed DOE activities as defined in this EIS. Direct impacts include ground-disturbing activities as well as alterations to existing, potentially significant historic structures. Indirect impacts may result from increased visitation and vehicular traffic within sensitive areas. While most adverse impacts to cultural resources can be negated through avoidance or mitigation, unavoidable impacts will be incurred at sites where contamination levels preclude archaeological survey, testing, or data recovery. Any cultural resources in these areas would be lost to surface and subsurface disturbance during remediation activities. Unavoidable impacts may also be incurred as a result of illegal artifact collecting. Such impacts may be minimized through educational programs involving NTS workers.

Another way that mitigative projects are made includes comparing a typical year's effort with what might likely occur under the alternatives. During Fiscal Year 1994 (October 1993 to September 1994), 42 cultural resource reconnaissance surveys were conducted and more than 67 archaeological sites were recorded as a result. Data recovery plans were generated for three previously recorded sites and one data recovery project was executed. This level of effort is estimated to be typical under Alternative 1. For alternatives involving increased use of the NTS, no matter what that use might be, the level of effort is likely to be much greater than that documented for Fiscal Year 1994. For Alternative 2, the level of effort is estimated to be much less, although some impacts are still anticipated. These estimates cannot always predict the type or number of sites which may be encountered. Therefore, cultural resource survey and site characterization should be a necessary step for planned activities.

E.2.11 Occupational and Public Health and Safety/Radiation

The methods and assumptions used to analyze human health and risk impacts resulting from the four alternatives are presented in Appendix H. Human health and safety analysis results are also presented in this Appendix.

E.2.12 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on minority populations and low-income populations.

Demographic analysis is the first step in the determination of disproportionately high and adverse human health or environmental effects to low-income and minority populations. This analysis sets the stage for impact analysis.

All program activities described in this EIS are located in Clark, Nye, or Lincoln counties; therefore, the region of influence for Environmental Justice includes these three counties for this sitewide EIS. Census block groups, which are clusters of blocks within the same census tracts, have been delineated for Clark, Nye, and Lincoln counties. Census block groups do not cross county or census tract boundaries and generally contain between 250 and 550 housing units (U.S. Bureau of the Census, 1993).

For the purpose of analysis, low-income populations are individuals living within a census block group whose income is below the poverty level. Households are classified as being below the poverty level if the total family income or unrelated individual income is less than the poverty threshold specified for the applicable family size. For example, the weighted average threshold for a 4-person family is $12,674 for the 1990 census. This reflects the different consumption requirements of families based on their size and composition (U.S. Bureau of the Census, 1994).

The U.S. Bureau of the Census identifies four racial classifications, including (1) white; (2) black; (3) American Indian, Eskimo, or Aleut; and (4) Asian or Pacific Islander. Hispanic is not considered a race by the U.S. Bureau of the Census; it is considered an origin. To determine the number of minorities for each census block group for the purpose of analysis, the white race category, less whites of Hispanic origin, were subtracted from the total census block group population (U.S. Bureau of the Census, 1994).

Within each census block group, percentages are calculated of low-income and minority communities. The denominator used is the tri-county (Clark, Nye, and Lincoln counties) total population of 763,015. To determine whether a census block group percentage is meaningfully larger than other census block group percentages, thresholds (the average absolute deviation from the mean) for low-income and minority communities are determined. To calculate a threshold, the percentage of low-income or minority communities (as compared to the tri-county population) in all census block groups is averaged. The deviation from this mean is determined for each census block group. The absolute value of this deviation is summed for all census block groups and averaged. This becomes the upper and lower limit of the mean. For the purpose of this analysis, the upper limit is the one of interest. If a census block group percentage is larger than the threshold, it is considered a low-income or minority community census block group and is shaded in the figures in Chapter 4.

The mean percentage of minorities in each census block group is 0.07 percent. The deviation from this 0.07 percent is figured for each census block group, the absolute value is determined, and this absolute value for all census block groups is averaged. The absolute value average of the deviation from the mean is 0.06 percent. Therefore, the upper limit for minorities in a census block group is 0.07 percent plus 0.06 percent, or 0.13 percent. Any census block group above 0.13 percent for minorities is considered a minority community.

The same methodology is used for low-income communities. The average of the percentage of low-income population in all census block groups is 0.03 percent. The absolute value average (of the deviation from the mean) is 0.01 percent. Therefore, the upper limit for low-income communities in a census block group is 0.03 percent plus 0.01 percent, or 0.04 percent. Any census block group above 0.04 percent for low-income population is considered a low-income community.

Clark County is subdivided into 318 census block groups. Ninety-one of the census block groups are made up of low-income populations, and 57 census block groups constitute minority communities census block groups. Nye County is divided into 25 census block groups. One census block group has a low-income community above the threshold level percentage, and four census block groups have minority communities above the threshold level percentage. Lincoln County contains eight census block groups. No census block groups in Lincoln County have low-income or minority communities above the threshold level percentages.

Once the locations of areas of low-income and minority communities are determined, the next step is to determine whether the programs discussed in this EIS have disproportionately high and adverse human health or environmental impacts on low-income and minority communities. Environmental Justice analysis involves two types of investigation. One is the determination of significant and adverse impacts. The other is an evaluation of whether a minority or low-income population is disproportionately affected by these significant and adverse impacts. If there are no significant and adverse impacts, then it follows that there would be no significant disproportionately high and adverse impacts experienced by minority and low-income populations.

To determine whether human health effects are adverse and disproportionately high, the following factors are considered:

- Whether the health effects, which may be measured in risks and rates, are significant, unacceptable, and above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death
- Whether the risk or rate of exposure by a minority population or low-income population to an environmental hazard is significant and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population
- Whether health effects occur in a minority population or low-income population affected by cumulative or multiple adverse exposures from environmental hazards.

To determine whether environmental effects are adverse and disproportionately high for low-income and minority communities, the following three factors are considered to the extent practicable:

- Whether there is an impact on the natural or physical environment that significantly and adversely affects a minority community or low-income community
- Whether environmental effects are significant and are having an adverse impact on minority or low-income populations that appreciably exceeds or are likely to appreciably exceed those of the general population or other appropriate comparison group
- Whether the environmental effects occur in a minority population or low-income population affected by cumulative or multiple adverse exposure from environmental hazards.

To determine where the impacts are located with respect to areas of low-income and minority populations, areas of significant and adverse impacts are in the Chapter 4 census block group maps and placed in the Chapter 5 Environmental Justice analysis section. The resulting maps identify where low-income and minority populations and significant and adverse impacts are located. With a geographic information system, an overlay analysis is performed to determine whether the impacts disproportionately affect low-income and minority populations. Disproportionate has been determined to mean 50 percent or more. In other words, if the overlay analysis determines that a significant adverse impact affects 50 percent or more of the areas of low-income populations or 50 percent or more of the areas of minority populations, then this impact is said to disproportionately affect these groups.

E.3 References

REGULATION, ORDER, LAW

36 CFR Part 60.4 — U.S. Department of the Interior (DOI), "Parks/Forest/Public Property: Criteria of Effect and Adverse Effect," *Code of Federal Regulations*, U.S. Government Printing Office, Washington, DC, 1980.

36 CFR Part 800.9 — DOI, "Parks/Forest/Public Property: "Coordination with Agency Requirements Under the National Environmental Policy Act," *Code of Federal Regulations*, U.S. Government Printing Office, Washington, DC, DOE, Parks/Forest/Public Property, 1980.

43 CFR Part 7 — DOI, "Public Lands: Protection of Archaeological Resources," *Code of Federal Regulations*, U.S. Government Printing Office, Washington, DC, 1995.

EO 12898 — Office of the President, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," Office of the President, Washington, DC, 1994.

GENERAL

AASHTO, 1990 — American Association of State Highway and Transportation Officials , *A Policy on Geometric Design of Highways and Streets*, Washington, DC, 1990.

ANSI/ASME, 1983 — American National Standards Institute/American Society of Mechanical Engineers , "Quality Assurance Program Requirements for Nuclear Facilities," NQA-1-1983, 1983.

BLM, 1980 — Bureau of Land Management (BLM), *Visual Resource Management Program*, U.S. Department of the Interior, Washington, DC, 1980.

BLM, 1990 — BLM, *Cultural Resources Inventory General Guidelines*, 4th edition, (revised), U.S. Department of the Interior, Bureau of Land Management, Nevada State Office, Reno, NV, 1990.

Cartwright et al., 1981 — Cartwright, J.V., R.M. Beemiller, and R.D. Gustely, *RIMSII, Regional Input-Output Modeling System*, U.S. Department of Commerce, Bureau of Economic Analysis, Washington, DC, 1981.

DOC, 1992 — U.S. Department of Commerce, *Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II), 1992,* based on Cartwright, J.V., R.M. Beemiller, and R.D. Gustely, *RIMS II, Regional Input-Output Modeling System*, U.S. Department of Commerce, Bureau of Economic Analysis, Washington, DC, 1981.

DOE, 1994	U.S. Department of Energy (DOE), *Yucca Mountain Site Characterization Project Socioeconomic Monitoring Program 1994 U.S. Department of Energy/Nevada Employee Survey Data Report, Executive Summary,* prepared by Science Applications International Corporation for DOE/Yucca Mountain Site Characterization Office, Las Vegas, NV, 1994.
EPA, 1971	U.S. Environmental Protection Agency (EPA), *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances,* NTID300.1, Office of Noise Abatement and Control, Washington, DC, 1971.
Geraghty and Miller, Inc., 1991	Geraghty and Miller, *Quickflow,* Geraghty and Miller, Inc., Reston, VA, 1991.
ICMA, 1982	International City Management Association (ICMA), *Local Government Police Management,* Second edition, B.L. Garmize (ed.), Washington, DC, 1982.
ITE, 1991	Institute of Transportation Engineers (ITE), *Trip Generation, an Information Report,* Fifth edition, Washington, DC, 1991.
King, 1984	King, J.M., "Computing drawdown distributions using microcomputer," *Groundwater,* Vol. 22, No. 6, pp. 780-784, 1984.
Lyneis, 1982	Lyneis, M. (Coordinator), *An Archaeological Element for the Nevada Historic Preservation Plan,* Nevada Division of Historic Preservation and Archaeology, Carson City, NV, 1982.
NDOT, 1993	Nevada Department of Transportation (NDOT), *1993 Annual Traffic Report,* Planning and Program Development, Traffic Section, in Cooperation with the U.S. Department of Transportation, Federal Highway Administration, Carson City, NV, 1993.
NFPA, 1986	National Fire Protection Association (NFPA), *Fire Protection Handbook,* 16th edition, A.E. Coto, P.E. and L.J. Liscville, (eds.), Quincy, MA, 1986.
Nye County Board of Commissioners, 1993	Nye County Board of Commissioners, *Draft Baseline Economic and Demographic Projections: 1990-2010, Nye County and Nye County Communities Draft,* Nye County, NV, 1993.
RSN, 1994	Raytheon Services Nevada (RSN), *Nevada Test Site Technical Information,* prepared for the DOE/NV, Las Vegas, NV, 1994.
Schwer, 1995	Schwer, R.K., *U.S. Economic Outlook 1995,* Center for Business and Economic Research, University of Nevada, Las Vegas, NV, 1995.
Stoffle et al., 1990	Stoffle, R.W., D.B. Halmo, J.E. Olmsted, and M.J. Evans, *Native American Cultural Resource Studies at Yucca Mountain, Nevada,* Institute for Social Research, University of Michigan, Ann Arbor, MI, 1990.

Stoffle et al., 1994	Stoffle, R.W., M.J. Evans, D.B. Halmo, M.E. Dufort, and B.K. Fulfrost, *Native American Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site*. Desert Research Institute Technical Report No. 84, BARA, University of Arizona, Tucson, AZ, 1994.
Strack 1989	Strack, O.D.L., *Groundwater Mechanics*, Prentice Hall, Engelwood Cliffs, NJ, 1989.
Tetra Tech, Inc., 1995	Tetra Tech, Inc., *Traffic Counts and Observations of Traffic Characteristics at the Mercury Gate by Tetra Tech, Inc. Personnel on March 23, 1995*, San Bernardino, CA, 1995.
U.S. Bureau of the Census, 1993	U.S. Bureau of the Census, *TIGER/Line Census Files, 1992*, Technical Documentation, U.S. Department of Commerce, Washington, DC, 1993.
U.S. Bureau of the Census, 1994	U.S. Bureau of the Census, *County and City Data Book 1994*, U.S. Department of Commerce, Bureau of the Census, Washington, DC, 1994.
White et al., 1991	White, W.G., R.M. James, and R. A. Bernstein, *Nevada Comprehensive Preservation Plan*, Nevada Department of Conservation and Natural Resources, Division of Historic Preservation and Archeology, Carson City, NV, 1991.
Wright and Green, 1987	Wright, D.S., and G.D. Greene, "An Environmental Impact Assessment of Methodology for Major Resource Development," *Journal of Environmental Management*, Vol. 24, pp. 1-16, 1987.

Appendix F

PROJECT-SPECIFIC ENVIRONMENTAL ANALYSIS

APPENDIX F
PROJECT-SPECIFIC ENVIRONMENTAL ANALYSIS

This project-specific environmental analysis is intended to complete the National Environmental Policy Act requirements for the Big Explosives Experimental Facility. It evaluates the potential environmental, health and safety impacts of Alternative 3, "Expanded Use of the Facility," and Alternative 1, "Continue Current Operations."

F.1 Introduction

Lawrence Livermore National Laboratory and Los Alamos National Laboratory act for the U.S. Department of Energy (DOE) under the aegis of the Nevada Test Site (NTS) Joint Test Organization. These laboratories are involved in bunker certification activities in support of the proposed hydrodynamic and pulse power testing at the Big Explosives Experimental Facility at the NTS. These tests are currently limited to the aboveground detonations of conventional high explosives and munitions with charges up to 3,629 kilograms (kg) (8,000 pounds [lb]) each. Lawrence Livermore National Laboratory and Los Alamos National Laboratory propose to expand the use of this facility to include testing of advanced technologies in support of the DOE Defense Program's stockpile stewardship, counter-proliferation, and work for others efforts. The expanded use of the Big Explosives Experimental Facility would involve large experimental systems and high-explosive charges up to 31,751 kg (70,000 lb) each. Experiments could contain potentially hazardous materials, such as beryllium, depleted uranium, deuterium, and tritium. No experiment that contains special nuclear materials as defined by the Atomic Energy Act of 1954 would be performed at the facility.

Alternative 3 (Expanded Use) and Alternative 1 (Continue Current Operations) and their associated potential impact are addressed in this project-specific environmental analysis. Under Alternative 1, the Big Explosives Experimental Facility would continue to be used for ongoing certification tests and shaped charge research, development, and demonstration activities with high-explosive charges up to 3,629 kg (8,000 lb) each; no beryllium, depleted uranium, deuterium, or tritium would be used.

F.2 Purpose and Need for Action

With the end of the Cold War, the DOE's Defense Program efforts are shifting from the development of new nuclear weapons to the difficult problem of maintaining the safety, reliability, and performance of the enduring stockpile, as well as the challenging task of developing the technologies for rendering safe potentially stolen United States stockpile nuclear weapons, nuclear weapons fielded by proliferant states, and nuclear threats from terrorist organizations. With the moratorium on underground nuclear testing, the Nation is pursuing alternative, science-based approaches to stewarding the enduring stockpile. As the numerically reduced stockpile ages, new issues emerge that are different, and in many ways more challenging than those involved in designing and testing the systems in the first place. Computational tools, appropriate for the initial design of nearly ideal systems, must be improved to address these new challenges. Further, experimental data from a variety of high energy density physics experiments are needed to validate the improved computational models.

The complement to effective stewardship of the United States' enduring stockpile is the ability to safely address the worldwide threat posed by stolen, proliferated, or improvised nuclear devices. Modern United States' nuclear weapons have sophisticated safety features and are small in size compared to nuclear weapons of 50 years ago. Consequently, their disablement is straightforward and certain in most cases. Proliferant countries and terrorist organizations, however, are likely to produce nuclear weapons that are large, unstable and, therefore, difficult to render safe with certainty. The purpose of this DOE action is to develop technologies that provide experimental data for validation of modern computer codes and technologies that could safely neutralize the nuclear weapons that could be produced by proliferant countries and terrorist organizations. The Big Explosives Experimental Facility would fulfill this need by providing a facility for very large explosively powered physics experiments, and the capacity to conduct hydrodynamic testing of proposed render-safe technologies against simulated nuclear devices where large amounts of conventional high explosives might be involved. The facility currently has diagnostic equipment sophisticated enough to provide this scientific data and a sufficient proof of destruct in the absence of underground nuclear testing.

F.3 Description of the Alternatives

Alternative 3, Expanded Use, and Alternative 1, Continue Current Operations, are described in the following sections.

F.3.1 Alternative 3

Alternative 3 would allow for the expanded use of the Big Explosives Experimental Facility to include hydrodynamic testing and pulse power experiments using high-explosive charges up to 31,751 kg (70,000 lb) each. These experiments would contain potentially hazardous materials such as beryllium, depleted uranium, deuterium, and tritium. Such testing would further the technologies required to support the DOE Defense Program's stockpile stewardship, counterproliferation, and work for others efforts. No experiment that contains special nuclear materials (as defined by the Atomic Energy Act of 1954) would be performed at the Big Explosives Experimental Facility.

F.3.1.1 Location. The Big Explosives Experimental Facility is located in north-central Area 4 of Yucca Flat, a site associated with atmospheric nuclear testing and nonexplosive nuclear research at the NTS (Figure F-1). The site contains seven underground structures associated with atmospheric testing, one set of unidentified stanchions that might have been associated with atmospheric testing, the Bare Reactor Experiment Nevada Tower foundations and stanchions, and a "Japanese Village" mock-up. Although these structures were abandoned when aboveground nuclear testing was halted, two of the underground structures, bunkers 4-300 and 4-480, are currently being used as part of the complex.

F.3.1.2 Bunkers 4-300 and 4-480. Bunkers 4-300 and 4-480 are part of the Big Explosives Experimental Facility. The bunkers house modern hydrodiagnostic testing equipment for use during detonations of very large, conventional high-explosive charges and devices (Wobser, 1994). The bunkers have upgraded electrical, lighting, and ventilation systems; optical ports; and electronic control conduits. The facility has the capability to support many of the sophisticated diagnostics techniques needed for the evaluation of hydrodynamic and pulse power experiments containing large amounts of high explosives. The facility is designed and has been modified in full compliance with applicable building codes and DOE orders and requirements (Bevers, 1994).

Bunker 4-480 is designed to contain up to five helium or nitrogen-gas-driven rotating-mirror framing cameras, one (or more) laser-illuminated image-converter camera, one (or more) continuous-rotating-mirror framing camera, one (or more) streaking camera, and one (or more) infrared imaging camera in various combinations. This bunker is equipped with five camera stands and five corresponding optical ports with access to the 20-meter (m) x 20-m (66-foot [ft] x 66-ft) area gravel firing pad. Bunker 4-300 contains three rooms: the control room, the laser room, and the utility room. The control and utility rooms were modified to house the diagnostic and firing control electronics, digitizers, electronic recording equipment, and other electronic equipment necessary for hydrodynamic and pulse power experiments. The laser room was modified to accommodate a pulsed Ruby laser for image-converter camera illumination and a laser for multibeam Fabry-Perot velocimetry. Both bunkers are shown in Figure F-2.

In the future, experiments of larger scale and more complexity may be proposed in support of both the stockpile stewardship and render-safe missions. These experiments would require sophisticated, advanced diagnostic techniques and may involve

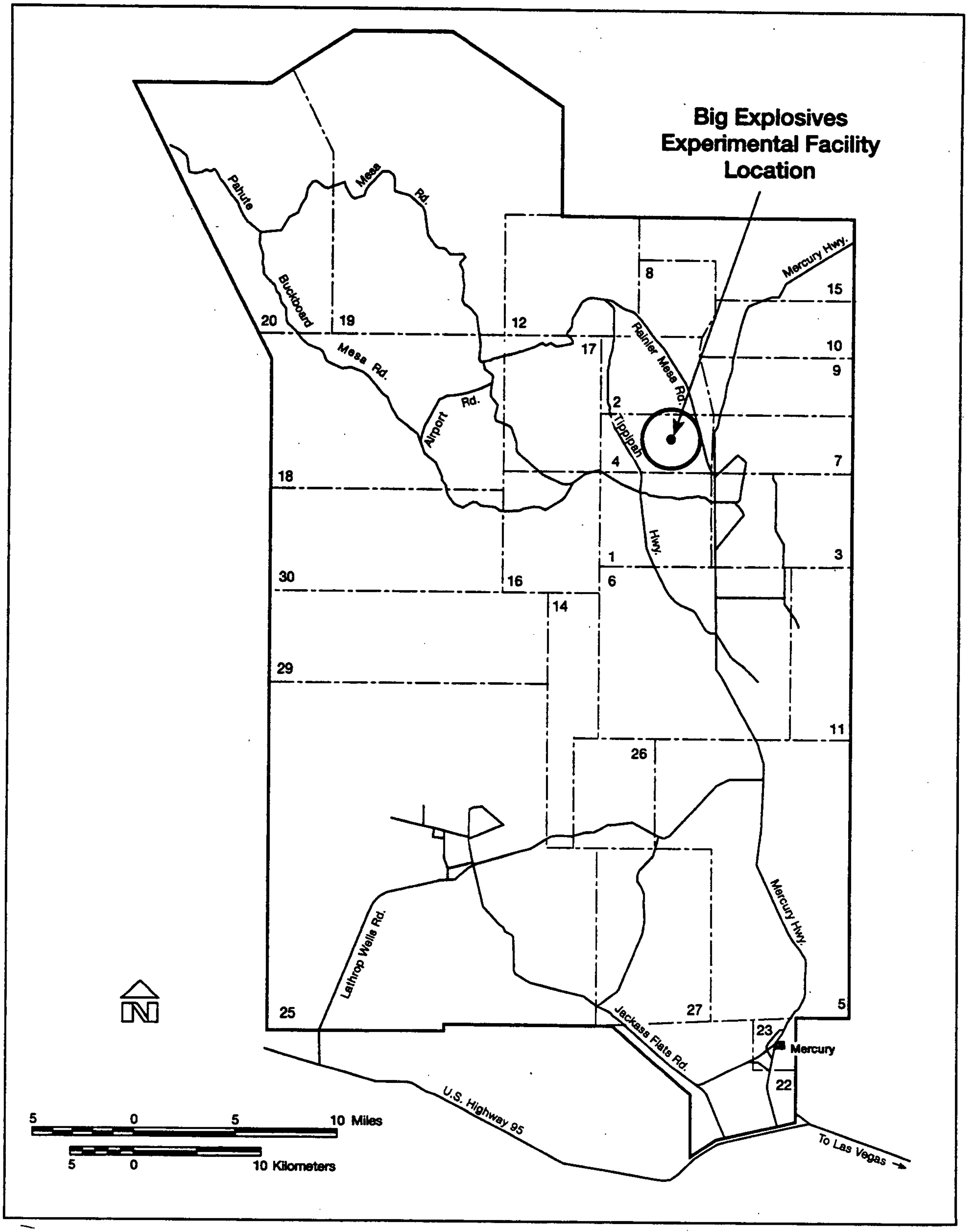


Figure F-1. Location of Area 4 at the NTS showing the Big Explosives Experimental Facility location

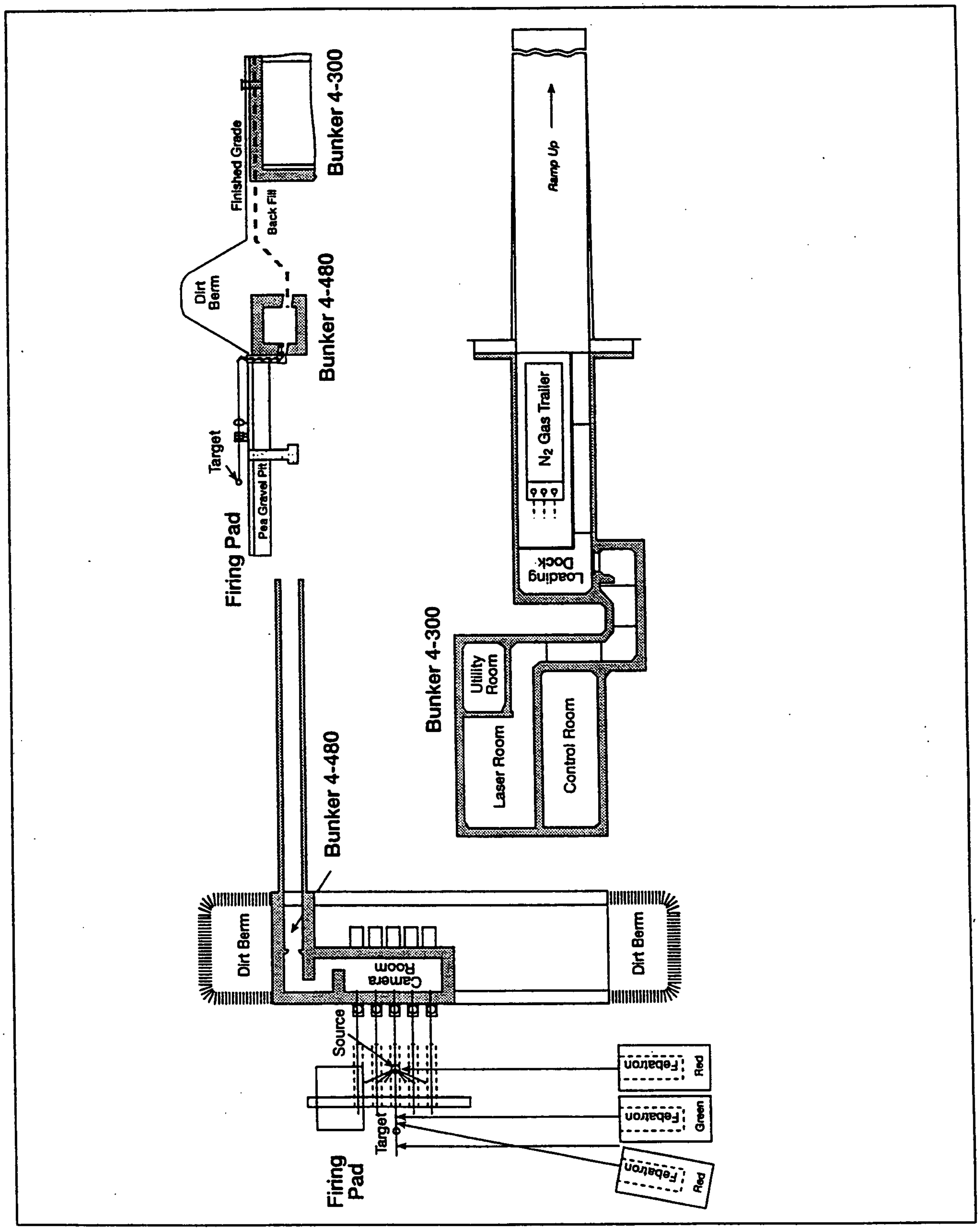


Figure F-2. Layout and orientation of the Big Explosives Experimental Facility, including bunkers 4-480 and 4-300 and firing pad advanced pulse power techniques as well. Specific diagnostic and pulse power equipment may require additional bunker/shelter space near the firing location. Future experiments may also require recording to a large number (several hundred) of electronic and optical data channels; an expanded, suitably sheltered recording station may also be required. Additional shelters and blast-shields may be temporary or permanent and constructed of native soil as earth berms or steel and sandbag structures. Additional bunker space, if needed, would be reinforced concrete construction, buried or earth covered, in a manner virtually identical to bunkers 4-480 and 4-300.

F.3.1.3 Firing Table and Surroundings. The Big Explosives Experimental Facility contains an approximately 20-m x 20-m (66-ft x 66-ft) firing table within the graded area west of the bunkers. The firing table consists of pea gravel 1.8 m (6 ft) to 2.4 m (8 ft) deep. Three large (3 m [10 ft] in diameter and 6-m [20-ft] long) steel cylinders are placed outside the bunkers near the firing pad to house 2.3-million-electron volt Febetron X–ray sources for high-energy X-ray radiography. Hycam recorders and video monitors are placed around the firing area to monitor aboveground activity and the experimental performance of the test devices. The area surrounding the bunkers is graded with new earthen berms that provide blast protection and shield from radiation, and with a downrange projectile stop. The Big Explosives Experimental Facility has a perimeter security fence, approximately 222 m x 480 m (728 ft x 1,575 ft), with a guardhouse to provide security and access control.

F.3.1.4 Operation. Approximately 100 research and diagnostic experiments would be conducted annually at the Big Explosives Experimental Facility. Quantities of high explosives expended in tests would range from 0.5 kg (1 lb) each to 31,751 kg (70,000 lb) each. The firing table configuration may be modified (i.e., extended or deepened) for certain experiments that involve very large high-explosive masses or unusual circumstances. The experiments would continue ongoing hydrodynamic testing and include applications of shaped-charge technology. Advanced technologies would also be pursued. Some of these tests would typically involve some components of beryllium and depleted uranium. Some tests would involve deuterium and or tritium. However, the quantities of these potentially hazardous and radioactive materials would be limited. The maximum quantities of these materials would be 120 kg/yr (265 lb/yr) of beryllium; 1,202 kg/yr (2,650 lb/yr) of depleted uranium; 200 milligram (mg) per year (mg/yr) (4.4×10^{-4} lb/yr) of deuterium; and 200 mg/yr (2,000 curies per year [Ci]/yr) of tritium. Tritium would be used in approximately 10 of the 100 tests per year; but no more than 100 mg (1000 Ci) per test would be used.

Table F-1 shows the estimates of annual material usage during Big Explosives Experimental Facility operations. Most of this material would be dispersed in the form of solid debris that either would be recovered after the test or would be deposited in the firing table gravel (which is periodically removed and replaced) (Section F.5.2.5). Because the experiments would be conducted outdoors, the remainder of the material would be, for the most part, dispersed to the environment (primarily as metal or oxides). The materials listed on Table F-1 are, therefore, an indication of what would constitute the maximum annual source terms for waste streams and/or emissions that would likely result from conducting approximately 100 tests per year.

F.3.1.4.1 Pretest and Test Activities—Storage and assembly of high-explosives charges for the Big Explosives Experimental Facility Operations would be provided in Sandia National Laboratories' Warehouse No. 8, located in Zone 2, Area 6 of the NTS (or its equivalent). Warehouse No. 8 is an approved facility for the storage of high-explosive charges used in support of the DOE-laboratory testing activities. The high-explosive device would be assembled at the Baker Site in Area 27, an NTS high-explosive and nuclear assembly area.

High-explosive devices would be transported from Warehouse No. 8 to the Baker Site, and then to the Big Explosives Experimental Facility. Under security guard, high-explosive charges would likely remain on the firing table at the facility until preparations for the experiment were completed and the high explosive was detonated.

Table F-1. Estimated materials usage for the Big Explosives Experimental Facility operations

Material	Estimated usage per year			
	Alternative 1 (Continue Current Operations)[a,b]		Alternative 3 (Expanded Use)[a,b]	
	kg	lb	kg	lb
Barium[c]	0.022	0.044	0.022	0.044
Beryllium[d]	0	0	120	265
Chromium[c,e]	6.9	15.2	6.9	15.2
Cobalt	0.01	0.02	0.01	0.02
Copper[f]	1,200	2,650	7,200	15,900
Fluoride salts	3.6	7.9	3.6	7.9
Lead[c]	4.1	9.0	4.1	9.0
Molybdenum	1,200	2,650	1,200	2,650
Nickel[e]	8.6	19.0	8.6	19.0
Silver[c]	120	265	120	265
Vanadium	3.6	7.9	3.6	7.9
Zinc	0.1	0.2	0.1	0.2
Lithium salts	22.6	49.8	22.6	49.8
Depleted uranium[d,g]	0	0	1,200	2,650
Explosives	226,800	500,000	453,600	1,000,000
Deuterium[d,h]	0	0	0.0002	0.0004
Tritium[d,h]	0	0	0.0002	0.0004
Tantalum	120	265	120	265

[a] Projected usage based on the estimated composition of 100 tests
[b] Only a very small fraction of the weights of the metallic materials and salts listed in this table would be expected to be volatilized as gaseous or aerosol products
[c] These materials are potentially hazardous and their use could lead to the generation of mixed waste when radiological materials are also present. These materials would be used only in those rare instances where suitable replacement materials cannot be found to meet programmatic requirements
[d] Beryllium, depleted uranium, deuterium, and tritium would be present in experiments only under Alternative 3; they would be absent under Alternative 1
[e] Chromium and nickel sources are primarily alloy materials and nickel on test hardware, such as nuts and bolts. Following an experiment, most of this material would be large enough to be retrieved by hand and can be either disposed of in a managed waste stream or recycled
[f] Copper source is partially electrical leads and wire. Most pieces of this material would be large enough to be retrieved by hand following an experiment and can be either disposed of in a managed waste stream or recycled
[g] In rare instances, thorium may be used in place of depleted uranium
[h] This projection is based on an estimated maximum of 10 tests per year.

Transport, handling, and testing of high-explosive devices would be conducted by trained and experienced NTS, Los Alamos National Laboratory, and Lawrence Livermore National Laboratory personnel in accordance with all federal and state regulations, DOE orders, *The DOE Explosives Safety Manual* (DOE, 1991), and the DOE-approved test plans and procedures to ensure safe handling and testing of high-explosive materials.

Nonexplosive support fixtures and apparatus needed for the test assemblies would be assembled at the facility and set up on the firing table. This apparatus often includes heavy foundations or shot stands to support the explosive experiment, armored radiographic film cassettes, heavy-steel momentum-transfer plates, mild-steel and wooden shrapnel shields, glass optical turning mirrors and mounting hardware, expendable capacitor discharge units, high-pressure gas-filled devices, and other special diagnostic equipment. Much of this apparatus is expended in the test. Motor-driven cranes and forklifts may be used to move both the inert apparatus and the explosives, if needed. Strict administrative controls would be applied to restrict personnel movement and location while certain of these set-up operations are conducted.

When other equipment has been readied, the explosives-containing assembly would be brought by truck to the firing table from its assembly point at the Baker Site or from an explosives storage magazine and carefully set in position; only essential personnel would be in attendance. System checks, in the form of "dry runs," would be performed to show that all electrical and mechanical systems had been properly installed and connected and to verify that proper time delays between individual events had been programmed.

When all dry-run testing is complete, the site would be secured. Personnel would be assembled and accounted for ("mustered") within the protected control room (bunker 4-300), and the experiment would be conducted. During testing, the muster control distance for any noninvolved worker could be up to 8,534 m (28,000 ft) from the firing table, depending on the size of the high-explosive charge.

F.3.1.4.2 Post-Test Activities—Experiments would be electronically and optically monitored by the Big Explosives Experimental Facility bunker supervisor and test personnel from the protected control room in bunker 4-300. After an experiment that does not involve radioactive materials, television cameras would survey the firing table for burning debris. Fires would be quenched by a short-duration water washdown or allowed to self-extinguish. When entry to the firing table is permissible, qualified explosives handlers (using breathing protection, if necessary) would reenter. Any smoldering materials or unreacted explosives would be rendered safe so that others could enter. Diagnostics data would be collected, and the firing table would be cleaned in preparation for the next experiment.

Tests involving components containing tritium would be administratively limited to 100 mg (1,000 Ci) tritium each; it is estimated that a maximum of 10 such tests per year would be performed (a maximum of 200 mg [2,000 Ci] of tritium per year). After an experiment, re-entry to the firing table would be delayed until tritium levels were deemed acceptable for re-entry. Re-entry scheduling would also depend on the levels of any other residual radiation, the intensity of which would be monitored during and after an experiment.

F.3.2 Alternative 1

Under Alternative 1, the DOE Defense Program would continue ongoing certification tests and shape charge research, development, and demonstration activities with aboveground detonations of high explosive charges up to 3,629 kg (8,000 lb) each. The facility configuration (Sections F.3.1.1 through 3.1.3), pretest and test activities (Section F.3.1.4.1) and post-test activities (Section F.3.1.4.2) would also apply to Alternative 1, except no beryllium, depleted uranium, deuterium, or tritium would be used. Estimates of annual material usage at the Big Explosives Experimental Facility under Alternative 1 are presented in Table F-1. The DOE would continue to develop render-safe technologies. However, without the use of beryllium, depleted uranium, and tritium to provide realistic threat-nuclear-device and without the ability to develop and test technologies requiring greater than 3,629 kg (8,000 lb) of conventional high explosives, the confidence in the proof of destruct and, therefore, the efficacy of new render-safe technologies might be seriously degraded.

F.4 Description of the Affected Environment

A brief description of the affected environment surrounding the Big Explosives Experimental Facility as it relates to the scope of Alternative 3 is presented in this section. Detailed descriptions can be found in Chapter 4 of this Environmental Impact Statement (EIS).

F.4.1 Topography, Geology, and Soils

Area 4 is located within the northern half of Yucca Flat, an (350-square kilometers [km^2] [135 square mile (mi^2)]) oval-shaped bolson (a basin with no outlet) located in the northeastern corner of the NTS. The area is mostly flat and gently slopes upward from east to west. Average elevation is approximately 1,280 m (4,200 ft). Sediments in this area are mostly alluvial because tributary streams erode the surrounding mountains and deposit sediments in Yucca Flat. The majority of these sediments in this area have been disturbed by human use.

F.4.2 Seismicity

The Big Explosives Experimental Facility is located in a region that has experienced seismic activity within historical times. Yucca Fault in Yucca Flat has been active within the last few thousand to tens of thousands of years.

F.4.3 Climate and Air Quality

Area 4 has a desert climate. Annual mean precipitation is approximately 152 millimeters (mm) (6 inches [in.]), most of which falls between October and April during major winter storms. Strong, persistent winds are characteristic of the site. In Yucca Flat, the average annual wind speed is 11 kilometers per hour (kph) (7 miles per hour [mph]). The prevailing wind direction during the winter months is north-northeasterly, and during the summer months is south-southeasterly.

The NTS region is designated as attainment for criteria pollutants under the National Ambient Air Quality Standards. Criteria pollutants include carbon monoxide, lead, oxides of nitrogen, ozone, particulate matter 10 microns or smaller (PM_{10}), and oxides of sulfur. Fugitive dust (PM_{10}) generated from the various programmatic construction activities at NTS includes 1,422 tons/yr from Defense Program activities, 4 tons/yr from waste management activities, 219 tons/yr from environmental restoration activities, and 180 tons/yr from site support activities. The total Nye County fugitive dust emissions are 866,400 tons/yr.

The NTS criteria pollutant emissions from mobile sources include 240 tons/yr carbon monoxide, 33 tons/yr volatile organic compounds, and 43 tons/yr nitrogen oxides. The Nye County criteria pollutant emissions from mobile sources include 571 tons/yr carbon monoxide, 82 tons/yr volatile organic compounds, and 135 tons/yr nitrogen oxides.

F.4.4 Hazardous Air Pollutants

Toxic air contaminants are subject to the National Emission Standards for Hazardous Air Pollutants. National Emission Standards for Hazardous Air Pollutants standards pertaining to operations at the Big Explosives Experimental Facility are those for beryllium and radionuclides.

Using the 1993 data for release of radionuclides from NTS operations, the maximum boundary dose to a hypothetical individual who remains continuously during the year at the NTS boundary located 60 km (37 mi) south-southeast of Area 12 tunnel ponds would have an effective dose equivalent of 4.8×10^{-3} millirem (mrem). This is below the National Emission Standards for Hazardous Air Pollutants standard of 10 mrem per year, and well below the natural background radiation to individuals of 382 mrem per year.

F.4.5 Surface and Groundwater Hydrology

No surface sources of water exist at the site. The depth to the water table under Yucca Flat is approximately 366 m (1,200 ft) (see Chapter 4, Section 4.1.5 of the NTS EIS). The Big Explosives

Experimental Facility firing table gravel is periodically removed and replaced (Section F.5.2.5); the percolation of metal residue to groundwater is not expected.

F.4.6 Vegetation

Vegetation of the area is dominated by rabbitbrush, cheatgrass, and other grasses. Desert thorn is an important associate. No plants that have been listed as threatened or endangered are known to occur at the NTS.

F.4.7 Wildlife

Fauna observed in the field is limited to jackrabbits, lizards, and various birds. The area is approximately 26 km (16 mi) north of the desert tortoise habitat (see Section 4.1.6 of this EIS).

F.4.8 Cultural Resources

Bunkers 4-300 and 4-480 are identified as historic structures and are potentially eligible for the National Register of Historic Places because of their association with the atmospheric nuclear testing period at the NTS. Coordination with the State Historic Preservation Officer (SHPO) and an evaluation of potential effects that would result from the modification and operation of the bunkers have been conducted. This evaluation showed that the modifications done on the bunkers and their ongoing operations would not adversely impact the bunkers.

One additional property exists that has been identified as a potential historic structure because of its association with the Bare Reactor Experiment Nevada Tower. This property consists of a grouping of three wood-frame structures and is referred to as the "Japanese Village." The village is located approximately 676 m (2,218 ft) east of the bunkers along Road 4-04. These structures have experienced severe weather-related deterioration; however, they have been hardened with steel structural plates to withstand a peak over-pressure of 70 g/cm^2 (1 lb/in.^{2}). The tower has since been relocated to Area 25 of the NTS. Further details concerning the cultural, archaeological, and biological resources of the site are provided by Johnson et al. (1994).

F.4.9 Floodplains and Wetlands

No floodplains or wetlands exist within or near the Big Explosives Experimental Facility.

F.4.10 Noise

Existing chronic noise sources at or near the Big Explosives Experimental Facility include vehicular traffic, heating, ventilating, and air conditioning equipment. Acute sources are limited to explosives testing (up to 140 decibels [dB] at the bunkers). Background noise levels are generally low, ranging from 50 dB to 70 dB.

F.5 Potential Effects of Alternative 1 and Alternative 3

In the sections that follow, the environmental impacts of Alternative 1 and Alternative 3 are described and compared.

F.5.1 Alternative 1

Under Alternative 1, the Big Explosives Experimental Facility would continue to be used for certification tests and shaped-charge research, development, and demonstration activities with high-explosive charges up to 3,629 kg (8,000 lb) each. A total of 100 shots per year would consume approximately 226,796 kg (500,000 lb) of high explosives. No beryllium, depleted uranium, deuterium, or tritium would be used. There would be no increased levels of generation of low-level or mixed wastes. Because Alternative 1 represents the levels of current ongoing operations, the facility would not contribute any incremental emissions or waste generation. The DOE would continue its present level of ongoing missions to support development of render-safe technologies.

F.5.2 Alternative 3

The following section describes the potential environmental impacts that would occur under Alternative 3. These impacts have been included in determining the cumulative impacts associated with Alternative 3.

F.5.2.1 ***Construction-Related Effects.*** Potential construction-related impacts associated with modification of the firing table and construction of bunkers would include increased fugitive dust, noise, and temporary on-site traffic disruptions from the use of earth-moving equipment. Fugitive dust emissions would be mitigated by spraying water on the roads and on the exposed piles of excavated soils. Workers would wear appropriate ear protection to reduce noise impacts. Traffic disruptions would be kept to a minimum by limiting other nonconstruction-related activities. The area within the perimeter of the Big Explosives Experimental Facility has previously been disturbed, and there are no foreseeable cultural or natural resources that would be impacted by the construction activities.

F.5.2.2 Noise and High-Explosive Weight Limits. Meteorological conditions at the Big Explosives Experimental Facility are monitored before each test so that noise levels can be projected and a minimum "stay-out" zone surrounding the firing table for safe operation can be determined. On previous tests performed at the facility, noise levels were monitored for each detonation at stations placed at various distances from the high-explosive charges and at stations within the bunkers (Bevers, 1994). The results of these noise-monitoring activities demonstrated that noise levels from explosives testing for up to 3,538 kg (7,800 lb) of trinitrotoluene (TNT) placed 8 m (27 ft) from bunker 4-480 did not exceed 140-dB within bunker 4-300, which would be manned during normal operations. The 140-dB limit has been adopted by the U.S. Department of Defense Explosives Safety Board *(Air Force Design Manual)* and is also an Occupational Safety and Health Administration limit. Traffic and NTS personnel would be prevented from entering within a radius between 500 m and 8,534 m (1,640 ft and 28,000 ft) from the high-explosive charges; the size and predicted noise levels of the test would determine the radius of exclusion.

All explosive experimental testing at the Big Explosives Experimental Facility would be carried out on the 20-m x 20-m x 1.8-m to 2.4-m (66-ft x 66-ft x 6-ft to 8-ft) deep gravel firing table in order to minimize dust uplift, dispersal of soil contaminants, and coupling of ground shocks to the surrounding structures. A 31,751 kg (70,000 lb) high-explosive detonation could form a crater 15 m (50 ft) in diameter and 3 m (10 ft) in depth. Therefore, the firing table would be modified (extended beyond 20 m [66 ft] from bunker 4-480) so that detonation of this size would not penetrate ground soils.

Additionally, high-explosive charge-weight versus distance limits would be established for safe, manned operation of the facility. Testing of a given high-explosive charge size and configuration would be performed while keeping the blast over-pressure, ground shock, and noise levels well within the envelope of the facility design criteria. Within a large margin of safety, the facility is designed to withstand the effects of 454 kg (1,000 lb) of high-explosives detonated 4.6 m (15 ft) from the outer wall of bunker 4-480, or 2,268 kg (5,000 lb) of high explosive detonated 8.2 m (27 ft) from the outer wall of bunker 4-480. Based on standard engineering principles, these design criteria, and the size of the firing table, an effective upper limit can be determined for the size of the high-explosive charge that could be detonated at the Big Explosives Experimental Facility. If the maximum distance from the outer wall of bunker 4-480 to the end of the gravel firing table is 20 m (65 ft), then the largest high-explosive charge that could be detonated at the Big Explosives Experimental Facility in its present configuration would be 31,751 kg (70,000 lb).

F.5.2.3 ***Air Emissions.*** Air emissions from the Big Explosives Experimental Facility were estimated based on material usage data (Table F-1), the total quantities of high explosives detonated, and applicable emission factors. Most of these materials would be dispersed as solid debris that could be recovered after the test or would be deposited in firing table gravel. Because the experiments would be conducted outdoors, some fraction of these materials would be dispersed to the environment as metal or oxides. Detonation products of the high explosives and high-explosive binders, however, would be dispersed to the air.

These projected emissions of high-explosive detonation products are presented in Table F-2. These emissions from the Big Explosives Experimental Facility are small when compared to the overall NTS and Nye County emission levels. In order to estimate a percentage increase from ongoing NTS and Nye County emissions due to the expanded Big Explosives Experimental Facility operations, it was assumed that Alternative 1 represents no increase above current levels of emissions (those from ongoing NTS operations). Therefore, increase in air emissions under the expanded use would be the difference between columns 2 and 4 of Table F-2. For example, incremental carbon monoxide emissions would be the difference between 3,311 kg/yr (7,300 lb/yr) and 1,678 kg/yr (3,700 lb/yr), or 1,633 kg/yr (3,600 lb/yr). This incremental increase in carbon monoxide emissions (due to proposed facility operations) of 1,633 kg/yr (3,600 lb/yr) is small compared to the NTS carbon monoxide emissions of 217,724 kg/yr (480,000 lb/yr) and Nye County carbon monoxide emissions of 517,095 kg/yr (1,140,000 lb/yr). Therefore, Alternative 3 represents less than an approximate 1-percent increase in NTS carbon monoxide emissions and an approximate 0.3-percent increase in Nye County carbon monoxide emission levels. Similarly, the incremental 1,633 kg/yr (3,600 lb/yr) volatile organic compound emissions represents a 7-percent increase in NTS volatile organic compound emissions and a 3-percent increase in Nye County emission levels. The carbon dust and soot increment of 1,451 kg/yr (3,200 lb/yr) would be small compared to the NTS and Nye County emissions of fugitive dust of approximately 1,825 tons/yr and 866,400 tons/yr, respectively. Hence, the expected emissions from proposed activities in the facility would represent a minor increase in air emission levels from the NTS site. Beryllium and radionuclide emissions are subject to National Emission Standards for Hazardous Air Pollutants standards. Most of the beryllium would be contained within the firing table as metal or oxide. Most of the depleted uranium, however, would be volatilized as metal oxide. It is conservatively estimated that the depleted uranium peak concentrations after a detonation would be 2.5×10^{-4} micrograms per cubic meter ($\mu g/m^3$) (1×10^{-5} micrograms per cubic foot [$\mu g/ft^3$]). In contrast, the Derived Concentration Guide (a calculated concentration of radionuclides that could be continuously consumed or inhaled and not exceed the DOE primary radiation protection standard to the public of 100-mrem-per-year effective dose equivalent) for depleted uranium is 0.3 $\mu g/m^3$ (0.01 $\mu g/ft^3$).

The radioactive air emission of potentially greatest impact is tritiated water. On approximately 10 tests per year, tritium may be used. On some of these 10 tests, the tritium content may be as high as 100 mg (1,000 Ci). The total tritium usage would be administratively limited to 200 mg (2,000 Ci) per year. It is assumed that, as a worst case, all tritium would be converted to tritiated water. Of the maximum of 1,000 Ci of tritium that could be present on the firing table, 99 mg (990 Ci) (99 percent) is expected to result in tritiated water vapor, and 1 mg (10 Ci) (1 percent) would condense on the steel supports, gravel, equipment, and debris at the firing table. (See Section F.5.2.4 for discussion of exposures to ionizing radiation.) Airborne emissions of radionuclides and hazardous air pollutants would comply with the National Emission Standards and Hazardous Air Pollutants compliance and reporting requirements.

F.5.2.4 Exposure to Radionuclides. Detonations at the Big Explosives Experimental Facility could involve radioactive materials such as tritium, depleted uranium, and, on some tests, thorium. Furthermore, certain test configurations could occasionally generate small quantities of neutrons, which could result in radioactive neutron-activation products. To estimate the radionuclide exposure to the workers and the public, a worst-case scenario was assumed for considering dispersal of the airborne tritium (tritiated water), depleted uranium, and neutron activation products. This scenario is defined by the use of only 2,268 kg (5,000 lb) of high explosives. This amount of high explosives will give the smallest plume height and, therefore, the largest dose closest to the firing point. The high explosive is assumed to be TNT, which is less energetic than many other forms of high explosives and, therefore, produces the least plume rise. It is further assumed that the firing of the high explosives would be done under relatively calm

Table F-2. Estimated air emissions from detonation of high explosives at the Big Explosives Experimental Facility

Material	Estimated emissions[a]			
	Alternative 1 Continue Current Operations		Alternative 3 Expanded Use	
	kg/yr	lb/yr	kg/yr	lb/yr
Carbon monoxide	1,678	3,700	3,311	7,300
Volatile organic compounds	1,633	3,600	3,266	7,200
Nitrogen oxides	998	2,200	1,950	4,300
Fugitive emissions[b]	1,451	3,200	2,903	6,400

[a] Projected air emission dispersals per year is based on the estimated composition of 100 tests/yr

[b] Carbon dust and soot.

wind-speed conditions, which result in less dispersion and higher plume centerline radiological concentration as the detonation cloud moves downwind.

The dose versus downwind distance results from the application of the HOTSPOT code are given in Table F-3. This worst-case scenario gives the maximum potential effects from the airborne radionuclides. All other scenario conditions would yield doses that are less than those given in Table F-3. Based on the collective effective dose equivalent for 10 shots per year for 30 years, the excess cancer fatality rate to the on-site maximally exposed individual would be 1.7×10^{-4} (approximately 2 in 10,000 chance of fatal cancer per year over a 30-year exposure). An off-site maximally exposed individual at a distance of 50 km (31 mi) from the Big Explosives Experimental Facility would have an excess cancer fatality rate of 4.6×10^{-7} (approximately 5 in 10 million chance of fatal cancer per year over a 30-year exposure).

It is assumed that after each such test, as many as 3 involved facility-area workers would spend 2 to 6 hours per day and up to 2 days at the firing table. To obtain the worst-case potential exposure estimate, it was assumed that 10 Ci of tritium and all activated products would be evenly distributed in an area of 0.5 km (0.31 mi) in radius. The workers would wait until residual radiation levels are safe for reentry (1 to 7 days). Maximum potential exposure to facility-area workers is presented in Table F-4. Based on this analysis, the collective dose to workers at 0 km (0 mi) and workers at a 3.5-km (2.2-mi) distance would result in a probability of excess cancer fatality of 4.3×10^{-4} (4 in 10,000 chance of fatal cancer per year over a 30-year exposure). Any airborne dispersal of activated products would be minimal and well below the DOE guideline of 5 rem per year and natural background radiation of 382 mrem per year.

F.5.2.5 ***Waste Effluents***. The proposed action would result in the generation of low-level waste and/or mixed waste. Conservative estimates are that one 36 m^3 (1,280 ft^3) transportainer of shot or test debris and four 2.5 m^3 (90 ft^3) gravel boxes would be generated as low-level waste from each test. This estimate assumes that low-level waste would be generated from all tests, including tests without any radiological components, because of some activation products remaining from previous tests with radionuclides. Mixed waste generation is expected from the proposed action because of the use of hazardous materials and radionuclides listed in Table F-1. Conservative estimates are that 4.5 m^3 (160 ft^3) of mixed waste would be generated from

Table F-3. Potential impacts from maximum potential exposure to tritium emissions

Distance		CEDE[a] (rem/test)[b]	Excess cancer fatalities to an MEI per year[c]
km	mi		
3.5	2.2	7.06×10^{-3}	1.7×10^{-4}
50	31.1	1.53×10^{-5}	4.6×10^{-7}

[a] Collective effective dose equivalent
[b] Rem (roentgen equivalent man)
[c] Based on the DOE dose-to-risk conversion factor of 4×10^{-4} (4 in 10,000) latent cancer fatalities per person-rem for workers and 5×10^{-4} (5 in 10,000) for the general public. Maximally exposed individuals would be on-site workers at 3.5 km (2.2 mi), and members of the public at 50 km (31.1 mi). Calculations assume 10 shots per year and 30-year exposure, and tritium usage of 200 mg/yr (2,000 Ci/yr).

Table F-4. Maximum potential exposure to Big Explosives Experimental Facility-area workers

Distance		CEDE[a] (rem/yr)[b]	Excess cancer fatalities to an MEI[c] per year[d]
km	mi		
0	0	1.08×10^{-2}	2.6×10^{-4}
3.5	2.2	7×10^{-3}	1.7×10^{-4}
Total workers[e]		1.78×10^{-2}	4.3×10^{-4}

[a] Collective effective dose equivalent
[b] Rem (roentgen equivalent man)
[c] Maximally exposed individual
[d] Based on the DOE dose-to-risk conversion factor of 4×10^{-4} (4 in 10,000) latent cancer fatalities per person-rem for workers and 5×10^{-4} (5 in 10,000) for the general public. Assumes maximally exposed individual exposure from 10 shots per year for 30 years
[e] Collective dose to three workers at the firing table (0 km [0 mi]) and workers at 3.5 km (2.2 mi).

each test. Mixed waste generation would be minimized by the use of nonhazardous substitutes for hazardous materials to the extent possible.

Table F-5 shows the amounts of mixed, hazardous, and radioactive waste generated annually from the Big Explosives Experimental Facility operations. The facility data in this table are based on the assumption that 10 tritium tests and 90 nontritium tests would be conducted annually at the Big Explosives Experimental Facility. These amounts of waste generation represent a small increase in the amounts of waste handled by the NTS. Although the amounts of low-level waste and mixed waste generated annually at the NTS are small, the amounts of waste handled by the NTS are large because the NTS receives, stores, and disposes of waste from throughout the DOE complex, as well as from its own operations.

F.5.2.6 ***Accident Scenarios.*** The reasonably foreseeable accident scenarios that could produce the greatest potential impacts would be (1) accidental detonation from a test with a 31,751-kg (70,000-lb) charge of high explosives at the Big Explosives Experimental Facility firing table and (2) accidental detonation of a high-explosive charge containing up to 100 mg

Table F-5. Comparison of annual Big Explosives Experimental Facility waste-generation rates with NTS waste-handling levels

Waste Type	Solids from Big Explosives Experimental Facility[a]		NTS waste-handling totals (1994) (cubic feet per year)	
	m^3	ft^3	m^3	ft^3
Hazardous waste[b]	0	0	303	10,695
Low-level waste	4,644	164,000	21,312[c]	752,644[c]
Mixed waste	46	1,640[d]	76[e]	2,698[e]
Transuranic waste[f]	0	0	NA[g]	NA[g]

[a] This is an estimate based on 100 shots per year
[b] No hazardous waste generation is anticipated from the Big Explosives Experimental Facility. If any is generated, quantities would be so small as to be an insignificant impact to hazardous waste operations at the NTS
[c] The amount of low-level waste generated at the NTS in 1994 was 91 m^3 (3,208 ft^3). However, the total volume of low-level waste disposal at the NTS in 1994 was 21,313 m^3 (752,644 ft^3). Existing disposal capacity available at the NTS is approximately 283,170 m^3 (1.0×10^7 ft^3)
[d] Mixed waste generation would be minimized by the use of nonhazardous substitutes to hazardous materials, when possible.
[e] Generation of mixed waste at the NTS is minimal. Most of the mixed waste at the NTS is from historical activities that are no longer conducted. Currently, there are 76 m^3 (2,698 ft^3) of stored mixed waste. The remaining capacity of the NTS for mixed waste is 90,614 m^3 (3.2×10^6 ft^3)
[f] No transuranic waste would be generated by Big Explosives Experimental Facility operations
[g] Not applicable.

(1,000 Ci) of tritium. In either case, the involved workers would probably be fatally injured from peak over pressure and debris due to blast effects, but there would be no injury to off-site members or the general public. No damage to current buildings off site or in other areas of the NTS would be expected.

Assuming the noninvolved worker is located approximately 3.5 km (2.2 mi) from the facility, that individual would have a committed effective dose equivalent of 7.0×10^{-3} rem. Hence, either accident scenario would result in a fatality to an involved worker, but there would be minor impacts to the structures and noninvolved workers. This projected radiation dose to the noninvolved worker is still lower than the DOE guideline limits for workers and for the general public; thus, the greatest effect would be fatalities or injuries to workers due to primary blast effects, as noted above.

F.5.2.7 ***Cultural Resources***. Testing at the Big Explosives Experimental Facility would be done so that the blast over-pressure, shock, and noise would be less than or equal to design criteria for bunkers 4-300 and 4-480 (Section F.5.2.2). Thus, the proposed testing would not adversely impact these bunkers. Additional calculations were done to estimate the potential over-pressure at the Japanese Village remains approximately 683 m (2,240 ft) from the facility. These calculations show that these structures might experience an over-pressure from a blast of 0.024 kg/square centimeter (cm^2) (0.34 lb/square inches [$in.^2$]) for 90 milliseconds. It is unlikely that such a short-duration pulse would have an adverse effect on the remnants of the Japanese Village. Forces from naturally occurring phenomena (e.g., winds) at the NTS could reach speeds that apply equivalent forces. Coordination with the SHPO was conducted to determine the historical value of the properties at the two sites. The remaining structures of the

Japanese Village were strengthened with wood screws and shoring planks. No adverse impacts on these structures are expected from operations of the Big Explosives Experimental Facility.

F.5.2.8 ***Natural Resources.*** Operations at the Big Explosives Experimental Facility would not impact the groundwater. The firing table gravel is periodically removed and replaced, and any percolation of metal residue to groundwater is not expected. Facility operations would not impact the desert tortoise habitat, located at least 26 km (16 mi) to the south. Also, no impacts are expected to sensitive natural resources because there are no known threatened, endangered, or candidate plant species near the facility.

F.5.2.9 ***Cumulative Impacts.*** The Big Explosives Experimental Facility operations would result in an approximate 4-percent increase in Nye County carbon monoxide emissions, a 3-percent increase in volatile organic compound emissions, and an approximate 0.002-percent increase in fugitive dust emissions. The cumulative exposure to radionuclides for a hypothetical individual at the site boundary would be 3.1×10^{-2} mrem per year. This would be well below the National Emission Standards and Hazardous Air Pollutants standard of 10 mrem per year, and well below the natural background radiation to individuals of 382 mrem per year. Based on a 30-year exposure at the fenceline, the maximally exposed individual would have a probability of an excess cancer fatality of 4.6×10^{-7} (i.e., the off-site maximally exposed individual would have a 5 in 10 million chance of fatal cancer per year over a 30-year exposure). Wastes generated from facility operations would be small compared to the existing disposal capacities at the NTS.

F.5.2.10 ***Conformity.*** The proposed expanded use of the Big Explosives Experimental Facility would not result in levels of emissions of precursor organic compounds (carbon monoxide and volatile organic compounds) that would place the facility above Environmental Protection Agency conformity thresholds. The operations would not cause or contribute to any violation of the national Ambient Air Quality Standards. The facility would be operated in conformance with all rules and regulations of the Environmental Protection Agency, which are included as part of the State Implementation Plan.

F.5.2.11 ***Environmental Justice.*** Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Executive Order [EO] 12898), requires that federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs and activities on minority and low-income populations. The DOE is developing official guidance on the implementation of this executive order. However, the analysis in this project-specific environmental analysis indicates that there would be insignificant or no potential for differential or disproportionate impacts from Alternative 3 (or from Alternative 1) to off-site populations that could be characterized as predominantly minority or low income.

F.6 Persons and Agencies Contacted

Consultation and notification of Alternative 3 and its environmental analysis were conducted as part of the NTS EIS National Environmental Policy Act process. Details of consultations can be found in Chapter 8 of this EIS.

F.7 References

REGULATION, ORDER, LAW

EO 12898 — Executive Order, *Federal Actions To Address Environmental Justice in Minority Populations and Low Income Population,* Office of the President, Washington, DC, 1994.

GENERAL

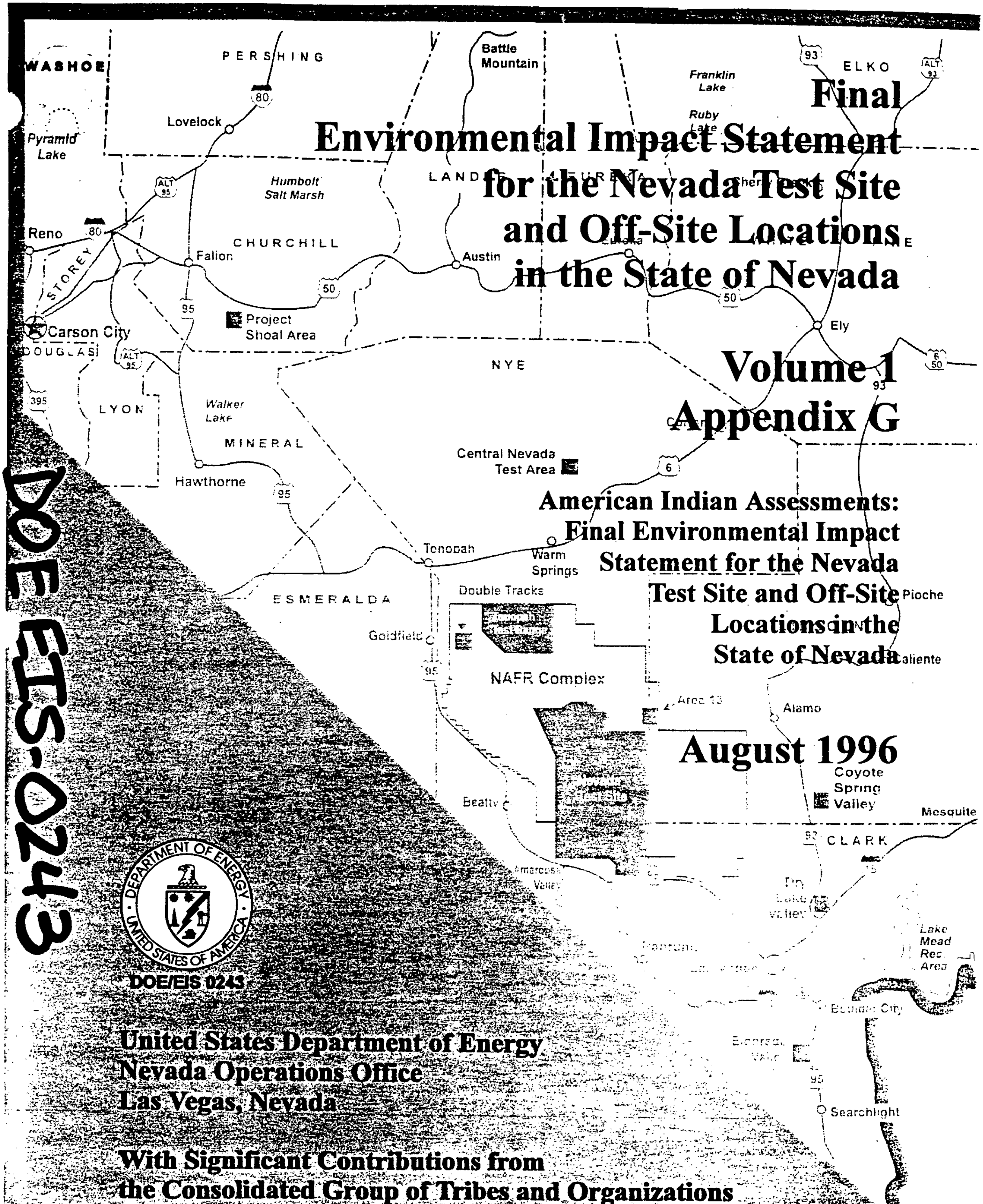
Bevers, 1994 — Bevers, T.L., *Safety Assessment Report for the Certification Testing of LLNL's Big Explosives Experimental Facility,* Livermore, CA, 1994.

DOE, 1991 — U.S. Department of Energy (DOE), *DOE Explosives Safety Manual,* Washington, DC, 1991.

Johnson et al., 1994 — Johnson, W. G., S.R. Edwards, and N.G. Goldenberg, *Desert Research Institute Cultural Resources Reconnaissance Short Report, A Class III Cultural Resources Reconnaissance of the Proposed Shaped-Charge Scaling Project and Utility Corridor, Yucca Flat, Area 4, NTS,* SR062994-1, NTS Project #945604, Desert Research Institute, Las Vegas, NV, 1994.

Wobser, 1994 — Wobser, J., *Big Explosives Experimental Facility/POPOVER Diagnostic and Instrumentation Plan for Bunker Certification Tests.,* MISC-94-10A, Livermore, CA, 1994.

 *U.S. GOVERNMENT PRINTING OFFICE: 1996-785-718



Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada

Volume 1 Appendix G

American Indian Assessments: Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada

August 1996

DOE-EIS-0243

DOE/EIS 0243

United States Department of Energy
Nevada Operations Office
Las Vegas, Nevada

With Significant Contributions from the Consolidated Group of Tribes and Organizations

American Indian Assessments: Final Environmental Impact Statement for the Nevada Test Site And Off-Site Locations in the State of Nevada

A Native American Resource Document

Prepared By
American Indian Writers Subgroup
Consolidated Group of Tribes and Organizations

June 26, 1996

This Page Intentionally Left Blank

Final
Environmental Impact Statement

for
the Nevada Test Site and Off-Site Locations in the State of Nevada

Volume 1

Appendix G

U.S. Department of Energy
Nevada Operations Office
Las Vegas, Nevada

With Significant Contributions from the Consolidated Group of Tribes and Organizations

TABLE OF CONTENTS

List of Attachments

List of Figures

List of Tables

This Page Intentionally Left Blank

APPENDIX G
AMERICAN INDIAN COMMENTS FOR THE NEVADA TEST SITE ENVIRONMENTAL IMPACT STATEMENT

SUMMARY

The Native American Resource Document is a summary of opinions expressed by the Consolidated Group of Tribes and Organizations (CGTO) regarding the Environmental Impact Statement for the Nevada Test Site and Other Off-Site Locations within the State of Nevada (NTS EIS). The document contains (a) general concerns regarding long-term impacts of the U.S. Department of Energy's (DOE) operations on the NTS and (b) a synopsis of specific comments made by the American Indian Writers Subgroup (AIWS) for various chapters of the NTS EIS[1].

The Native American Resource Document was produced in response to consultation required for the NTS EIS, in accordance with DOE Order 1230.2, American Indian Tribal Government Policy. The consultation focused specifically on four alternative management decisions concerning the future mission of the NTS and related off-site locations in Nevada. However, the present CGTO's response to this consultation is not limited to EIS alternatives, but also integrates relevant recommendations made by Indian people for previous DOE projects in which American Indians participated.

The CGTO has a long history of relationships with the DOE. In 1985, the DOE began long-term research concerning the inventory and evaluation of American Indian cultural resources on the NTS area. This research was designed to comply with the American Indian Religious Freedom Act (AIRFA), which specifically reaffirms the First Amendment of the United States Constitution rights of American Indian people to have access to lands and resources essential in the conduct of their traditional religion. These rights are exercised not only in tribal lands but beyond the boundaries of a reservation (Stoffle et al., 1994b).

To reinforce their cultural affiliation rights and to prevent the loss of ancestral ties to the NTS, 19 tribes and organizations aligned themselves together to form the CGTO. This group is formed by officially appointed representatives who are responsible for representing their respective tribal concerns and perspectives. The primary focus of the group has been the protection of cultural resources. The DOE and the CGTO have participated in cultural resource management projects, including the Yucca Mountain Project (Stoffle 1987; Stoffle and Evans 1988, 1990, 1992, Stoffle et al. 1988a, 1988b, 1989a, 1989b, 1990a, 1990b), the Underground Weapons Testing Project (Stoffle et al. 1994b), and ongoing consultation in compliance with the Native American Graves Protection and Repatriation Act (NAGPRA) for the Nevada Test Site Collection (Stoffle et al., 1996a).

While this American Indian Resource Document provides recommendations that target the preservation of American Indian religion, culture, society, and economy, many of the comments presented here focus heavily on cultural resources. This emphasis is the product of continued cultural resource management consultation between the DOE and the CGTO, which has reinforced Indian people's awareness of the wealth of cultural resources present at the NTS. On the other hand, the potential impacts of NTS actions on other essential aspects of Indian life, such as health and socioeconomics, are virtually undocumented. This is due to the absence of consultation and research on the long-term effects of radiation exposure, nuclear waste transportation and storage on the life of Indian communities. Being a minority group, American Indians have also been overlooked in

[1] A detailed summary of the NTS EIS consultation process can be found in *Nevada Test Site Environmental Impact Statement - Summary of Meeting with Native Americans. Mercury, NV, March 17-19, 1995* (May 1995) and in Section A of the *American Indian Comments for the Nevada Test Site - Environmental Impact Statement* (June 15, 1995).

regard to issues of Environmental Justice. The CGTO recommends that these issues be systematically evaluated by the federal government. The opportunity given to the CGTO to contribute their written comments to the NTS EIS is a highly positive step the DOE has taken toward voicing Indian concerns.

The NTS EIS is a document that (a) evaluates the impacts, consequences, and cumulative effects that alternative management decisions about the future mission of the NTS will have on the environment, (b) proposes strategies for mitigating adverse impacts of the various programs and project activities being considered under each proposed alternative, and (c) develops a *Framework for the Resource Management Plan* for the NTS. The specific organization and content of an EIS is required by the law. The Native American Resource Document, therefore, is organized according to the sequence of topics discussed in the NTS EIS. In the sections that follow this introduction, the document briefly reviews past and present relationships between Indian people and NTS lands, examines impacts of past and present NTS programs and activity projects on American Indian religion, culture and economy, and summarizes the CGTO's position regarding the future mission of the NTS. In short, the Native American Resource Document describes the nature of the relationship between Indian people and NTS lands, from an all-encompassing overview to specific discussion about impacts, consequences, mitigation, and management.

The Native American Resource Document begins with a summary of formal interactions between the CGTO members and NTS EIS management (Section G.1). In Section G.2, the members of the American Indian Writers Subgroup explain their role in the production of this document and the responsibilities and difficulties they had to confront throughout the writing process.

Section G.3, Native American Overview, stresses the central role that NTS lands have had in American Indian life from antiquity to contemporary times. Moving from the concept of cultural landscape as a whole to the resources contained in a landscape, this section also examines impacts to cultural resources, Environmental Justice, health, and socioeconomics, which are categorized by the EIS as part of the "affected environment." This section also includes a brief discussion on political integration.

After introducing the American Indians' view of the NTS, Section G.4 addresses the environmental consequences of proposed NTS actions and discusses specifically the position of the CGTO toward each alternative management decision for the NTS EIS.

In the view of Indian people, the ideal mitigation strategy would be to avoid any action that further disturbs NTS lands. However, the CGTO is aware that actions must be taken to restore NTS lands and resources and keep the site safe and clean for future human use. The CGTO recommendations for mitigating adverse consequences of such actions are summarized in Section G.5.

Section G.6 explains step-by-step consultation procedures that American Indians would like federal agencies to follow in order to achieve positive government-to-government consultation relationships. This section is complemented with Attachment C, a detailed Consultation Model originally produced for the U.S. Department of Defense (DoD) that was reviewed and edited by the AIWS. Section G.7 contains the American Indian comments on the Transportation Study (Appendix I of the NTS EIS).

The Native American Resource Document concludes with a response to the draft document entitled *Framework for the Resource Management Plan.* The Native American Resource Document explains the importance of taking into consideration ecological categories of Indian people for resource management. This section (Section G.8) also provides a brief picture of future co-management relationships between the DOE and the CGTO that could potentially be implemented as part of the mission of the NTS.

American Indian Participation in the NTS EIS

The CGTO consists of the following tribes and official Indian organizations:

- *Southern Paiutes*

  Kaibab Paiute Tribe, Arizona
  Paiute Indian Tribe of Utah
  Moapa Band of Paiutes, Nevada
  Las Vegas Paiute Tribe, Nevada
  Pahrump Paiute Tribe, Nevada
  Chemehuevi Paiute Tribe, California
  Colorado River Indian Tribes, Arizona

- *Western Shoshones*

  Duckwater Shoshone Tribe, Nevada
  Ely Shoshone Tribe, Nevada
  Yomba Shoshone Tribe, Nevada
  Timbisha Shoshone Tribe, California

- *Owens Valley Paiutes and Shoshones*

  Benton Paiute Tribe, California
  Bishop Paiute Tribe, California
  Big Pine Paiute Tribe, California
  Lone Pine Paiute Tribe, California
  Fort Independence Paiute Tribe, California

- *Other Official Indian Organizations*

  Las Vegas Indian Center, Nevada
  Southern Paiute Tribal Chairman's Association, Arizona, Nevada, Utah
  Owens Valley Board of Trustees, California

American Indian Writers Subgroup

Representing the Western Shoshone:

Maurice Frank	Yomba Shoshone Tribe, Nevada
Glen Hooper	

Representing the Owens Valley Paiute/Shoshone:

Neddeen Naylor	Lone Pine Indian Tribe, California
Gaylene Moose	Big Pine Indian Tribe, California

Representing the Southern Paiute:

Betty Cornelius	Colorado River Indian Tribes, Arizona
Don Cloquet	Las Vegas Indian Center, Nevada

Coordinator

Richard Arnold	Pahrump Indian Tribe, Las Vegas Indian Center, Nevada

Sponsors, Organizers, and Facilitators

Department of Energy Nevada Operations Office

Mary Ellen Giampaoli	NTS EIS Manager
Robert Furlow	Environmental Protection Division

International Technology Corporation
Las Vegas, Nevada

Caroleen K. Toyama	IT Contact Person
Geraldine Quintana	Public Relations
Linda Cardenas	IT Project Manager

Science Applications International Corporation
Las Vegas, Nevada

Robert Smith	Coordinator, Cumulative Effects

Bureau of Applied Research in Anthropology
University of Arizona, Tucson

Richard Stoffle	Associate Research Anthropologist
M. Nieves Zedeno	Research Associate
Diane Austin	Research Associate
David Halmo	Anthropology Extern
Maria Banks	Student Assistant
Maria Porter	Student Assistant

G.1 American Indian Writers Subgroup

On March 17-19, 1995, representatives of the CGTO met with U.S. Department of Energy, Nevada Operations Office (DOE/NV) personnel regarding American Indian participation in the preparation of the NTS EIS. The CGTO's recommendations covered a wide range of issues.

One CGTO recommendation was that two representatives from the Western Shoshone, Owens Valley Paiute, and Southern Paiute groups be appointed to write the American Indian perspective for the NTS EIS. The CGTO recommended that all six members of the AIWS be provided with funding, technical assistance, and resources to participate in writing the American Indian perspective for the NTS EIS. Richard Arnold, executive director of the Las Vegas Indian Center in Las Vegas, Nevada, would coordinate the activities of the AIWS. The draft text produced by the AIWS was reviewed by the DOE/NV and incorporated into the Final NTS EIS, as well as being an appendix to the NTS EIS.

The DOE/NV accepted this recommendation, offering to compensate the writers for their services and travel expenses, and to provide the AIWS with funding, technical assistance, and resources needed to write the American Indian perspective for the NTS EIS. The DOE/NV and the CGTO agreed that the AIWS should meet in Las Vegas, Nevada, as frequently as needed to complete the writing tasks. The Bureau of Applied Research in Anthropology (BARA), University of Arizona, Tucson, Arizona, was contracted by the DOE/NV to assist the AIWS with this work.

G.1.1 First AIWS Meeting

The first meeting of the AIWS was held May 1-5, 1995, at the offices of IT Corporation in Las Vegas, Nevada. The goal of this meeting was to develop a writing strategy, draft an outline of writing tasks, and produce draft text. The (BARA), University of Arizona, facilitated the meeting and all AIWS members were present. The AIWS identified three major issues to be addressed in the American Indian sections of the NTS EIS:

1. That American Indians have lived on NTS lands since these people were created
2. That American Indian culture, economy, religion, and health could be affected by the proposed NTS EIS alternatives
3. That the NTS EIS actions could have long-term and cumulative consequences for American Indian culture, economy, religion, and health.

G.1.1.1 Nevada Test Site Environmental Impact Statement Implementation Plan Review. The plan contains comments and recommendations made by the CGTO during the March 1995, NTS EIS American Indian consultation meeting. The plan refers to American Indian consultation as a main component of the scoping process and as a critical source of information regarding the impact of NTS EIS proposed alternatives on natural and cultural resources important to American Indians.

The AIWS noted that three major issues discussed in the plan still do not address American Indian concerns: socioeconomic, health and safety, and Environmental Justice and equity. The AIWS felt that the CGTO should be systematically consulted about these critical issues and their direct and cumulative effects on American Indians living in the vicinity of the NTS.

G.1.1.2 Outline of Writing Tasks. The AIWS made the following three decisions regarding the writing of the American Indian perspective for the NTS EIS:

1. The AIWS will produce short technical essays to expand sections of the NTS EIS, particularly those sections that refer to cultural resources, economics, and health. These essays could be included in the main text of the NTS EIS.
2. The AIWS will also produce an Native Indian Resource Document that will become an NTS EIS appendix.

3. The text produced will be included in the report entitled *American Indian Comments for the NTS EIS*.

*G.1.1.3 **Draft Text***. The AIWS produced short essays that document the American Indian perspective for the NTS EIS.

G.1.2 Second AIWS Meeting

The second meeting of the AIWS was held May 22-26, 1995, at the offices of IT Corporation in Las Vegas, Nevada. The goal of this meeting was to complete portions of Chapter 4 and continue writing sections of Chapter 5 of the NTS EIS. The BARA facilitated the meeting, and all seven members of the AIWS attended.

The AIWS completed the write-up of draft text for Chapters 2 and 4 of the NTS EIS and drafted sections on Environmental Justice and equity, social and economic impacts, and waste transportation and tribal enterprises to be included in Chapter 4.

Additionally, the AIWS produced draft text for the cultural resources section in Chapter 5, Environmental Consequences. This text included (1) an overview of potential impacts of the NTS EIS alternatives on American Indian cultural resources and (2) specific comments on the potential impacts of programs and activities proposed for each of those alternatives. The AIWS also discussed mitigation issues for proposed programs and activities.

G.1.3 Third AIWS Meeting

The third meeting of the AIWS was held June 9-12, 1995, at the offices of IT Corporation in Las Vegas, Nevada. The goals of this meeting were to complete and edit the cultural resources section of Chapter 5 of the NTS EIS and to produce draft text on mitigation issues for proposed programs and activities. The BARA facilitated the meetings and all AIWS members were present.

The AIWS completed and edited draft text for Chapter 5 of the NTS EIS and expanded Chapter 4 sections on Environmental Justice and equity, social and economic impacts, and waste transportation and tribal enterprises, and produced draft text on mitigation to be included in Chapters 5 and 7. The AIWS's main activities focused on a discussion of the meaning of mitigation and related concepts in the NTS EIS. The AIWS reviewed the archaeology section of Chapter 5 of this EIS, as well as all other available text, in order to establish a proper style for the American Indian text.

In addition to the writing activities, the AIWS reviewed information about other EIS projects, such as Hickinson Petroglyph Recreation Park, Navy Project Shoal Area Land Withdrawal, and the Solar Request for Proposal. The AIWS suggested that, to obtain an integrated view of present and future activities in the area and evaluate potential impacts, it is necessary to tie these outside projects to the NTS EIS.

G.1.4 Review of the *Framework for the Resource Management Plan* for the Nevada Test Site

A key issue of this meeting was the discussion of DOE/NV's commitment to prepare a resource management plan outline for the NTS. MaryEllen Giampaoli, NTS EIS Project Manager, and Kurt Rautenstrauch, EG&G Energy Measurements, Inc., the DOE/NV contractor who prepared the outline, led the discussion. The *Framework for the Resource Management Plan*, Volume 2 of the Final NTS EIS, describes how DOE/NV will prepare the Resource Management Plan following the release of the Record of Decision. The AIWS reviewed the outline and drafted an action plan to address the outline.

G.1.5 Fourth AIWS Meeting

Two AIWS meetings were held in Las Vegas, Nevada, after the public review period for the Draft NTS EIS (issued January 1996). The main purposes of these meetings were (1) to review and edit the Draft American Indian Comments for the NTS EIS, (2) to respond to public comments on document, and (3) to write additional text for inclusion in the NTS EIS. The meetings were sponsored by the DOE/NV and facilitated by the University of Arizona.

The fourth AIWS meeting was held at the Science Applications International Corporation offices in Las Vegas, Nevada, on March 18-21, 1996. Present at this meeting were:

AIWS
- Betty Cornelius
- Richard Arnold
- Maurice Frank
- Don Cloquet

University of Arizona
- Richard Stoffle
- M. Nieves Zedeno

At this meeting, the AIWS refined the original list of writing tasks and identified those tasks to be completed before the Final NTS EIS is issued. The writing tasks were:

1. Socioeconomic issues
2. Risk perception
3. Summary of the CGTO position regarding the four NTS EIS alternatives
4. Waste transportation study
5. Comments on the Draft *Framework for the Resource Management Plan*
6. Consultation procedures
7. Executive summary.

The AIWS completed the write-up of text on socioeconomic issues, specifically, the impact of NTS alternative actions on tribal employment and education. This section is suggested for inclusion in Chapter 4 of the NTS EIS (Volume 1). An outline of American Indian consultation procedures was also drafted for Chapter 8 of the NTS EIS (Volume 1). A draft executive summary for Appendix G and summary of the CGTO position regarding the four NTS EIS action alternatives were completed as well. Additionally, information on American Indian nuclear risk perception was collected from the AIWS. This information was developed into a section on Environmental Justice for Chapters 4 and 5 of the NTS EIS.

On Wednesday, March 20, 1996, the AIWS met with DOE officials to discuss the current American Indian involvement in the NTS EIS, as well as other consultation issues. The DOE/NV officials present at this meeting were Don Elle, Director of the Environmental Protection Division; Kathy Izell, Assistant Manager for Environment, Safety, Security, and Health; Joe Fiore, Acting Deputy Manager; Terry Vaeth, Acting Manager; and Robert Furlow, Project Manager and Agency Point of Contact for American Indian consultation.

On Thursday March 21, 1996, MaryEllen Giampaoli, NTS EIS manager, and Timothy Killen, task leader of the Draft *Framework for the Resource Management Plan*, gave a brief presentation of this document to the AIWS. The AIWS decided to focus on comments for the Resource Management Plan at the following meeting. The text produced the fourth AIWS meeting and was compiled into a workbook to be submitted to the CGTO for review and comment.

G.1.6 NTS EIS Consultation Meeting with the CGTO

On April 15-17, 1996, the DOE/NV conducted a consultation meeting at the NTS with the CGTO representatives to update them on the changes, final schedule, and public comments for the NTS EIS. The NTS EIS manager provided updated information on these issues. The AIWS gave a report of activities and writing tasks completed during the fourth AIWS meeting. The CGTO reviewed and commented on the draft text developed by the AIWS and offered suggestions for expanding sections of this text.

The AIWS also presented a draft of their paper entitled *Voicing American Indian Concerns through an Indian EIS Writing Team* to CGTO representatives. The AIWS explained that this paper will be presented at the Meetings of National Association of Environmental

Professionals in Houston, Texas, on June 4-6, 1996. The CGTO approved this presentation and recommended that the DOE/NV fully support this effort.

G.1.7 Fifth AIWS Meeting

After the CGTO meeting the AIWS continued working on the write-up of new text for the NTS EIS. The fifth AIWS meeting was held at the offices of Science Applications International Corporation in Las Vegas, Nevada, on April 18-21, 1996. The main goals of this meeting were (1) to incorporate the CGTO comments, and complete and edit the text developed during the fourth AIWS meeting, (2) to focus writing efforts on the Transportation Study and the *Framework for the Resource Management Plan*, and (3) to complete an expanded inventory of American Indian traditional-use plants and animals for the NTS EIS. The AIWS also completed sections of text on Perceived Risks and Environmental Justice to be included in Chapter 5 of the NTS EIS.

On April 21, the AIWS completed the write-up of new text for Appendix G, as well as sections of text to be included in four chapters of Volume 1 and in three chapters of Volume 2 (*Framework for the Resource Management Plan*) of the NTS EIS. By the end of the fifth AIWS meeting, new text produced for the two volumes of the NTS EIS and for Appendix G included:

- Glossary
- Executive Summary
- AIWS meeting paper
- Summary of the CGTO position regarding the NTS EIS alternatives
- Socioeconomic Issues
- Environmental Justice
- Consultation Procedures
- Comments on the Transportation Study
- Framework for the Resource Management Plan.

The following section is an excerpt from the paper entitled *Voicing American Indian Concerns through an Indian EIS Writing Team.* The AIWS will present this paper at the annual meeting of the National Association of Environmental Professionals in Houston, Texas. The excerpt explains how the AIWS proceeded to write this text, their role and responsibilities in the production of the American Indian Resource Document, and the difficulties they had to overcome throughout the preparation of text for the NTS EIS. A copy of the published proceedings paper (National Association of Environmental Professionals Conference Proceedings) will be available through the DOE/NV Environmental Protection Division Office after June 7, 1996.

G.2 Voicing American Indian Concerns Through an Indian EIS Writing Team

Prepared By:

Richard Arnold, Pahrump Indian Tribe, Pahrump, NV
Don Cloquet, Las Vegas Indian Center, Las Vegas, NV
Betty Cornelius, Colorado River Indian Tribe, Parker, AZ
Maurice Frank, Yomba Shoshone Tribe, Austin, NV
Glen Hooper, Yomba Shoshone Tribe, Austin, NV
Gaylene Moose, Big Pine Indian Tribe, Big Pine, CA
Neddeen Naylor, Lone Pine Indian Tribe, Lone Pine, CA

G.2.1 Abstract

An American Indian writing team appointed by the 19 members of the CGTO prepared text for direct inclusion in the NTS EIS, prepared under the supervision of the DOE/NV. The procedure of having American Indians work directly on this EIS has produced relevant text in a timely manner, while keeping secret certain knowledge about Indian cultural resources.

G.2.2 Excerpt Introduction

American Indian concerns are by law and regulation to be incorporated into the environmental impact assessments of planned federal projects. Tribes do not consider themselves as "stakeholders" as defined, but rather a sovereign government within the boundaries of the United States who have a unique relationship and status unlike any other. All too often tribal input is gathered through regularly scheduled public scoping meetings. This approach is not the appropriate manner in which to involve Indian tribes. These tribal governments, and the people they represent, generally desire to have their environmental action preferences fully voiced in the NTS EIS on a government-to-government basis.

Two factors directly impact the quantity and quality of Indian participation: (1) the time permitted for their involvement; and (2) the level of confidentiality that can be provided to protect cultural resources. Time is needed for Indian tribes to understand what actions are being proposed and to learn what rules govern the production of this EIS so that knowledgeable tribal members can be selected to participate and devote sufficient time for the identification and evaluation of potentially impacted resources. When past American Indian studies can be used as a base, shorter evaluation periods are appropriate; unfortunately, there is a national tendency to involve tribes late in this EIS process or not at all. Indian people demand rights of meaningful involvement and confidentiality of information shared about sacred places and natural resources used in ceremonies, and do not want these threatened by being made public during this EIS process. Indian people would prefer not to participate in this EIS unless they can be assured that sharing culturally sensitive information with the agency will afford more protection rather than threaten cultural resources. This paper describes the formation and successful performance of the first American Indian EIS writing team established and supported by a major federal agency. The paper describes how past DOE/NV consultations with the 19 members of the CGTO provided the foundation of knowledge and trust that made the Indian EIS writing team possible. The paper includes how the DOE/NV EIS writing team trained the Indian writing team so that Indian EIS text would be produced under common assumptions and with similar quality controls. The paper ends with a general model for involving American Indian tribal governments and organizations into the EIS process, using the Indian EIS writing team approach.

G.2.3 Issues in the Functioning of the Subgroup

G.2.3.1 ***Translating Ideas.*** Members of the AIWS had to learn about this EIS and how to translate American Indian concerns into the EIS language. When members of the CGTO talk among themselves, they do so from the perspective of a common culture and history. Many issues are understood, and these remain an unspoken dimension of American Indian conversations. Some issues are specific to gender; there are issues that women are assumed to know about and when discussion turns to these subjects men listen rather than speak. Other issues involve respect for age; elders have a special place in these Indian societies, so when they speak special attention is given. Even the style of speech is an understood issue of communication, because there is an appropriate amount of time after a speaker ends his presentation before someone else should speak. There are certain understandings that should not be expressed in public communication, especially when non-Indians are present. When certain issues are discussed, Indian speakers may be accused of "Talking Too Much or Telling Too Much." All these dimensions of culturally based Indian communication can be challenged when AIWS members translate their assessments of potential project impacts into the language of the EIS.

The amount of responsibility placed on the AIWS members is in direct proportion to the amount of consultation that has occurred between the agency and the culturally affiliated tribes. When the AIWS has years of consultation on which to build an EIS argument, they are more confident of what variables they suggest and of ways to study the issue. Key here is the issue of cultural confidentiality, because certain issues may be inappropriate for public discussion. The AIWS will always be concerned about "Not saying too much to non-Indians." If the issues have emerged in previous consultation studies, however, the AIWS can simply raise the variable and cite the report. The NTS consultation has produced 10 years of issues raised and studies completed, so when talking about cultural resources, the AIWS worked from a position of strength. When they moved to topics that had not been previously assessed, however, they were much more tenuous about raising issues and suggesting research methodologies and anticipating the findings of systematic research.

G.2.3.2 Negotiating Text. In an EIS, all variables, levels of analysis, and descriptive text is negotiated. By this, it is understood that something like the relationship between economics and residence on a reservation or radiation and air as a living organism cannot become a variable for consideration in the EIS unless a strong and reasonable argument can be made by someone that it is potentially impacted by the proposed actions under consideration. Generally, variables are established very early in the scoping stages of an EIS. Clear cause and effect hypotheses must be described before a variable is included and before a study can be designed to assess potential impacts. Once a variable becomes a part of the EIS analysis, it is necessary then to specify the type and level of analysis required to fully or appropriately assess the potential impact of the proposed project on it. A study design is agreed to, funds are allocated, and a research team is selected to conduct the research. When the analysis is completed, the EIS team must decide how much space to allocate for presenting the findings. Since all EIS text is negotiated, the further along the EIS process proceeds the more difficult it is to change the structure of the document. Early involvement of Indian writers assures them a better chance to produce and argue the EIS studies and findings.

Consensus decisionmaking characterizes how most American Indian committees operate. In this context, alternative views are carefully expressed so as not to imply others are incorrect. Forceful debate is not encouraged, because of the mutual respect observed and the ongoing relationships between the committee members is considered more important than a specific issue under discussion.

The EIS process is a virtual battle-ground of debate over which variables should be included, how much data collection is needed, and the amount of report space to allocate for presenting the findings. EIS teams typically have dozens of experts who represent the subject in the agency, and generally have not and will not again work directly with one another. The DOE EIS writing team, for example, consisted of 80 experts with more than 1,082 years of collective professional research and EIS preparation experience. Their performance is judged by their unit in the agency according to how much attention the EIS devotes to their subjects. Good debate resolutions are often described as being when everyone is equally unhappy about the decision. In this environment, the AIWS had to change the rules under which they would operate and become each other's first critic. If they could not convince each other, then they probably could neither convince the EIS writing team nor the agency decisionmakers who would use the findings to formulate a Record of Decision.

G.2.3.3 Supporters and Detractors. The Indian writers' involvement in this EIS process would not have occurred or been as successful without the foresight and continuous commitment of key federal employees and program managers who supported the American Indian writing effort. Since the inclusion of Indian writers in an EIS had never been undertaken previously by the DOE, various apprehensions developed, as might be expected. Interestingly enough, during this EIS scoping period, many of the concerns about the potential adverse effects of American Indian involvement were voiced by individuals who neither worked on the EIS study team nor worked with the DOE/NV. These concerns ranged from questioning the appropriateness of actually including American Indian perspectives in an EIS, to the fear of setting a precedence within the DOE and in other federal agencies.

Throughout the development of the actual text and the final source document, those individuals who originally expressed doubts about the process regained their confidence, and eventually concluded that American Indians should be included in the EIS process in order to share important cultural information relating to the area. Additionally, the Indian writers provided interpretative information that many times either expanded or contradicted the conclusions of other scientists involved in the EIS. Often times, reconsideration and estimations about the cumulative effects on their reservations were provided, which were typically overlooked or misunderstood. Many of those who initially were considered detractors have now seen the demonstrated value of Indian writers in the EIS. Both the U.S. Bureau of Land Management and the U.S. Forest Service (not initial critics) have now contacted the CGTO about similar involvement in their agency's EIS and resource management plans.

G.2.3.4 Trainers. How do you get a team of Indian people up to speed quickly so they can understand what data and writing rules govern the production of an EIS? Probably one of the most challenging tasks for both the American Indian writers and the DOE scientists was learning about each other's frame of reference. According to one member of the AIWS, although we never fully understood each other, a better understanding and familiarity was achieved. This was followed by explanations about the scientific outcomes and data in a manner which was responsive to the needs of the Indian writers. Some of the primary ways of presenting this information was to respond to direct questions, provide background information about the project, thoroughly explain the study design, and finally concluding with an analysis and interpretation of scientific findings. This approach worked successfully and allowed the presented information to be discussed among the writers who in turn formulated the information within their own cultural context and frame of reference. Occasionally, difficulties arose due to the complexities of a sitewide EIS and in understanding the relationship, if any, to other EIS's and environmental assessments that were occurring simultaneously within the DOE.

To further ensure that the text developed by the Indian writing team was appropriate and consistent with the rest of the EIS document, ongoing critiques of Draft Indian text were requested by the Indian writers. Key people were identified from the EIS writing team to help critique the format and style of the EIS text produced by the Indian writers. These key people possessed previous cross-cultural interactions and had experience with diverse populations. This type of background proved to be invaluable throughout the entire process.

G.2.4 Where Do We Go From Here?

After completion of the final text, the AIWS made a formal presentation to the entire CGTO for review and acceptance. This presentation provided an opportunity for writers to describe the EIS process, dilemmas, and a comprehensive overview of the text. Members of the CGTO were asked to thoroughly review the document, make editorial changes, and provide any new information not previously addressed. This information was then synthesized by the AIWS for inclusion into the text.

This particular meeting was a very intense experience due to the complexities surrounding the NTS EIS. However, when discussions revolved around familiar topics such as Indian place names, or plant and animal identification, the demeanor of the meeting changed drastically. At the conclusion of the meeting, the CGTO made various recommendations including support for the AIWS to present this paper describing their experiences with the NTS EIS.

The CGTO hopes that their effort will encourage other federal agencies to include American Indian tribes and organizations into their EIS processes and to encourage American Indian tribes and organizations to become actively involved in the protection of their interests.

Over the last decade, the DOE NV has supported a series of systematic American Indian studies that have provided an extensive set of elders' opinions about the cultural significance of the lands and the natural resources of the NTS. Despite this extensive effort, many studies are yet to be undertaken, and some kinds of studies are yet to be proposed. Naturally, a full assessment of potential projects requires a complete database of American Indian opinion regarding a variety of topics. As new studies are completed, Indian people will be able to speak with increasing confidence when invited to participate in the assessment of potential DOE activities.

The AIWS and the CGTO are becoming recognized for their knowledge and expertise gained throughout the EIS process. Their efforts can serve as a model for involving American Indians in future EIS efforts. Already other Indian tribes and federal agencies are reviewing this process and considering similar American Indian participation in the management of Indian holy lands.

G.3 Native American Overview

G.3.1 Centrality Issue

For many centuries, the NTS has been a central place in the lives of American Indians. The NTS and nearby lands contain traditional gathering, ceremonial, and recreational areas for Indian people. From antiquity to contemporary times, this area has been used continuously by many tribes. It contains numerous ceremonial resources and power places that are crucial for the continuation of American Indian culture, religion, and society. Until the mid-1900s, traditional festivals involving religious and secular activities attracted Indian people to the area from as far as San Bernardino, California. Similarly, groups came to the area from a broad region during the hunting season and used animal and plant resources that were crucial for their survival and cultural practices.

Many non-Indian peoples hold a different view of these lands. For example, the U.S. Federal Government has maintained the perception that the NTS is a remote wasteland with very low population density and other characteristics that make it ideal for developing defense and energy projects. Because of this "wasteland perception," NTS lands have been withdrawn by the Federal Government since 1943.

Despite the loss of some traditional lands to pollution and reduced access, Indian people have neither lost their ancestral ties to, nor have forgotten, their cultural resources on the NTS. There is continuity in the American Indian use of and broad cultural ties to the NTS. Indian people have cared for NTS resources and will continue to do so.

The NTS land was part of cultural landscapes that extended many miles in all directions. Because this land is a part and not the whole, it is, therefore, essential that DOE determinations of cultural affiliation, ancestral ties, and impact of NTS actions and programs on traditional Indian culture, religion, and society be made according to the broad regional use of NTS lands.

Recognizing this continuity in traditional ties between the NTS and Indian people, in 1985 the DOE began long-term research involving the inventory and evaluation of American Indian cultural resources in the area. This research was designed to comply with the AIRFA, which specifically reaffirms the First Amendment of the United States Constitution and protects the rights of American Indian people to have access to lands and resources essential in the conduct of their traditional religion. These rights are exercised not only in tribal lands, but also beyond the boundaries of a reservation (Stoffle et al., 1994a).

To reinforce their cultural affiliation rights and to prevent the loss of ancestral ties to the NTS, 17 tribes and organizations have aligned themselves together to form the CGTO. This group is formed by officially appointed representatives who are responsible for representing their respective tribal concerns and perspectives. The CGTO has established a long-standing relationship with the DOE. The primary focus of the group has been the protection of cultural resources. The DOE and the CGTO have participated in cultural resource management projects, including the Yucca Mountain Project (Stoffle, 1987; Stoffle et al., 1988b, 1989a, 1989b, 1990a, 1990b, 1990c; Stoffle and Evans, 1988, 1990, 1992) and the Underground Weapons Testing Project (Stoffle et al., 1994b).

The extensive information compiled through long-term research sponsored by the DOE demonstrates that American Indian cultural resources are not limited to archaeological or historical remains of native ancestors, but include all natural resources, as well as geological formations contained in the NTS landscape. Natural resources constitute critical components of American Indian daily life and religious beliefs. Plants and animals are a source of food, raw materials, and medicine. Ritual practices cannot be properly carried out without plants and animals. Similarly, natural landforms mark locations that are significant for keeping the historic memory of American Indian people alive and for teaching children about their culture and history.

This land and its resources are well-known by American Indian people, who consider the NTS as a central part of their cultural landscape. This knowledge has allowed them to be self-sufficient and to transfer all their cultural values and practices to future generations until this day.

G.3.2 American Indian Cultural Resources

G.3.2.1 Nevada Test Site. The CGTO knows, based upon its collective knowledge of Indian culture and past American Indian studies, that American Indian people view cultural resources as being integrated. Thus, certain systematic studies of a variety of American Indian cultural resources must be conducted before the cultural significance of a place, area, or region can be fully assessed. Although some of these studies have been conducted on the NTS and nearby lands, many studies still need to be completed. In some portions of the NTS, a number of American Indian studies have been conducted, while in other areas studies have not begun. A number of studies are currently planned.

Indian people can fully assess the cultural significance of a place and its associated natural and cultural resources when all studies have been completed and our governments and tribal organizations have reviewed the recorded thoughts of our elders and have officially supported these conclusions. American Indian studies focus on one topic at a time so that tribes and organizations can send experts in the subject being assessed. The following is a list of studies that are required for a complete American Indian assessment:

1. Ethnoarchaeology - the interpretation of the physical artifacts produced by our Indian ancestors

2. Ethnobotany - the identification and interpretation of the plants used by Indian people

3. Ethnozoology - the identification and interpretation of the animals used by Indian people

4. Rock art - the identification and interpretation of traditional Indian paintings and rock peckings

5. Traditional Cultural Properties - the identification and interpretation of places of central cultural importance to a people, called Traditional Cultural Properties; often Indian people refer to these as "power places"

6. Ethnogeography - the identification and interpretation of soil, rocks, water, and air

7. Cultural Landscapes - the identification and interpretation of spatial units that are culturally and geographically unique areas for American Indian people.

When all of these subjects have been studied, then it will be possible for American Indian people to assess three critical issues: (1) What is the natural condition of this portion of our traditional lands? (2) What has changed due to DOE activities? and (3) What impacts will proposed alternatives have on either furthering existing changes in the natural environment or restoring our traditional lands to their natural condition? Indian people believe that the natural state of their traditional lands was what existed before 1492, when Indian people were fully responsible for the continued use and management of these lands.

The NTS and nearby lands were central to the Western Shoshone, Owens Valley Paiute, and Southern Paiute people (see Figure G-1, American Indian region of influence map). The lands were central in the lives of these people and so were mutually shared for religious ceremony, resource use, and social events (Stoffle et al., 1990a and b). When Europeans encroached on these lands, the numbers of Indian people, their relations with one another, and the condition of their traditional lands began to change. European diseases killed many Indian people; European animals replaced Indian animals and disrupted fields of natural plants; Europeans were guided to and then assumed control over Indian minerals; and Europeans took Indian agricultural areas.

The withdrawal of Nevada's lands for the use of the War Department as an aerial bombing and gunnery range in 1942 (Executive Orders No. 8578 of October 1940 and No. 9019 of January 12, 1942) and later the final land withdrawal of February 12, 1952 (Public Law Order 805), for use by the Atomic Energy Commission, continued the process of Euroamerican encroachment on these Indian lands. Pollution and destruction followed in the form of bombs and atomic testing, thus causing some places to become unusable again for Indian people. On the other hand, many places were protected by this land withdrawal because pothunters were kept from stealing artifacts from rock shelters and European animals were kept from grazing on Indian plants. The forced removal of Indian people from the NTS lands was combined with their involuntary registration and removal to distant reservations in the early 1940s. Indian people were thus removed from lands that had been central in their lives for thousands of years.

Despite the pollution and destruction of some cultural resources and the physical separation from the NTS and neighboring lands, Indian people continue to value and recognize the central role of these lands in their continued survival. Recognizing this continuity in traditional ties between the NTS and Indian people, the DOE in 1985 began long-term research involving the inventory and evaluation of American Indian cultural resources in the area. This research was designed to comply with AIRFA, which specifically reaffirms the First Amendment of the U.S. Constitution rights of American Indian people to have access to lands and resources essential in the conduct of their traditional religion. These rights are exercised not only in tribal lands, but also beyond the boundaries of a reservation (Stoffle et al., 1994a and b).

To reinforce their cultural affiliation rights and to prevent the loss of ancestral ties to the NTS, 17 tribes and organizations have aligned themselves to form the CGTO. This group is formed by officially appointed representatives who are responsible for representing their respective tribal concerns and perspectives. The CGTO has established a long-standing relationship with the DOE. The primary focus of the group has been the protection of cultural resources.

The DOE and the CGTO have participated in cultural resource management projects, including the Yucca Mountain Project (Stoffle, 1987; Stoffle et al., 1988b, 1989a, 1989b, 1990a, 1990b, 1990c; Stoffle and Evans, 1988; 1990; 1992;) and the Underground Weapons Testing Project (Stoffle et al., 1994a and b). These studies are used in this report, along with the collective knowledge of the CGTO, as the basis of the comments in this NTS EIS. The cultural resource management projects sponsored by the DOE have been extremely useful for expanding the inventory of American Indian cultural resources beyond the identification of archaeological remains and historic properties.

To date, the DOE/NV's American Indian Program in the Environmental Protection Division has supported the in-depth study of 107 plants and more than 20 animals that are present on the NTS. These plants and animals (see Tables G-1 and G-2) were identified by Indian elders as part of their traditional resources. Attachments A and B contain all plants and animals that are both present on the NTS and potentially will affect American Indian cultural resources within an area roughly bounded and known from various sources to have been used by either Western Shoshone, Southern Paiutes, or Owens Valley Paiutes. Attachments A and B also contain the Indian names for these plants and animals.

Table G-1. American Indian traditional-use plants present at the NTS (Page 1 of 4)

Scientific Name	Common Name	GC/UTTR	YM	PM/RM
1. *Ambrosia dumosa*	White bursage	X		
2. *Amelanchier utahensis*	serviceberry		X	
3. *Amsinckia tesselata*	fiddleneck		X	
4. *Anemopsis californica*	yerba mansa		X	
5. *Arabis pulchra*	wild mustard		X	
6. *Artemisia ludoviciana*	sagebrush, wormwood	X	X	
7. *Artemisia nova*	black sagebrush	X		X
8. *Artemisia tridentata*	big sagebrush		X	X
9. *Atriplex canescens*	four-winged saltbush	X		
10. *Atriplex confertifolia*	shadscale		X	
11. *Brodiaea pulchella*	desert hyacinth		X	
12. *Calochortus bruneaunis*	sego lily			X
13. *Calochortus flexuosus*	mariposa lily		X	
14. *Carex spp.*	sedge	X		
15. *Castilleja chromosa*	Indian paintbrush		X	
16. *Castilleja martinii*	narrowleaf paintbrush			X
17. *Ceratoides lanata*	winterfat			X
18. *Chenopodium fremontii*	Fremont goosefoot			X
19. *Chrysothamnus nauseosus*	rabbitbrush	X	X	X
20. *Cirsium mohavense*	desert thistle		X	
21. *Coleogyne ramosissima*	black brush		X	
22. *Coryphantha vivipara* var.	fishhook cactus	X	X	
23. *Coryphantha vivipara* var.	foxtail cactus			X
24. *Datura meteloides*	jimsonweed	X	X	
25. *Descurainia pinnata*	tansy mustard		X	
26. *Distichlis spicata*	salt grass		X	
27. *Echinocactus polycephalus*	cotton-top cactus		X	
28. *Echinocereus englemannii*	hedge hog cactus	X	X	
29. *Eleocharis palustris*	spikerush			X
30. *Elymus elymoides*	squirrel tail			X
31. *Encelia virginensis* var.	brittlebush		X	

NOTE: American Indian traditional-use plants present in the NTS area are identified in the project reports entitled *Native American Plant Resources in the Yucca Mountain Area, Nevada* (YM) (Stoffle et al., 1989b) and *Native American Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site (PM/RM)* (Stoffle et al., 1994b). This table includes traditional-use plants identified in the Colorado River Corridor Study (GC) and in the Utah Test and Training Range Study (UTTR) that are also present at the NTS (see NTS EIS, Table 4-38).

Table G-1. American Indian traditional-use plants present at the NTS (Page 2 of 4)

Scientific Name	Common Name	GC/UTTR	YM	PM/RM
32. *Ephedra nevadensis*	Indian tea	X	X	X
33. *Ephedra viridis*	Indian tea		X	X
34. *Eriastrum eremicum*	desert eriastrum			X
35. *Eriogonum inflatum*	desert trumpet		X	
36. *Erodium cicutarium*	herringbill			X
37. *Euphorbia albomarginata*	rattlesnake weed		X	X
38. *Geastrum spp.*	earthstar		X	
39. *Gilia inconspicua*	gilia			X
40. *Grayia spinosa*	spiny hop sage			X
41. *Gutierrezia microcephala*	matchweed	X	X	
42. *Juncus mexicanus*	wire grass		X	
43. *Juniperus osteosperma*	juniper, cedar	X	X	X
44. *Krameria parvifolia*	range ratany		X	
45. *Larrea tridentata*	creosote bush	X	X	
46. *Lewisia rediviva*	bitter root			X
47. *Lycium andersonii*	wolfberry	X	X	
48. *Lichen*	lichen		X	X
49. *Lycium pallidum*	wolfberry		X	
50. *Menodora spinescens*	spiny menodora		X	
51. *Mentzelia albicaulis*	desert corsage		X	X
52. *Mirabilis multiflora*	four o'clock	X		X
53. *Nicotiana attenuata*	coyote tobacco			X
54. *Nicotiana trigonophylla*	Indian tobacco	X	X	
55. *Opuntia basilaris*	beavertail cactus	X	X	
56. *Opuntia echinocarpa*	golden cholla cactus		X	
57. *Opuntia erinacea*	Mojave prickly pear	X	X	
58. *Opuntia polycantha*	grizzly bear cactus			X
59. *Orobanche corymbosa*	broomrape, wild			X
60. *Oryzopsis (Stipa) hymenoides*	Indian ricegrass	X	X	X
61. *Penstemon floridus*	Panamint beard tongue			X
62. *Penstemon pahutensis*	Pahute beard tongue			X

NOTE: American Indian traditional-use plants present in the NTS area are identified in the project reports entitled *Native American Plant Resources in the Yucca Mountain Area, Nevada* (YM) (Stoffle et al., 1989b) and *Native American Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site* (PM/RM) (Stoffle et al., 1994b). This table includes traditional-use plants identified in the Colorado River Corridor Study (GC) and in the Utah Test and Training Range Study (UTTR) that are also present at the NTS (see NTS EIS, Table 4-38).

Table G-1. American Indian traditional-use plants present at the NTS (Page 3 of 4)

Scientific Name	Common Name	GC/UTTR	YM	PM/RM
63. *Peraphyllum ramosissimum*	squawapple		X	
64. *Phragmites australis*	cane, reed	X	X	
65. *Pinus monophylla*	pinyon pine		X	X
66. *Prosopis glandulosa*	mesquite	X	X	
67. *Prosopis pubescens*	screwbean		X	
68. *Psorothamnus polydenius*	dotted dalea		X	
69. *Purshia glandulosa*	buckbrush		X	
70. *Purshia mexicana*	cliffrose			X
71. *Purshia tridentata*	buckbrush			X
72. *Quercus gambelii*	scrub oak		X	X
73. *Rhus aromatica*	skunkbush, sumac			X
74. *Rhus trilobata* var. *anisophylla*	squawbush		X	
75. *Rhus trilobata* var. *simplicifolia*	squawbush	X	X	
76. *Ribes cereum*	white squaw currant			X
77. *Ribes velutinum*	desert gooseberry			X
78. *Rosa woodsii*	woods rose			X
79. *Rumex crispus*	curly dock, wild rhubarb		X	
80. *Salix exigua*	willow	X	X	
81. *Salix gooddingii*	black willow	X	X	
82. *Salsola iberica*	Russian thistle	X		X
83. *Salvia columbariae*	chia sage		X	
84. *Salvia dorrii*	purple sage, Indian	X		
85. *Sarcobatus vermiculatus*	greasewood	X		
86. *Sisymbrium altissimum*	tumbling mustard			X
87. *Sphaeralcea ambigua*	globe mallow	X	X	X
88. *Stanleya pinnata*	Indian spinach	X	X	X
89. *Stephanomeria sp. spinosa*	spiny wire lettuce, gum	X	X	
90. *Stipa speciosa*	bunchgrass			
91. *Streptanthella longirostris*	wild mustard		X	
92. *Streptanthus cordatus*	wild mustard		X	
93. *Suaeda torreyana*	seepweed		X	
94. *Symphoricarpos longiflorus*	snowberry		X	

NOTE: American Indian traditional-use plants present in the NTS area are identified in the project reports entitled *Native American Plant Resources in the Yucca Mountain Area, Nevada* (YM) (Stoffle et al., 1989b) and *Native American Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site* (PM/RM) (Stoffle et al., 1994b). This table includes traditional-use plants identified in the Colorado River Corridor Study (GC) and in the Utah Test and Training Range Study (UTTR) that are also present at the NTS (see NTS EIS, Table 4-38).

Table G-1. American Indian traditional-use plants present at the NTS (Page 4 of 4)

Scientific Name	Common Name	GC/UTTR	YM	PM/RM
95. *Symphoricarpos spp.*	snowberry			
96. *Tessaria sericeae*	arrowweed	X	X	
97. *Thamnosma montana*	turpentine bush	X	X	
98. *Thelypodium integrifolium*	wild cabbage		X	
99. *Typha domingensis*	cattail		X	
100. *Typha latifolia*	cattail	X	X	
101. *Veronica anagallis-aquatica*	speedwell		X	
102. *Vitis arizonica*	wild grape	X	X	
103. *Xylorhiza tortifolia*	desert aster		X	
104. *Yucca baccata*	banana yucca	X	X	X
105. *Yucca brevifolia*	Joshua tree		X	
106. *Yucca spp.*	yucca		X	
107. *Yucca schidigera*	Mojave yucca ;Spanish		X	

NOTE: American Indian traditional-use plants present in the NTS area are identified in the project reports entitled *Native American Plant Resources in the Yucca Mountain Area, Nevada* (YM) (Stoffle et al., 1989b) and *Native American Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site* (PM/RM) (Stoffle et al., 1994b). This table includes traditional-use plants identified in the Colorado River Corridor Study (GC) and in the Utah Test and Training Range Study (UTTR) that are also present at the NTS (see NTS EIS, Table 4-38).

Table G-2. American Indian traditional-use animals present at the NTS

Scientific Name	Common name
Alectoris chukar	chukar
Ammospermophilus leucurus	white-tailed antelope squirrel
Amphispiza bilienata	black-throated sparrow
Aquila chrysaetos	golden eagle
Buteo jamaicensis	red-tailed hawk
Callipepla gambelii	Gambel's quail
Canis latrans	coyote
Cicadidae spp.	cicada
Cnemidophorus tigris	western whiptail lizard
Canis latrans	coyote
Colaptes auratus	northern flicker
Crotalus spp.	rattlesnake
Eutamias dorsalis	cliff chipmunk
Felis concolor	mountain lion
Felis rufus	bobcat
Formicidae formicinae	mound-building ant (red and black ant)
Gopherus agassizii	desert tortoise
Haliaeetus leucocephalus	bald eagle
Odocoileus hemionus	mule deer
Ovis canadensis	bighorn sheep
Sauromalus obesus	chuckwalla
Spizella breweri	Brewer's sparrow
Stagmomantis spp.	praying mantis
Sylvilagus spp.	cottontail
Vulpes velox	kit fox
Zanaida macroura	mourning dove

NOTE: American Indian traditional-use animals are identified in the project report entitled *Native American Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site* (Stoffle et al., 1994b). This table presents only a partial list of traditional-use animals present at the NTS (see NTS EIS, Table 4-39). To date, no systematic or extensive animal studies have been conducted at the NTS.

The CGTO knows that the actions considered in the NTS EIS potentially will affect American Indian cultural resources within an area roughly bounded by where these people live today on their traditional lands (see Figure G-1). The proposed NTS EIS actions will have cultural effects within this region of influence because of the cultural centrality of these lands to all three ethnic groups (Western Shoshone, Owens Valley Paiute, and Southern Paiutes). Within this region of influence, specific actions will have direct local impacts. Ultimately, however, any action that moves the NTS away from or back towards its natural state has influence on all Indian people.

The CGTO recognizes that some of the actions proposed in the NTS EIS will have direct impacts on other Indian tribes and organizations. For example, the Project Shoal Area is located on the traditional lands of Northern Paiute people. The Eldorado Valley actions potentially impact the Mohave people. The return of radioactive waste to the NTS has permitted and potentially will permit people like the Alaskan natives to have their lands restored to a natural state (see Project Chariot Report, DOE/NV, 1994). Therefore, the CGTO defines the No Action Alternative region of influence map in an effort to focus on the cultural concerns of those people having traditional ties to the NTS itself, but in so doing does not intend to preclude the cultural concerns of other Indian ethnic groups.

G.3.2.1.1 Mercury Valley, Section 4.1.10—The CGTO knows that the Mercury Valley hydrographic area contains a wide range of important cultural resources, including plants, animals, and archaeological sites. This knowledge comes from frequent visits by CGTO members to this area. Observed plants in this valley include Indian rice grass (*Oryzopsis hymenoides*), prince's plume (*Stanleya pinnata*), yucca (*Yucca Baccata*), and sacred datura (*Datura meteloides*). These plants represent sources of food, fiber, and medicine. Some important animal resources are rabbit, turtle, coyote, and chuckwalla. These and other Indian cultural resources found in Mercury Valley were and continue to be critical in the lives and culture of Indian peoples. No systematic American Indian studies have been conducted in Mercury Valley; therefore, at this time, it is not possible to completely assess the cultural significance of this area.

G.3.2.1.2 Rock Valley, Section 4.1.10—The CGTO knows that the Rock Valley hydrographic area contains a wide range of important cultural resources, including plants, animals, archaeological sites, and minerals. One formal American Indian plant study involving tribal elders who are plant experts was conducted in Rock Valley as part of the Yucca Mountain Project. A total of 32 medicine and food plants in upper Rock Valley were identified as part of the Yucca Mountain Project ethnobotany study (Stoffle et al., 1989b). Another 10 traditional-use plants were identified at the northeast base of Little Skull Mountain near the divide between Rock Valley and Jackass Flats (Stoffle et al., 1988a). Some of the important animals in the valley include rabbit, turtle, coyote, and whiptail lizard, which were used for food, ceremony, and eye surgery. Systematic American Indian studies of animals and archaeology have not been conducted in Rock Valley; therefore, a complete assessment of the cultural significance of this area is not possible at this time.

G.3.2.1.3 Fortymile Canyon and Jackass Flats, Section 4.1.10—The CGTO knows that the Fortymile Canyon and Jackass Flats hydrological area contains a wide range of important cultural resources, including plants, animals, archaeological sites, minerals, and power places. Three formal plant studies were conducted in this area as part of the Yucca Mountain Project; these studies identified 13 traditional-use plants (Stoffle et al., 1988a).

Fifteen formal ethnoarchaeological studies were conducted in this area as part of the Yucca Mountain Project; these studies identified numerous archaeological resources in this area, dating as early as Clovis (10,000 years ago) (Stoffle et al., 1989a). Also present in this area are important minerals, which were extracted by Indian people to make tools and other stone artifacts. Traditional quarry sites and localities are associated with these mineral resources. At least one power place known to be associated with traditional healing ceremonies is located in this area. Fortymile Canyon is well-known among Indian people who continue to use

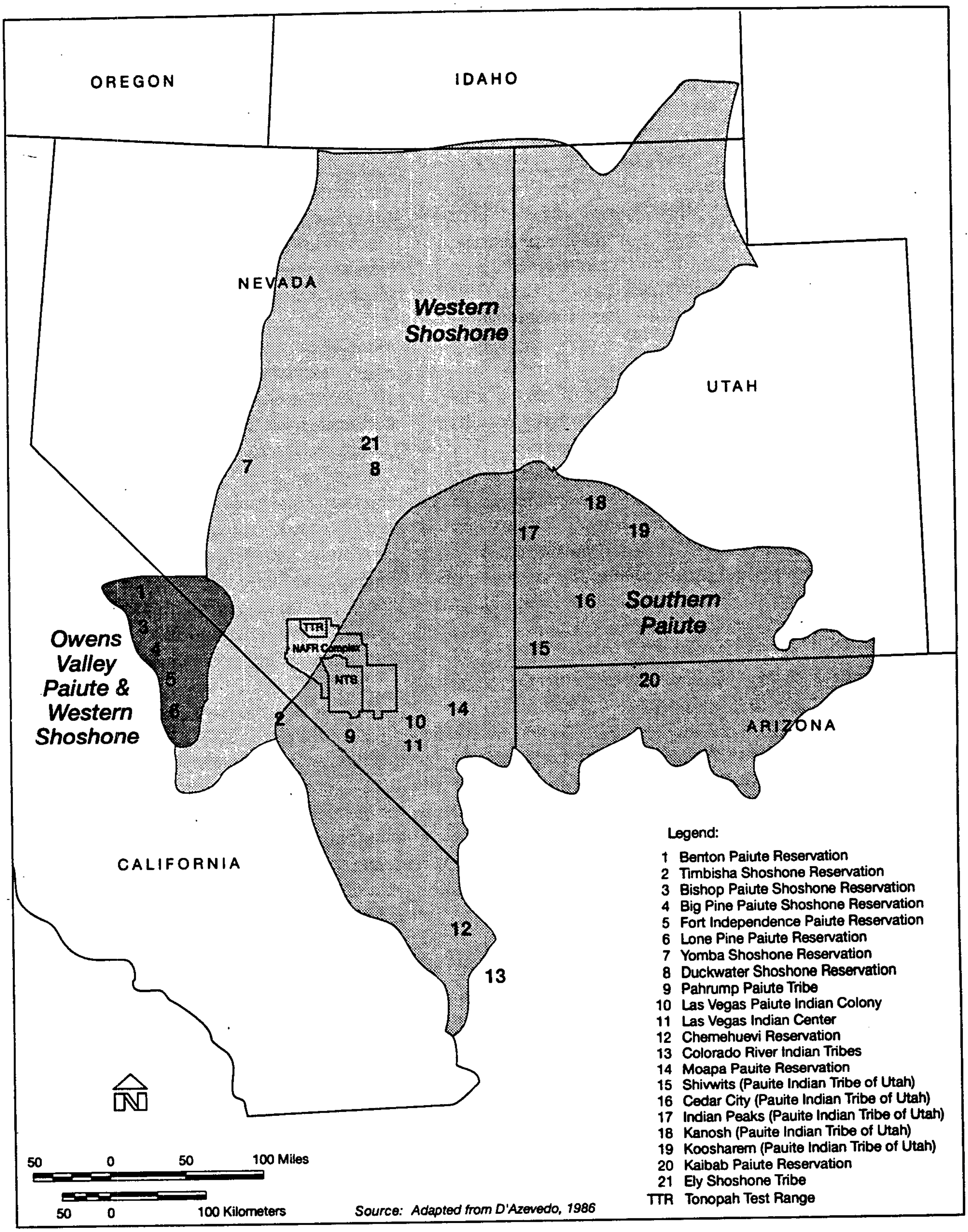


Figure G-1. American Indian region of influence for the NTS EIS either its traditional Shoshone name *Dogowya Hunumpi* (Snake Wash) or the Owens Valley name *Towahonupi* (Snake Canyon) to describe it. The canyon was a significant crossroad where numerous traditional Indian trails from distant places like Owens Valley, Death Valley, and the Avawtz Mountains came together (Stoffle et al., 1989a). While many American Indian studies have been conducted in this area, other cultural resources have not been systematically studied. Other needed studies include rock art (which is called in Southern Paiute *tumpituxwinap* or literally "storied rocks") (Stoffle et al., 1995), power places, and animals.

G.3.2.1.4 Buckboard Mesa, Section 4.1.10 — The CGTO knows that the Buckboard Mesa hydrological area contains a wide range of important cultural resources, including plants, animals, archaeological sites, minerals, and power places. Two ethnoarchaeological site visits have been conducted in this area. One study was focused on a power rock and a series of petroglyph panels located at the southern end of Buckboard Mesa (Stoffle et al., 1994a) and the second study included a visit to rock shelters containing obsidian nodules, artifacts, and Indian rock paintings. To the north of Buckboard Mesa is an extensive area of obsidian nodules which were significant in many ways to Indian people. Scrugham Peak, a volcanic cone, was preliminarily identified by Indian people as a place of traditional power and ceremony. A full cultural assessment of this place and its role in the Buckboard Mesa area awaits systematic American Indian traditional cultural property studies. While some American Indian studies have been conducted in this area, only a few archaeological sites have been assessed. There have been no systematic studies of plants, animals, and traditional cultural properties.

G.3.2.1.5 Oasis Valley, Section 4.1.10—The CGTO knows that the Oasis Valley hydrologic area is a part of the agricultural core area of a much larger Indian district called *Ogwe'pi* by the Indian people who used this farming, gathering, and medicine area. The cultural significance of the *Ogwe'pi* District is well established by document research (Stoffle et al., 1988b), one plant area study, one archaeological study area (Stoffle et al., 1994a), and by interviews conducted during the 1930s. According to Indian people interviewed in the 1930s (Steward, 1938), the *Ogwe'pi* District contained agricultural lands next to springs and streams in Oasis Valley itself, while the uplands formed by nearby mountains contributed pine nuts and deer to the diet of the Indian people (Stoffle et al., 1990b). The *Ogwe'pi* District was an important place for Indian trade and ceremonialism. Mineral hot springs were used by Indian people for curing, thus further increasing the cultural importance of the Oasis Valley core area. During much of the historic period, Indian people continued to live in Oasis Valley and use the surrounding uplands of the *Ogwe'pi* District. Much of the Oasis Valley hydrological basin has not been systematically studied by American Indian people. Therefore, at this time, it is not possible to fully assess the cultural significance of all places in the Oasis Valley.

G.3.2.1.6 Gold Flat, Section 4.1.10—The CGTO knows that the Gold Flat hydrological area contains a wide range of important cultural resources including plants, archaeological sites, and power places. This conclusion is based on American Indian studies conducted along the central and northern portions of Pahute Mesa. These studies identified 42 species of Indian plants found in this area (Stoffle et al., 1994b). American Indian archaeological studies in this area document the presence of living areas, food and tool processing areas, burial sites, and power places. Initial animal studies indicate the presence of culturally significant species, such as hawks and eagles. At this time, it is not possible to make a full cultural assessment of this hydrological area because only the Pahute Mesa has been studied and additional studies are planned to assess rock art and traditional cultural properties.

G.3.2.1.7 Kawich Valley, Section 4.1.10—The CGTO knows that the Kawich Valley hydrological area contains a wide range of important Indian cultural resources, including plants, animals, archaeological sites, and places of both power and ceremony. This knowledge comes from a series of systematic American Indian studies on Pahute Mesa regarding plants and animals and by selected observations by individual Indian people. A total of 42 plants were identified from 6 plant locations, 36 of which are still used today (Stoffle et al., 1994b). Interviews with Indian experts about animals indicated a number of culturally significant species, including hawks and eagles, and a unique species of ant valued as both food and medicine. Archaeological studies at sites indicate the presence of living areas and places where food and plants were processed (Stoffle et al., 1994b). Kawich Valley contains an important trail used within the current memory of Indian people. Members of the Kawich family visited this area and recounted family memories of Kawich Valley and the use of Pahute Mesa. Individual Indian people identified places in Gold Meadows where places of power and ceremony traditionally occurred, but no systematic interviews on this issue have been conducted. The CGTO has recommended that the Gold Meadows area be set aside for special protection and use by Indian people because of the concentration and variety of Indian cultural resources it contains. The cultural significance of the entire Kawich Valley hydrological area cannot be assessed at this time because studies have been limited to Pahute Mesa and because both traditional cultural properties and animal studies are planned for the area.

G.3.2.1.8 Emigrant Valley, Section 4.1.10—The CGTO knows that the Emigrant Valley hydrological area contains a wide variety of important cultural resources, including plants, animals, and archaeological sites because it is next to Gold Meadows and Rainier Mesa areas (Stoffle et al., 1994b). Indian people have requested access to this area but have not been permitted to either visit or conduct systematic interviews here; therefore, all current information about this area derives from recorded and unrecorded Indian oral history. It is known that an Indian man who received the Anglo name Panamint Joe Stuart was from the Belted Range, which is the western boundary of the Emigrant Valley (Steward, 1938). Steward's Indian interviews conducted in the 1930s indicated that, in the late 1800s, there were 15 known locations of Indian camps in the Belted Range (Steward, 1938). Steward's interviews revealed that the Indian people of these Belted Range villages associated with the Indian people in the Kawich Range to the east and the Beatty people to the southwest. These data support the tentative conclusion of the AIWS that the two valleys have similar levels of cultural significance. No systematic Indian studies have been conducted in Emigrant Valley, so a complete cultural assessment is not possible at this time.

G.3.2.1.9 Yucca Flat, Section 4.1.10—The CGTO knows that the Yucca Flat hydrological area contains a wide variety of culturally important Indian resources, including plants, animals, archaeological sites, rock paintings, and ceremonial areas. Systematic American Indian studies have been conducted along the southern rim and base of Rainier Mesa, in the Eleana Range, on the northeastern flank of Shoshone Mountain and along the western edge of Yucca Flat itself. Plant studies indicate that 2 species are located in the more arid lowlands, 13 species at Tippipah Spring, 21 species at Captain Jack Spring, 11 species at White Rock Spring, and 4 species on the mesa rim (Stoffle et al., 1988a). The few interviews with Indian people about animals observed in this area do indicate that many significant animals are present, including mountain lion, deer, and hawks. The area is archaeologically complex with major camps located at permanent springs and food and tool processing places scattered throughout the area. All the springs in this area were permanent Indian camps. White Rock Spring, *Toshatimbibah*, had a major settlement call *Tunava* in the late 1880s and was a central place for interethnic gatherings. Indian people came to these ceremonies from distant communities. These ceremonies included major annual rabbit drives and dances that lasted up to a month (Steward, 1938). This spring was the home of a regional chief whose name was *Wangagwana* (Steward, 1938). The White Rock Spring was occupied by Indian people until the 1930s and used until the mid-1950s after the NTS was officially withdrawn from public use. The cultural significance of the western portion of this hydrological area is well established; however, no studies have been conducted in the central, eastern, and southern portions of this area. Because additional American Indian studies are planned and some areas have not been studied, a full cultural assessment of this area is not possible at this time.

G.3.2.1.10 Frenchman Flat, Section 4.1.10—The CGTO knows that the Frenchman Flat hydrological area contains a wide variety of plants, animals, and archaeological sites of cultural importance to Indian people. Systematic studies of both plants and archaeology sites have been conducted in the west-central portion of this area. A total of 20 plant species were identified at 2 plant study locations, with 2 species identified on a flat area near the eastern flank of Mt. Sayler and another 18 species identified at Cane Spring (Stoffle et al., 1988a). A complete cultural assessment of this area is not possible at this time because past studies were geographically and topically restricted.

G.3.2.1.11 Tonopah Test Range, Section 4.1.10—The CGTO knows that the Tonopah Test Range contains significant cultural resources, including plants, animals, archaeological sites, and places of historic value to Indian people. This is known from Indian interviews conducted in the 1930s (Steward, 1938) and from recent plant, animal, and archaeology studies conducted south of this area in comparable environments (Stoffle et al., 1990b, 1994a and b). These studies document long-term and extensive involvement of Indian people in these traditional lands. These were among the last areas lived in before Indian people were forced out of the area to live on more distant Indian reservations. As a result of oral history, Indian people know there are various types of cultural resources located in this study area, but cannot provide site-specific information at this time. No Indian people officially representing the CGTO have visited the Tonopah Test Range or any other portion of the Nellis Air Force Range (NAFR) Complex, although such interviews have been requested and one initial meeting with an NAFR Complex archaeologist has occurred. Therefore, it is not possible to fully assess the cultural significance of the Tonopah Test Range at this time.

G.3.2.1.12 Nellis Air Force Range Complex, Section 4.1.10—The CGTO knows that the Double Tracks Test Area contains significant cultural resources, including plants, animals, archaeological sites, and places of historic value to Indian people. This is known from Indian interviews conducted in the 1930s (Steward, 1938) and from recent plant, animal, and archaeology studies conducted south of this area in comparable environments (Stoffle et al., 1990b, 1994a and b). These studies document long-term and extensive involvement of Indian people in these traditional lands. These were among the last areas lived in before Indian people were forced out of the area to live on more distant Indian reservations. As a result of oral history, Indian people know there are various types of cultural resources located in this study area, but cannot provide site-specific information about these areas at this time. No Indian people officially representing the CGTO have visited the Double Tracks Test Area or any other portion of the NAFR Complex, although such interviews have been requested and one initial meeting with an NAFR Complex archaeologist has occurred. Therefore, it is not possible to fully assess the cultural significance of the Double Tracks Test Area at this time.

G.3.2.1.13 Area 13, Section 4.2.10—The CGTO knows that Area 13 contains significant cultural resources, including plants, animals, archaeological sites and places of historic value to Indian people. This is known from Indian interviews conducted in the 1930s (Steward, 1938) and recent plant, animal, and archaeology studies conducted south of this area in comparable environments (Stoffle et al., 1990b, 1994a and b). These studies document long-term and extensive involvement of Indian people in these traditional lands. These were among the last areas lived in before Indian people were forced out of the area to live on more distant Indian reservations. As a result of oral history, Indian people know there are various types of cultural resources located in this study area, but cannot provide site-specific information about these areas at this time. No official representatives of the CGTO have visited Area 13 or any other portion of the NAFR Complex, although such interviews have been requested and one initial meeting with an NAFR Complex archaeologist has occurred. Therefore, it is not possible to fully assess the cultural significance of Area 13 at this time.

G.3.2.2 Project Shoal Area, Section 4.3.10. This study area is not within the traditional lands of the Indian people represented by the CGTO. It is recommended by the CGTO that the DOE EIS team directly contact Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake and Lovelock Paiute.

G.3.2.3 Central Nevada Test Area, Section 4.4.10. The CGTO knows that there are a variety of cultural resources contained in the Central Nevada Test Area. Information about this area comes from previous ethnographic research (Steward, 1938) and recent archaeology reports (Edwards and Johnson, 1994). The area contains a number of cultural resources of special interest to the CGTO. These include (1) hot springs, (2) a cold spring, (3) petroglyph panels, and (4) more than 100 archaeological sites. Earlier archaeological research conducted by the University of Nevada Las Vegas collected between 20,000 to 30,000 artifacts. The simple fact that so many artifacts were recovered from this small area indicated the long-term involvement of Indian people with this site. The CGTO has requested the opportunity to visit the area as part of this EIS in order to more fully understand its cultural significance. Until this site visit occurs, it is impossible to more fully assess the cultural significance of this area.

G.3.2.4 Dry Lake Valley, Section 4.6.10. The CGTO knows that the Dry Lake Valley area contains a wide range of important cultural resources. This knowledge derives from previous American Indian cultural resource studies of the area conducted during the Harry Allen-Warner Valley (Bean and Vane, 1979) and the Intermountain Power Project (Stoffle and Dobyns, 1982; Stoffle et al., 1983) studies of Indian concerns along various proposed power line routes. These power line study areas were located in the bottom and along the eastern edge of Dry Lake Valley. During these studies, elders identified a wide range of plants, animals, and archaeological sites within this valley. A 1982 mail survey of Indian people indicated an "Intensity of Concern" score of 2.5 on a 4.0 scale (Stoffle and Dobyns, 1982). A 1983 on-site visit to the Dry Lake Valley area indicated numerous rock shelters that Indian people considered very significant and the presence of 10 Indian plants (Stoffle et al., 1983). The cultural assessment of the Navajo-McCullough right-of-way indicated the presence of eight plants identified elsewhere as American Indian plants, numerous archaeological sites, and artifact scatters in Dry Lake Valley (Brooks et al., 1975). Previous studies have been geographically limited, so a complete cultural assessment of the Dry Lake Valley is not possible without visiting other portions of the valley.

G.3.2.5 Eldorado Valley, Section 4.5.10. The CGTO knows that the Eldorado Valley study area contains a wide variety of cultural resources, including plants, animals, and archaeological sites. This knowledge is derived from previous American Indian cultural resource studies of the area conducted during the Harry Allen-Warner Valley (Bean and Vane, 1979) and Intermountain Power Project (Stoffle and Dobyns, 1982; Stoffle, 1983) studies of Indian concerns along various proposed power line routes and the Ivanpah Generating Station Study (Bean and Vane, 1982) conducted in a neighboring valley. Identified Indian plants include creosote (*Larrea tridentata*), desert trumpet (*Erigonum inflatum*), and Indian tea (*Nevada ephedra*). Indian animals include bighorn sheep (*Ovis canadensis*), desert tortoise (*Gopherus agassizii*), and speckled rattlesnake (*Croatalus mitchellii*). The valley is a theme of songs that are sung at funerals and also in the Cry Ceremonial. There are both spiritual and physical Indian trails associated with this valley. Eldorado Valley trails were used by Pahrump and Las Vegas Paiutes to travel to places along the Colorado River, especially Cottonwood Island. Traditional Indian trails are a significant Indian cultural resource because they were both physical and spiritual paths (Laird, 1976). The Ivanpah Generating Station Study concluded that the MuCullough Mountains (which defines the western edge of Eldorado Valley) are of much concern to Indian people, both Southern Paiute and Mohave. According to the Ivanpah study, these Indian people have trails, sacred sites, plants, and animals of cultural importance in the MuCullough Mountains, the associated Eldorado Valley, and in the Eldorado Mountains (Bean and Vane, 1982). A 1975 study of the Navajo-McCullough transmission line right-of-way further indicates the presence of traditional-use plants, early Pinto Series-style projectile points, numerous lithic scatters, and grinding stone fragments that are related to the seed gathering activities possibly of the later Paiute peoples (Brooks et al., 1975). Previous studies have been geographically limited to a few places within

Eldorado Valley or in neighboring areas, so a complete cultural assessment of the Eldorado Valley is not possible without visiting other portions of the valley with Indian people.

G.3.2.6 Coyote Spring Valley, Section 4.7.10. Coyote Spring Valley is an area on the west flank of the Meadow Valley Mountains. The CGTO knows that this site contains a wide variety of American Indian cultural resources. The site was studied by Indian people during the Intermountain Power Project (IPP) (Stoffle and Dobyns, 1982). Nine Indian-use plants were identified during that on-site visit, including white bursage (*Ambrosia dumosa*), four-winged saltbush (*Atriplex canescens*), salt grass (*Distichlis spicata*), desert trumpet (*Eriogonum inflatum*), matchweed (*Gutierrezia microcephala*), range ratany (*Krameria parvifolia*), desert willow (*Chilopsis linearis*), prince's plume (*Stanleya pinnata*), and Wolfberry (*Lycium andersonii*) (Stoffle and Dobyns, 1982). The large desert tortoise was observed at this location. The area contains portions of an original Indian trail-wagon road from Moapa Valley to Pahranagat Valley. Archaeological survey of the IPP corridor revealed 9 sites and 20 scattered finds (Tucker et al., 1982). Known Indian cultural resources exist in the Coyote Spring Valley area, but it is impossible to fully understand the potential impacts to cultural resources without additional systematic on-site resource studies by Indian people.

G.3.3 Occupational and Public Health and Safety/Radiation

Indian people believe that various perceived risks are present and occur as a result of DOE activities. Although there are no Indian words for terms such as *radiation* in the Indian language, early ethnographic studies supported by the DOE documented a traditional view of radioactivity that centers on the perception by Indian elders of radiation being produced by an *angry rock* (Stoffle et al., 1989a). Briefly this view is as follows:

Rocks have power. It is recognized that some rocks have more or different power than others. Breaking a rock or removing it from its place without fully explaining these actions not only releases the power inherent in the rock, but also angers the rock.

Rocks can also be self-willing, inasmuch as they can reveal themselves to people and act on people. Crystals, for example have a self-willing, animate power and will reveal themselves to a person whom they desire to be with. If this person picks them up, the person will have great luck. The luck, however, is taken away from others and eventually people will come to recognize this fact and single out the excessively lucky person as having used some nonhuman power at the expense of his or her people. Usually the person takes the crystal back to where it had revealed itself and returns it with an explanation of why it was being returned.

Radioactivity was interpreted as being the angry action of a powerful rock that had been quarried without its permission and had its power used for purposes it did not agree to. Now the remains of the rock (radioactive waste) is angry and it is taking its anger out on things around it. Plants, animals, people, water, and even the air itself can be hurt or even killed by the radiation from the angry rock. Indian people express the belief that past radiation releases have contaminated plants and animals traditionally used for foods and medicines. Spiritual people believe that they can see and feel radiation, that it has unique colors. This is why they can neither eat nor collect some plants, animals, and minerals in some areas. It is now impossible for Indian people to go to certain places, do certain ceremonies, and eat certain foods because radiation from the angry rock has been released.

Air: Living and Dead - Indian people express the belief that the air is alive. There are different kinds of air with different names in Indian language. The Creator puts life into the air which is shared by all living things. When a child is born, they pull in the air to begin its life. The mother watches carefully to make sure that the first breath is natural and that there is no obstruction in the throat. It is believed that if the day of birth is a windy day, it is a good day and the child will have a good life. According to one elder:

"The seasons—like winter, spring, summer, and fall—they're all important when a child comes into the world because their spirit is tied in with the harvest, or hunt; they say that it gets kinda like into their blood and they become hunters or farmers.

You can listen to the wind, the wind talks to you. Things happen in nature. Our people had weather watchers, who are kinds of people who will know when crops and things should be done. They watch the different elements in nature and pray to ask the winds to come and talk about these things. Sometimes you ask the north wind to come down and cool the weather. The north wind is asked to blow away the footsteps of the people who have passed on to the afterlife. That kind of wind helps people, it is positive. The wind also brings you songs and messages. Sometimes the messages are about healing people, a sign that the sickness is gone now from the person, or that it is coming to get that sickness to take it away, or it is coming to bring you the strength that you need to deal with the illness."

But air can be destroyed by radiation that has been released by the angry rock, thus causing pockets of dead air. There is only so much alive air which surrounds the world. If you kill the living air, it is gone forever and cannot be restored. Dead air lacks the spirituality and life necessary to support other life forms. Airplanes crash when they hit dead air. One member of the CGTO compared this Indian view of killing air with what happens when a jet flies through the air and consumes all of the oxygen, producing a condition where another jet cannot fly through the air. The atomic blast consumes the oxygen like the jet, killing the air. While this comparison of the Western science view of dead air from burning seems close to the Indian perspective, the latter has a "life force" component that makes killing air more significant than just consuming its natural components.

Some Indian people who were present during the aboveground atomic blasts believe that the sickness they have today came from the radiation. To some of these people, the effects of the radiation were in addition to what happened when the air itself was killed. Some elders today say that even when the plants survive the effects of radiation, the dead air killed them or made them lose their power, their spiritual power to heal things.

BLAST RADIATION—The aboveground atomic detonations were witnessed by many Indian people. Today, these Indian eyewitness accounts are told with retrospective assessment of the risks that were involved by being close to the blasts and from using the natural resources in the area. Indian people continued to regularly enter the NTS to hunt and collect long after atomic testing began. Today, the eyewitnesses are elders talking about when they were younger in the 1950s. A few of these accounts are provided in order to explain to non-Indian people the Indian perception of risk derived from these experiences.

A Western Shoshone woman, who still lives near the NTS, recounted her memories of being a young woman during the blasts. According to her:

"After the bombs (aboveground atomic explosions), my people (Shoshone people) would kill the animals in the area and find something wrong with them. They would kill a deer, but when the hide was skinned off it would just pull apart. When they saw the mushrooms going up (atomic bomb blasts), they knew something was bad. The people (my family and others) were in the mountains picking pine nuts when one of the blasts went off; it felt like an earthquake. I was there, about 8,000 feet. The little animals ran away. The old people looked up into the swaying trees and asked what would happen to those little (bird) nests up there. We Indian people do not go up in the trees, so we will not disturb the birds.

After some of the blasts occurred, the old people told us not to pick the pine nuts off the ground, so after that time we just took the green cones from the trees. This made fewer pine nuts available to us. Lots of animals seemed different after the blasts. The migrating birds did not come through after that. The rabbits, of which we were eating a lot at that time, were not right. We developed a way to test them for sores. Many rabbits we could not even skin properly, the skin would just fall apart. The chuckwallas and tortoises disappeared, like the migrating birds. The old people told us that the plants are not maturing properly, so the tortoises and chuckwallas are dying. Both the Indian women and the Indian cattle lost their unborn children (through miscarriage) at this time.

Many of the essential plants were affected by the blasts, either directly or because the rain would not *come. Those old basket makers would say the willows were really brittle after that, they were hard and would not split easily. Even the greasewood became bad too—it is related to the tortoises and the playas (dry lakes)—the Shoshone songs sing about the tortoises and the greasewood together. The old ones would say that when the plants go away, it (what we need to live) will not be there for us anymore. So, we will go away too. One elder is remembered as saying, "What will become of us?" You know they (the elders) would talk like that when they saw what was changing around them.*

A Southern Paiute man remembered his mother (who is still living) telling him stories of the atomic blasts and their effects on plants and animals. His mother would travel with her family to hunt and gather plants. They (old Paiutes) say that the deer would come down over the Bare Mountains and collapse. People would eat other deer that they had killed for themselves, but when they tried to make clothing out of the hides, the hides would fall apart. Plants in the area don't grow as big anymore and were not preferred because they lost some of their power as food and medicine.

A Southern Paiute woman recounted the story of one of her tribal elders who personally experienced the blasts. This elder currently lives on the Colorado River Indian Reservation hundreds of miles to the south of the NTS, thus again reinforcing the need to talk with Indian people regardless of where they live today. (Name withheld) is a 78 year old Chemehuevi woman who lived in this area when she was young. She was here when the blasting occurred and she remembers the white flashes. She has vivid recollections of seeing all of this and now that she is older, she has cancer and is real afraid. She feels good when she comes to the NTS as part of the CGTO studies, but she is real afraid of the rocks and the plants because of what has happened. She says what happened to them, happened to her.

Perceptions such as these are well known among the Western Shoshone, Southern Paiute and Owens Valley Paiute people of this region. These perceptions of risks from radiation are frightening. and remain an important part of our lives. We will always carry these thoughts with us. Today, people are afraid of many things and places in this whole area, but we still love to come out and see our land. We worry about more radiation being brought to this land."

If the DOE wants to better understand our feelings about the impacts of radiation on our cultures, they should support a study of risks from radiation designed, conducted and produced by the CGTO. At this time there has not been a systematic study of American Indians perceptions of risk. Therefore, it is not possible to provide action-by-action estimation of risk perception impacts. We believe it is a topic that urgently needs to be studied so that Indian people may better address the actual cultural impacts of proposed DOE actions. There have been recent workshops funded by the National Science Foundation to understand how to research the special issue of culturally-based risk perception among American Indian communities, and at least one major project has been funded. Although this is a relatively new topic of research, it is one that can be more fully understood by research that deeply involves the people being considered. To understand our view of radiation is to begin to understand why we responded in certain ways to past and present, and why we will continue to respond to future DOE activities.

G.3.4 Environmental Justice and Equity

Federal agencies are directed by Executive Order 12898 to detect and mitigate potentially disproportionately high and adverse human health or environmental effects of its planned programs, policies, and activities to promote nondiscrimination among various populations in the United States. The CGTO knows of three violations of this act that have derived from past NTS programs, policies, and activities. These are (1) holy land violations, (2) health violations, and (3) cultural survival-access violations. Evidence for each of these violations varies. There is no question that only the holy lands of Indian peoples have been, continue to be, and will be impacted by NTS actions. There is no question that only Indian people have lost cultural traditions because they have been denied access to places on the NTS where ceremonies need to occur, where plants need to be gathered, and where animals need to be hunted in a traditional way. There is no scientific evidence, and there never will be, to completely document the physical health risks of Indian people deriving from NTS-produced radioactivity. Indian people have such poor health care and there are so few of them that it is difficult, if not impossible, to establish the collective health impacts of radiation. Studies of how Indian people perceive themselves to be at risk from radioactivity and what social and cultural impacts derived from these risk perceptions can be conducted, but these have not been conducted.

G.3.4.1 Holy Land Violations. American Indian people who belong to the CGTO consider the NTS lands to be central in their lives today as these lands have been since the creation of these people. The NTS lands are part of the holy lands of Owens Valley Paiute, Western Shoshone, and Southern Paiute peoples. These holy lands have been polluted and their resources damaged by long-term activities involving radioactive materials. The CGTO perceives that the past, present, and future pollution of these holy lands constitutes both Environmental Justice and equity violations. No other people have had their holy lands impacted by NTS-related environmental pollution and damage.

G.3.4.2 Health Violations. The lives and health of Indian people who have occupied this area since their creation have been seriously threatened by continued exposure to radioactivity. This threat is not limited to Indian people who live in the immediate vicinity of the NTS and use its resources on a regular basis, but extends to those Indian people who share resources that have been collected on the NTS region. Indian people fear the continuous invisible peril of radioactive contamination and its cumulative effects on future Indian generations. These Indian people have experienced, and will continue to experience, health effects and perceived risks from NTS radioactivity.

G.3.4.3 Cultural Survival - Access Violations. One of the most detrimental consequences of NTS operations for the survival of American Indian culture, religion, and society has been the denial of access to their traditional lands and resources. Loss of access to traditional foodstuffs and medicine have greatly contributed to undermining the cultural well-being of Indian people. These Indian people have experienced, and will continue to experience, breakdowns in the process of cultural transmission due to lack of access to NTS lands and resources. No other people have experienced similar cultural survival impacts due to lack of access to the NTS. Recently, the DOE has accepted a CGTO recommendation to open access for American Indians who must conduct their traditional ceremonies and obtain resources within NTS lands, provided that these lands are not contaminated; areas set aside for Indian use would be cleaned up. Unfortunately, land disturbance and irreparable contamination of the soil and underground water may render many locations unusable.

To date, a systematic evaluation of traditional places within the NTS has not been made by Indian people; therefore, no specific statements about access to particular locations can be made at this time. An important exception is the recommendation of the CGTO that the Gold Meadows area be set aside for exclusive Indian use because it contains a concentration of important cultural resources. The DOE/NV has acknowledged the importance of this area to Indian people and will make every effort to protect it.

American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival especially access violations.

These concerns are discussed in Section 4.1.10, Cultural Resources, and Section 4.1.11, Occupational and Public Health and Safety/Radiation.

There has not been a systematic study of these issues for any of the areas examined in this EIS. The CGTO maintains that past, present and future activities on the NTS have, are, or will disproportionately impact the American Indian people. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

G.3.4.4 Tonopah Test Range. Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. There has not been a systematic study of these issues for the Tonopah

Test Range. The CGTO maintains that past, present and future activities on the Tonopah Test Range have, are, or will disproportionately impact these American Indian Environmental Justice issues. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

G.3.4.5 Project Shoal Area, Section 4.3.12. American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. There has not been systematic study of these issues for the Project Shoal Area site.

This study area is not within the traditional lands of the American Indian people represented by the CGTO. It is recommended by the CGTO that the DOE NTS EIS team directly contact American Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake and Lovelock Paiute Tribes.

G.3.4.6 Central Nevada Test Area, Section 4.4.12. American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. There has not been a systematic study of these issues for the Central Nevada Test Area. The CGTO maintains that past, present and future activities on the Central Nevada Test Area have, are, or will impact these American Indian Environmental Justice issues. Even though the CGTO has not been permitted to visit the area, the area is especially important due to the concentration of cultural resources. Therefore, this area provides a special opportunity for the DOE to undue past Environmental Justice impacts. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

G.3.4.7 Eldorado Valley, Section 4.5.12. American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. There has not been a systematic study of these issues for the Eldorado Valley. The CGTO maintains that past activities in the Eldorado Valley have impacted these American Indian Environmental Justice issues, especially Holy Land violations. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

G.3.4.8 Dry Lake Valley, Section 4.6.12. American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. There has not been a systematic study of these issues for the Dry Lake Valley. The CGTO maintains that past activities in the Dry Lake Valley have impacted these American Indian Environmental Justice issues, especially Holy Land violations. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

G.3.4.9 Coyote Spring Valley, Section 4.7.12. American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. There has not been a systematic study of these issues for the Coyote Spring Valley. The CGTO maintains that past activities in the Coyote Spring Valley have impacted these American Indian Environmental Justice issues, especially Holy Land violations. This area was traditional lands for Southern Paiutes, especially the Moapa Paiute Tribe. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

G.3.5 Outline of Social and Economic Issues

G.3.5.1 American Indian Region of Influence. Within this region of influence, there also are several Indian reservations, tribal enterprises, tribally controlled schools, tribal police departments, and tribal emergency response units. The following reservations are located within the designated region of influence: Duckwater Shoshone Tribe, Las Vegas

Paiute Tribe, Moapa Paiute Tribe, and the Yomba Shoshone Tribe. In addition, there are tribes which are located geographically outside of the region of influence, but are potentially impacted by NTS activities. One of these tribes is the Timbisha Shoshone Tribe, based in Death Valley, California. This tribe is actually located closer to the NTS than many towns in northern Nye County. As a consequence of this proximity, people from the Timbisha Shoshone Tribe are a part of the social and economic region of influence of the NTS. For example, students from the Timbisha Shoshone Tribe attend public school in Beatty, Nevada, whereas many Shoshone students from Tacopa, California, attend school in Pahrump, Nevada. Timbisha tribal members work and shop in Clark and Nye counties.

The Pahrump Paiute Tribe, located in Pahrump Valley, is composed of Indian people who have been historically recognized by state and federal agencies as qualified to receive services as Indian people, and who as a group are currently seeking federal acknowledgment.

G.3.5.2 American Indian Education. Under federal and tribal law, American Indian children can be educated in tribally controlled and federally certified schools located on Indian reservations. Federal funds are available through the Indian Education Act for the education of Indian children. Compensation from the federal government is provided to any school district that has entered into a cooperative agreement with federally recognized tribes, whether it be public, private, or an Indian-controlled school.

One tribally controlled elementary school is in Nye County. It is operated by the Duckwater Shoshone Tribe. In 1995, the school had 32 students enrolled from preschool to 8th grade, who were taught by 3 full-time certified teachers; these included 2 certified elementary teachers, 2 teaching assistants, 1 preschool teacher, and 1 teacher under Chapter 1 Program. Using these numbers, the student-to-teacher ratio was 10.66:1 (Duckwater Shoshone Tribe, 1996).

A tribally operated Headstart Program is located on the Moapa Paiute Indian reservation. The program is open to all eligible preschool students. Both included Indian students and non-Indian students from nearby communities. This program is funded through the Inter-Tribal Council of Nevada, which operates Headstart sites elsewhere in Nevada. Indian students also attend non-Indian public schools.

G.3.5.3 Farming and Ranching. The NTS contains valuable resources for American Indian economy that were lost not only to Euroamerican encroachment but also to land withdrawal, pollution, and radioactive contamination. The NTS is in a desert region where water is the most crucial source. Springs located within the NTS and in its immediate vicinity were the place of Indian settlement and traditional farming until the first half of this century. Although much of the well-watered land in the aboriginal territory was lost to Euroamerican settlers, by the turn of the century American Indian families owned small farms in the area both for their own consumption and for commercial purposes. Livestock was also a part of the Indian economy. Foodstuffs and stock forage were grown and sold by Indian people to supplement wage labor (Stoffle et al., 1990a). With decreased access to spring and agricultural fields, and with some pollution of land and water, traditional Indian farming was seriously impacted.

G.3.5.4 Mining. American Indian people played a major role in the development of mining in the region of the NTS. Many local American Indians were active prospectors on their own behalf, locating their own mining claims. Many of the producing mines in southern Nye County, for example, were located by local American Indian people, whose knowledge of minerals had been developed throughout centuries of mineral collecting. The NTS was one of the areas where Indian people conducted their mining activities. Several American Indian people guided Euroamerican prospectors to valuable ore deposits, providing them with transportation, food and lodging, and teaching them about minerals, water resources and trails. Yet, American Indians were not made equal partners in mineral development as they may have expected and may have been promised (Stoffle et al., 1990a). Perhaps because mining was seen as a primarily Euroamerican economic activity, the rights of American Indians to claim mines was never made explicit. Mining was further precluded when the NTS land was withdrawn. Thus, Euroamerican settlers began a process that was continued by the withdrawal of NTS lands.

G.3.5.5 Political Integration and Community Cohesion. The process of fragmentation of Indian nations into small, increasingly isolated communities began with Euroamerican settlement and continued with the withdrawal of NTS lands. The loss of cohesion has lowered the ability of Indian people to (1) negotiate, (2) resolve conflicts, (3) keep peace, and (4) share resources. The White Rock Spring area was traditionally where all activities promoting community cohesion and political integration took place. When Indian people were denied access to White Rock Spring, they lost a central place shared by the three ethnic groups. Without this central place, the three ethnic groups did not meet as often. Eventually, the lack of contact weakened interethnic relationships and, to some extent, caused an overall loss of political power and skills among the groups. The political strength of the three ethnic groups, to some extent, has been restored with the NTS American Indian consultation program, which has provided the opportunity for the three ethnic groups to meet on a regular basis, work together, find common ground, and speak with one voice.

G.3.5.6 Waste Transportation and Tribal Enterprises. Other major concerns of the CGTO are the impact and cumulative effects of NTS operations on the tribal economy, particularly regarding the issue of radioactive waste being transported across reservation lands. To date, only minimal efforts have been made to investigate socioeconomic impacts of NTS actions on Indian tribes and organizations. Ongoing research by the AIWS on such effects suggests, for example, that continued or increased transportation is detrimental to the economic success of tribal-owned businesses and may increase the value of insurance policies. Currently, there are no compensation measures planned nor mitigation efforts taken by the federal government to improve the socioeconomic problems of tribes and organizations directly affected by NTS operations. Similarly, no efforts have been made to distribute equally the benefits and losses caused by NTS operations among Indian and non-Indian populations.

G.4 Environmental Consequences

This section contains the overall and integrated responses of the CGTO to five categories of actions. These have been packaged into the categories: (1) Defense Program, (2) Waste Management Program, (3) Environmental Restoration Program, (4) Nondefense Research and Development Program, and (5) Work for Others Program. This section provides a summary of each project and a general response by the CGTO which includes at least one recommended action.

Defense Program. The Defense Program involves actions that range from complying with the nuclear weapons test moratorium of 1991 that precludes new underground nuclear testing to maintaining a state of readiness to resume unlimited nuclear tests if so instructed by Congress. The CGTO believes that any future nuclear testing will continue to adversely impact American Indian cultural resources. Studies have shown that nuclear testing has caused rock shelters and petroglyph panels to be destroyed when the edges of rock outcrops break off due to ground vibrations generated by the test (Stoffle et al., 1994b). Studies have shown that plants have been removed so that roads, power lines, drill pads, and water ponds can be built as part of constructing the underground test chambers. Indian people express the opinion that some plants have been polluted due to releases of radioactivity from underground tests. Indian people also express the opinion that some plants are dying or do not flourish because they are not being prayed for ("talked to") and used in a traditional manner by Indian people. Indian people express the concern that animals and their habitat have been harmed by underground tests. Indian people express concern that future underground tests will continue to crack the earth, releasing radioactivity into the large underground water systems who are themselves alive, as well as being a basis for all other life and a part of the earth itself. Many Indian people indicated that they were emotionally and spiritually troubled by ground-disturbing activities and underground nuclear tests. Even in areas where American Indian studies have occurred, there have not been studies of petroglyphs, power places, or cultural landscapes. Some areas have not been studied at all. It is not possible to completely assess the potential impacts of future underground tests on these cultural resources.

Another major component of the Defense Program involves construction of a tritium production and recycling facility, expanding stockpile management responsibility, storage and disposal of weapons-usable fissile materials, and counterproliferation research and development. The CGTO has insufficient information and understanding of these issues to make a complete assessment of their impacts on cultural resources. There are some observations that can be made at this time. The NTS is a holy area that is central to these Indian people. In general, the more fearful activities that occur here and the more ground disturbance that occurs, the more cultural risks will be involved if Indian people use these lands. The more such activities occur on these lands, the longer and more difficult it will be to restore these lands to their natural condition.

Waste Management Program. The storage of radioactive and mixed waste generated by the DOE will be an ongoing responsibility regardless of which EIS alternative is selected. This program minimally involves the storage of existing waste and waste generated during the environmental restoration of NTS lands. Under Alternative 3, waste could be received from any DOE facility, which would cause current NTS waste disposal locations to be filled and new waste facilities to be sited and operated. Indian people hold both traditional and scientific views of radioactivity. The former builds on the view that rocks are alive; radioactive rocks are powerful, but they can become "angry rocks" if they are removed without proper ceremony, used in a culturally inappropriate way, disposed of without ceremony, and placed where they do not want to be (Stoffle et al., 1989a and 1990c). Another issue is the ethics of relocating radioactive waste from other American Indian lands so those people can live without fear of radioactivity (see Project Chariot, DOE/NV, 1994). In general, after properly removed rocks have been used, they are either returned to their place of origin or to a place of cultural significance. The practice of dealing with "bad medicine" or neutralizing negative forces was a part of the traditional culture. So, the question of "how to dispose of radioactive waste in a culturally appropriate manner" could be resolved if the time and resources were provided to tribes to participate in a formal study of this issue. Indian people have not studied the cultural impacts of siting any of the existing waste facilities. So, Indian people would like to become a part of a retrospective assessment of these facilities, as well as to participate in the assessment of siting all new waste facilities. The CGTO recommends that adequate funds and time be provided so that Indian people can conduct systematic studies of waste management programs.

Environmental Restoration Program. The Environmental Restoration Program involves actions that would return disturbed land to its natural condition. Up to 1,800 monitoring wells and access roads are a part of this effort. All alternatives involve some environmental restoration and monitoring; however, Alternative 3 would require more restoration because it would disturb more land. Indian people believe that the natural condition of the land existed before 1492 when Europeans arrived. The land was in a natural condition when it was managed and used by Indian people. For example, Indian plant management techniques involved spiritual interactions like praying and conducting ceremonies for the plants, as well as physical actions like selective burning, transplanting cuttings and seeds, pruning of plants like Tumar (*Stanleya pinnata)* and willow, and "whipping" pine nut trees to make them fuller. Indian water management techniques involved spiritual interactions that satisfied the water and its occupants like Water Babies, who need to know why Indian people are using the water. Water ceremonies assured both rain and snowfall; for example, by praying for a continued relationship between wet snow and the little black bugs who are responsible for making the snow become wet. Generally, Indian people managed the land according to religious teachings. From the Indian perspective, environmental restoration should proceed according to Indian culture and with the participation of Indian people. The CGTO recommends that adequate funds and time be provided so that Indian people can conduct systematic studies of environmental restoration actions.

Nondefense Research and Development Program. There are a variety of planned actions considered within this category. Many of these are related to National Environmental Research Park, which permits universities and other federal agencies to conduct research. Other projects involve testing alternative vehicle fuels, testing techniques for handling chemical spills, and building alternative energy generators like solar collectors. Indian people view each of these as potentially impacting cultural resources. More cars potentially endanger the desert tortoises. University students studying biology may find and collect arrowheads or remove plants that are significant to Indian people. Solar collectors involve scraping the land. Indian people believe they should be involved in assessing the impacts of all these proposed actions.

Only Indian people know which places are appropriate for visits by non-Indian people and how to collect plants, animals, and soil samples so that these activities do not disrupt the land and its associated spirituality. Only Indian people can provide guidance for proper behavior; however, a guidance document has not been collectively produced and approved by the CGTO. On the other hand, with proper guidance by Indian people, university students and other members of the public may learn about the beauty and cultural significance of these lands and begin to change national perceptions of these lands from one of a wasteland to one of an Indian holy land. Thus, the CGTO recommends that adequate funds and time be provided so that CGTO members can develop and field-test an American Indian public education program for the NTS.

Work for Others Program. This program contains two major subcategories of activities: the Conventional Weapons Demilitarization Program and Defense-related Research and Development Program. The first program involves the shipment, storage, disposal, and destruction of conventional weapons. The second program involves military training exercises and weaponry tests.

The CGTO in principle approves of the Conventional Weapons Demilitarization Program, because world peace will reduce the need to use the NTS for nuclear weapon production, storage, assembly, and testing. On the other hand, the CGTO believes that if the NTS becomes the place where most or all weapons are stored, disassembled, and disposed then the NTS lands will be polluted. The presence of conventional and nuclear weapons defines the NTS as a place of destruction, which promotes an image that is inappropriate for a place for peaceful relations between Indian ethnic groups.

The CGTO knows from past experience, but not formal study, that military training exercises and weaponry tests can adversely impact cultural resources. Military people move across the land on foot and in vehicles without either the time or the purpose to pay attention to the plants that are being crushed, the animals that are being dislocated, or the archaeology materials underfoot. Cultural resources are damaged when conventional weapons are fired nearby. Often geographically distinctive power places, like the big white rock near Rattlesnake Ridge, are targeted without regard or knowledge of their cultural significance. Without a formal study, the exact impacts of military training exercises will not be fully understood. Thus, the CGTO recommends that adequate funds and time be provided so that a guidance document can be developed.

G.4.1 Summary of American Indian Responses to the NTS Action Alternatives

The response of the CGTO to the four action alternatives proposed for the NTS and discussed site-by-site in the previous paragraphs can be summarized as follows:

Alternative 1: Continue Current Operations

Under this alternative, the DOE will continue with its current operations and interagency project activities in each of the programs listed above. There will be little or no change planned for the future mission of the NTS.

CGTO Response to Alternative 1:

The CGTO opposes Alternative 1 because of our strong cultural ties to the land. Nevada Test Site operations have adversely impacted the land, causing irreparable damage to traditional resources. If NTS operations continue, it is expected that damage will be increased and more land will be wasted. Access to culturally significant spiritual places and use of animals, plants, water, and lands may cease because Indian people's perception of health and spiritual risks will increase if nuclear weapon testing, assembly, storage, disassembly, and disposal continues. Nondefense programs are expected to cause adverse impacts if these produce more ground disturbance or if they bring in people who trample and destroy traditional resources.

Alternative 2: Discontinue Operations

Under this alternative, all current and planned programs, activities, and operations would be discontinued. Only activities conducted in support of decommissioning, radiation monitoring, and security functions necessary for human health, safety, and security would be maintained. Environmental restoration would not be done. All defense and nondefense programs would be discontinued. Inactive waste disposal sites would be abandoned. Only a minimum of low-level radioactive and mixed waste disposal capacity would be maintained to support closure of the NTS.

CGTO Response to Alternative 2:

The CGTO supports Alternative 2 because it would allow the land to heal and perhaps return to its natural condition. The CGTO recommends that an evaluation of areas that can be restored for human use be made and that environmental restoration activities be included in this alternative. Access to culturally significant places should be allowed. The DOE should continue to protect all cultural resource sites.

The CGTO would like to have the right of first refusal in the event that NTS lands are turned to public use.

Alternative 3: Expanded Use

Under this alternative, expanded use of NTS and its resources would be made to support national programs of both a defense and nondefense nature. Current defense programs would continue, and a variety of defense-related projects currently under consideration would be pursued. Waste management operations would increase and storage/disposal areas expanded. Waste transportation would be increased as well. Environmental restoration and research and development activities would continue and expand. A solar-energy production facility would be built.

CGTO Response to Alternative 3:

The CGTO opposes Alternative 3 because of our strong cultural ties to the land. Under expanded use, it is expected that the continuation and expansion of current operations, as well as the implementation of additional defense and nondefense project activities and programs would irreparably damage American Indian cultural resources present at the NTS. Expansion of NTS operations would conceivably require use of land that is yet untouched, and would worsen the risk of radioactive contamination. Potentially, American Indian access to resources and sacred sites would be even more restricted. Expanded use would be detrimental for the socioeconomic development and health of Indian communities.

Alternative 4: Alternate Use of Withdrawn Lands

This alternative will evaluate the impacts associated with locating new programs and project activities at the NTS, including nondefense research and development programs, expansion of the Spill Test Facility in Area 5, and various types of personnel training for locating, containing, handling, or transporting hazardous materials, radioisotopes, fuels, explosives, and other materials. Under this alternative, waste management operations, waste-generating operations, and ongoing NTS environmental restoration activities would continue. However, the DOE would not maintain a state of readiness for nuclear testing at the NTS.

The NTS would be opened for unprecedented public access to some of the most remote areas, including areas that contain American Indian rock shelters, archaeological sites, and petroglyphs. Educational and recreational activities would be pursued. The potential for turning back lands to the public domain would depend on the ability to achieve established cleanup and safety levels.

CGTO Response to Alternative 4:

The CGTO tentatively supports Alternative 4 with reservations regarding certain components of this alternative. Aside from the concerns already expressed regarding waste-related pollution and ground disturbance, the CGTO expects that opening the NTS to the public will adversely impact traditional resources, particularly petroglyphs, archaeological sites, and rock shelters, because of their appeal as tourist attractions. Heavy traffic will trample plants, hurt animals, limit American Indian access to sacred sites and power places, and interfere with traditional practices.

The CGTO would like to have the right of first refusal in the event that the NTS lands are turned to public use.

G.4.2 American Indian Cultural Resources Impacts

G.4.2.1 American Indian Place by Action Comments, Alternative 1.

G.4.2.1.1 Nevada Test Site

Defense Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if further underground nuclear tests occur and if natural lands are scraped for construction. Access to culturally significant places will be reduced because Indian peoples' perception of health and spiritual risks will increase if additional testing, storage, disassembly, or disposal of nuclear and conventional weapons occur.

Waste Management Program. Under Alternative 1, it is expected that American Indian cultural resources will continue to be adversely impacted because the waste has not been disposed of in a culturally appropriate manner. Access to culturally significant places on the NTS will be reduced because waste isolation facilities increase Indian peoples' perception of health and spiritual risks.

Environmental Restoration Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted by the well and access road monitoring program, but will be positively impacted by actions that return disturbed lands to their natural condition in a culturally appropriate manner and with the participation of Indian people.

Nondefense Research and Development Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted by increased visits by students and researchers who collect artifacts, visit sacred areas, and remove plants or animals. Cultural resources could be positively impacted if students and researchers receive proper guidance by Indian people regarding how to visit places and interact with the environment.

Work for Others Program Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the NTS continued to be a place where weapons are stored, disassembled, and disposed. These actions have continued and will continue to pollute these lands.

The presence of conventional and nuclear weapons defines the NTS as a place of destruction, which promotes an image that is inappropriate for a place for peaceful relations between Indian ethnic groups.

American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

G.4.2.1.2 Tonopah Test Range

Defense Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if further aboveground nuclear tests occur and if natural lands are scraped for construction.

Waste Management Program. Under Alternative 1, it is expected that American Indian cultural resources will not be impacted because there is no Waste Management Program on the Tonopah Test Range and none has been identified for this alternative.

Environmental Restoration Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during any nondefense research and development actions. At this time, no actions are planned for the Tonopah Test Range.

Work for Others Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the Tonopah Test Range continues to be a place where weapons are researched and developed. These actions have continued and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

G.4.2.1.3 Nellis Air Force Range Complex

Defense Program. At this time, no defense actions are planned for the Double Tracks site on the NAFR Complex; therefore, American Indian cultural resources will not be adversely impacted under this alternative.

Waste Management Program. Under Alternative 1, it is expected that American Indian cultural resources will not be adversely impacted because there is no Waste Management Program on the NAFR Complex and none has been identified for this alternative.

Environmental Restoration Program Under Alternative 1, it is expected that American Indian cultural resources on the NAFR Complex will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during any nondefense research and development actions. At this time, no actions are planned for the Double Tracks site on the NAFR Complex.

Work for Others Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the Double Tracks site continues to be a place where weapons are researched and developed. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

G.4.2.1.4 Nellis Air Force Range Complex Area 13

Defense Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if further nuclear safety tests occur and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests at the Area 13 site on the NAFR Complex.

Waste Management Program. Under Alternative 1, it is expected that American Indian cultural resources will not be impacted because there is no Waste Management Program on the Area 13 site on the NAFR Complex and none has been identified for this alternative.

Environmental Restoration Program. Under Alternative 1, it is expected that American Indian cultural resources on the Area 13 site on the NAFR Complex will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the Area 13 site on the NAFR Complex continues to be a place where weapons are researched and developed. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

Work for Others Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the Area 13 site on the NAFR Complex continues to be a place where weapons are researched and developed. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

G.4.2.1.5 Project Shoal Area—This study area is not within the traditional lands of the Indian people represented by the CGTO. It is recommended by the CGTO that the DOE NTS EIS team directly contact Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, and Pyramid Lake and Lovelock Paiute Tribes.

G.4.2.1.6 Central Nevada Test Area

Defense Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if further nuclear tests occur and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests or construction at the Central Nevada Test Area.

Waste Management Program. Under Alternative 1, it is expected that American Indian cultural resources will not be impacted because there is no Waste Management Program on the Central Nevada Test Area and none has been identified for this alternative.

Environmental Restoration Program. Under Alternative 1, it is expected that American Indian cultural resources on the Central Nevada Test Area will be adversely impacted if natural lands were scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the Central Nevada Test Area becomes a place where weapons are researched and developed. No such actions are planned for this alternative, so American Indian cultural resources will not be adversely impacted.

Work for Others Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if the Central Nevada Test Area becomes a place where weapons are researched and developed. No such actions are considered in this alternative, so American Indian cultural resources will not be adversely impacted.

G.4.2.1.7 Eldorado Valley

Defense Program. Under Alternative 1, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Eldorado Valley.

Waste Management Program. Under Alternative 1, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Eldorado Valley.

Environmental Restoration Program. No environmental restoration activities are planned for

Eldorado Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 1.

Nondefense Research and Development Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program. It is unlikely that Work for Others Program activities will be implemented in Eldorado Valley. Therefore, no adverse impacts on American Indian resources are expected under Alternative 1.

G.4.2.1.8 Dry Lake Valley

Defense Program. Under Alternative 1, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Dry Lake Valley.

Waste Management Program. Under Alternative 1, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Dry Lake Valley.

Environmental Restoration Program. No environmental restoration activities are planned for Dry Lake Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 1.

Nondefense Research and Development Program. Under Alternative 1, it is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program. It is unlikely that Work for Others Program activities will be implemented in Dry Lake Valley. Therefore, no adverse impacts on American Indian resources are expected under Alternative 1.

G.4.2.1.9 Coyote Spring Valley

Defense Program. Under Alternative 1, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Coyote Spring Valley.

Waste Management Program. Under Alternative 1, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Coyote Spring Valley.

Environmental Restoration Program. No environmental restoration activities are planned for Coyote Spring Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 1.

Nondefense Research and Development Program. Under Alternative 1, it is expected that American Indian cultural resources at Coyote Spring Valley will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program. It is unlikely that Work for Others Program activities will be implemented in Coyote Spring Valley. Therefore, no adverse impacts on American Indian resources are expected under Alternative 1.

G.4.2.2 American Indian Place by Action Comments, Alternative 2.

G.4.2.2.1 Nevada Test Site

Defense Program. Under Alternative 2, there will be no further defense testing and storage activities; however, overflights and monitoring will continue in keeping with the International Arms Control Treaties. American Indian cultural resources will no longer be impacted by defense activities; however, overflights and monitoring have the potential for impacting American Indian cultural resources. Indian people require further information before completely evaluating the cultural impacts of this Defense Program alternative.

Waste Management Program. Under Alternative 2, it is expected that American Indian cultural resources will continue to be adversely impacted because the waste has not been disposed of in a culturally appropriate manner. Access to culturally significant places on the NTS will be reduced because waste isolation facilities increase Indian peoples' perception of health and spiritual risks.

Environmental Restoration Program. Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted by the Monitoring Well and Access Road Program, but will be positively impacted by actions that return disturbed land to its natural condition in a culturally appropriate manner and with the participation of Indian people.

Nondefense Research and Development Program. Under Alternative 2, it is expected that American Indian cultural resources will not be adversely impacted by visits by students and researchers.

Work for Others Program. Under Alternative 2, it is expected that American Indian cultural resources will not be adversely impacted.

G.4.2.2.2 Tonopah Test Range

Defense Program. Under Alternative 2, there will be no belowground nuclear testing, so American Indian cultural resources will not be adversely impacted.

Waste Management Program. Under Alternative 2, there will be no Waste Management Program on the Tonopah Test Range and none has been identified for this alternative, so it is expected that American Indian cultural resources will not be adversely impacted.

Environmental Restoration Program. Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during any Nondefense Research and Development Program actions. At this time, no actions are planned for the Tonopah Test Range.

Work for Others Program. Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if the Tonopah Test Range continues to be a place where weapons are researched and developed. These actions have continued and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

G.4.2.2.3 Nellis Air Force Range Complex

Defense Program. Under Alternative 2, it is expected that American Indian cultural resources will not be adversely impacted because no defense actions are planned for the Double Tracks site on the NAFR Complex.

Waste Management Program. Under Alternative 2, it is expected that American Indian cultural resources on the Double Tracks site will not be adversely impacted because there is no Waste Management Program there and none is planned in this alternative.

Environmental Restoration Program. Under Alternative 2, it is expected that American Indian cultural resources on the Double Tracks site will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 2, it is expected that American Indian cultural resources on the Double Tracks site will not be adversely impacted by discontinuing research and development actions.

Work for Others Program. Under Alternative 2, American Indian cultural resources will be adversely impacted if the Double Tracks site continues to be a place where weapons are researched and developed. These actions have continued and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

G.4.2.2.4 Nellis Air Force Range Complex Area 13

Defense Program. Under Alternative 2, American Indian cultural resources will not be adversely impacted because there are no plans for additional tests at the Area 13 site on the NAFR Complex.

Waste Management Program. Under Alternative 2, American Indian cultural resources will not be adversely impacted because there are no waste facilities at the Area 13 site on the NAFR Complex.

Environmental Restoration Program. Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 2, it is expected that American Indian cultural resources in the Double Tracks site will not be adversely impacted by discontinuing research and development actions.

Work for Others Program. Under Alternative 2, it is expected that American Indian cultural resources will not be adversely impacted because no Work for Others Program actions are being planned.

G.4.2.2.5 Project Shoal Area—This study area is not within the traditional lands of the Indian people represented by the CGTO. It is recommended by the CGTO that the DOE NTS EIS team directly contact Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake and Lovelock Paiute Tribes.

G.4.2.2.6 Central Nevada Test Area

Defense Program. Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if further nuclear tests occur and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests or construction at the Central Nevada Test Area.

Waste Management Program. Under Alternative 2, it is expected that American Indian cultural resources will not be impacted because there is no Waste Management Program on the Central Nevada Test Area and none has been identified for this alternative.

Environmental Restoration Program. Under Alternative 2, it is expected that American Indian cultural resources on the Central Nevada Test Area will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if the Central Nevada Test Area becomes a place where weapons are researched and developed. No such actions are planned for this alternative, so cultural resources will not be adversely impacted.

Work for Others Program. Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if the Central Nevada Test Area becomes a place where weapons are researched and developed. No such actions are considered in this alternative, so American Indian cultural resources will not be adversely impacted.

G.4.2.2.7 Eldorado Valley

Defense Program. Under Alternative 2, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Eldorado Valley.

Waste Management Program. Under Alternative 2, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Eldorado Valley.

Environmental Restoration Program. No environmental restoration activities are planned for Eldorado Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 2.

Nondefense Research and Development Program. Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program. It is unlikely that Work for Others Program activities will be implemented in Eldorado Valley. Therefore, no adverse impacts on American Indian resources are expected under Alternative 2.

G.4.2.2.8 Dry Lake Valley

Defense Program. Under Alternative 2, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Dry Lake Valley.

Waste Management Program. Under Alternative 2, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Dry Lake Valley.

Environmental Restoration Program. No environmental restoration activities are planned for Dry Lake Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 2.

Nondefense Research and Development Program. Under Alternative 2, it is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

G.4.2.2.9 Coyote Spring Valley

Defense Program. Under Alternative 2, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Coyote Spring Valley.

Waste Management Program. Under Alternative 2, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Coyote Spring Valley.

Environmental Restoration Program. No environmental restoration activities are planned for Coyote Spring Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 2.

Nondefense Research and Development Program. Under Alternative 2, it is expected that American Indian cultural resources at Coyote Spring Valley will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program. It is unlikely that Work for Others Program activities will be implemented in Coyote Spring Valley. Therefore, no adverse impacts on American Indian resources are expected under Alternative 2.

G.4.2.3 American Indian Place by Action Comments, Alternative 3.

G.4.2.3.1 Nevada Test Site

Defense Program. Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if new Defense Program operations are undertaken or if current underground nuclear tests are expanded into previously unused areas. Access to culturally significant places will be reduced because Indian peoples' perception of health and spiritual risk will increase if additional testing, storage, disassembly, or disposal of nuclear and conventional weapons occur.

Waste Management Program. Under Alternative 3, it is expected that American Indian cultural resources will continue to be adversely impacted, in particular if waste storage facilities are expanded because the waste has not been disposed of in a culturally appropriate manner. Access to significant places on the NTS will be reduced because waste isolation facilities increase Indian peoples' perception of health and spiritual risks.

Environmental Restoration Program. Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted by an expansion of the well and access road monitoring program, but will be positively impacted by actions that return disturbed lands to its natural condition in a culturally appropriate manner and with the participation of Indian people.

Nondefense Research and Development Program. Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted by increased visits by students and researchers who collect artifacts, visit sacred areas, and remove plants or animals. Cultural resources will be positively impacted if students and researchers receive proper guidance by Indian people regarding how to visit places and interact with the environment.

Work for Others Program. Under Alternative 3, it is expected that American Indian cultural resources will be impacted if the NTS continues to be a place where weapons are stored, disassembled, and disposed. These actions have continued and will continue to pollute these lands. The presence of conventional and nuclear weapons defines the NTS as a place of destruction, which promotes an image that is inappropriate for a place for peaceful relations between Indian ethnic groups. American Indian cultural resources will continue to be impacted by military training exercises and weapons tests.

G.4.2.3.2 Tonopah Test Range—Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if further aboveground nuclear tests occur or if new areas are used for expanded testing programs.

Waste Management Program. Under Alternative 3, it is expected that American Indian cultural resources will not to be adversely impacted because there is no Waste Management Program on the Tonopah Test Range and none has been identified for this alternative.

Environmental Restoration Program. Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during any nondefense research and development actions. At this time, no actions are planned for the Tonopah Test Range.

Work for Others Program. Under Alternative 3, it is expected that American Indian cultural resources will be impacted if Tonopah Test Range weapons research and development programs are expanded. These actions have continued and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

G.4.2.3.3 Nellis Air Force Range Complex

Defense Program. At this time, no defense actions are planned for Double Tracks site on the NAFR Complex. Under Alternative 3, however, it is expected that American Indian cultural resources will not be adversely impacted under this alternative.

Waste Management Program. Under Alternative 3, it is expected that American Indian cultural resources will not be adversely impacted unless a Waste Management Program for the NAFR Complex is begun, and there are no plans identified for this alternative.

Environmental Restoration Program. Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during any nondefense research and development actions. At this time, no actions are planned for the Double Tracks site on the NAFR Complex.

Work for Others Program. Under Alternative 3, it is expected that American Indian cultural resources will be impacted if weapon research and development programs continue or are expanded at the Double Tracks site. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

G.4.2.3.4 Nellis Air Force Range Complex Area 13

Defense Program. Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if nuclear safety tests continue or increase and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests at the Area 13 site on the NAFR Complex.

Waste Management Program. Under Alternative 3, it is expected that American Indian cultural resources will not to be adversely impacted because there is no Waste Management Program on the Area 13 site on the NAFR Complex and none has been identified for this alternative.

Environmental Restoration Program. Under Alternative 3, it is expected that American Indian cultural resources of the Area 13 site on the NAFR Complex will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will get increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during research and development. These actions have continued and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

Work for Others Program. Under Alternative 3, it is expected that American Indian cultural resources will be impacted if weapon research and development programs continue or are expanded at the Area 13 site. These actions have continued and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

G.4.2.3.5 Project Shoal Area —This study area is not within the traditional lands of the Indian people represented by the CGTO. It is recommended by the CGTO that the DOE NTS EIS team directly contact Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake and Lovelock Paiute Tribes.

G.4.2.3.6 Central Nevada Test Area

Defense Program. Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if nuclear tests continue or increase and if natural lands are scraped for construction. In this alternative, however, there are no plans for additional tests or construction at the Central Nevada Test Area.

Waste Management Program. Under Alternative 3, it is expected that American Indian cultural resources will not to be adversely impacted because there is no Waste Management Program on the Central Nevada Test Area and none has been identified for this alternative.

Environmental Restoration Program. Under Alternative 3, it is expected that American Indian cultural resources on the Central Nevada Test Area will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during weapons research and development. No such actions are planned for this alternative, so cultural resources will not be adversely impacted.

Work for Others Program. Under Alternative 3, it is expected that American Indian cultural resources will be impacted if weapon research and development programs are implemented in the Central Nevada Test Area. No such actions are planned for this alternative, so American Indian cultural resources will not be adversely impacted.

G.4.2.3.7 Eldorado Valley

Defense Program. Under Alternative 3, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Eldorado Valley.

Waste Management Program. Under Alternative 3, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Eldorado Valley.

Environmental Restoration Program. No environmental restoration activities are planned for Eldorado Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 3.

Nondefense Research and Development Program. Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program. It is unlikely that Work for Others Program activities will be implemented in Eldorado Valley. Therefore, no adverse impacts on American Indian resources are expected under Alternative 3.

G.4.2.3.8 Dry Lake Valley

Defense Program. Under Alternative 3, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Dry Lake Valley.

Waste Management Program. Under Alternative 3, American Indian cultural resources will not be impacted because no Waste

Management Program activities are scheduled for Dry Lake Valley.

Environmental Restoration Program. No environmental restoration activities are planned for Dry Lake Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 3.

Nondefense Research and Development Program. Under Alternative 3, it is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program. It is unlikely that Work for Others Program activities will be implemented in Dry Lake Valley. Therefore, no adverse impacts on American Indian resources are expected under Alternative 3.

G.4.2.3.9 Coyote Spring Valley

Defense Program. Under Alternative 3, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Coyote Spring Valley.

Waste Management Program. Under Alternative 3, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Coyote Spring Valley.

Environmental Restoration Program. No environmental restoration activities are planned for Coyote Spring Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 3.

Nondefense Research and Development Program. Under Alternative 3, it is expected that American Indian cultural resources at Coyote Spring Valley will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program. It is unlikely that Work for Others Program activities will be implemented in Coyote Spring Valley. Therefore, no adverse impacts on American Indian resources are expected under Alternative 3.

G.4.2.4 American Indian Place by Action Comments, Alternative 4.

G.4.2.4.1 Nevada Test Site

Defense Program. Under Alternative 4, it is expected that American Indian cultural resources will no longer be impacted by defense activities; however, oversight and monitoring have the potential for impacting American Indian cultural resources. Indian people require further information before completely evaluating the cultural impacts of this Defense Program alternative.

Waste Management Program. Under Alternative 4, it is expected that American Indian cultural resources will continue to be adversely impacted because the waste has not been disposed of in a culturally appropriate manner. Access to culturally significant places on the NTS will be reduced because waste isolation facilities increase Indian peoples' perception of health and spiritual risks.

Environmental Restoration Program. Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted by monitoring well and access road activities, but will be positively impacted by actions that return disturbed lands to its natural condition in a culturally appropriate manner and with the participation of Indian people.

Nondefense Research and Development Program. Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted by visits by students and researchers.

Work for Others Program. Under Alternative 4, it is expected that American Indian cultural resources will be impacted if activities at the Spill Test Facility in Area 5, the Treatability Test Facility in Area 25, and the newly renovated decontamination pad in Area 6 are expanded. It is expected that American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons.

G.4.2.4.2 Tonopah Test Range

Defense Program. Under Alternative 4, it is expected that American Indian cultural resources will not be impacted by defense activities; however, overflights and monitoring have the potential for impacting American Indian cultural resources. Indian people require further information before completely evaluating the cultural impacts of this Defense Program alternative.

Waste Management Program. Under Alternative 4, it is expected that American Indian cultural resources will not be adversely impacted because there are no actions planned.

Environmental Restoration Program. Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 4, it is expected that American Indian cultural resources will not be impacted because no activities are planned under this alternative.

Work for Others Program. Under Alternative 4, it is expected that American Indian cultural resources will be impacted by military training exercises and conventional weapons tests.

G.4.2.4.3 Nellis Air Force Range Complex

Defense Program. Under Alternative 4, it is expected that American Indian cultural resources will not be adversely impacted.

Waste Management Program. Under Alternative 4, it is expected that American Indian cultural resources will not be adversely impacted.

Environmental Restoration Program Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 4, it is expected that American Indian cultural resources will not be impacted because no actions are planned.

Work for Others Program. Under Alternative 4, it is expected that American Indian cultural resources will be impacted if the Double Tracks site continues to be a place where weapons are researched and developed. These actions have and will continue to pollute these lands. American Indian cultural resources will continue to be adversely impacted by military training exercises and weapons tests.

G.4.2.4.4 Nellis Air Force Range Complex Area 13

Defense Program. Under Alternative 4, it is expected that American Indian cultural resources will not be impacted.

Waste Management Program. Under Alternative 4, it is expected that American Indian cultural resources will not be impacted because there is no Waste Management Program on the Area 13 site and none has been identified.

Environmental Restoration Program. Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if military training exercises and weapons tests continue.

Work for Others Program. Under Alternative 4, it is expected that American Indian cultural resources will be impacted if military training exercises and weapons test continue.

G.4.2.4.5 Project Shoal Area—This study area is not within the traditional lands of the Indian people represented by the CGTO. It is recommended by the CGTO that the DOE NTS EIS team directly contact Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake and Lovelock Paiute Tribes.

G.4.2.4.6 Central Nevada Test Area

Defense Program. Under Alternative 4, it is expected that American Indian cultural resources will not be impacted.

Waste Management Program. Under Alternative 4, it is expected that American Indian cultural resources will not be impacted.

Environmental Restoration Program. Under Alternative 4, it is expected that American Indian cultural resources on the Central Nevada Test Area will be impacted if natural lands are scraped during environmental restoration. Access to culturally significant places will be increased if environmental restoration is successful, thus reducing Indian peoples' perception of health and spiritual risks associated with this area. Indian people wish to be involved in identifying environmental restoration methods and in the evaluation of restoration success.

Nondefense Research and Development Program. Under Alternative 4, it is expected that American Indian cultural resources will not be adversely impacted.

Work for Others Program. Under Alternative 4, it is expected that American Indian cultural resources will not be impacted.

G.4.2.4.7 Eldorado Valley

Defense Program. Under Alternative 4, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Eldorado Valley.

Waste Management Program. Under Alternative 4, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Eldorado Valley.

Environmental Restoration Program. Under Alternative 4, no environmental restoration activities are planned for Eldorado Valley; therefore, no adverse impacts to American Indian resources are expected.

Nondefense Research and Development Program. Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program. It is unlikely that Work for Others Program activities will be implemented in Eldorado Valley. Therefore, no adverse impacts on American Indian resources are expected under Alternative 4.

G.4.2.4.8 Dry Lake Valley

Defense Program. Under Alternative 4, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Dry Lake Valley.

Waste Management Program. Under Alternative 4, American Indian cultural resources will not be impacted because no Waste

Management Program activities are scheduled for Dry Lake Valley.

Environmental Restoration Program. No environmental restoration activities are planned for Dry Lake Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 4.

Nondefense Research and Development Program. Under Alternative 4, it is expected that American Indian cultural resources will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program. It is unlikely that Work for Others Program activities will be implemented in Dry Lake Valley. Therefore, no adverse impacts on American Indian resources are expected under Alternative 4.

G.4.2.4.9 Coyote Spring Valley

Defense Program. Under Alternative 4, American Indian cultural resources will not be impacted because no Defense Program activities are scheduled for Coyote Spring Valley.

Waste Management Program. Under Alternative 4, American Indian cultural resources will not be impacted because no Waste Management Program activities are scheduled for Coyote Spring Valley.

Environmental Restoration Program. No environmental restoration activities are planned for Coyote Spring Valley; therefore, no adverse impacts to American Indian resources are expected under Alternative 4.

Nondefense Research and Development Program. Under Alternative 4, it is expected that American Indian cultural resources at Coyote Spring Valley will be adversely impacted if a solar production facility is constructed and operated.

Work for Others Program. It is unlikely that Work for Others Program activities will be implemented in Coyote Spring Valley. Therefore, no adverse impacts on American Indian resources are expected under Alternative 4.

G.4.3 Occupational and Public Health and Safety Radiation Impacts

Perceptions of radiation effects are discussed in Section 4.1.1.11 and are well known among the Western Shoshone, Southern Paiute and Owens Valley Paiute people of this region. *"These perceptions of risks from radiation are frightening, and remain an important part of our lives. We will always carry these thoughts with us. Today, people are afraid of many things and places in this whole area, but we still love to come out and see our land. We worry about more radiation being brought to this land.*

If the DOE wants to better understand our feelings about the impacts of radiation on our cultures, they should support a study of risks from radiation designed, conducted and produced by the CGTO. At this time there has not been a systematic study of American Indians perceptions of risk. Therefore, it is not possible to provide action by action estimation of risk perception impacts. We believe it is a topic that urgently needs to be studied so that Indian people may better address the actual cultural impacts of proposed DOE actions. There have been recent workshops funded by the National Science Foundation to understand how to research the special issue of culturally-based risk perception among American Indian communities, and at least one major project has been funded. Although this is a relatively new topic of research, it is one that can be more fully understood by research that deeply involves the people being considered. To understand our view of radiation is to begin to understand why we responded in certain ways to past and present activities, and why we will continue to respond to future DOE activities."

G.4.4 Environmental Justice and Equity Impacts

G.4.4.1 Alternative 1 - Continue Current Operations (No Action).

G.4.4.1.1 Nevada Test Site—The CGTO knows that the actions considered in the NTS EIS potentially will disproportionately affect the American Indian people. As discussed in Section 5.1.1.10, Cultural Resources, and Section 5.1.1.11, Occupational and Public Health and Safety/Radiation, the American Indian impacts include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations.

The effects of Alternative 1 on American Indian Environmental Justice issues are discussed below by program.

Defense Program. Under Alternative 1, it is expected that all three American Indian Environmental Justice impacts would occur. Holy Land violations occur whenever a portion of traditional land and its resources are taken away from Indian people by contamination or surface disturbance. Perceived risks will occur when more radioactivity is brought to or created at the NTS. Cultural survival impacts will occur if any defense activities reduce the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

Waste Management Program. Under Alternative 1, it is expected that all three American Indian Environmental Justice impacts would occur. Holy Land violations occur whenever a portion of traditional land and its resources are taken away from Indian people by contamination or surface disturbance. Perceived risks will occur when more radioactivity is brought to or created at the NTS. Cultural survival impacts will occur if any waste management activities reduce the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

Environmental Restoration Program. Under Alternative 1, it is expected that all three American Indian Environmental Justice issues would occur. Holy Land violations can be reversed when a portion of traditional land and its resources are returned to the Indian people by eliminating contamination and restoring surface disturbance areas with traditional Indian plants and animals. Perceived risks potentially can be reduced when radioactivity is reduced by the physical and spiritual restoration of the NTS. Cultural survival impacts will reverse if any environmental restoration activities increase the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

Nondefense Research and Development Program. Under Alternative 1, it is expected that all three American Indian Environmental Justice impacts would occur. Holy Land violations occur whenever a portion of traditional land and its resources are taken away from Indian people whether this occurs by contamination or use by students and researchers. Perceived risks will not increase unless more radioactivity is brought to or created at the NTS. Cultural survival impacts will occur if any research and development activities reduce the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

Work for Others Program. Under Alternative 1, it is expected that all three American Indian Environmental Justice impacts would occur. Holy Land violations occur whenever a portion of traditional land and its resources are taken away from Indian people by contamination or surface disturbance. Perceived risks will occur when more radioactivity or hazardous waste is brought to or created at the NTS. Cultural survival impacts will occur if any military training exercises and weapons tests reduce the present and future access of Indian people and their children to places where cultural transmission occurs. Because these impacts would be perceived only by American Indian people, an Environmental Justice impact would occur.

G.4.4.2 Alternative 2 - Discontinue Operations.

G.4.4.2.1 *Nevada Test Site*—American Indian impacts include: (1) Holy Land violations,

(2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts for all sites are discussed in Section 5.2.1.10, Cultural Resources, and Section 5.2.1.11, Occupational and Public Health and Safety/Radiation. These impacts would only be felt by American Indian people. Therefore, a disproportionate impact would occur. There has not been a systematic study of these issues for the NTS. The CGTO maintains that past, present, and future activities on the NTS have impacted, are impacting, or will impact these American Indian Environmental Justice issues. Although Alternative 2 involves no new activities, it contains the possibility of adversely impacting American Indian issues. For example, if road maintenance is discontinued, it may be difficult for American Indian people to return to the area. Also, if DOE/NV Environmental Protection personnel are not available, there may be a difficulty in maintaining consultation with American Indian tribes through the CGTO. Therefore, it is essential to maintain both the physical access to places and the agreement that facilitates access to these places. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Program-by-program impacts are assessed in Section 5.1.1.12.

G.4.4.2.2 ***Tonopah Test Range***—American Indian impacts include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.2.2.10, Cultural Resources, and Section 5.2.1.11, Occupational and Public Health and Safety/Radiation, for all sites. There has not been a systematic study of these issues for the Tonopah Test Range. The CGTO maintains that past, present and future activities on the Tonopah Test Range have disproportionately impacted, are disproportionately impacting, or will have a disproportionate impact on American Indian people. Although Alternative 2 involves no new activities, it contains the possibility of adversely impacting American Indian issues. If DOE/NV Environmental Protection personnel are not available, there may be a difficulty establishing future consultation with American Indian tribes through the CGTO. Therefore, it is essential to establish both the physical access to places and agreements that will facilitate access to these places. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

G.4.4.2.3 ***Project Shoal Area***—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.2.3.10, Cultural Resources, and Section 5.2.1.11, Occupational and Public Health and Safety/Radiation. There has not been systematic study of these issues for the Project Shoal Area.

This study area is not within the traditional lands of the American Indian people represented by the CGTO. It is recommended by the CGTO that the DOE NTS EIS team directly contact American Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute; Walker River Paiute, Pyramid Lake and Lovelock Paiute Tribes.

G.4.4.2.4 ***Central Nevada Test Area***—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.2.4.10, Cultural Resources, and Section 5.2.1.11, Occupational and Public Health and Safety/Radiation. There has not been a systematic study of these issues for the Central Nevada Test Area. The CGTO maintains that past, present and future activities on the Central Nevada Test Area have disproportionately impacted, are disproportionately impacting, or will disproportionately impact the American Indian people. Although Alternative 2 contains no new activities, it contains the possibility of adversely impacting these issues. Even though the CGTO has not been permitted to visit the area, the area is especially important due to the concentration of cultural resources. Therefore, this area provides a special opportunity for the DOE to undo past environmental justice impacts. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

G.4.4.3 Alternative 3 - Expanded Use.

G.4.4.3.1 Nevada Test Site—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.3.1.10, Cultural Resources, and Section 5.3.1.11, Occupational and Public Health and Safety/Radiation. There has not been a systematic study of these issues for the NTS. The CGTO maintains that past, present and future activities on the NTS have disproportionately impacted, are disproportionately impacting, or will disproportionately impact the American Indian people. Under the Expanded Use Alternative 3, there is a high potential of adverse impacts to these issues. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Action-by-action responses are assessed in Section 5.1.1.12 and are not repeated here.

G.4.4.3.2 Tonopah Test Range—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.3.2.10, Cultural Resources, and Section 5.3.1.11, Occupational and Public Health and Safety/Radiation. There has not been a systematic study of these issues for the Tonopah Test Range. The CGTO maintains that past, present and future activities on the Tonopah Test Range have disproportionately impacted, are disproportionately impacting, or will disproportionately impact the American Indian people. Under the Expanded Use Alternative 3, there is a high potential of adverse impacts. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

G.4.4.3.3 Project Shoal Area—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.3.3.10, Cultural Resources, and Section 5.3.1.11, Occupational and Public Health and Safety. There has been no systematic study of these issues for the Project Shoal Area.

This study area is not within the traditional lands of the American Indian people represented by the CGTO. It is recommended by the CGTO that the DOE NTS EIS team directly contact American Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake and Lovelock Paiute Tribes.

G.4.4.3.4 Central Nevada Test Area—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.3.4.10, Cultural Resources, and Section 5.3.1.11, Occupational and Public Health and Safety/Radiation. There has not been a systematic study of these issues for the Central Nevada Test Area. The CGTO maintains that past, present and future activities on the Central Nevada Test Area have disproportionately impacted, are disproportionately impacting, or will disproportionately impact the American Indian people. Under the Expanded Use Alternative 3, there is a high potential of adverse impacts. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. Even though the CGTO has not been permitted to visit the area, the area is especially important due to the concentration of cultural resources. Therefore, this area provides a special opportunity for the DOE to undo past

Environmental Justice impacts. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

G.4.4.3.5 ***Eldorado Valley***—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.3.5.10, Cultural Resources, and Section 5.3.1.11, Occupational and Public Health and Safety/Radiation. There has not been a systematic study of these issues for the Eldorado Valley. The CGTO maintains that past activities in the Eldorado Valley have impacted these American Indian issues, especially Holy Land violations. This constitutes a disproportionate impact on the American Indian people. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

G.4.4.3.6 ***Dry Lake Valley***—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.3.6.10, Cultural Resources, and Section 5.3.1.11, Occupational and Public Health and Safety/Radiation. There has not been a systematic study of these issues for the Dry Lake Valley. The CGTO maintains that past activities in the Dry Lake Valley have disproportionately impacted the American Indian people, especially the issue of Holy Land violations. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

G.4.4.3.7 ***Coyote Spring Valley***—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.3.7.10, Cultural Resources, and Section 5.3.1.11, Occupational and Public Health and Safety/Radiation. There has not been a systematic study of these issues for the Coyote Spring Valley. The CGTO maintains that past activities in the Coyote Spring Valley have disproportionately impacted these American Indian issues, especially Holy Land violations. This area was traditionally land for Southern Paiutes especially the Moapa Paiute Tribe. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

G.4.4.4 Alternative 4 - Alternative Use of Withdrawn Lands.

G.4.4.4.1 ***Nevada Test Site***—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.1.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety/Radiation. There has not been a systematic study of these issues for the NTS. The CGTO maintains that past, present and future activities on the NTS have disproportionately impacted, are disproportionately impacting, or will disproportionately impact the American Indian people. Under Alternative 4, there is a high potential of adverse impacts to these issues, even though most DOE activities would be discontinued. The continuation of waste management operations and the physical activities associated with environmental restoration and other planned activities, are expected to cause both risks from radiation and reduced access from land disturbance. The CGTO should be funded to design, conduct, and produce a systematic American Indian

Environmental Justice study, before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

G.4.4.4.2 ***Tonopah Test Range***—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.2.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety/Radiation. There has not been a systematic study of these issues for the Tonopah Test Range. The CGTO maintains that past, present and future activities on the Tonopah Test Range have disproportionately impacted, are disproportionately impacting, or will disproportionately impact the American Indian people. Under Alternative 4, there is a high potential of adverse impacts to these issues. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

G.4.4.4.3 ***Project Shoal Area***—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.3.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety/Radiation. There has not been systematic study of these issues for the Project Shoal Area.

This study area is not within the traditional lands of the American Indian people represented by the CGTO. It is recommended by the CGTO that the DOE EIS team directly contact American Indian tribes and organizations having traditional lands in the Project Shoal Area. The following tribes were suggested: Fallon Paiute, Walker River Paiute, Pyramid Lake and Lovelock Paiute Tribes.

G.4.4.4.4 ***Central Nevada Test Area***—American Indian Environmental Justice concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.4.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety/Radiation. There has not been a systematic study of these issues for the Central Nevada Test Area. The CGTO maintains that past, present and future activities on the Central Nevada Test Area have disproportionately impacted, are disproportionately impacting, or will disproportionately impact the American Indian people. Under Alternative 4, there is a high potential of adverse impacts. As more activities occur, both risks from radiation and reduced access from land disturbance is expected to occur. Even though the CGTO has not been permitted to visit the area, the area is especially important due to the concentration of cultural resources. Therefore, this area provides a special opportunity for the DOE to undo past Environmental Justice impacts. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study, before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

G.4.4.4.5 ***Eldorado Valley***—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.5.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety/Radiation. There has not been a systematic study of these issues for the Eldorado Valley. The CGTO maintains that past activities in the Eldorado Valley have disproportionately impacted the American Indian people, especially the issue of Holy Land violations. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

G.4.4.4.6 Dry Lake Valley—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.6.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety/Radiation. There has not been a systematic study of these issues for the Dry Lake Valley. The CGTO maintains that past activities in the Dry Lake Valley have disproportionately impacted the American Indian people, especially the issue of Holy Land violations. Any activities occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

G.4.4.4.7 Coyote Spring Valley—American Indian concerns include: (1) Holy Land violations, (2) perceived risks from radiation, and (3) cultural survival, especially access violations. These impacts are discussed in Section 5.4.7.10, Cultural Resources, and Section 5.4.1.11, Occupational and Public Health and Safety/Radiation. There has not been a systematic study of these issues for the Coyote Spring Valley. The CGTO maintains that past activities in the Coyote Spring Valley have disproportionately impacted the American Indian people, especially the issue of Holy Land violations. This area was traditionally land for Southern Paiutes especially the Moapa Paiute Tribe. Any activities, occurring near Indian reservations further precludes future opportunities for expansion and access to these lands for any purpose. The CGTO should be funded to design, conduct, and produce a systematic American Indian Environmental Justice study before new activities are approved.

Program-by-program responses are assessed in Section 5.1.1.12 and are not repeated here.

G.4.5 Social and Economics Impact

G.4.5.1 Alternative 1 - Continue Current Operations (No Action).

G.4.5.1.1 Nevada Test Site—This section describes the American Indian concerns associated with implementing Alternative 1, as summarized by the CGTO.

Indian people prefer to live in their traditional homelands. One reason for this preference, is that Indian people have special ties to their traditional lands and a unique relationship with each other. When Indian people receive employment near their reservations they can remain on the reservation while commuting to work. This pattern of employment tends to have positive benefits for both the Indian community and tribal enterprises like housing. The reservation Indian community has the participation of the individual and his (her) financial contribution. The individual payment for housing is tied to income level, so the more a person earns with the job the more they pay to the tribal housing office, thus making tribally sponsored housing more economically viable.

When employment opportunities decline on reservations, however, often times Indian families must move away from their reservations to seek employment. These situations have resulted in approximately one-half to two-thirds of the tribal members in the CGTO region of influence moving away from their reservations.

As Indian people move away from reservations due to employment opportunities, Indian culture is threatened because the number of families living on reservations declines. Tribal members who choose to relocate from their reservations impact reservation economies, school, housing and emergency services. Both schools and economies are impacted because federal funding available to tribes is based on population statistics.

With local employment opportunities such as those offered by NTS to neighboring tribes, prices of tribal housing rise because they are based on income. If a positive balance between increased income and increased cost of living in tribal reservations is achieved, then, both individual members and the tribe benefit from employment opportunities. However, continued salary raises may tip the balance toward a sharp increase in cost of living, making it unable for tribal members to continue living in the reservation.

Tribal housing programs become jeopardized if vacancies occur in tribal housing projects and cannot be reoccupied. If vacancies occur, tribal revenues and federal funding will be adversely impacted and will make it more difficult to expand housing programs in future years. Additionally, vacant units require more maintenance. If tribal members are unavailable to occupy a tribal housing unit, then tribes make units available to non-Indians, and this too potentially impacts Indian culture. The increased presence of non-Indians on a reservation or in an Indian community reduces the privacy needed for the conduct of certain ceremonies and traditional practices. When non-Indian children are in constant interaction with Indian children, it creates a situation that potentially disrupts cultural learning opportunities that occur in everyday life.

Small rural reservations must have a sufficient number of people to generate an emergency response capability. The need for emergency services will decline as people move away from the reservation. Tribal members employed in these emergency service occupations may move away because of their marketable skills. Tribal revenues for administration, school, housing and emergency services will be reduced accordingly, due to a decline in population size.

When Indian people move away from their reservations several dilemmas occur. Typically, Indian people experience a feeling of isolation from their tribe, culture and family. When an Indian person relocates to an off-reservation area, the individual finds that there are fewer people of their tribe and culture around them. As a result, Indian people must decide on the appropriateness of practicing traditional ceremonies in the presence of non-Indian people. Indian people are continually torn between the decision to stay in the city or return to the reservation to participate in traditional ceremonies and interact with other tribal members. This dilemma occurs on a regular basis and potentially impacts the livelihood and cultural well-being of off-reservation employees and their families. When off-reservation individuals choose to return to their homelands to participate in traditional ceremonies, they risk their jobs or disciplinary actions against their children who attend public schools due to excessive absenteeism.

Should an emergency situation resulting from NTS related activities including the transportation of hazardous and radioactive waste occur, it could result in the closure of a major reservation road. Many of the Indian reservations within the region of influence are located in remote areas with limited access by standard and substandard roads. Were a major (only) road into a reservation to be closed, numerous adverse social and economic impacts could occur. For example, Indian students who have to travel an unusually high number of miles to or from school could realize delays. Delays also could occur for regular deliveries of necessary supplies for inventories needed by tribal enterprises and personal use. Purchases by patrons of tribal enterprises and emergency medical services in route to or from the reservation could be dramatically impeded. Potential investors interested in expanding tribal enterprises and on-going considerations by tribal governments for future tribal developments may significantly diminish because of the perceived risks associated with NTS related activities including the transportation of hazardous waste.

Defense Program. Under Alternative 1, the Defense Program would produce a total of 4,274 jobs. It is expected that a percentage of these jobs would be filled by tribal members from reservations within the American Indian Region of Influence. Many of these Indian people will move away from their reservations to take these jobs causing the socioeconomic impacts discussed above. Increased employment can positively impact American Indian employees and their families; however, this off-reservation employment is expected to adversely impact the social structure and cultural activities on the reservation.

Waste Management Program. Under Alternative 1, the Waste Management Program would result in no change to total current employment. No American Indian socioeconomic impacts are expected.

Environmental Restoration Program. Under Alternative 1, the Environmental Restoration Program would create approximately 1,129 jobs. Although this is approximately one-third the number of jobs created by the Defense Program, it is anticipated that a higher percentage of American Indians would be attracted to the Environmental Restoration jobs because they are more consistent with American Indian land preservation values. American Indians have special skills that may be especially critical to Environmental Restoration activities, and the CGTO has specifically asked that Indian people be involved in these programs. American Indians have asked to be involved when soil mediation actions remove contaminated soil, and afterwards, during habitat restoration.

Nondefense Research and Development Program. Under Alternative 1, no new jobs would be created by the Nondefense Research and Development Program. Were existing research programs, especially the National Environmental Research Park Program, to integrate American Indians into the study designs, it is possible that a few more Indian people would be employed. These shifts in employment are expected to be minor, so no American Indian socioeconomic impacts are expected.

Work for Others Program. Under Alternative 1, no new jobs would be created by the Work for Others Program. No American Indian socioeconomic impacts are expected.

Site Support Activities. Under Alternative 1, no new jobs would be created by the Site Support Activities. No American Indian socioeconomic impacts are expected.

G.4.5.1.2 ***Tonopah Test Range***—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.1.3 ***Project Shoal Area***—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.1.4 ***Central Nevada Test Area***—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.2 Alternative 2 - Discontinue Operations.

G.4.5.2.1 ***Nevada Test Site***—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.2.2 ***Tonopah Test Range***—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.2.3 ***Project Shoal Area***—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.2.4 ***Central Nevada Test Area***—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.3 Alternative 3 - Expanded Use.

G.4.5.3.1 ***Nevada Test Site***—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.3.2 ***Tonopah Test Range***—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.3.3 Project Shoal Area—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.3.4 Central Nevada Test Area—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.3.5 Eldorado Valley—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.3.6 Dry Lake Valley—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.3.7 Coyote Spring Valley—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.4 Alternative 4 - Alternate Use of Withdrawn Lands.

G.4.5.4.1 Nevada Test Site—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.4.2 Tonopah Test Range—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.4.3 Project Shoal Area—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.4.4 Central Nevada Test Area—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.4.5 Eldorado Valley—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.4.6 Dry Lake Valley—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.4.5.4.7 Coyote Spring Valley—American Indian socioeconomic impacts due to fluctuations in DOE employment opportunities for tribal members from the CGTO region of influence are discussed in Section 5.1.1.3.

G.5. Mitigation Recommendations

(NOTE: The AIWS understands that the mitigation recommendations may be divided between NTS EIS chapters and within chapters behind each alternative discussion. Despite the need for breaking this section into its component parts, the AIWS wanted their thoughts on mitigation to be held together in this, their own, document.)

(NOTE: The Council on Environmental Quality's definition of Mitigation (40 CFR Part 1508.19), which guides EIS actions, "includes (a) avoiding the impact altogether by not taking a certain action or parts of an action, (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation, (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment, (d) reducing or eliminating the impact over time by preserving and maintaining operations during the life of the action, and (e) compensating for the impact by replacing or providing substitute resources or environments." The DOE has adopted this definition (10 CFR Part 1021.104).)

Federal and state agencies that must comply with legal requirements for the management and protection of American Indian cultural resources have developed, in the last few years, fairly standard procedures for funding and implementing present and future mitigation programs. The vast majority of these programs have focused on mitigating archaeological and historic sites to the exclusion of other resources found in the American Indian cultural landscape. Only recently have American Indian plants been incorporated into mitigation programs, but these have concentrated mostly on endangered plant species. Animal studies, which require a more complex methodology, are only now being developed. Other components of the cultural landscape, such as geological formations, are not systematically considered for mitigation unless they have potential for tourism.

A key problem of existing procedures for implementing mitigation is the lack of an integrated approach to resources that takes into consideration the functional and reproductive interdependence of American Indian cultural resources. In the view of the CGTO, there is not one type of resource that can continue to reproduce and be of use to the American Indian people without the continuation of all other resources. For Indian people, an adversely impacted resource will most certainly affect the spiritual harmony of the land as a whole. Unfortunately, laws and regulations designed to protect American Indian cultural resources (e.g., National Historic Preservation Act) treat each resource in isolation, without considering that a specific resource is but one component of the American Indian cultural landscape.

G.5.1 American Indian Cultural Resources

The CGTO recommends that mitigation programs implemented at the NTS fully incorporate the assistance of American Indian people so that adverse impacts on American Indian resources can be efficiently averted. American Indian people know the NTS landscape in great depth and thus can help scientists with the identification of plants, animals, geography, archaeological sites, and traditional cultural properties that have been or will be adversely impacted by NTS programs and activities.

The CGTO considers that the natural and spiritual balance of the NTS landscape has been profoundly upset by prolonged nuclear testing activities and that the land must be purified and the spirits appeased in order to fully restore the environment to its previous condition. Through ceremonies, prayer, and offerings, American Indian people will contribute to increase the benefits of mitigation and will aid in restoring the spiritual harmony of impacted landscapes.

There are a number of proposed NTS actions that are of great concern to Indian people because of their adverse impact on the American Indian landscape. To avert or mitigate such impacts, the CGTO recommends that the DOE/NV fund systematic American Indian studies to:

- Identify those areas/resources that are irreparably damaged, as well as areas/resources that can be restored for human use
- Avoid further ground-disturbing activities
- Make mitigation of restorable areas a top priority
- Replace lost plant and animal species integral to the spiritual landscape
- Avert or minimize damage to geological formations important to the spiritual landscape
- Implement environmental restoration techniques that require minimum ground-disturbing activities
- Develop systematic consultation with American Indians so that potentially impacted resources can be identified, alternative solutions discussed, and adverse impacts averted
- Give American Indian people access to adversely impacted areas so that they can contribute their knowledge, purification ceremonies, prayers, and offerings to the restoration of the natural and spiritual harmony of the NTS landscape.

In addition to these recommendations that derive from analysis of potential action and alternative impacts to American Indian cultural resources, the CGTO made the following stipulations and recommendations at the first CGTO meeting with the DOE NTS EIS study team:

1. Consultation with the CGTO does not relieve the DOE/NV of its obligation to maintain a government-to-government relationship with American Indian tribes.

2. The DOE/NV must consult with all culturally affiliated tribes and organizations belonging to the CGTO.

3. The DOE/NV should incorporate other American Indian tribes and organizations when considering activities away from (i.e., outside the American Indian region of influence) the NTS.

4. The CGTO recommends that the DOE/NV incorporate wherever possible in this EIS the "Final Tribal Recommendations to the DOE" prepared at the second mitigation meeting, NTS AIRFA, October 1-3, 1993.

5. The CGTO recommends that the DOE/NV incorporate wherever possible in this EIS all former American Indian recommendations made by the CGTO to the DOE.

6. The CGTO recommends the continuance and expansion of the American Indian consultation program.

7. The CGTO recommends that they be actively involved in the planning, developing, and monitoring of all future DOE/NV ground-disturbing activities.

8. Public meetings are not the proper way to consult with tribes and organizations. They should not be considered "stakeholders" as defined by the DOE.

9. Responses to the various NTS EIS alternatives:

   A. Alternative 1, (No Action, Continue Current Operations). The CGTO opposes Alternative 1 because of our strong cultural ties to the land.

   B. Alternative 2, (Discontinue Operations). The CGTO supports Alternative 2 with the inclusion of access and protection of all cultural resource sites.

   C. Alternative 3, (Expanded Use). The CGTO opposes Alternative 3 because of our strong cultural ties to the land.

      The CGTO recommends that lands set aside for exclusive Indian use continue to be kept free, secure, and monitored for contamination of radioactivity and hazardous waste.

      The CGTO recommends that the Gold Meadows area be set aside for exclusive Indian use because the area contains a concentration of important cultural resources.

   D. Alternative 4, (Alternate Use of Withdrawn Lands). The CGTO tentatively supports Alternative 4 with reservations regarding certain components of this alternative.

The following statements are specifically adapted from the first CGTO meeting by the AIWS to reflect new information compiled during the work of the AIWS. Each of the following recommendations applies specifically to a situation where the DOE has selected an alternative. The recommendation of mitigation by the AIWS does not imply they support the alternative; it merely is the best way of responding to alternative impacts on American Indian cultural resources.

If Alternative 1 is chosen, the following are recommended:

- Continue AIRFA Compliance Program
- Expand American Indian ethnographic studies

- Conduct land-restoration ceremonies
- Provide access to the CGTO and limit access to culturally sensitive areas.
- Continue American Indian monitors needed for cultural resources investigations
- Provide for American Indian monitors needed for oversight of land and DOE activities.

If Alternative 2 is chosen, the following are recommended:

- Continue AIRFA Compliance Program
- Turn back land to the CGTO (designate areas for exclusive Indian control)
- Provide for American Indian monitors needed for oversight of land and DOE activities
- Conduct land-restoration ceremonies.

If Alternative 3 is chosen, the following are recommended:

- Continue AIRFA Compliance Program
- Expand American Indian ethnographic studies
- Conduct land-restoration ceremonies
- Provide access to the CGTO and limit access to culturally sensitive areas
- Continue American Indian monitors needed for cultural resources investigations
- Provide for American Indian monitors needed for oversight of land and DOE activities.

If Alternative 4 is chosen, the following are recommended:

- Designate joint-use area for three ethnic groups
- Restrict/limit access to culturally sensitive areas
- Continue AIRFA Compliance Program.

G.5.2. American Indian Socioeconomics

This section describes the American Indian concerns associated with implementing Alternative 1, as summarized by the CGTO.

When Indian people are hired, special problems emerge for themselves, families and reservation communities. The DOE can assist in mitigating these problems by recognizing the exact nature of the problems and developing a culturally responsive approach to mitigating the problem. For example, an Indian employee may be required to attend a ceremony on the reservation. When this situation occurs, the DOE could grant special leave status to the employee to participate in the ceremony. Children of the Indian employee may go to non-Indian schools, causing cross-cultural stresses. The DOE could potentially mitigate this situation by developing an American Indian outreach/educational program directed at the school system and the surrounding communities. Cultural awareness activities could be implemented similar to the Yucca Mountain Project's outreach program in which knowledgeable Indian people share various aspects of their culture. The DOE could encourage other Indian employees to participate in the development and implementation of these culturally specific programs.

Reservation problems resulting from the loss of tribal members to external employment with the DOE/NV cannot be fully identified without a systematic study of these issues involving the tribes. It is recommended that this issue be mitigated by the DOE/NV, and be specifically addressed by the DOE/NV Diversity Council. The CGTO potentially can serve as a management consultant to the DOE for the development and implementation of culturally specific programs that address the unique issues that may arise due to off-reservation migration caused by the employment of Indian people.

G.6 American Indian Consultation Procedures

American Indian tribes are sovereign nations who acknowledge the U.S. government and expect that, in return, the U.S. government recognize tribal sovereignty. In a memorandum dated April 29, 1994, President William J. Clinton wrote "I am strongly committed to building a more effective day-to-day working relationship reflecting respect for the rights of self-government due the sovereign tribal rights." American Indian governments expect that federal agencies and state officials will honor President Clinton's explicit commitment to building such a relationship and follow his mandate (Executive Orders Nos. 12875 and 12866, DOE, 1994). Accordingly, government officials must implement comprehensive consultation policies that take into consideration the vast cultural, social, and political diversity of American Indians, as well as the needs, concerns, and impacts that are shared by our nations.

American Indian tribes are not considered as, nor do they fit the definition of, businesses or "stakeholders." Formal government-to-government consultation with tribal governments require diplomacy. U.S. government officials who are in charge of maintaining friendly and productive day-to-day relationships with foreign countries, such as Japan, Mexico, or Germany, must acquire knowledge on the languages, culture, and politics of those countries in order to best represent the interests of the United States of America and to achieve success in international economic and political negotiations. Yet, there is little or no interest among government officials to educate themselves as to how American Indians living in their own country, organize themselves culturally and politically. How, we ask, are federal agencies and state officials going to succeed in following President Clinton 's mandate if they do not work at improving their knowledge of American Indian life ways?

The AIWS, who represents the concerns of the CGTO for the NTS EIS, suggests a series of procedures for implementing a comprehensive, day-to-day consultation relationship with the DOE. The Environmental Protection Division of DOE/NV has maintained its commitment to consultation and has established a working relationship with culturally affiliated American Indian tribes regarding cultural resources at Yucca Mountain and the NTS since 1985. There are, however, numerous other areas of great concern for tribal governments that are currently addressed in the NTS EIS, but that have not been explored or systematically subjected to consultation with tribal governments. Some of these areas are:

- Land use
- Risk assessment
- Socioeconomic issues
- Nuclear waste transportation
- Environmental restoration
- Mitigation.

The AIWS is aware that at present there are programmatic EISs taking place without the direct involvement of American Indian people. This lack of involvement is a source of great concern for culturally affiliated tribes. The gravity of past and proposed future nuclear and defense-related programs and activities at the NTS and other areas withdrawn by the DOE calls for a broadening of the scope of American Indian consultation programs. As stated in the American Indian Policy (DOE, 1994), the DOE must identify and seek to remove impediments to working directly and effectively with tribal governments on DOE programs and activities. The DOE has already recognized that there may be certain procedural impediments which limit or restrict the ability to work effectively and consistently with American Indian tribes. In keeping with the American Indian Policy, which requires government-to-government consultation, this federal agency must make every effort to remove such impediments. In the following paragraphs we present a step-by-step consultation procedure that is culturally and politically appropriate.

The following consultation procedures are drawn both from past and current consultation relationships between DOE/NV and the CGTO. Furthermore, these procedures reflect the need for adjustments on consultation strategies for future DOE programs and activities that may potentially impact the traditional culture and contemporary well-being of Indian people. Therefore, this section not only highlights the accomplishments of DOE/NV consultation with tribal governments, but also points out procedures that have yet to be developed and implemented. Because the NTS EIS will be read by government officials from sister DOE facilities and perhaps by other federal and state agencies as well, the AIWS expects that the following consultation procedures will serve as a model for future interaction between tribal governments and federal and state agencies. It is important to note that specific consultation procedures should be approved by tribal governments at the onset of each consultation process.

G.6.1 Outline of Consultation Procedures

- *Initial Notification.* A formal letter addressed to the tribal government head or chairperson must be sent to inform the tribe of any proposed action that may affect American Indian resources and/or may impact the well-being of tribal members. Initial formal letters must be followed up to ensure that the tribal government is aware of the proposed action and has received copies of all pertinent documentation. When a Notice of Intent is part of an ongoing consultation relationship, it should also be sent to official tribal contact representatives.

- *Pertinent Documentation.* A non-technical document that clearly and concisely presents the scope and goals of the proposed action, including an explanation of potential effects and consequences of such action, both positive and negative, should accompany the Notice of Intent.

- *Formal Visitation.* A request for a formal visitation with the tribal government(s) to make an oral presentation of the proposed action and its effects and consequences should follow a Notice of Intent. Presentations must be concise and no more than 15 minutes. Visual aids and non-technical language will greatly facilitate communication.

- *Official Tribal Contact Representative.* For new proposed actions, the federal agency should request that the tribal government review this information and appoint an Official Tribal Contact Representative(s) who will directly interact with DOE officials. If representatives have already been appointed, then the DOE has the responsibility to keep the tribal contacts informed and periodically double-check whether new representatives have been appointed by the tribal government.

- *Agency Point of Contact.* A permanent agency point of contact should be appointed for all DOE consultation activities (e.g., cultural resource management, NTS EIS write-up). This individual(s) must have prior knowledge of consultation procedures and American Indian culture, long-range vision, and be responsible for maintaining long-term consultation with the tribes. Continuity in consultation relationships achieved and maintained between the DOE/NV and the CGTO could not have been possible without the commitment of responsible and knowledgeable agency officials.

- *Memorandum of Agreement.* Consultation with the CGTO representatives is a productive opportunity for sharing information and voicing common tribal concerns regarding DOE programs and activities at the NTS and other areas withdrawn by the agency. However, there are more specific impacts of these programs and activities that directly affect those tribes that live in the vicinity of the NTS. For example, radioactive waste transportation affects directly the Moapa Paiute and the Las Vegas Paiute Tribes. A Memorandum of Agreement between the federal agency and the affected tribal governments should be signed before implementing a proposed action.

- *Information Updates.* Tribal governments involved in consultation with the DOE must be kept informed of the progress of programs and activities, modifications of the original action plans, and changes of agency personnel that may affect the consultation relationship. Draft reports should be sent to the tribal governments for review and comment.

- *Indian Monitoring Program.* Appointing Indian Monitors is essential for ensuring that cultural resource management and mitigation of adverse impacts of DOE programs and activities to American Indian cultural resources is conducted in an appropriate manner. The involvement of officially appointed Indian Monitors in archaeological research at the NTS, for example, has been successful and will continue to be so in the immediate future. Monitoring should be expanded to other areas of potential impact to American Indian culture and well-being.

- *Formation of American Indian Task Subgroups.* Ideally, tribal governments should be directly involved in the design and implementation of programs and activities that could potentially impact Indian culture and society. This involvement can be made possible if task subgroups formed by Official Tribal Contact Representatives are allowed to work alongside federal agency planners or managers. For example, during the preparation of the Draft NTS EIS, the CGTO suggested to DOE/NV that a subgroup of its Official Tribal Contact Representatives (representing three ethnic groups) be allowed to write American Indian text directly into this EIS. This task subgroup became the AIWS. A positive response from the DOE/NV was needed to demonstrate that American Indians can work effectively with federal agencies. It is expected that Indian task subgroups will become an established consultation procedure.

- *Regular Meetings Between Agency Managers and Official Tribal Contact Representatives.* Periodically, DOE managers should agree to a formal meeting with tribal representatives to share information on current and future plans, ongoing consultation, needs and concerns of both the tribes and the agency, and policy updates. These meetings are useful for reassuring both agency managers and tribal governments that consultation is being conducted in a culturally and politically appropriate manner and for mutual benefit.

- *Co-management.* Ideally, tribal governments who are involved in consultation with the DOE should share tasks and responsibilities in the management of resources that are significant for Indian people. Future agency efforts should target the development of a resource co-management plan.

- *Funding.* Funding for consultation, including Official Tribal Contact Representatives meetings, site visits, task subgroups, and monitoring should be provided for the continuation of current compliance programs and future projects.

- *Time Allowance.* Tribal governments are often overworked and understaffed. Proposal reviews by the tribal council, personnel appointments, and review and comment of draft documents take time. Agencies should send notices of intent and any other documentation within a reasonable timeframe so that tribes can respond on a timely basis. Proposal and document review periods should be 30 to 45 days.

G.6.2 Consultation Issues

- *Land Use.* Land has no monetary value for Indian tribes. Indian people do not recognize boundaries other than their traditional territories. Land was traditionally respected for its ability to sustain the people economically, spiritually, and socially. American Indian perspectives on land use should be incorporated into all federal agency programs and activities that will potentially transform the natural landscape of traditional Indian land or impact its biological resources.

- *Biological Resources.* The DOE's projects and activities have impacted the region's plant and animal species. A number of them are currently candidates for listings as either threatened or endangered. Indian people have deep knowledge of the biological resources of the area and should participate directly with scientists responsible for the protection of its biological resources. Although systematic traditional-use plant studies have been conducted in Yucca Mountain, Pahute Mesa, and Rainier Mesa, American Indians would like to see the DOE take a step further and invite them to assist the agency in the planning and implementing of ecosystem management programs at the NTS.

- *Air Quality and Climate.* The DOE should make an effort to record systematically the adverse effects of nuclear testing on the air quality of American Indian communities located near the NTS.

- *Visual Resources.* All land forms within the NTS have high sensitivity levels for American Indians. The ability to see the land without the distraction of buildings, towers, cables, roads, and other objects is essential for the spiritual interaction between Indian people and their traditional lands. Landscape modifications should be done in consultation with American Indians.

- *Occupational and Public Health and Safety.* The DOE's programs and activities are performed in accordance with the regulations of the Occupational Safety and Health Administration. Tribes that live near the NTS would like to be included in systematic research aimed at ensuring that public health and safety measures devised by the DOE extend into tribal lands and communities.

- *Nuclear Waste Transportation.* Portions of the current road system within the western United States is based on ancient pathways and trails of Indian people. The Southwest Desert Trail System was not used for trivial activities but for trade, commerce, pilgrimage, and often for a hasty retreat or to pursue an enemy in the act of warfare. Trails were used to relay important messages to distant tribal groups.

-

  Tribal governments would like to cooperate with the DOE in the development and implementation of safe transportation policies. However, no systematic consultation with tribal governments has been conducted to date. Indian communities located along transportation routes are continuously exposed to risks of accidents, spills, and adverse impacts of transportation on tribal economies. The cumulative effects of long-term nuclear waste transportation through tribal lands would be traumatic and potentially life-threatening to the well-being of the Indian people.

  The DOE has the responsibility to assist neighboring tribes in developing an emergency response management program in regard to transportation of low-and high-level nuclear waste as it passes through tribal lands. A Memorandum of Agreement should be signed.

- *Geology and Soils.* Severe disturbance of the geology and soils in large portions of the NTS has been caused by repeated nuclear testing (e.g., mountain sides, craters). These impacts have made certain areas unfit for human use. These areas have become inaccessible to American Indians for religious purposes.

- *Surface Hydrology and Groundwater.* Surface waters of the NTS, the Tonopah Test Range, and the NAFR Complex are not used for human consumption. Animals in these regions must drink this water: they do not have a choice. Water pollution also puts plant communities in jeopardy. Tribal governments are concerned that the migration of polluted water from contaminated areas into land outside the NTS will have long-term adverse effects.

The AIWS reviewed and edited the Consultation Model produced for the U.S. Department of Energy Legacy Project (Stoffle et al., 1994c). A detailed version of this American Indian Consultation Model, which has been tailored to meet current DOE/NV consultation procedures, is included in Attachment C of Appendix G.

G.7 Transportation Study

G.7.1 Consultation

The compilers of the NTS EIS Transportation Study refer to meeting with various American Indian individuals, groups, and tribes. The interactions are listed as tables and discussed throughout the text.

These meetings do not constitute full government-to-government consultation with American Indian tribes, nor have they led to an American Indian transportation study. Instead, the meetings simply informed Indian people that an NTS EIS transportation study was being conducted. Information about pending studies is an important first step in consultation with American Indian tribes and organizations; however, no additional consultation steps were taken. The Transportation Study, therefore, cannot be supported by the American Indian tribes and organizations represented by the CGTO.

Especially disturbing to the CGTO is an apparent confusion regarding the purpose of CGTO consultation during the NTS EIS. For example, the response to Question #16 (D-8, D-9) where a public response raised the issue of the DOE going to the tribes for consultation, rather than them having to come to the DOE. The writers of the Transportation Study responded by referring to the CGTO involvement with other portions of the NTS EIS as though it was an example of consultation specific to the transportation study. This is an incorrect statement, in as much as the CGTO was informed by the DOE NTS EIS Transportation Study team that the CGTO did not have to respond to transportation issues because the Transportation Study team was working directly with the tribes in a parallel but separate consultation. The CGTO is only now responding to the Transportation Study because it neither identifies nor assesses American Indian impacts.

American Indian tribes are not "stakeholders" and, thus, meetings designed to elicit the opinion of public stakeholders are not an appropriate method for consulting with tribes who are to be addressed on a government-to-government basis according to the President of the United States. Thus, there are misleading and incorrect statements in Chapter 2, Stakeholder Issues, that indicate that American Indian tribes were given the opportunity to identify issues during public meetings. No public meetings should be considered as a replacement for government-to-government consultation. All reference to American Indian consultation should be removed from this section of the report unless it specifically refers to American Indian consultation on a government-to-government basis.

G.7.2 American Indian Transportation Issues

Although some American Indian transportation issues were suggested during the NTS EIS scoping period and again raised in the CGTO meetings with the Transportation Study team, the report does not include these issues. Despite a record of meetings with American Indian people, groups, and tribes, the study does not present critical American Indian concerns. These include, among others, the impact of radioactive and hazardous waste travel along rail and highway on nearby existing and planned American Indian businesses, especially those of the Moapa Paiute Tribe and the Las Vegas Paiute Tribe. American Indian people, especially elders, express a fear of radiation as an "angry rock" which can impact people as it travels, even though it remains packaged and no transportation accident occurs to spill the contents of the package. Although this perception of radioactivity was expressed by American Indian people in the 1987 DOE archaeology study, the nature and extent of this fear has not been addressed by the transportation study. American Indian people also express concern that places of spiritual power are being and could be additionally harmed by the transportation of radioactive and hazardous waste. American Indian people are currently reacting to these concerns by worrying about the past and current impacts of waste transportation and by avoiding certain places they believe have been adversely impacted by the transportation of radioactive and hazardous waste.

The CGTO recommends that the cultural concerns of other American Indian tribes and organizations should be included in the Transportation Study. The CGTO understands that the Transportation Study is focused on what it called "local issues" (Volume 1, Appendix I, p. 1-1), but is not certain why other Indian tribes, who potentially are impacted by transportation and who live in the West and Southwest, are not included in this study. When most statistics cited in the report are statewide from Nevada, why are other Nevada Indian tribes not considered in this transportation study?

The CGTO would like to know if probability calculations are based on transportation safety nationwide or in the local area of the Transportation Study. If the calculations are based on national statistics, why were local statistics not used instead, given the local-issue focus of the analysis.

The CGTO recommends that recent rail derailments in the west and southwest be incorporated into the probability calculations of railroad accidents.

The CGTO would like to express the opinion that the probability of either railroad or highway accidents has increased and is increasing owing to domestic acts of violence directed at the federal government, its employees, and its activities. These increased accident probabilities should be calculated into the Transportation Study and the report should clearly inform readers how these accident trends and potential domestic terrorist activities were incorporated into the transportation analysis.

G.7.3 A Faulty Transportation Assessment (Attachment F, Nevada Test Site Rail Access Study)

Attachment F contains a faulty assessment of potential impacts to American Indian cultural resources that would occur if a variety of new railroad tracks were constructed connecting the NTS with existing railroads. The cultural resource analysis contained in this study was conducted without the involvement of the CGTO who serve as guides, participants, and monitors of all cultural resource studies associated with the NTS. As a result, the study cannot be considered to be even a preliminary assessment of potential American Indian cultural resource impacts.

Some of the more significant flaws in the study are as follows:

- The study in Attachment F is limited to an analysis of archaeological remains, thus failing to consider the full range of American Indian cultural resources which include, among others, Indian plants, animals, traditional cultural properties, mineral deposits, water, sites of historical importance, and cultural landscapes.

- The archaeological site analysis in Attachment F is limited to a review of previously recorded sites. While such an analysis is certainly appropriate as a beginning of an assessment, it cannot be used to make conclusions about potential impacts to these sites unless their cultural significance has been evaluated by American Indian people. Also, previous archaeology studies were not conducted with the railroad development in mind, thus their sampling methods and study locations do not correspond with the ground disturbing activities that would be associated with the construction of a railroad. Also, previous archaeological studies were not conducted with the guidance, participation, and review of American Indian tribes and organizations and, thus, do not reflect current DOE/NV policies of involving Indian people in these studies.

- The cultural resource analysis in Attachment F fails to reflect the well-known and well-documented cultural significance of the area around the Spring Mountains. The area is where the Creator transported all Southern Paiutes into existence, and, therefore, gave them the mandate to use and protect these lands. As such, the area around the Spring Mountains is the center of the Southern Paiute Holy Land, and it is literally filled with places of utmost cultural significance.

- Much of this analysis suggests it is about Yucca Mountain rather than about proposals properly considered in the NTS EIS. Beyond the frequent reference to Yucca Mountain in the study, there is Figure F-1 which specifically indicates that all of the considered routes lead only to the Yucca Mountain Site. If the Transportation Study is to be used as part of the Yucca Mountain EIS, then the CGTO would like to be advised and have the opportunity to respond to the Transportation Study as a component of the Yucca Mountain study. Some other flaws in the Attachment F study are as follows:

- The Moapa Paiute Indian Reservation is missing from the transportation maps.

- Figures F-2 and F-4 incorrectly identify the "Las Vegas Paiute Indian Reservation" as the "Paiute Indian Reservation."

- The term "Southern Paiute Reservation" is used in the text (F-29) to refer to the "Las Vegas Paiute Indian Reservation."

- The term "Indian Reservation" is used without a defined boundary on Figure F-1. Since there is no place with this name, the term could be referring to the "Walker River Paiute Indian Reservation". or the "Yomba Shoshone Reservation". It should also be pointed out that the "Duckwater Shoshone Reservation" is located between railroad routes #8 and #9, but this important place is missing from the figure. The "Ely Shoshone Reservation" is also missing from the map.

- The analysis of Stateline Route (F-30) fails to mention the Pahrump Paiute Tribe, which is a member of the CGTO and which is currently seeking federal recognition. An especially important omission is the Pahrump Paiute Tribe's plan to have lands withdrawn for a new reservation in the Pahrump Valley once the Pahrump Paiute Tribe receives tribal recognition.

- The study has an "error of omission," when it states that impacts on cultural resources are regulated though Section 106 of the National Historic Preservation Act of 1966 (F-28). In fact, cultural resources are also regulated by the AIRFA of 1979 and the NAGPRA of 1990. All three cultural resource acts specify the critical role of American Indian tribes and Indian organizations in the identification and assessment of cultural resources.

G.7.4 Conclusion - A Fatally Flawed Attachment F

The study in Appendix F is fatally flawed and should not be used for its expressed purpose which is:

> to support a dialogue with Nevada stakeholders...(and be) a basis for starting a formal discussion of this issue (Volume 1, Appendix I, Attachment F, page F-1).

The CGTO believes that a reasonable dialogue about potential impacts cannot be begun with Attachment F because it fails to involve an American Indian assessment component in the cultural resources sections. Were a dialogue to begin without involving American Indian issues, it would be a violation of both cultural resource protection laws and regulations, and would not be in keeping with past DOE/NV commitments to involve American Indian tribes and organizations in such discussions.

G.8 *Framework for the Resource Management Plan*

G.8.1 American Indian Participation

American Indian ethnic groups whose aboriginal territories included the NTS lands have accumulated centuries of knowledge on the resources present at this site. Through continued use, Indian people developed a profound understanding of the cycles of resource renewal and natural transformation of the landscape, the relationships between plants, animals, minerals, water, air, and landforms that form the ecosystem, and the spiritual and healing power of this land. Elders describe their relationship with the NTS lands:

> "When you come to this land you feel at home, it gives you a peaceful feeling, the land, the mountains, the birds. Like when I cross over the mountains and see Owens Valley. In the old times the people used to come together and have social gatherings and pow-wows. When we came together here [at Gold Meadow] in 1993 it was the

> first time after at least 50 years that the three ethnic groups had the opportunity to get together. It felt very peaceful to be back home among Indian people. This opportunity for tribal elders to return to this holy place was an important pilgrimage after being kept forcefully away from this land for all those years. It was a special gift for tribal elders who still remembered Gold Meadow, and for the younger people who experienced this pilgrimage with us."

American Indians can contribute this knowledge to the development of a comprehensive and culturally sensitive *Resource Management Plan* for the NTS by:

- Assisting the DOE/NV in the development of methods of identification, inventory, and preservation of American Indian resources
- Sharing values and perceptions that Indian people place on the resources at the NTS
- Broadening and refining the goals that DOE/NV will use to guide the conservation and culturally appropriate use of those resources
- Identifying American Indian priorities and constraints on resource management goals, and
- Bringing American Indian views on traditional ecosystems so that the principles of ecosystem management can be incorporated into the *Resource Management Plan* in a culturally sensitive manner.

Ultimately, the goal of American Indian Participation in the *Resource Management Plan* is to develop a long term co-management plan for the cultural resources present at the NTS.

G.8.2 How American Indian Participation may be incorporated into the *Resource Management Plan*

We use the proposed steps of development of the *Resource Management Plan* to offer a framework for American Indian participation:

Step 1. Review Information and Identify Resources. Since 1987 the DOE/NV has worked with the CGTO to identify American Indian resources first at Yucca Mountain and currently at the NTS. Systematic studies of American Indian resources include archaeological sites, traditional cultural properties, and plant resources in Pahute and Rainier Mesas. These studies demonstrate not only how important this land and its resources are for Indian people but also how valuable traditional knowledge can be for developing the Resource Management Plan. Other American Indian resources present at the NTS that need to be systematically investigated are:

- animals
- minerals
- rock art
- water
- air
- soils
- landforms.

Currently, American Indian participation in the protection and management of resources at the NTS is not limited to compliance with section 106 of the Historic Preservation Act, but includes 10 years of consultation with DOE/NV, including the AIRFA compliance program, the NAGPRA compliance program, and the direct participation of American Indians in the writing of sections for the NTS EIS. Consultation that may be implemented in the future, specifically that related to the *Resource Management Plan*, will be successful if it is built on past and present relationships between the DOE/NV and the CGTO.

Step 2. Develop Management Goals for Resource Issues and Constraints. Throughout the years of nuclear testing and other defense-related operations conducted at the NTS, American Indians were extremely concerned by the American government's lack of regard for the tragic effects that these activities had on cultural and environmental resources and the minimal response to public concerns on these activities. The CGTO is concerned that alternative NTS missions and activities—defense-related or not—may continue to negatively impact Indian resources at the NTS. The goal of the CGTO is to participate as a partner in the development of strategies that the DOE/NV could use to minimize or even completely eliminate impacts to their critical resources.

Step 3. Develop Management Actions to Reach the Goals. The CGTO is concerned that the current *Framework for the Resource Management Plan* has excluded the sovereign nations from the drafting of the list of management actions that the DOE/NV may take during land-use planning and resource management. The CGTO expects that its member tribes and organizations be invited to coordinate and cooperate with the DOE/NV to reach this goal. A critical issue that must be addressed in the future is the socioeconomic impact that NTS activities have had on neighboring tribal lands. The CGTO considers that an expansion of DOE/NV's existing working relationships and a negotiation of agreements with neighboring tribal governments is essential for developing a positive and effective co-management strategy.

Step 4. Identify, Collect, and Summarize Data Needed to Implement the Management Actions. A comprehensive and culturally sensitive *Resource Management Plan* should include systematic identification and data collection on American Indian resources and on contemporary issues of concern for tribal governments, such as health and safety, Environmental Justice, socioeconomic impacts, and risk assessment of nuclear waste transportation. The current working relationship between the DOE/NV and the CGTO includes the identification and partial data collection on American Indian cultural resources. However, issues of concern for the contemporary well-being of Indian people have yet to be addressed. American Indians would like to participate in the identification, collection, and summary of data needed to implement management actions.

Step 5. Develop the Land-Use Planning Tools. American Indian resources should be systematically incorporated into the evaluation of management actions and mapping of data collected through Step 4. At least one member organization of the CGTO, the Kaibab Southern Paiute Tribe, is currently developing a multimedia management plan for their own resources along the Colorado River Corridor, including resource identification, data collection, field monitoring, and long-term education programs on the conservation management of resources by tribal people. In the near future, American Indians will have the technical knowledge and tools to actively collaborate with the DOE/NV in the development of land-use planning tools. An agreement which includes DOE/NV's sponsorship of technical training of Indian people on this step would greatly accelerate learning and improve collaborative efforts.

American Indians would like to be invited to examine, discuss, and provide recommendations on suitable land uses and compatibility between future land-use alternatives and cultural concerns of Indian people. It is important for the DOE/NV to understand that, in the American Indian point of view, "land-disturbing activities" are not limited to construction or land restoration, but include well drilling, waste disposal, opening of the NTS to public use, and other alternative programs and actions being considered in this EIS.

Step 6. Implement the *Resource Management Plan* During Land-Use Planning. American Indian governments would like the DOE/NV to engage in government-to-government consultation during the selection and design of new projects, so that Indian people can evaluate in detail and follow closely the development and progress of projects that can potentially affect their traditional resources. American Indians consider the selection of suitable locations for new projects a critical step in all NTS proposed programs and activities and thus would like to be directly involved during the evaluation, decisionmaking, and implementation stages.

Step 7. Monitor Resources and Adaptively Manage. An American Indian monitoring program is currently in place and has been sponsored by the DOE/NV since 1993. This monitoring program is currently limited to archaeological research at the site. Indian tribes would like to expand the monitoring program to other ground-disturbing activities that may affect wildlife, forestry, water, air, soils, and minerals of importance to Indian people. Ideally, a training program to provide American Indians with background knowledge and monitoring skills would complement traditional knowledge on ecosystems and would help implement a culturally sensitive monitoring strategy that is positive and feasible for both the DOE/NV and tribal governments. Expanding the American Indian monitoring program to include other resources and training Indian monitors would greatly enhance the DOE/NV's ability to identify, collect, and summarize the data needed to implement the *Resource Management Plan* (Step 4).

A long-term goal of the CGTO has been to achieve co-management of the NTS. Co-management is a term that seems to best describe the relationship between the DOE/NV and the CGTO who have come together over the past 10 years to jointly identify and suggest mitigation recommendations to protect American Indian cultural resources. This co-management relationship must be identified and addressed in detail during the implementation of the *Resource Management Plan*. Tribal governments would like to continue having the opportunity to voice their concerns whenever culturally and socially unacceptable proposals are being evaluated by the DOE/NV.

Step 8. Periodically Review and Update the Plan. American Indians are not just one more resource within the NTS lands, nor are they independent "stakeholders." Tribal governments are sovereign nations which, under President Clinton's mandate (American Indian Policy, DOE, 1994), must be addressed in a government-to-government consultation. Tribal governments would like the opportunity to follow up the development and implementation of the *Resource Management Plan*, engage in formal consultation whenever new programs and activities are being evaluated, and participate in land-use management strategies, including mapping and inventory of resources, monitoring, and risk assessment evaluations. Maintaining communication between the DOE/NV and tribal governments will ensure that the *Resource Management Plan* is responsive to cultural concerns and the well-being of Indian people.

G.8.3 American Indian Ecosystem Perspectives

Ecosystem management is a term that is being used in the current *Framework for the Resource Management Plan* in response to recent federal guidelines. Indian people have a unique view of ecosystems and culturally established procedures for using them in a sustainable manner. These cultural ways, which could be called *ecosystem management strategies*, have been developed out of thousands of years of experience living on and learning from the NTS ecosystems. The Indian ecosystem approach reflects what is being called *cultural landscapes* (Stoffle et al. 1996b) elsewhere in cultural resource management.

The meaning of a natural ecosystem is a key issue within the Indian people's view of ecosystem management. According to traditional ecosystem management perspectives, natural ecosystems contain Indian people interacting with the physical environment, plants, and animals. After thousands of years of interacting with American Indians, the plants, animals, and physical resources of the NTS have adjusted to this relationship. Indian people believe that the land is to be used in a culturally appropriate manner or it becomes infertile. "Talk to it" is what Indian people say. The plant to be picked, the animal to be hunted, the mineral to be mined, the water to be drunk, all need to be talked to so they understand why they are being used and so they can willingly give themselves over to the service of Indian people. In return, the picked plant comes back thicker, the animal herd is stronger, the mineral deposits are used in religious ceremonies, and the water satisfies one of its purposes. The view of a natural landscape containing Indian people interacting with the landscape is already expressed in previous NTS EIS comments as well as in previous NTS documents (Stoffle et al., 1990a).

Defining an American Indian Ecological Unit is a critical issue for implementing an ecosystem management strategy that includes cultural resources. Indian people often accept geographically unique units like hydrological basins as reflecting traditional adaptive units. However, these geographically unique units are bound together into larger culturally-based units. Ultimately it is cultural, not natural geography that reflect the mind of Indian peoples' adaptation. Cultural-geographic units identified by past studies are the (1) local use area, (2) district, and (3) holy land or nation. Additional cultural-geographic units are the (1) regional landscape, (2) ecoscape, (3) story-scape, and (4) landmarks (Stoffle et al. 1996b). The AIWS would like the *Resource Management Plan* to consider using American Indian cultural-geographic units as part of the base management plan.

G.8.4 Comments to *Framework for the Resource Management Plan*

American Indian participation in the protection and management of resources at the NTS is not limited to compliance with Section 106 of the Historic Preservation Act, but includes 10 years of consultation with the DOE/NV, including the AIRFA compliance program, the NAGPRA compliance program, and the direct participation of American Indians in the writing of sections for the NTS EIS. Consultation that may be implemented in the future, specifically that related to the *Resource Management Plan*, will be successful if it is built on past and present relationships between the DOE/NV and the CGTO.

This Page Intentionally Left Blank

G.9 References

REGULATION, ORDER, LAW

10 CFR Part 1021.104 — U.S. Department of Energy (DOE), "Energy: National Environmental Policy Act Implementing Procedures," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.

40 CFR Part 1508.19 — EPA, "Protection of the Environment: Council on Environmental Quality," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.

DOE Order 1230.2 — DOE, "American Indian Tribal Government Policy," Washington, DC, 1992.

EO 8578 — Executive Order, *"Withdrawal of Public Land for Use of the War Department as an Aerial Bombing and Gunnery Range, Nevada,"* Office of the President, Washington, DC, 1940.

EO 9019 — Executive Order, *"Revoking in Part and Modifying Executive Order 8578 of October 29, 1940, and Reserving Public Land for Use of the War Department as an Aerial Machine-gun Range,"* Office of the President, Washington, DC, 1942.

EO 12866 — Executive Order, *"Regulatory Planning and Review,"* Office of the President, Washington, DC, 1993.

EO 12875 — Executive Order, *"Enhancing the Intergovernmental Partnership,"* Office of the President, Washington, DC, 1993.

EO 12898 — Executive Order, *"Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Population,"* Office of the President, Washington, DC, 1994.

PL Order 805 — Public Land Order (PL Order), "Withdrawing Public Lands for Use of the U.S. Atomic Energy Commission; Partial Revocation of Executive Orders Nos. 8578 and 9019," Bureau of Land Management, U.S. Department of the Interior, *Federal Register*, 1952.

GENERAL

Arnstein, 1969 — Arnstein, S.R., "A Ladder of Citizen Participation", *Journal of the American Institute of Planners,* 217-224, 1969.

Bean and Vane, 1978 — Bean, L.J., and S.B. Vane, *Persistence and Power: A Study of Native American Peoples in the Sonoran Desert and the Denver-Palo Verde High Voltage Transmission Line*, Cultural Research, Inc., Menlo Park, CA, 1978.

Bean and Vane, 1979	Bean, L.J., and S.B. Vane, *Allen-Warner Valley Energy System, Western Transmission System, Ethnographic and Historical Resources*, Cultural System Research, Inc., Menlo Park, CA, 1979.
Bean and Vane, 1982	Bean, L.J., and S.B. Vane, *The Ivanpah Generating Station Project Ethnographic (Native American) Resources*, Cultural Systems Research, Inc., Menlo Park, CA, 1982.
Brooks et al., 1975	Brooks, R.H., D. Olson, J. King, G. King, R. Leavitt, and P. Anderson, *Prehistoric and Historic Research Along the Navajo-McCullough Transmission Line Right-of-Way*, Nevada Archaeological Survey, University of Nevada, Las Vegas, NV, 1975.
Cernea, 1991	Cernea, M.M. (ed.), *Putting People First: Sociological Variables in Rural Development*, New York, Oxford University Press, 1991.
D'Azevedo, 1986	D'Azevedo, W.L. (ed.), 1986, *Great Basin*, Vol. II, Smithsonian Institute, Washington, DC, 1986.
Deloria, 1985	Deloria Jr., V., *Behind the Trail of Broken Treaties: An Indian Declaration of Independence*, University of Texas Press, Austin, TX, 1985.
Deloria and Stoffle, 1994	Deloria Jr., V., and R. Stoffle (eds.), *Sacred Sites Protection Strategies - Legacy Project,* Preliminary report prepared for the National Park Service and the U.S. Army Environmental Center, Bureau of Applied Research in Anthropology, University of Arizona, Tucson, AZ, 1994.
Dobyns, 1951	Dobyns, H., "Blunders with Bolsas," *Human Organization,* 10:25-32, 1951.
DOE, 1994	U.S. Department of Energy (DOE), Memorandum for the Heads of Executive Departments and Agencies, Government-to-Government Relations with Native American Tribal Governments, Washington, DC, 1994.
DOE/NV, 1994	DOE, Nevada Operations Office (DOE/NV), *Project Chariot Site, Assessment and Remedial Action Final Report,* DOE/NV 368, Las Vegas, NV, 1994.
Duckwater Shoshone Tribe, 1996	Personal Communication with Kim Townsend, 1996.
Edwards and Johnson, 1994	Edwards, S.R., and W.G. Johnson, *A Status Report on the Hot Creek Archaeological Collection: Project Faultless Area, Nye County, Nevada*, Quaternary Sciences Center, Desert Research Institute, Las Vegas, NV, 1994.
Euler, 1966	Euler, R.C., "Southern Paiute Ethnohistory," *Anthropological Paper No. 78*, University of Utah Press, Salt Lake City, UT, 1966.
Fowler, 1979	Fowler, D.D., and J.F. Matley, "Material Culture of the Numa: The John Wesley Powell Collection, 1967-1880," Smithsonian Contributions to *Anthropology No. 26*, Smithsonian Institution Press, Washington, DC, 1979.

Fowler, and Fowler, 1971	Fowler, C.S., and D.D. Fowler, "Notes on the History of the Southern Paiutes and Western Shoshonis," *Utah Historical Quarterly,* Vol. 39, No. 2, pp. 95-113, Salt Lake City, UT, 1971.
Gore, 1993	Gore, A., *Earth in the Balance: Ecology and the Human Spirit*, New York, Plume, 1993.
Greaves, 1994	Greaves, T. (ed.), *Intellectual Property Rights for Indigenous Peoples: A Sourcebook*, Society for Applied Anthropology, Oklahoma City, OK, 1994.
Halmo, 1994	Halmo, D.B., "With One Voice: Collective Action in Cultural Impact Assessments," *Practicing Anthropology* 16(3):14-16, 1994.
Laird, 1976	Laird, C., *The Chemehuevis*, Banning, Malki Museum Press, 1976.
LeVine and Shweder, 1984	LeVine, R., and R. Shweder (eds.)," Properties of Culture: An Ethnographic View," in *Culture Theory: Essays on Mind, Self, and Emotion*, pp. 67-87, Cambridge University Press, Cambridge, England, 1984.
Merriam, 1979	Merriam, C.H., "Indian Names for Plants and Animals Among California and Other Western North American Tribes," *Baliena Press Publication in Archaeology: Ethnology and History 14*, Robert F. Heizer (assist.), Socorro, NM, 1979.
Morrissey, et al., 1994	Morrissey, W.A., J.A. Zinn, and M. Corn, "Ecosystem Management: Federal Agency Activities," in *CRS Report for Congress,* Library of Congress, Washington, DC, 1994.
Palmer, 1978	Palmer, W.R., *(1946) Why the North Star Stands Still and Other Indian Legends,* Zion Natural History Association, Zion National Park, Springdale, UT, 1978.
Parentaeu, 1988	Parentaue, R., *Public Participation in Environmental Decision-Making*, University of Montreal Press, Montreal, Canada, 1988.
Presnall, 1936	Presnall, C.C., *Zion-Bryce Nature Notes,* Zion Natural History Association, Zion National Park, Springdale, UT, 1978.
Ruppert, 1994	Ruppert, D., "Buying Secrets: Federal Government Procurement of Intellectual Cultural Property," in *Intellectual Cultural Property Rights for Indigenous Peoples: A Source Book.* Tom Greaves (ed.), pp. 111-128, Society for Applied Anthropology, Oklahoma City, OK, 1994.
Sapir, 1910	Sapir, E., *Kaibab Paiute Linguistic and Ethnologic Field Notes*, Manuscript No. 2643 in American Philosophical Library, Philadelphia, PA, 1910.
Steward, 1938	Steward, J.H., "Basin-Plateau Aboriginal Sociopolitical Groups," *Bureau of American Ethnology Bulletin No. 120*, Smithsonian Institution, Washington, DC, 1938.

Stewart, 1939	Stewart, O.C., "The Northern Paiute Bands," *Anthropological Records,* Vol. 2, No. 3, pp. 127-149, University of California, Berkeley, CA.
Stoffle and Dobyns, 1982	Stoffle, R.W., and H. Dobyns, *Nuvagantu: Nevada Indians Comment on the Intermountain Power Project, Intermountain-Adelanto Bipole I. Transmission Line Nevada: Ethnographic (Native American Resources),* Applied Urban Field School, University of Wisconsin-Parkside, Kenosha, WI, 1982.
Stoffle and Dobyns, 1983	Sotffle, R., and H.F. Dobyns, *Nuvagantu,* U.S. Bureau of Land Management, Reno, NV, 1983.
Stoffle and Evans, 1988	Stoffle, R.W., and M.J. Evans, "American Indians and Nuclear Waste Storage: The Debate at Yucca Mountain, Nevada," *Policy Studies Journal,* Vol. 16, pp. 751-767, 1988.
Stoffle and Evans, 1990	Stoffle, R.W., and M.J. Evans, "Holistic Conservation and Cultural Triage: American Indian Perspectives on Cultural Resources," *Human Organization,* Vol. 49, No. 2, pp. 91-99, 1990.
Stoffle and Evans, 1992	Stoffle, R.W., and M.J. Evans, "American Indians and Nuclear Waste Storage: The Debate at Yucca Mountain, Nevada," in *Native Americans and Public Policy,* Fremont, J. L. and L. H. Legters, (eds.), pp. 243-262, University of Pittsburgh Press, Pittsburgh, PA, 1992.
Stoffle, 1987	Stoffle, R.W., *Native Americans and Nuclear Waste Storage at Yucca Mountain, Nevada: Potential Impacts of Site Characterization Activities,* Institute for Social Research, University of Michigan, Ann Arbor, MI, 1987.
Stoffle et al., 1983	Stoffle, R.W., H. Dobyns, and J.M. Evans, *Nungwu-Uakapi: Southern Paiute Indians Comment on The Intermountain Power Project Intermountain-Adelanto Bipole I Transmission Line*, Applied Urban Field School, University of Wisconsin-Parkside, Kenosha, WI, 1983.
Stoffle et al, 1987	Stoffle, R.W., M.W. Traugott, F.V. Jensen, and R. Copeland, *Social Assessment of High Technology: The Superconducting Super Collider in Southeast Michigan,* Survey Research Center/Center for Political Studies, Institute for Social Research, University of Michigan, Ann Arbor, MI, 1987.
Stoffle et al., 1989a	Stoffle, R.W., M.J. Evans, and C. Harshbarger, *Native American Interpretation of Cultural Resources in the Area of Yucca Mountain,* Interim Report, Institute for Social Research, University of Michigan, Ann Arbor, MI, 1989.
Stoffle et al., 1989b	Stoffle, R.W., M.J. Evans, D.B. Halmo, W.E. Niles, and J.T. O'Farrell, *Native American Plant Resources in the Yucca Mountain Area, Nevada,* Institute for Social Research, University of Michigan, Ann Arbor, MI, 1989.

Stoffle et al., 1988a	Stoffle, R.W., M.J. Evans, and D.B. Halmo, *Recommended Actions for Reducing Potential Adverse Effects on Native American Cultural Resources Caused by Site Characterization Activities,* Institute for Social Research, University of Michigan, Ann Arbor, MI, 1988.
Stoffle et al., 1988b	Stoffle, R.W., D.B. Halmo, J.E. Olmsted, and M.J. Evans, *Annual Report, Native American Cultural Resource Studies, Yucca Mountain, Nevada,* report prepared for Science Applications International Corporation, Institute for Social Research, University of Michigan, Ann Arbor, MI, 1988.
Stoffle et al., 1990a	Stoffle, R.W., D.B. Halmo, J.E. Olmsted, and M.J. Evans, *Native American Cultural Resource Studies at Yucca Mountain, Nevada,* Institute for Social Research, University of Michigan, Ann Arbor, MI, 1990.
Stoffle et al., 1990b	Stoffle, R.W, D.B. Halmo, M.J. Evans, and J.E. Olmsted, "Calculating the Cultural Significance of American Indian Plants: Paiute and Shoshone Ethnobotany at Yucca Mountain," *American Anthropologist,* Vol. 92, pp. 416-432, 1990.
Stoffle et al., 1990c	Stoffle, R.W., J.E. Olmsted, and M.J. Evans, *Literature Review and Ethnohistory of Native American Occupancy and Use of the Yucca Mountain Region,* Institute for Social Research, University of Michigan, Ann Arbor, MI, 1990.
Stoffle et al., 1994a	Stoffle, R.W., D.B. Halmo, and M. Dufort, *NAGPRA Consultation and the Nevada Test Site: Final Report of Subgroup Activities,* Bureau of Applied Research in Anthropology (BARA), University of Arizona, Tucson, AZ, 1994.
Stoffle et al., 1994b	Stoffle, R.W., M.J. Evans, D.B. Halmo, M.E. Dufort, and B.K. Fulfrost, *Native American Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site,* Desert Research Institute Technical Report No. 84, BARA, University of Arizona, Tucson, AZ, 1994.
Stoffle et al., 1994c	Stoffle, R.W., M.J. Evans, M.N. Zedeno, B.W. Stoffle, C. Kesel, *American Indians and Fajada Butte: Ethnographic Overview and Assessment for Fajada Butte and Traditional (Ethnobotanical) Use Study for Chaco Culture National Historical Park,* (BARA), University of Arizona, Tucson, AZ, 1994.
Stoffle et al., 1994d	Stoffle, R.W., D.B. Halmo, M.J. Evans, and D.E. Austin, *Piapasa 'Uipi' (Big River Canyon),* prepared for the National Park Service, Bureau of Applied Research in Anthropology, University of Arizona, Tucson, AZ, 1994.
Stoffle et al., 1995	Stoffle, R.W., L.L. Loendorf, D.E. Austin, D.B. Halmo, A.S. Bulletts, and B.K. Fulfrost, *"Tumpituxwinap (Storied Rocks),"* Draft, BARA, University of Arizona, Tucson, AZ, 1995.
Stoffle et al., 1996a	Stoffle, R.W., N. Zedeno, D. Halmo, and D. Austin, *NAGPRA Consultation and the Nevada Test Site* Collection, BARA, University of Arizona, Tucson, AZ , 1996.

Stoffle et al., 1996b	Stoffle, R.W., D. Halmo, and D. Austin, "Cultural Landscapes and Traditional Cultural Properties: A Southern Paiute View of the Grand Canyon and Colorado River," accepted for Publication in *American Indian Quarterly,* 1996.
Stoffle et al., 1996c	Stoffle, R.W., D. Austin, D. Halmo, and M. Banks, *Southern Paiute Ecoscape Perspectives: Applied Ethnographic Study of Cultural Resources at Zion National Park, Utah and Pipe Springs National Monument, Arizona,* preliminary draft prepared for National Park Service, Bureau of Applied Research in Anthropology, University of Arizona, Tucson, AZ, 1996.
Train, 1957	Train, P., J.R. Henrichs, and W.A. Archer, *Medicinal Uses of Plants by Indian Tribes of Nevada,* Lawrence: Quarterman Publications, Inc., 1957.
Tucker, 1982	Tucker, G. C., D. Christensen, and T. McEnany, *"Results of Archaeological Investigations Along the Nevada Section of the Proposed Intermountain Power Project, Adelanto-Bipole I Transmission Line,"* Nickens and Associates Inc., Montrose, CO, 1982.

G.10 LIST OF PREPARERS

Neddeen Naylor
Tribal Elder - Council Member
Lone Pine Paiute-Shoshone Indian Tribe
Consolidated Group of Tribes and Organizations

Don Cloquet
Tribal Elder
Board Member - Las Vegas Indian Center
Consolidated Group of Tribes and Organizations
American Indian Writers Subgroup

Betty Cornelius
Tribal Elder
Museum Director - Colorado River Indian Tribes
Consolidated Group of Tribes and Organizations
American Indian Writers Subgroup

Maurice Frank
Contracts, Grants, and Cultural Resources Expert
Vice Chairman - Yomba Shoshone Tribe
Consolidated Group of Tribes and Organizations
American Indian Writers Subgroup

Gaylene Moose
Cultural Resources Expert
Native American Youth Sports Coordinator -
Owens Valley
Big Pine Paiute-Shoshone Indian Tribe
Consolidated Group of Tribes and Organizations
American Indian Writers Subgroup

Glen Hooper
Cultural Resources Expert
Consolidated Group of Tribes and Organizations
American Indian Writers Subgroup
Yomba Shoshone Tribe

This Page Intentionally Left Blank

Attachment A

THREE HUNDRED AND SIXTY-FOUR AMERICAN INDIAN TRADITIONAL USE PLANTS PRESENT ON THE NEVADA TEST SITE

This Page Intentionally Left Blank

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site
(Page 1 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Abies concolor	White fir	ca-ta-vee[g]	wong-govie[g]	
Abronia turbinata	White sand verbena		nut-zooh-boh-hombe[g]	
Abronia sp.	White sand verbena		bah-gun-boh-hombe[g]	
Achillea millefolium	Milfoil yarrow	i'itsikwasipi[f]		
Achillea sp.	Yarrow	i'itsikwasipi[f] todze-tonega[g] toe-tee-tone-ga[g] wats-ov[g] toh-tee-tone-e-gah[g] toh-tee-tonega[g]	coo-see-pah-wah-zip[g] dogowah-wan-guh[g] donzee-anga[g] pah-ronzee-ah[g]	
Agave utahensis var. *kaibabhensis*	Kaibab agave	kaiva uusiv[b]		
Agave utahensis var. *utahensis*	Utah agave	yaant[b] nanta[f] yant[f]		
Agave sp.	Agave, Mescal	yant (mp)[f]		
Agropyron smithii	Western wheat grass	paxankwa[f]		
Agropyron sp.	Wheat grass	paxankwa[f]		
Agrostis exarata	Spike bentgrass	NF[f]		
Allium sp.	Wild onion	kwichasi[f]	bah-zuh-see[g]	un-zee[g]
Amaranthus albus	Pale amaranth	toki-mont[f] tokimont[f]		
Amaranthus retroflexus	Redroot pigweed	kumutʉ[f]		
Amaranthus powellii	Powell's amaranth, Pigweed	kumutʉ[f] pun-kont[f]		

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site
(Page 2 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Amaranthus sp.	Pigweed	toki-mont[f] ku-mont[f] camoot[f] kumutʉ[f]	tokimont[f] pun-kont[f] punkont[f]		
Ambrosia dumosa	White bursage, Burrobush	kʉtsiav[f]	tʉmpisangwav[b]		
Ambrosia artemisiifolia	Ragweed	NF[f]			
Amelanchier alnifolia	Saskatoon service-berry	toyabe[f]	tʉvwampʉ[f]		
Amelanchier utahensis	Utah serviceberry	tʉngwʉmp[f] tʉvwampʉ[f] NF[e]	kwiyav[f] toyaba[f]	<u>duh</u>-hee yemba[8]	
Amelanchier sp.	Serviceberry	tŭ-ab′ (k)[4] kwiyav[f] tʉngwump[f] kwiyav[f]	toyabe[f] tʉvwampʉ[f] toyaba[f] tʉngwʉmp[f]		
Amsinkia tesselata	Fiddleneck	NF[e]			kua[e]
Androstephium breviflorum	Funnel-lily	NF[f]			
Anemopsis californica	Yerba mansa	cheu-<u>pahn</u>-iv (mp)[8] tchupaniv[e]	NF[f]	chew-<u>pon</u>-iv[8] NF[e]	tchawanav[e] tsawaniv[e]
Anemone tuberosa	Desert thimbleweed, Windflower	NF[f]			

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site
(Page 3 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Angelica sp.	Angelica	to'nchavi[f] kibah na-tizuah[8] tontsabi[f] bogo[8]	bee-ah-bogo[8] be-ah boquah[8]	
Apocynum cannabinum	Dogbane, Indian hemp	NF[1]		
Arabis pulchra	Pretty rockcress	ak[e] ahk[e]		
Arabis sp.	Rockcress	toxopakuv[f]	don-zeah[8]	
Arceuthobium sp.	Mistletoe	San-hap´ o-tsav[4]	Not-tof-yum	
Arctostaphylos patula	Green-leaf manzanita	ararʉmpipi[f]		
Arctostaphylos pungens	Pointleaf manzanita, Mexican manzanita	ararʉmpipi[f] ada'dimpipi[f]		
Arctostaphylos sp.	Manzanita	ki´-app´e (k)[4] a-rai´-um-pīv (k)[6] tim-go´-op (lv)[6] ararʉmpipi[f] ada'dimpipi[f]	yah-he-wat-um[8]	
Arenaria sp.	Sandwort		boo-ee nut-zoo[8]	
Argemone sp.	Prickly poppy	esha-ah-goo-wha[8]	sag-ee-da[8] sag-ee-dump[8] wya-sag-wee-duh[8] wya-sag-gee-gee[8]	
Artemisia bigelovii	Bigelow sagebrush	sangwav[b]		NF[9]
Artemisia dracunculus	Tarragon	sangwavi[f] pas[f]		
Artemisia ludoviciana	Water sage, Louisiana wormwood, Sage herb	huipata-sangwav[b, c] sangwa[f] sangwavi[f] pass-pahs[f] pa'sangwav[e]		

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 4 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Artemisia nova	Black sagebrush	sangwav[d] sangwav[c] sua'piv[c]	bah-que-numb[8] boh-hoe-be[8] du-boh-hobe[8] toyabe-behobe[8] bahopi[c]	
Artemisia spinescens	Bud sage, Button brush	kuh-eeb tah-cun-oh-guah[8] kuh-wepit-tuh-cun-o-guah[8]	doot-see-ab[8] dootsie-up[8] koo-buh tah-cun-o-quah[8] ku-ba-tah-cun-oh-quah[8]	
Artemisia tridentata	Big sagebrush	po-ho´-be (lv)[4] sahng-wav´[4] sah-wahb´ (k)[4] sangwav[c, e] pah-eesh sah-wavvy[8] pah-hoe-be[8] sangwavi[f] sangwa[f] sanwa'bi[f] pah-wavvy[8] sah-wah-be[8] sah-wavvy[8]	bah-guh-yoom[8] bah-hoe-be[8] bah-yah-hoe-be[8] boh-hoe-be[8] boh-ombe[8] sah-wah-be[8] wah-gup-pee[8] povi[e] pohovi[e] bahopi[c] povi[e] po-hó-be (ps)[4]	NF[e, c]
Artemisia sp.	Sagebrush	ïnáp´[u l] po-ho´-be (lv)[4] sahng-wav´[4] sah-wahb´ (k)[4] sangwav[c, e] pa'sangwav[e] huipata-sangwav[b, c] wadzo-ba[8] coo-see pah-wah-zip[8] coo-see quatz-oh-bah[8] coo-see-sah-wah-be[8] coo-see sah-wavvy[8] chumav[b] sangwa[f] sangwavi[f] sanwa'bi[f] pas[f] pass-pahs[f] salmapweep[f] salm-ap-weep[f] coo-see-wy-up[8] koh-see-wah-ah[8] pah-wadz-oh-buh[8] wat-sob[8] whood-see-tah-cun-oh-quah[8]	bah-vah-hoe-be[8] bay-oh-hoe[8] coo-see-pah-zip[8] coo-see-pah-wah-zip[8] pah-vah-hobe: pava-hobe[8]	

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 5 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Asclepias speciosa	Milkweed	nah-quee-dah nat-tizuah[8] toh-hawk-quee[8] ut-sah-av[8] wee-ab-a-nuh[8]	be-ah bee-sha divo-oh-wip[8] be-jah-no-ko[8] be-sha-no-ko[8] bee-sha-wannup[8] pee-gee-wanna[8]	
Asclepias sp.	Milkweed, broad leaf	hewovey[8] NF[1] wa-na[8]	we-ā´-vimp (ps)[4]	
Aster frondosus	Leafy aster	tods-e-tonega[8]		
Aster sp.	Aster	NF[f]	hoo-nut-zoo[8] dimbe-be-ett-zee[8] duh-na-eye-go[8]	
Astragalus praelongus	Milkvetch	NF[b]		
Astragalus purshii	Milkvetch	NF[f]		
Astragalus spp.	Locoweed	NF[b]	tim-bah-hay nut-zoo[8] coopi-joomb[8] gup-wuh-ghu[8] tok-quee[8]	
Atriplex canescens	Four-wing saltbush	skump[b] tono[b] murunibi[f]	noo-roon-up[8]	tonoh[e]
Atriplex confertifolia	Shadscale	NF[2] oavi[f] kakumb[e]		
Atriplex lentiformis	Big saltbush	NF[f]		
Atriplex sp.	Saltbush	kakumb[e] skump[b] tono[b] oari[f] oavi[f] que-aheque[f] murunibi[f]		

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 6 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Avena sativa	Wild oats	hoo-wēv´ (c)[4]		
Baccharis sp.	Seepwillow	koauw[b] kanav[b]		
Balsamorhiza sp.	Balsamroot	key-gah-da-goop[8] ah-ku-pah[8] coo-see quah-soop[8] pah-kuk[8]	ah-kuk[8] coo-see ah-kuh[8]	
Berberis fremontii	Freemont's barberry	tonip[f]		
Berberis repens	Creeping barberry	cor-ren-nup pah-vee[8] poo-heg-wee-dah[8] NF[f]	so-go-diem[8] so-go-du-yembe[8] toh-yuh-tu-yuh-bu-huh[8]	
Berberis sp.	Oregon grape, Barberry	tonip[f]		
Betula sp.	Birch	un-gai´-yu-nin-jump (lv)[6] kai´-shu-imp (k)[6]	who-ghee-juup[e]	
Brickellia oblongifolia	Mohave Brickell bush		sahn-a wap[8]	
Brodiaea pulchella	Desert hyacinth	NF[e]	sigo[e]	
Bryophytes	Moss	NF[f]		
Calochortus bruneaunis	Sego lily	sixo'o[c]	se'go[c]	
Calochortus flexuosus	Weakstem mariposa	sixo'o[f] sixo'o[e]	sigo[e]	kogi[e]
Calochortus nuttallii	Sego lily	sigo'o[f]		
Calochortus sp.	Sego lily, Mariposa lily	sixo'o[f] sigo'o[f]		

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 7 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Carex douglasii	Sedge	NF[f]		
Carex sp.	Sedge	sambiv[d] NF[f]		
Castilleja chromosa	Early Indian paintbrush	NF[e]	angawitambu[e]	NF[e]
Castilleja linariaefolia	Paintbrush		anga-quee-ah-wee-tumb[8] dogowah-die-um[8]	
Castilleja martinii	Narrowleaf paintbrush			NF[c]
Castilleja sp.	Indian paintbrush	NF[d]		
Caulanthus crassicaulis	Squaw cabbage	NF[f]	wah-numb[8]	
Ceratoides lanata	Winterfat		NF[c]	
Cercoparpus ledifolius	Curl-leaf mountain mahogany	tonumpi[f] dunumbe[f](mp)[8] toobe-[8] Dunumbe[f] too-pee[8] toobe-buh-ah[8]	doh-numbe[8] toh-nombe[8] toobap-ee[8] too-be[8] too-bee-boh-ah[8] too-nambe[8] too-pee[8]	
Cercocarpus sp.	Mountain-mahogany	to-namp´ (k)[4] tonumpi[f] dunumbe[f] dunumbe[f]	too-num´-be (ps)[4] too-namp´-pe[4] toó-nam-be[4]	NF[9]
Chaenactis douglasii	Douglas dusty-maiden	hoot-see-eva[8] si-af-iv[8] toh-hoe-quah[8]	witch-ah das-ah-dee-ah[8] witch-ah-numba[8] yahn-gan-gooie[8]	

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 8 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Chamaebatiaria millefolium	Fernbush	par-o-wah tah-cun-o-quah[8]	ting-wee-buh[8]	
Chenopodium fremontii	Frèmont goosefoot	sax'watikup[c]	u'uphi[c]	
Chenopodium sp.	Goosefoot	sax'watikup[c]		
Chorizanthe rigida	Rigid spine-flower	sanʉv[f] kamuhurusanuv[f] kanumuvusanuv[f]		
Chorizanthe sp.	Spine-flower	sanʉv[f] kamʉnurʉ[f]		
Chrysothamnus nauseosus	Rubber rabbitbrush	s'kump[c, e] sikomp[b] sikʉmp[f] sikump[f] pantus'kump[d]	see-bape[8] su'pimba[c] NF[e]	
Chrysothamnus viscidiflorus	Little rabbitbrush	see-gu-pee[8] tah-bee-she-goop[8] tah-beese-see-goop[8]	nagaha-see-bup-ee[8] oh-ha-see-bup-e[8]	
Chrysothamnus sp.	Rabbitbrush	koo-chum´-ahv (lv)[4] koo-tsam´-mah hav´ (c)[4] sikomp[f] sikump[f] sikʉmp[f] s'kump[c, e]	siǵ-um-bip´ (ps)[4]	
Cirsium mohavense	Desert thistle	tsiev[e]		
Cirsium sp.	Pink thistle	manavip[b]		
Claytonia sp.	Spring beauty	NF[f, 8]		
Clematis ligusticifolia	Virgin's bower, Wild clematis	esha-wanna[8]	esha-wanna[8] esha-wannup[8]	
Coleogyne ramosissima	Blackbrush	NF[f, e]		

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 9 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Comandra umbellata	Bastard toad-flax	NF[f]			
Cordylanthus sp.	Birdsbeak			tim-bah-hay nut-zoo[8]	
Cornus stolinifera	Dogwood	NF[f]			
Cornus sp.	Dogwood	NF[f]			
Coryphantha vivipara var. *desertii*	Fishhook cactus, Coryphanth cactus	manav[d]			NF[c]
Coryphantha vivipara var. *rosea*	Foxtail cactus	manav[d] manav[c]	yuav[c]	NF[c]	
Cowania mexicana (see *Purshia stansburiana*)	Cliffrose				
Crepis sp.	Hawksbeard			ah-zah-div-o-wip[8] bee-sha-no-go[8] bee-jee div-o-wip[8]	
Cryptantha sp.	Cryptantha	NF[f]			
Cucurbita foetidissima	Coyote gourd, Missouri gourd	ankompi[f] ahn-no-quav (mp)[8, f] arno-cup[f, 8]	ahn-noquav[f] arnocup[f]	poo-nono[8]	
Cuscuta spp.	Dodder	canaza-kwee-sha[8]	too-vah-saah[8]		
Cymopterus globosus	Golfball spring-parsley	ye-duts[8]	ye-luts[8]		
Cymopterus sp.	Spring-parsley	nampip[f]			

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 10 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Dalea fremontii (see *Psorothamnus fremontii*)	Fremont indigo bush			
Dalea polyadenia	Smokebush	ma-good-du-hoo[8] ma-good-tu-hoo[8] moh-goon-du-hoop[8] moh-goon-du-hoopie[8]	ma-good-tu-hoo[8] moh-goon-du-hu[8]	
Dalea sp.	Indigobush	kaatamon~~u~~p[f] i-era-midja[f] i-eramidja[f]		
Datura meteloides	Sacred thorn-apple, Sacred datura, Jimsonweed	moa-nump[7] momomp[b, e] momomp~~u~~[f] mimip[f] man-op-weep[f] main-oph-weep[f] mainophweep[f] manopweep[f] moh-mope (mp)[8]	moh-eep[8]	
Datura sp.	Jimsonweed	mu-maup´ (k)[6] moa-nump[7] momomp[b, e] momomp~~u~~[f] mimip[f] main-oph-weep[f] man-op-weep[f] mainophweep[f] manopweep[f]		
Delphinium parishii	Larkspur	NF[e]		
Descurainia pinnata	Tansy mustard	ak~~u~~[f] aku[f] NF[b] hahck[f] ku'u[e]	poyah[e]	
Descurainia sophia	Tansy mustard, Herb sophia	ahk[e]	poyah[e]	
Descurainia sp.	Tansy mustard	ahk[e] ku'u[e] ak~~u~~[f] aku[f] hahck[f] ak[f] ok[f]		

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 11 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Dichelostemma pulchellum	Bluedicks	NF[f]		
Distichlis spicata	Saltgrass	ĕ´-shŭ (lv)[4] e-soov´ (c)[4] Nf[f] mo-nump´ (k)[4]	pas-shoo-tum (ps)[4] ó-hah só-nĭp[4] ŏ-hah só-nip[4]	ongavi[e]
Dyssodia pentachaeta (=D. thurberi)	Scale glandweed	sakwapi[b] NF[f]	ahn-dah-gah nut-tah-zoom[8]	
Echinocactus polycephalus	Cotton-top cactus	tash[e]	NF[e]	NF[e]
Echinocactus sp.	Barrel cactus	pavio[f] tamar (lv)(p)[f] tʉmar (mp)[f]		
Echinocereus engelmannii	Engelmann hedgehog cactus	usivwuits[f] tule[e] manav[d]		
Echinocereus triglochidiatus	Claretcup cactus	chuamanav i'mamanavi[b] ova'xobi[f] cacuusov'xobi[f]		
Echinocereus sp.	Hedgehog, Tule cactus	tule[e] chuamanav i'mamanavi[b] usivwuits[f] ova'xobi[f] cacuusov'xobi[f] usirwuits (lv)(p)[f] NF[d]		
Echinochloa sp.	Cockspur	NF[f]		
Eleocharis palustris	Spikerush	NF[c, f]		
Eleocharis sp.	Spike rush	pahrasiev[c]	bumohap[c]	NF[9]
Elymus cinereus	Wild rye			NF[9]

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 12 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Elymus elymoides	Squirrel tail	saxwanartotsivuaium[c]		
Elymus triticoides	Beardless wildrye, Creeping wildrye	NF[f]		
Elymus sp.	Wildrye, Wheatgrass	ph-hoe-buh wah-hava[g] sah-wah-havva[g] wah-havva[g] saxwanartotsivuaium[c] NF[f]	pay-wah-guave[g] wy-ron-zip[g]	
Encelia farinosa	White brittlebrush	NF[b]		
Encelia frutescens var. resinosa	Brittlebush	sana ich[b] tuwich[b]		
Encelia virginensis (all varieties)	Virgin encelia, Brittlebush	sana ich[b] suopiv[e] tuwich[b]		
Enceliopsis nudicaulis	Nakedstem		anga-go-ahp[g] coo-see ah-kuk[g]	
Ephedra nevadensis	Nevada Indian tea	tup, tup[b] hutuup[c] tu'up[c] tutuupi[f] tutupi[f, e] tu-tupe (mp)[g] tutupe[f] utuupi[f] u'tuup[e] yatup[e] NF[d]	coo-see too-roombe[g] tutumbi[e] turundi[c]	turup[e] tutuup[c]
Ephedra torreyana	Torrey Indian tea	tutuupi[f] tutu'pi[f] tu-tupe[f] u'tup[b] tupi[b]		
Ephedra viridis	Indian tea	tup[b] tup[b] tutuupi[f] soo-roop-ee[g] too-roop-ee[g] tutu'pi[f] utuupi[f] u'tuup[e] too-toop-ee[g]	too-roombe[g] too-toom-be[g] tutumbi[e] NF[c]	turup[e] NF[c]

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 13 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
		NF[c]			
Ephedra sp.	Mormon tea, Jointfir, Indian tea	too-troop´ (c)[4] hoo-toop´ (k)[4] tup, tup[b] u'tuup[e] yatup[e] hutuup[c] tu'up[c]	tutuupi[f] utuupi[f] tutu'pi[f] tutupi[e, f] tutupe[i] tu-tupe[f]	too-toom´-bip (ps)[4]	
Equisetum laevigatum	Smooth scouring rush	sakwa-'ivi-p[b]	paxwav[f]		
Equisetum sp.	Scouringrush			bah-see-noo[8] kah-wah-quah-see[8]	
Eragrostis sp.	Love grass	NF[f]			NF[9]
Eriastrum eremicum	Mohave eriastrum	NF[c]			NF[c]
Erigeron sp.	Daisy	booie na-tizuah[8] dootsie tah-bah-she-up[8]	kah-noop-ah[8] too-bee-man-ob[8]	boo-ee nut-zoo[8]	
Eriodictyon angustifolium	Narrow-leaf yerba santa	wee-poo-en-ub (mp)[8, f] weepoo-enub[f]	kutsa'rimpi[f] pa'sinipi[f]	wee-pah-got-um[8]	
Eriogonum inflatum	Desert trumpet, Bladderstem, Indian pipeweed	papakurum[f] papakurum[f, e]	papakurum(p)[e]	tusarambokup[e]	
Eriogonum microthecum	Wild buckwheat	pee-wee-guy-womb-mutz-zee[8]		ahn-ga-see-ga wee-ub[8] anga-kah-sah-rumba[8]	
Eriogonum ovalifolium	Butterballs	ya-paw-taw-the[8]		naka-donup[8]	

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 14 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Eriogonum caespitosum	Buckwheat brush	NF[f]		
Eriogonum umbellatum	Sulphur flower	na-ka-donip[8] wadda-e-goh[8]	bah-hoe-zee[8] naka-donup[8]	
Eriogonum sp.	Buckwheat	ya-paw-taw-the[8]		
Erodium cicutarium	Storksbill, Heronbill	wyuvimp[c]		
Euphorbia albomarginata	Rattlesnake weed	tuvika'xaiv[c] tuvipukaxi[f] tuvipukaxi[f] tava'namu'obi[f] tuvipaxghaiv[e]	nah-com-boot-zip[8]	
Euphorbia sp.	Spurge	tuvipaxghaiv[e] tuvika'xaiv[c] tuvipukaxi[f] tah-wee-carib (mp)[8] tava'namu'obi[f] tuvipukaxi[f] tah-wee-carib[f]	nah-comb-boh-zip[8] nah-wah-go bud-zip[8]	
Eurotia lanata	White sage, Winter fat	boo-see-ah-wah-be[8] she-shu-bah[8]	shee-shub[8] tuh-yeep[8]	
Fallugia paradoxa	Apache plume	muup[b]		
Forsellesia nevadensis	Nevada greasebush	bas-un-dook nut-zoo[8]		
Frasera albomarginata (see *Swertia albomarginata*)	White-margined swertia			
Fraxinus anomala	Singleleaf ash	tuav[f] tuav[f]		
Fraxinus sp.	Ash	wam-pīp (k)[6] wan-pimp´ (lv)[6] tuav[f] NF[b]		

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 15 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Fritillaria atropurpurea	Spotted missionbells, Leopard-lily	NF[f]		
Garrya flavescens	Ashy silktassel	ka'ninkwap[f]		
Gaura coccinea	Scarlet beeblossom	NF[f]		
Gilia aggregata (see *Ipomopsis aggregata*)	Scarlet gilia, Skyrocket			
Gilia congesta (see *Ipomopsis congesta*)	Ballhead gilia			
Gilia inconspicua (see *Ipomopsis inconspicua*)	Floccose gilia			
Glycyrrhiza lepidota	Desert root, American licorice	NF[f]		
Grayia spinosa	Spiny hop sage			NF[c]
Grindelia squarrosa	Gum plant	oha tonega[g] sah-nah tonegan[g]	sah-nah cav-oh-no-ah[g] sah-nah-goop-ah-rah[g] woh-ah-gum[g]	
Gutierrezia microcephala	Matchweed, Small-head snakeweed	NF[c] yainup[b] waarump[b]	tavishepi[e]	
Gutierrezia sarothrae	Snakeweed, Matchweed	s'kump[d]	see-gupe[g] too-goot-se-ooh-goope[g] toom-bee-see-bupe[g]	
Haplopappus acaulis	Stemless Goldenweed	pau'p[f] apu'p[f]		

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 16 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Haplopappus sp.	Goldenweed	pau'p[f] apu'p[f]		
Helianthus annuus	Common sunflower	ah-kump´ (k)[4] bah-kuk[8]		
Helianthus sp.	Sunflower	ah-kump´ (k)[4] akump[f]		
Heliotropium curassavicum	Heliotrope	tube-manabe[8] wa'ateyowimpi[f] tu-ma-nabe[8]	i-yah-oh-ho[8] i-yah-oh-ho[8] tu-man-ah-be[8]	
Hermidium alipes	Four-o'clock	he-wov-bee[8] hewovey[8]		
Heuchera rubescens	Alum root		toya-dimba-wah-rumb[8] zee-guoy[8]	
Hilaria rigida	Big galleta	NF[f]		
Holodiscus dumomus	Mountain spray	oh-na-nut-tiz-u-wabbe[8] tah-see-vuh[8] wah-poose-oh-guay[8]	tot-zip[8] toya-huhnabbe[8]	
Hymenoclea salsola	White cheesebush, Burrobush	paiab[f]		
Ipomoea sp.	Morning glory	NF[f]		
Ipomopsis aggregata	Scarlet gilia, Skyrocket	anka'siti[f] soh-noy tah-cun-oh-quah[8] pah-wah-gopish[8] para-give[8]	enga-mo-wanya[8] enga-mutz-oh-y-newie[8] tem-piute[8] tin-ah-piute[8]	

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 17 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Ipomopsis congesta	Ballhead gilia	quoy-hee nooma natiz-u-ah[g]	bas-oh-nup[g] be-he-vah[g] bee-ah-du-hu[g] bee-hee-vah[g] hoe-ni[g] hoo-na[g] hoo-ni[g] sah-tone-zee[g] sah-tone-zee-yung[g]	
Ipomopsis inconspicua	Floccose gilia			NF[c]
Ipomopsis sp.	Gilia	eck-quee-hu-binga[g] sigh-yah-gava[g] si-yah-gum[g] too-bee man-a-ba[g] too-bee too-ben-aba[g] too-man-aba[g]	din-ah-ee-goom[g] duh-na-ee-go[g] duh-nah-eye-go[g] duh-nah-eye-gum[g] tin-ah-ee-go[g] NF[c]	
Iris missouriensis	Wild iris	pah-see-toob-ah[g] poo-gooey-roop[g] poo-gooey-rub[g]	pah-sag-ee-dah[g] pah-sag-ee-duh[g] pah-sag-e-dump[g] pah-sag-gee-gee[g] sag-e-dump[g]	
Iris sp.	Iris	NF[f]		
Iva axillaris	Poverty weed	quee-duh-tee-nava[g] too-ha-babba[g]	du-du-zip[g] too-du-zip[g]	
Juncus mexicanus	Wire grass	NF[d] pa'sip[e]	sonophi[e]	NF[e]
Juncus sp.	Rush	paxwav[f] pauv[b]		

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 18 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Juniperus communis	Common juniper	pawa'apʉ[f] pah-wap-o-ruit[f] dootsie pah-wap-pee[8]	pahwaporuit[f] pah-wap-o-ruitz (mp)[8] wap-pee[8]	mah-hav-wa[8]	
Juniperus osteosperma	Utah juniper, Cedar	wa'ap[c, d, e] wa'apu[f] wa'apʉ[f] wa'apumpi[f]	wa'apʉmpi[f] noo-ahntup[f] noo-ahn-tup[f] NF[d]	sahwavi[e] suwavi[c] sawabi[c]	hunuvu[e] hunuvu[c]
Juniperus scopulorum	Rocky mountain red cedar	bah-sah-mabe[8]	bas-um-ah-be[8]		
Juniperus sp.	Juniper, Cedar	wah-ahp´ (lv)[4] che-emp´ (c)[4] pah-wahp´ (k)[4] wahp´[4] wap (k)[6] wa-op (lv)[6] wa'ap[c, e] pahwaporuit[f] noo-ahntup[f] wah-pee[8]	noo-ahn-tup[f] wa'apʉ[f] wa'apʉmpi[f] pawa'apʉ[f] wa'-pi[f] wap[f] wa'apu[f] wa'apumpi[f] pah-wap-o-ruit[f] wah-puee[8]	sah-mah-be[8] sam-ah-bee[8] sahn-ah-poh[8] sam-ah-bee[8] sahm-wah´-be[4] tsé-kev-ve[4] sah´-nah-be[4]	NF[9]
Krameria parvifolia	Range ratany	nagavaronump[e]	NF[f]		
Krameria sp.	Ratany	nah-kah-vah dah-tohnub (mp)[8, f]		nah-gee too-nah-nib[8]	
Lappula occidentalis	Stickseed	NF[f]			
Larrea divaricata	Creosote bush	yah-temp (mp)[8]		ya-temp[8]	
Larrea tridentata	Creosote bush	yatʉmpi[f] yatʉmp[f] yatump[f, e]	yah-temp[f] yahtemp[f] ys'ya'mip[f]	yatumbi[e]	NF[e]

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 19 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Larrea tridentata	Creosote bush	yatamp[f, e]; ya'tampi[f]; yatumb[b]; ya'ta'mpi[f]; yatampi[f]		
Lepidium fremontii	Fremont's peppergrass	NF[f]		
Lepidium lasiocarpum	Desert pepperweed	NF[f]		
Lepidium Montanum	Mountain Pepperplant	NF[a]		
Lewisia rediviva	Bitter root	NF[f]	gungah[c]	
Lichen	Lichen	NF[f]; timpapsuchicu[c]		
Linum lewisii	Blue flax, Wild flax	booie-ah-nooma[g]; booie na-tizuah[g]; po-eena-tiz-uah[g]; NF[f]	boo-ee nut-tah-zoom[g]; boo-ee nut-zoo[g]; boo-eep nut-zoo[g]; poo-ena nut-tiz-zooh[g]	
Lithospermum ruderale	Gromwell, Stoneseed		nem-ish-aw[g]; nom-ish-aw[g]	
Lomatium sp.	Biscuitroot, Indianroot	NF[f]		
Lupinus spp.	Lupine	quee-duh-kwana[g]	quee-duh-quen-ah[g]	
Lycium andersonii	Anderson wolfberry	u'upwivi[b]; u'up[d, f]; pa'up[d]; u'upi[f]; hu'up[e]; u'up[e]	huupi[e]	huupia[e]
Lycium pallidum	Pale wolfberry	u'upi[f]; pa'up[e]	huupi[e]	huupia[e]

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 20 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Lycium sp.	Squawberry, Wolfberry	u'up[f] pa'up[d, f] hu'up[e] u'upwivi[b] u'up[b]	u'up[f] u'upi[f] pa'up[c, f] u?upi[2]		
Lygodesmia spinosa	Indian gum plant, Skeleton weed	i-goon-zon-um[8] pee-ee-ah-gub[8] see-ko-pe[8]	too-man-abbe[8] too-wan-oo-pah[8]		
Mahonia repens (see *Berberis repens*)	Creeping barberry				
Marrubium vulgare	Common horehound	quee-ban-oob[8]	NF[a]		
Melilotus alba	White sweet-clover	NF[2]			
Melilotus indicus	Yellow sweet-clover	NF[2]			
Menodora spinescens	Spiny Menodora	NF[e, f]		huupi[e]	
Menodora sp.	Menodora	NF[f]			
Mentha arvensis	Field mint, American wild mint	NF[b]			
Mentha sp.	Mint	paxwa'nanimpi[f] pah-quanna[8] pah-quanna-ah[8] pah-quanna-ah[8]	paxananumpi[f] pah-quanna-av[8] quee-boh-nay[8] toh-see-ten-ava[8]	pah-guanna[8]	
Mentzelia albicaulis	Desert corsage, White-stem blazingstar	ku'u[f] ku'u[c]	NF[e]	pacita[e] kua[c, e]	kua[c] ma'kua[c]

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 21 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Mentzelia laevicaulis	Blazing star				NF[g]
Mentzelia oreophila	Blazing star, Stickleaf	ku'u[f]			
Mentzelia sp.	Stickleaf, Desert corsage	ku'u[c, f]			
Mimulus guttatus	Monkey flower			unda-vitch-quanna[g] pahn-zah-quatum[g]	
Mirabilis multiflora	Colorado four-o'clock	toxo'owatsiv[c]	tukwivi[b]		
Monardella odoratissima	Western bee balm	see-boo moh-goon-up[g]	too-buzz-see-be[g]	guy-moh[g] toya-abba-hobe[g]	
Muhlenbergia asperfolia	Scratchgrass	wichavi ma'ap[b]			
Muhlenbergia sp.	Muhly	nʉtavi[f]			
Nasturtium officinale	Watercress	pamavʉ[b] paʉnaxʉnanar[b]			
Nicotiana attenuata	Coyote tobacco	koapi[f] koap[f] koaop[f] tsaw-wap[f] koap[c]	bah-moh[g] poo-ee-bah-hoon[g] poo-ee-bah-moh[g] poo-wee-buh-hoon[g] toh-quoh-quah[g]	new-wha bah-hoon[g] poo-ee-pah[g] pue-bax[g] NF[c]	NF[c]
Nicotiana trigonophylla	Indian tobacco, Desert tobacco	koapi[f] nungwukoap[f] nʉngwʉkoap[f]	saxwaxwapi[c] koap[b] nʉngwʉkoap[b]	pombi[c]	

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 22 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Nicotiana sp.	Tobacco, Wild tobacco	ko-op´[6] sĕ-wah´-wahp (lv)[4] ko-ahp´ (c)[4] sow-wow´-wahp (k)[4] sĕ-wah´-gwah'b'[4] koapi[f]	koap[f] koaop[f] saxwaxwapi[e] nungwukoap[f] nungwukoap[f] tsaw-wap[f]	pah-hum´-be (ps)[4]	
Oenothera pallida	Pale evening-primrose	sixo[b]			
Opuntia basilaris	Beavertail cactus	manav[b] yuavi[f] yuavimp[f] NF[e]	yuavimpu[f] yuavimpi[f] navump[f]	nugwia[e] <u>nah</u>-vomb[8] <u>wo</u>-gay-be[8]	
Opuntia echinocarpa	Golden cholla, Silver cholla	NF[e]		wiatimbu[e]	
Opuntia erinacea	Mohave prickly pear, Grizzly bear cactus	yuavip[b] manavi[e]	manav[d]		
Opuntia phaeacantha	Engelmann prickly pear	manav[b]			
Opuntia polyacantha	Central prickly pear	usivuwits[c]		NF[c]	
Opuntia spp.	Tuna, "Tule" cactus	manav[b] yuavimpi[f] yuavip[b] usivwuits[f] navump[f] manavimpi[f]	manavi[f] yuavimpu[f] yuavimpu[f] yuavimp[f] yuavi[f] manavimp[f]		
Orobanche cooperi	Broomrape	tu'u[f]			

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 23 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Orobanche corymbosa	Broomrape, Wild asparagus	tu'u[c]	tu'tum[c] tu'du[c]	
Orobanche fasciculata	Broomrape	tu'u[f]		
Orobanche sp.	Broomrape, Indian asparagus	tu'u[f] tue-hoo[8] too-hoo[8] NF[a]	doo[8] too-ee[8]	
Oryzopsis hymenoides	Indian ricegrass	wa-i[7] wa'iv[b] wa'ir[e] wa'ai[d,e,f]	wai[e]	wai[e] NF[9]
Osmorhiza occidentalis	Sweetroot	pah-wah-cape[8] pah-wah-capish[8] pah-wah-gah-bish[8] wadda-eye-gop[8] worra-eye-gob[8]	bah-soh-wip[8] bas-oh-gway[8] bas-oh-wip[8]	
Panicum sp.	Panic grass	NF[f]		
Parthenocissus sp.	Virginia creeper	patowanamauv[b]		
Pedicularis sp.	Lousewort, Elephant head		gooie-took-ie[8]	
Penstemon eatonii	Red penstemon		toh-quoh-bag-um[8]	
Penstemon floridus	Panamint beard tongue			NF[c]
Penstemon pahutensis	Pahute beard tongue	NF[c]		NF[c]
Penstemon palmeri	Palmer beardtongue	toxo'awatsip[f]		
Penstemon sp.	Beardtongue	toxoawatsip[f] too-buzz-sah-wop[8] toh-quoh-wat-ziv[8] toxo'awatsip[f] toe-buzz-see-bee[8]	dim-bah-sego[8] dim-bah-shego[8] too-buzz-see-bee[8]	

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 24 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Peraphyllum ramosissimum	Squawapple	suovi[e]		
Phacelia sp.	Phacelia	NF[f]		
Phlox sp.	Phlox	moh-goon-zee-eye-ah[8] quee-duh-too-nabba[8] NF[f] toh-hah-tonegan[8] tu-be-man-up[8]	din-ah-ee-go[8] eye-go-dun-um[8] so-go-div-oh-sah[8] so-go-ron-zee-ah[8]	
Phragmites australis	Common reed, Giant common reed, Cane, Honey dew	po´-ru (k)[6] pa-gump (lv)[6] paxamp[b, f] pa'xamp[e] pah-gump[f]	NF[e]	pihavi[e]
Phragmites communis	Common reed, Honey dew	moh-goh-koh (mp)[8] pahgump[f] pa-hump[7] wo-cau-cau-pu[8] hohgohkoh[f]		
Phragmites sp.	Reed	po´-ru (k)[6] pa-gump (lv)[6] pahgump[f] hoh-goh-koh[f] paxamp[b, f] hohgohkoh[f]		
Physalis crassifolia	Groundcherry	NF[f]		
Physalis sp.	Groundcherry	NF[f]		
Physaria chambersii	Chambers' twinpod	tah-rah-gee-noob[8] NF[f]	tah-pah-day[8]	
Pinus monophylla	Singleleaf pinyon,	tu-vap´ (lv)[4] toov´ (c)[4] tŭ-bah´-kah-bub (k)[4] tuvap[c, e] sahn-a-pah wah-pee[8] too-bee[8] tu-ba[8] tu'uv[c] tʉva[f] tuva[f] tuvwap[e] tu-bap-ee[8] wah-pee[8]	wahpi[e, c] tuvah[e] wah-pee[8] wahp´ (ps)[4] wah´-pe[4] sah´-nah-wah´-pe[4] tɨpa[9]	tuvap[e] tuva[c] tɨba[9]

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site
(Page 25 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Pinus ponderosa	Ponderosa pine	yu-vim´ (lv)[4] ŏ-gump´ (k)[4] yu-wim´p [4]	wung-gah-be[4] wun-kó-be (ps)[4]	
Pinus sp.	Pinyon	tu-wop´ (k), (lv)[6] tu-vap´ (lv)[4] toov´ (c)[4] tŭ-bah´-kah-bub (k)[4] yu-vim´ (lv)[4] ŏ-gump´ (k)[4] yu-wim´p[4] tʉva[f] tivah[f] tuva[f] tuvap[c, e] tu'uv[c] tuvwap[e]	wong-govie[8]	
Pinus sp.	Sugar pine		wi-ah´-kah-tum (ps)[4]	
Plantago major	Common plantain		wee-dee[8] woo-dee[8]	
Pluchea sericea (see *Tessaria sericea*)	Arrow weed			
Poa bigelovii	Bluegrass	NF[f]		
Poa fendleriana	Muttongrass, Bluegrass	uxwishuv[f]		
Populus fremontii	Fremont cottonwood	sovip[b]		
Populus tremuloides	Quaking aspen		sing-gah-ve[8] sung-up[8]	
Populus trichocarpa	Black cottonwood		sing-gah-ve[8] sing-gop[8] so-ho-be[8] su-nabbe[8] toya-soo-nap[8]	

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 26 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Populus sp.	Cottonwood	sho-wīp´ (k)[6] so-vwīp (lv)[6] sovip[b] só-vip (k)[4] sah´-vip (lv)[4] sah´-vip´ (c)[4]	só-o-vimp´ (ps)[4] sah´-hah-be[4] sig´-ge[4]	
Porophyllum gracile	Odora	pa'kwitupip[f]		
Porophyllum sp.	Odora	pa-guidobe (mp)[8]		
Portulaca sp.	Purslane	topuene[f] to-puene[f]		
Prosopis glandulosa var. *torreyana*	Torrey mesquite	opimp[b] 'op[f] 'opimpʉ[f] o'pimb[e]	o'phi[e]	
Prosopis pubescens	Screwbean	kwiyarʉ[f] wi'ump[e] kwierum[e] 'opimpʉ (mp)[f] quee-et-umb[8]		
Prosopis spp.	Mesquite	'Op[f] opimp[b] 'opimpʉ[f] kwiyarʉ[f] quee-et-umb[f] quee-etumb[f]		
Prunus andersonii	Desert peach	sahn-avvie[8] sahn-nab-bee[8] NF[f]	bahn-zon-ip[8]	
Prunus fasciculata	Desert almond	tonopi[f] tonapi[f]		
Prunus virginiana	Chokecherry	tonap[f] doh-ish-ah-boo-e[8] tonapi[f] toh-ish-a-booe[8]		
Prunus sp.	Chokecherry	tonap[f] tonopi[f] tonapi[f]		
Psathyrotes annua	Turtle back	sebu-moh-goon-a-bu[8]	yoh-nip[8]	
Psathyrotes ramosissima	Turtle back	ka-sigh-yah-gave[8] sebu-moh-goon-a-bu[8] see-boh mo-goon-ub[8] sigh-yah-gava[8]	quoy-hee nut-zoo[8]	

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 27 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Psoralea sp.	Scruf-pea	kwaovi[f]		
Psorothamnus fremontii	Fremont indigo-bush	kaatamon~~u~~p[f] i-era-midja (mp)[8] i-eramidjar	quee-um-be[8] tuh-goo-buss-e-emp[8]	
Psorothamnus polydenius	Dotted dalea		muipuh[e]	NF[e]
Purshia glandulosa	Buckbrush	u'nup[e]	hunavi[e]	
Purshia stansburiana (=*Purshia mexicana* and *Cowania mexicana*)	Cliffrose	~~u~~nap~~u~~[f] uh-nop (mp)[8] hunap[c] uhnop[f] NF[d]	hunavi[c] be-ah-huh-nabbe[8] huh-nabbe[8]	
Purshia tridentata	Bitterbrush,	unap[c] NF[f] huh-na-bee[8]	huh-nabbe[8] linna-huh-nabbe[8]	
Purshia sp.	Cliffrose	hunap[c]	hunavi[c]	
Quercus gambelii	Gambel oak, Scrub oak	tuav[c] kwiav[e]		tsiginoh[e] tsigino[c] we'a[c]
Quercus sp.	Oak	kwi´-uv (k)[6] to-mum-pīv (lv)[6] hēm´-pah (c)[4] kwe´-av[4] we-am´-pe (c)[4] hēm´-pah (c)[4] tom~~u~~mpi[f] tuav[c] kwiav[e] tomump[f] tomumpi[f]	wé-ah (ps)[4]	wiya[9]
Rhus aromatica	Skunkbush, Sumac	i'is[c] su'uv[c] u'up[c]		

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 28 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Rhus trilobata (all varieties)	Squawbush	e-is´ [4] i'isi[f] i-siv´ (lv)[6] shen-pimp´ (lv)[6] sʉʉv[b] shʉʉvi[b] siʉvimpu[f] huupi[f] see-a-wimp (mp)[8]	huiupi[f] sʉ'ʉvimpʉ[f] i'isi[f] sʉʉvimp[f] i'is[f] see-a-wimp[f] see-awimp[f] su'uv[d, f] su'uv[e]		
Rhus sp.	Skunkbush, Lemonade- berry, Sumac, Poison oak	i'is[c]	su'uv[c]	nat´-soo ō'k[4]	
Ribes aureum	Golden currant	bo-gumbe[8] poh-oh-bis[8]	NF[f]	bo-gumbe[8]	
Ribes cereum	White squaw currant	NF[l]	NF[c]	bogombi[c]	
Ribes velutinum	Desert gooseberry	NF[c]		NF[c]	NF[c]
Rorippa sp.	Watercress	NF[d]			
Rosa woodsii	Woods wild rose	pikikurump[c]	see-avvie[8]	siwa'vit[c] cimbi[c] see-avvie[8] see-am-bip[8]	NF[c]
Rosa sp.	Wild rose	tsi-am-pīv (lv)[6] pikikurump[c]	sʉ'impipi[f]	tsé-ab[lb 4]	
Rubus sp.	Raspberry	nagauvwʉnatʉmpipi[f]		see-am-bip[8]	
Rumex crispus	Curly dock, Wild rhubarb	nambitu[e] enga-pah-wee-ub[8]	pah-wee-ah[8] pah-wee-ub[8]	be-ja-no-ko[8] dim-woo-ee[8] enga-pa-wee-ah[8] new-wha no-ko[8]	

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 29 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Rumex sp.	Rhubarb	nambitu[e] tuha-kono-be[8] ku'u[b] tuha-kono-gip[8]	bah-rah-zip[8] tuha-konobe[8] wya nut-zoo[8]	
Salazaria mexicana	Bladder sage	NF[f]		
Salix exigua	Coyote willow	kanav[b, e] kah-nav (mp)[8] coo-see suh-ee-be[8] soo-vee[8] suh-ee-be[8] suh-ee-wee[8]	kwishisuuvi[e] coo-see see-bupe[8] soo-vee[8] suh-ee-be[8]	su'huva[e]
Salix gooddingii	Goodding willow	pakanav[b] pawaxanav[e]	suuvi[e]	
Salix sp.	Willow	kahn-nahv (lv)[4] sah'b (c)[4] kah-nahv´ [4] sah-kahv´ [4] kan-av´ (k)[4] ka-nav (lv)[6] kanavi[f] kah-nav[f] kahnav[f] pakanav[b] pawaxanav[e]	se-oó-be (ps)[4] sĕ-yu'b[4] sĕ-yu-be[4] soó-be[4]	su-hu-vee[e]
Salsola iberica	Russian thistle, Tumbleweed	manavip[b] manav[c]		
Salvia columbariae	Chia sage, California sage	sangwav[f] saywav[f] pasiits[e] patsits[f]	pacita[e]	pacita[e]
Salvia dorrii	Purple sage, Indian tobacco	nungwukoap[e] kwatamanum[e] NF[e] kanarukoap[b]		
Salvia sp.	Sage	siguwiipi[f] pasiits[e] sangwav[f] see-goo-we-up[f] seegoowe-up[f] see-goo-we-up (mp)[8] nungwukoap[b] nungwukoap[e] kwatamanum[e] saywav[f] sigimwiap[f] kung-nuh sah-wabbe[8] too-bee she-gin-oop[8]	kahn-gwanna[8] suh-goo-wee-up[8] toya-abba-hobe[8] toya-tim-ba-zip[8]	

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 30 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Sambucus sp.	Elderberry	koo-booie-du-ney[8] koon-oo-gip[8] ko-nó-wip´ (c)[4]	who-booie[8] hoo-boo[8] koo-noo[ch4] kunukwi[f] kunuxwi[f]	duh-he-yemba[8] du-yembe[8] hoh-tiem[8]	
Sarcobatus vermiculatus	Greasewood	yah-tahmp´ (lv)[4] tah-uh-be[8] toh-no-be[8]	yah-tamp´[4] tone-oh-bee[8] NF[f]	to-nó-be (ps)[4]	
Scirpus acutus	Hard-stem bulrush	to'oivi[f]			
Scirpus validus	Soft stem bulrush, Tule	to'oivi[f]			
Scirpus sp.	Bullrush, Big round tule	he´- taw (lv)[4] pow-ahv´ (k)[4]	to'oivi[f] manav[d]	sī̃n-vib´[4] pah sīp[4] bah-sī´´p[4]	
Sclerocactus sp.	Fishhook cactus, Pineapple cactus	manav[d]	NF[b]		
Selinocarpus diffusus	Moonpod	NF[f]			
Senecio sp.	Groundsel	NF[f]			
Sisymbrium altissimum	Tumble mustard	wa'ai[c]			
Smilacina stellata	Solomon-seal	esha-tone-ub[8] pee-havvie[8]	quoh-quavvie[8] quoy-quavvie[8]	wah-toh-voh[8] wom-boh-nomb[8]	
Smilacina sp.	False solomon-seal, Coyote berry	NF[f]			
Solanum sp.	Nightshade	ah-dye-ee na-tizuah[8]			

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site
(Page 31 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Solidago sp.	Goldenrod	NF[2]			
Sonchus oleraceus	Common sow-thistle	mamoiv[b]	mamuiv[b]		
Sphaeralcea ambigua	Apricot globemallow, Desert globemallow	tupwiv[b, c]	NF[e]		
Sphaeralcea sp.	Globemallow	tupwiv[c] kupinav[f]	ku'pinav (mp)[f] NF[b]	quoin-oh-combee[8] quoya-no-comb[8] see-quoy no-ko[8] wee-dah-gom[8] wee-doh-comb[8]	
Sporobolus airoides	Bunchgrass, Alkali sacton	NF[f]			
Sporobolus sp.	Dropseed	postushukunt[f] pas-tu-shu-kunt[f]	kwakwai[f]		
Stanleya pinnata	Prince's-plume, Indian spinach	tʉmar[b, f] namvit[f] tumar[c, e] tʉmarʉ[f] who-goo-buh[8]	nambitʉ[f] tumaru[f] nambitu[f] tʉmaru[f] whoo-goop[8]	tuhuara[e] tu'mara[c] woy-boh-numb[8]	yuhuara[e] NF[c]
Stephanomeria exigua	Wire lettuce	NF[b]			
Stephanomeria sp. *spinosa*	Spiny wire lettuce, Gum bush	NF[e]		NF[c]	
Stephanomeria tenuifolia	Slender wirelettuce	tuwishanakup[b]	NF[8]	NF[8]	

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 32 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Stipa comata	Needle-and-thread grass	NF[e]		
Stipa hymenoides (see *Oryzopsis hymenoides*)	Indian ricegrass	wa'ai[c]	wai[c]	pacita[c]
Stipa speciosa	Desert needlegrass	NF[e]		NF[9]
Stipa sp.	Indian ricegrass	wa'aiv[c]		
Streptanthella longirostris	Wild mustard, Long-beak fiddle-mustard	NF[e, f]		
Streptanthus cordatus	Heartleaf twistflower, Wild mustard	NF[e, f]		
Suaeda torreyana	Seepweed	NF[e] ah-rumb (mp)[8]	attem[8]	
Suaeda sp.	Seepweed	ahrr[f] aah-ap-weep[f] sah-ap-weep[f] NF (lv)(p)[f]		
Swertia albomarginata	White-margined swertia	NF[8]		
Swertia sp.	Swertia	kwiu[f]	coo-see div-oh-savva[8]	
Symphoricarpos longiflorus	Long-flower snowberry	NF[e, f] sahn-ah-vee[8]		
Tamarix sp.	Tamarisk	pantʉmaavʉ[b]		
Tessaria sericea	Arrow weed	sah-wape (mp)[8] NF[b, e, f]		

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 33 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Tetradymia canescens	Gray horsebrush			nah-ga-ha-boh-be[8] pah-vah-bah-hoe-be[8] tah-beese-ee-goop[8]	
Tetradymia sp.	Horsebrush	coo-see see-bupe[8] see-goop-e[8]	too-hah-see-goop-ee[8]	coo-see see-bup[8] coo-see see-bup-e[8]	
Thalictrum fendleri	Meadow rue			boss-oo-guay[8]	
Thamnosma montana	Turpentine bush	NF[f, e]	kaiva sixwana[b]	mo-gun-du[8] moh-goon-du-oop[8]	
Thelypodium integrifolium	Wild cabbage	nambitu[e]	NF[f]		
Townsendia scapigera	Eaton's townsendia	NF[f]			
Townsendia sp.	Townsendia	NF[f]			
Typha domingensis	Cattail, Southern cattail	NF[e,f]		toyh[e]	NF[e]
Typha latifolia	Cattail, Broad-leaf cattail	taw-e´-vah (lv)[4] to-oiv (k)[4] tø'iv[b]	pantusahwav[b] NF[e]	toyh[e] taw´-e[4] tof[4]	NF[e]
Typha sp.	Cattail	taw-e´-vah (lv)[4] to-oiv (k)[4] ta-oiv[7]	tonovi[f] tonoz[f]		
Urtica sp.	Nettle	quee-bah-noop[8]	quee-quawn-oop[8]	by-wee-ah[8]	
Valeriana sp.	Valerian, Tobacco root	NF[f]			

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 34 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Veronica anagallis-aquatica	Speedwell	NF[e]		NF[e]
Viguiera multiflora	Showy goldeneye	NF[f]		
Vitis arizonica	Canyon grape, Wild grape	i'av[e] kuripsup[e] NF[b]	muvasi[e]	
Vitis spp.	Grape	we'ump[f]		
Wyethia sp.	Mules' ear	taxuichaxantiip[f] tixu'si taxanti[f] taxu'itcaxantip[f] tikoitcixantipi[f] tixu'si taxantip[f]		
Yucca baccata	Banana yucca, Blue yucca	uusiv[b, c] wiisiv[b] tachʉmpi[f] tachumpi[f] uusi[f] tcimpi[f] o-u-se[f] u'wivi[e]	NF[e]	
Yucca brevifolia	Joshua tree	tachʉmpi[f] NF[e]	umpu[e]	
Yucca kanabensis	Kanab yucca	NF[a]		
Yucca schidigera	Mojave yucca, Spanish bayonet	tachump[e] u'vimp[e] tachʉmpi[f] uusivi[f] uusiv[f]	NF[e]	
Yucca sp.	Yucca	cho-ram´-pik (k)[6] sam-ah´-vip (k)[4] tsam-a-vip[7] tcimpi[f] u'wivi[e] wiisiv[b] tachʉmpi[f] uusi[f] o-u-se[f] uusivi[f] tachumpi[f] uusiv[f] uus[f]		

Table A-1. Three Hundred and Sixty-Four American Indian Traditional Use Plants Present on the Nevada Test Site (Page 35 of 35)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names	Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Zigadenus paniculatus	Foothill death camas	koggie-a-den-up[8] tah-beese-e-goh[8] see-goh-oh[8]	tah-bah-she-go[8] tah-vah-see-go[8]	
Zigadenus sp.	Meadow death camas	koggie-a-den-up[8] see-go oh-buh[8]		
Gramineae (grass family)	Grass	pa-wah´ (lv)[4] o-gweeb´ (k)[4] hoo-wēv´ (c)[4] u-gu´-siv (k)[6] u-gwīv´ (k) (lv)[6] oo-kwiv´[4]	Sah´-nip[4] Só-nip[4] Só-nĭp[4] Pah´-mah-hap[4]	

[1] Work done by Powell between 1867-1880: (Fowler and Matley, 1979)
[2] Work done by Euler between 1956-1966: (Euler, 1966)
[3] Work done by Palmer before 1946: (Palmer, 1978)
[4] Work done by Merriam between 1902- 1935: (Merriam, 1979)
[5] Work done by Sapir in 1910: (Sapir, 1910)
[6] Work done by Powell in 1873: (Fowler and Fowler, 1971)
[7] Work done by Presnall in 1936: (Presnall, 1936)
[8] Work done by Train between 1935-1941: (Train, 1957)
[9] Handbook of North American Indians-Great Basin (Vol. 11, "Owens Valley Paiute") D'Azevedo, 1986

[a] Stoffle et al., 1996
[b] Stoffle et al., 1994
[c] Stoffle et al., 1994b
[d] Stoffle et al., 1989b
[e] Stoffle et al., 1990
[f] Stoffle and Dobyns, 1982
Stoffle and Dobyns, 1983
Stoffle et al., 1983
[g] Names by CGTO members; April 1996 NTS EIS meeting.

NF = Not found; mentioned in text but no Indian name given.
(c) = Chemehuevi
(k) = Kaibab
(lv) = Las Vegas
(mp) = Moapa Paiute
(p) = Pahrump Paiute
(ps) = Panamint Shoshone

This Page Intentionally Left Blank

Attachment B

ONE HUNDRED AND SEVENTY AMERICAN INDIAN TRADITIONAL USE ANIMALS PRESENT ON THE NEVADA TEST SITE

This Page Intentionally Left Blank

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site
(Page 1 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Mammals					
Family Antilocapridae					
Antilocapra americana	Pronghorn Antelope	Won'-sits (k)[6] Wants [5,] (lv)[6] Wahn-ze[4] Wongs[4]	Wahntz (k)[4] Wakneh[4] Waantsi[f]	Wan-zee[8]	
Family Bovidae					
Ovis canadensis	Desert Bighorn Sheep	Na´-guts (k)[6] Na´-k^w (lv)[6] Naaxa[5] Nahk (k)[4]	Nah[ch4] Nahk[4] Nah-gah[4] Naax[b]		
Ovis sp.	Bighorn Sheep	Nah´-gah (lv)[4]	Nah[ˈch] (c)[4] Nahk´ (k)[4]	Wah´-soo-be (ps)[4] Wah´-sŭp[ˈl4] Wah´-soo-pe[4] Wahs-pe[4]	
Family Canidae					
Canis latrans	Coyote	Yo-go-wo´-tsi (k)[6] Yoxovwits[5] Yoxovʉtsi[5] Sʉnangwavi[5] Tʉrasʉnav[5] Tʉrasinav[5] Tā´-rā-shin´-nav (lv)[4]	Sin-nav[4] Shin-nah-ab[4] Tʉrasʉna'av[b] Turahsunav[c] Sin-nav´ (c)[4] Yo-go´-bits (k)[4]	E-shah-wi´-pah (ps)[4] Ē-jap´-pah[4] E´-jah[4] E´-chah[4] It´-za´[6]	
Canis sp.	Coyote	tu-er-shin-avi[7]		Duhvoe-ee-jah[8]	Ee-sha[8]
Vulpes maerotis	Kit fox			Kuida moss-suguee[8]	

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 2 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Vulpes sp.	Fox	Yú-ĭp (lv)[4]	Yó-putch (lv)[4] Yu-pats (c)[4]	Ye-putch-ah (ps)[4] Yu-pitch´-e[4] Wah´-ne[4]	
--	Fox	Sah-vi´-puts (k)[4] Hú-pats (k)[6] Un-si´-ats (k)[6] Hunt-si´ (lv)[6] Tavangwaimpitsi[5] Hon-ză´ (lv)[4]	Sin-nants[4] Tah-vahn-set[4] Hon-za[4] Onsi'its[b] Onsi'ikarum[b] Hon-ze (c)[4]	Wo´-tse-ah (ps)[4] Wah´-ne[4] Wah-je´-ah[4] Wo´-tse-ah[4] Wa-ni[6] Wo-tsi-a[6] (small)	
Family Cervidae					
Odocoileus hemionus	Mule Deer	Tu-we-ah[4] Yu-oo-e[4] Too-hoo´-e (lv)[4]	Too-hoo-e[4] Tuxia[b] Tŭ-hē´[4] Tŭ-ĕ´ (k)[4]	Dŭ-yah (ps)[4] Dŭ´-he[4] Tŭ-hĕ´-yah[4] Toó-ho´-yah[4]	
Odocoileus sp.	Deer	Ti´-ats (k)[6] Tu-i (lv)[6] Tuxia[5] Tuuyi[f]	Tuhi[c] Tuhuya[c] Tĕ-he´ (lv)[4] NF[b]	Duhayet[c] Ti-hi[6]	Tahenah[c] Tuh'ena[c] Tu-he-nah[8]
Family Cricetidae					
Neotoma sp.	Wood Rat	Kats (k)[6, 4] Kaatsi[5] Kaht´ (k)[4]	Kahts[4] Kaats[b] Kahts´ (lv), (c)[4]	Kow´-wah (ps)[4] Kah´[4]	
--	Wood Rat			Gah"[4]	
--	Rat	Kāts (lv)[6]			
Peromyscus sp.	Mouse	Poo-e´-chet (k)[4] Poo-e-tsets[4] Poo-in´-chets (lv)[4]	Poo-e-chet[4] Poo-in-chets[4] Poo-in´-jets (c)[4]	Poo´-ī (ps)[4] Bo´-ni[4] Po´-ni[4] Poo -nah[4]	

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 3 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
--	Mouse	Pu'ichats[5, b] Pŏm poo´-e-chet (k)[4]	Moi (s)[4]	Po-an´-chah (ps)[4]	Poong-way-szhee[8]
Family Equidae					
Equus sp.	Horse	Kah-wi´-yu (ps)[4] Wah-af-ar (c)[4]	Kah-vah´[4]	Poo'nk[4] Bun´-go[4]	
Family Erethizontidae					
Erethizon dorsatum	Porcupine	Yungumputsi[5] Ye-num-puts (k)[4] Ye-hum-puts[4]	Ye-num-puts[4] Yu[ch][4] NF[b]		
Erethizon sp.	Porcupine	Yú[ch] (lv)[4]	Yŭńg (c)[4] Ye-num´-puts (k)[4]	Yŭ´-hŭ (ps)[4] Yen"[4] Yŭ´-hŭ[4] Yo´-hah[4] Tsa´-gwit[6]	
Family Felidae					
Felis concolor	Mountain Lion	Tu-ma´-mu-ints (lv)[6] Tukumumutsi[5] Piaruku[5] 'Kummo-muts (k)[4] Too-koó-mo-munch (lv)[4]	Too-koo-puts[4] To-ko-mo-muts[4] Too-koo-mo-munch[4] Piaruk[b] Tŏ-koo´-muts (c)[4]	Too-koo´-muts (ps)[4] Toi-yă-too´-koo[4] To-ko-bitch[4] Mi´-yum-be[4] Kong´-gwi-tu-nu[6]	Too-ku-vitchs[8]
Lynx rufus	Bobcat, Wildcat	Tukuputs[b]	Tukuvits[c]	NF[c]	
Lynx sp.	Bobcat, Wildcat	To-ko´-puts (k)[6] Tōk (lv)[6] Tukutsi[5] Tukuputs[5] NF[b]	Took[4] Took[4] Mo-sahts[4] Tukuvits[c] Too-koo´-puts (k)[4]	Too´-koo´-vitch (ps)[4] Doo´-ko-vitch[4] Too´-ko-vitch[4] Too´-ko-bitch[4] To´-ko-pik[6]	Too-ku-vitchs[8]

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 4 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Lynx sp.	Bobcat, Wildcat			NF[c]	
Family Geomyidae					
Thomomys sp.	Pocket Gopher	Mʉyʉmpitsi[5] Mŭ´-e (c)[4]	Mwe-em-puts[4] Mŭ-e (lv)[4] Me-im´-put (k)[4]	Yu-ab´-bitch (ps)[4] Yĕ´-hah-vitch[4] Yĕ´-hah´-vitch[4] Ye-hah´-vitch-e[4]	
--	Gopher	NF[f]			
Family Heteromyidae					
Dipodomys sp.	Kangaroo Rat	Pi-yu-ah[4] Pi´-ah (c)[4] Tă-wā´-tet (k)[4] Pi´ (lv)[4]	Tah-we-tat[4] Pi-im´-buts[4] tom-we-a-tats[7]	Pi´-yu (ps)[4] Bi´-e[4] Pi´-yu[4]	
Perognathus sp.	Pocket Mouse	Pi-im-buts (k)[4]			
Family Leporidae					
Lepus californicus	Black-tailed Jackrabbit	Ka-mu (k)[6] Kam (k), (lv)[6] Kaamʉ[5]	Kahm (k)[4] Kaam[b] Kamuntsi[f]		
Lepus sp.	Rabbit	Tă-voots´ (lv)[4] Tah-voots´ (c)[4] Tah-wuts´ (k)[4]	Kahm´ (lv), (c), (k)[4]	Kah´-moo (ps)[4] Tă´-boo´-tse (ps)[4] Tah´-bo[4] Tah´-bot-se[4] Gah´-mo[4] Kah´-mo[4] Kah´-mah[4] Be´-ah gah´-mo[4] Be´-ah qah´-mo[4] Ta-vut´-si[6] Tsi-gut´-si[6]	

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 5 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Lepus sp.	Rabbit			Ka-mut´-si[6] To-ha´-kum[6]	
--	Jackrabbit	Kamb[c]		Kamusi[c] Tavusi[c]	Kuma[c] Ka-mua[g]
--	Rabbit	Tsok-um (k)[6] Kamb[c]	NF[b]		
Sylvilagus audubonii	Desert Cottontail	Ta-vwōts´ (k)[6] Ta-vōts (lv)[6] Tavutsi[5] Tah-wuts (k)[4] Tah-boots[4]	Tah-vuts[4] Ta-voots[4] Tavuts[b] Tavuuts[f]		
Sylvilagus sp.	Cottontail	Taviti[c]	Tavuuts[c]	Dah-voo[g]	Taputsi[c] Ta-votsi[g]
Family Mustelidae					
Spilogale putorius	Western Spotted Skunk	Kah'bo-ne (k)[4] Kah Bo-na[4]	Kah-bo-na[4]		
Spilogale sp.	Skunk	Kah´-bo-nā (lv)[4] Kah´bo-nĕ (k)[4]	Kah´-bo-ne (c)[4]	Yu-hah[4]	
--	Skunk	Pu´-ni (k)[6] Poni'a[5] Po-nĕ´ (k)[4] Po-ne-ets (lv)[4]	Po-na[4] Po-ne-ets[4] Poni'[b] Pŏ-ne´ (c)[4]	Po-nē´-ĕtś (ps)[4] Bŏ'n-he-atz[4] Baw´-ne-yăts[4] Po-hoi´-ats[4] Po´-nint[6] bo-ho-yetz[g]	
Taxidea taxus	Badger	Hūn (lv)[6] ~~U~~namp~~ut~~si[5] Un-nam-but (k)[4]	Hoon[4] To-chi-e[4] ~~U~~namp~~ut~~s[b]		

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 6 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Taxidea sp.	Badger	Hoon´ (lv), (c)[4]	Un-nam´-but (k)[4]	Ho´-nah[4] Hoo´-nah[4] Hoo-nah[4] Ho´-nan[6] Hoo´-nah (ps)[4]	
--	Weasel	Sŭ-sŭg (lv)[4]	Pah-rook´ (c)[4] Pah-ve´-chit (k)[4]	Bah´-bitch-ē't[4] Bah´-tsoo-goo[4] Pah´-moo-kah´[4] Soo´-soo-gah (ps)[4]	
Family Procyonidae					
Bassariscus astutus	Ringtail	Kah-goots[4] te-av-ats[7]			
Bassariscus sp.	Ringtail	Hŏ-run´-tah-vahts (c)[4]		Kah´-wo-dze´-ah (ps)[4]	
Family Sciuridae					
Ammospermophilus leucurus	White-tailed Antelope Squirrel	Tava'atsi[5] Tav-vat (k)[4]	Ta-bats[4] Ta-vats[4]		
Eutamias sp.	Chipmunk	Ta-vwōts (k)[6] O'gun´-to-ats (k)[6] O´-i-chots (lv)[6] Oxontava'atsi[5] Tava'atsi[5] Ho-ă´-tsits (lv)[4]	Tavarungkwits[5] Oi-chits (k)[4] O-gon tav-vah-ats[4] Ho-a-tsits[4] Tavarungkwits[b] Ko-e´-tsets (c)[4] a-oits-its[7]	Woi-che (ps)[4] Woi´[4] Wah´-oi[4] Woh´-oi[4] Wo-i´-tsi[6]	
Citellus sp.	Ground Squirrel	O'itsitsi[5] Aw-oi-chits (k)[4]	Ki-vah skoots[4] Skwe-ets[4]	Ing'wa[c] Zip-pe (field dwelling)[8] Guhm-be (white belly, lives in desert)[8]	

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 7 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
--	Squirrel	Skāts (k)[6] O-'gun´-to-ats (k)[6] Si-kuts´ (lv)[6] Sé-koots (lv)[4] Su-koots´ (c)[4] Skoot´ (k)[4] Skwe´-ĕts (lv)[4] Sŭ-pe´ (c)[4] Aw-oi´-chits (k)[4] Ye-we´-set (k)[4] u-wish-its[7]	Skuts[5, b] Sikuts[5, b] Skuuts[c] Un-tsup´ (k)[4] Tah-vats´ (lv)[4] Tah-vahts (c)[4] Tav-vat´ (k)[4] Ho-uń-tă-vats (c)[4] Ah-wun´ tah-vat (k)[4] NF[f]	Hoo´-kŏn-tah-bi´ (ps)[4] Tă-vah´-che (ps)[4] Kōng´-ah (ps)[4] O-wun´-dah-vi (ps)[4] Eng´-wah (ps)[4] Tseep´[4] Che´-gah[4] Kŭmp[4] Wung-gwah´-rah-bi[4] Koom´-pi[4] Che´-gă[4] Woh´-i[4] Dah´-wah-ni[4] Tah´-bi-i[4] Tsi´-pish[6] Tav´-a[6] Ko´-gwi[6]	
Family Vespertilionidae					
--	Bat	Pacha'ats[5] Pat-sats[4] Paht-sats (c)[4] Pă´-tsats (k)[4]	Pah-chats[4] Pats-ats (lv)[4] Pacha'ats[b]	Ho´-no-vitch[4] Ho-no-bitch (ps)[4] Ho´-e-nah vitch´-e[4]	
Reptiles					
Family Iguanidae	Iguanids				
Crotaphytus collaris	Collared Lizard	Kan´-ne moi-kar-rat´ (k)[4] pomp-ots-ats[7]	Tom-po´-tsat´ (lv)[4] Tum-bo-tats (ps)[4] Towm-po´-tsuts (c)[4]	Tum´-bo-tats´ (ps)[4] Po´-go-che[4] Tem´-im-boi[4]	

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site
(Page 8 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Crotaphytus collaris	Collard Lizard			Doo-kor´-a-ke[4]	
Gambelia wislizenia	Leopard Lizard	Chah-a-mi-ahv (k)[4] Too-ar-rah[4] Sah-we´-vah (c)[4]	Neu-mah-zing-ahts[4] Si-vah (lv)[4]	Sow´-we-vah´[4] Sah´-we-vah[4]	
Sauromalus obesus	Chuckwalla	Saxwaru[5] Chah-kwar-rah (k)[4] Tsah-wahr´ (lv)[4] Sow-wahr´ (c)[4]	Sahk-war-rah[4] Tsah wahr[4] sa-wha-rha[7] Chah-kwar´-rah (k)[4]	Sow-war´-rah (ps)[4] Sah-gwar´-rah[4]	
Sceloporus magister	Desert Spiny Lizard	Tsahng-ahv (k)[4] Chahng-ahnts[4] tsang-a[7]	Ching-ki-ahng-ah[4] Tsang-ants[4]		
Sceloporus sp.	Lizard	Changa´[5] Tsahng-ahv (k)[4] Chahng-ahnts[4]	Ching-ki-ahng-ah[4] Tsang-ants[4] Changa' changats[f]		
--	Lizard	Su-gu´-pits (k)[6] Mu-gwi´ (lv)[6] Pompotsatsi[5] Tsang-ants (lv)[4] Tsang-ah´ (c)[4]	Moxwia[5] Suxuputsi[5] Mow´-wav´-ve (c)[4] Tsahng-ahv´[4]	Tim´-puts[6] Pa´-vo-go-nai[6] Poh-gwua-gee[8] Po-goi´-che (ps)[4] Ah-wah´-poi (ps)[4] Ki´-e-too-ar (ps)[4] Tŭ´-moi[4] Dĕ´-hoi[4] Dem´-mon-zah[4]	
Family Colubridae	Colubrids				
Lampropeltus	Common Kingsnake	Sing-ump (k)[4] Sung[4]	Shing-aht[4] Nun-too-nav[4]		

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site
(Page 9 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Pituophis melanoleucus	Gopher Snake, Pine	Oxomputsi[5] Ko-hum-buts (k)[4] Kaw´ (c)[4]	Kaw-kum-puts[4] Oxoputs[b] Ko-hum´-buts[4]	Ko´-go (ps)[4] Pas´-să-wah´-kah[4]	
--	Snake	Ta-na´-kuts (lv)[6] Pah´-we-ĕts (lv)[4] Nun´-too-nav´ (lv)[4] Nin-din´-av (lv)[4] Pah-we´-ets (c)[4] Sing´-ump (k)[4]	Kwi´-uts (lv)[6] Sĕu-ung´-ah (c)[4] Ah-wah-rum pă-at (c)[4] Pah´-ro ahv´ (k)[4]	Pah-soo´-go (ps)[4] Ki´-ar-răr´-rah (ps)[4] Nă-boo´-ah-gwah-tsoo´ (ps)[4] Paś-se-neu[4] Gawk´[4] Pah´-rah go-ah[4] Ki´-yă gar´-rah[4] Wun´-gah-rah[4]	Tah-go-ah[8]
Family Viperidae	Pit Vipers				
Crotalus sp.	Rattlesnake	To-go´-avw (k)[6] O-lo´-ga (lv)[6] Toxoavi[5] Tanakitsi[5] To´-go-av´-ve (lv)[4]	To-go-ahb (k)[4] To-ko-ahv[4] To-go-av-ve[4] Kwe-ets (c)[4] To-go-ahb´ (k)[4]	To-to´-a[6] Do-gowah[8] To-go´-ah (ps)[4] To´-gwah[4] To-qo´-ah[4] To´-go-ah[4]	
Birds					
--	Bird	Wi´-chits (k), (lv)[6] Witsi´tsi[5]	Witsi'tsi[b]	Ko´-cho[6] who-choo[8]	Chee-pah[8]
Family Accipitridae	Hawks, Kites, Eagles				
Accipiter cooperii	Cooper's Hawk	Wit se-mor-rat (k)[4] Kwe-sahp[4]	Pah-rahm-puts[4] Kwe-sahp[4]		

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 10 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Accipiter sp.	Hawk, goshawk	Kwen-noonts-a-mord (k)[4]	Ku-shav-i[7]		
Aquila chrysaetos	Golden Eagle	Kwahn-ants (k)[4] Mung[4]	Kwanants[b]		
Buteo jamaicensis	Red-tailed Hawk	Kwī-nat´-sits (k)[6] Kwanantsits[5,c] Kwah-nah-tsits (k)[4] Se-kan-na kwahn-ant[4] Qua-nats-its[7]	Ta-ah kwah-nahts[4] Kwen-nan-zits[4] Kʉsav[b] Quinnah[c]	NF[c]	
Circus sp.	Hawk, Harrier	Oong-aur-ats[7]			
Haliaeetus leucocephalus	Bald Eagle	Si-kwah (k)[4] Piakwanants[b]	Piasakwanants[b]		
--	Eagle	Kwi´-nants (k)[6] Mung-i´-puts (lv)[6]	Kwanants[5] Kwanantsi[f]	Kwi´-na[6] Kivi-na[6] Bia' quinah[g]	Quing-ah[g]
--	Hawk			G'in-nee[g] Ing´-a-kwi-na[6] Sah-na qui-na[g] Ki´-ni[6]	
Family Alaudidae	Larks				
Eremophila alpestris	Horned Lark	Tʉranwintsi´tsi[5] Nʉva witsi´ts[5] Ter-rah-we-che (k)[4]	Te-we-wit-se[4] Te-rah we-cha-its[4] Ne-vow-we-tsits[4]		
Family Alcedinidae	Kingfishers				
Ceryle sp.	Kingfisher	Wun-na-tus (k)[4]	Wuń-nah-taht[4]		

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 11 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Family Anatidae	Swans, Geese, Ducks				
Anas clypeata	Shoveler	Pa choog (k)[4]			
Anas platyrhynchos	Mallard Duck	Oo-chʉxa[5] Pe-at choog (k)[4] Choo[ch4]	Choog[4] Parʉv[b] Uuchʉxa[b]		
Anas sp.	Duck	Chʉxa[5]	Chʉx[b]	Pu´-yan[6] Buhn'yeeh[8]	NF[c] Puh-yuh-ah[8]
Branta canadensis	Canada Goose	Chakoarʉ[6] Ah-vin-kay-raht (k)[4]	To-o-pah[4] Koo-res-sen[4]		
--	Goose			Nu´-gud[6]	
Oxyura jamaicensis	Ruddy Duck	Pi-ah-kwits (k)[4]			
Family Ardeidae	Herons, Egrets, Bitterns				
Ardea herodias	Great Blue Heron	Pah-too-koo ko-vah kahnt[4]	Pah-koor-kuv[4] Nah-kwah[4]	Wus´-sa[6]	
--	Bittern	Tah-wah woo-ne-ker-rit (k)[4]	Choo-goob (n)[4]		
Family Caprimulgidae	Nightjars				
Chordeiles acutipennis	Lesser Nighthawk	Tuwawitsi'ts[b]			
Chordeiles sp.	Nighthawk	Mono´opangwits[5] Pe-utch (k)[4] Too-gow-wit-se[4]	Mo-mo-pits[4] Mum-mo-paht[4]	Du-va-go[8]	
Phalaenoptilus sp.	Poorwill	Pan-no-witch (k)[4] Pah-nah-kwits[4]	Pi-na-wits[4]		

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site
(Page 12 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Family Cathartidae	American vultures				
Cathartes aura	Turkey Vulture	Whu-gump´-uts (k)[6] Whi-ku´-puts (lv)[6] Wikumputsi[5] We-kum-buts (k)[4]	We-koo-puts[4] Week[4] NF[b]		
--	Vulture			Wi´-ho[6] Wee-whom-binch[g]	Wee-hoo[g]
Family Charadriidae	Plovers				
Charadrius vociferus	Killdeer	Pantuxuits[5] Pan-te-geetch (k)[4] Pahn-tig-wits[4]	Pah-re koo-its[4] Pa-roo-goo-e'ts[4]	Bah-zah-wee[g]	
Family Columbidae	Pigeons and Doves				
Zenaida macroura	Mourning Dove	Iyov[b]	Ayov[b]		
--	Dove	Ai´-yuv (k)[6] Iyovi[5] Oi-uv (k)[4] Ha-o'v[4]	Che-yu'ch[4] He-ov[4] Hiav[c] Hiuv[c]	High-wee[g]	Hay-wee[g]
--	Pigeon	I-yov[4]			
Family Corvidae	Jay, Magpies, Crows				
Aphelocoma coerulescens	Scrub Jay	NF[b]			
Corvus brachyrhynchos	American Crow	Paht-kot[4]	Ah-tah-bits[4]		
--	Crow			A´-ta[6] Hi[g]	Cuta-puzee[g]

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 13 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Corvus corax	Common Raven	A-ta´-puts (k)[6] A-ta´-puts (lv)[6] Ataputs[5] Atakots[5] Tah-kwots (k)[4] Ha-ta-puits[7]	Ah-tah-pah-ki'p[4] Tah-kwahts[4] Ah-tah-pwits[4] Ataputs[b] Atakots[b]		
Cyanocitta sp.	Jay	O-go´-chi-ok (k)[6] Oxo-chayaku[5] Ah-run Chi-ahk (k)[4]	Sik-koo-ra-gwuts[4] Ho-gon Tsi-ahk[4]		
Gymnorhinus cyanocephala	Pinyon Jay	Aanga[5] Ahng Uv-ve (k)[4] Ki-vah witch et[4] Ahng-av[4] Ahng[4]	Tuvawitsi´ts[b] Tuvavwitsiits[c] Tuuv watsits[c] Yamp[c]	Guy-nutz[8]	
--	Jay	Ong´-a (k)[6]		Wi-at´-si[6]	
Pica sp.	Magpie	Mama´kwa´yavi[5] Mah-kwi-ahv (k)[4] Mah-mah-kwe-as[4]	Mah-mahk kwi-ahv[4] Mah-mah-kew-ahs[4]	Kwi´-da-wo-i[6] Qwithe-woy-yoh[8]	Cui-ta' go'ya[8]
Family Cuculidae	Cuckoos, Roadrunners, Anis				
Geococcyx sp.	Roadrunner	Nants (k)[5] Wuts (k)[4]	Ko cha bo'ki[4] Oo'ts[4]		Unnup-pi[8]
Family Emberizidae	Emberizid Finches and Allies				
Subfamily Cardinalinae	Cardinal-Grosbeaks				
Passerinea cyanea	Indigo Bunting	NF[b]			

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 14 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Subfamily Emberizinae	American Sparrows and Towhees				
Amphispiza bilineata	Black-throated Sparrow	NF[b]			
Junco sp.	Junco	Ne-war-rum po-kuts (k)[4] Nu-wer-rowk[4]	Noo-war-rum po-koots[4]		
Pipilo chlorurus	Green-tailed Towhee	Tam pe-ats (k)[4]			
Pipilo sp.	Towhee	E-se-voo-it (k)[4] Ke-we-rit-se[4]	Tim-mah-tin[4]		
Spizella passerina	Chipping Sparrow	Kam pe-ats (k)[4]	Yu-oo-ro-whats[4]		
Zonotrichia leucophrys	White-crowned Sparrow	Yu-rah-vaht (k)[4] Se-we-cha-et[4]	We-tsids[4]		
--	Sparrow	Wʉ'iatsi[5] Kam pe-ats (k)[4]	Yu-oo-ro-whats[4]		
Subfamily Icterinae	American Blackbirds and Orioles				
Agelaius phoeniceus	Red-winged Blackbird	Paxachakapi[5] Pah rahts-kahp[4]	Pah-ran-to-twit[4]		
Euphagus cyanocephalus	Brewer's Blackbird	Pah-ranch Che-kahp (k)[4] Too we-tse[4]	Cha-kahp[4] Pah-ran-zu-wit[4]		
--	Blackbird			Bah-gan-zuk-qwue[8]	

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 15 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Icterus sp.	Oriole	Oangwintsi´ts (yellow bird)[5] Kah-ni-amp (k)[4]	O-ow-wit-se[4] Wahts-ke-it[4] O-ah-we-tsits[4]		
Sturnella sp.	Meadowlark	Iitotsi[5] A-tawt (k)[4] Tu-we-uk[4]	Kah-nah-we tse-its[4] Te-ve-uk[4]	Pa´-tsi-ton[6]	
Subfamily Parulinae	Wood-Warblers				
Dendroica petechia	Yellow Warbler	Ka-na-wits-its[7]			
Subfamily Thraupinae	Tanagers				
Piranga ludoviciana	Western Tanager, Mountain Tanager	Oo-win-nt (k)[4]			
Family Falconidae	Falcons and Carcaras				
Falco sparverius	Sparrow Hawk, American Kestrel	Kurin´ang kats[5] Ku-we-nah-kut (k)[4]	Te-ze-nah-kahts[4] Kwan-an-tsits[4]	Ku-ti´-ta[6]	
Family Fringillidae	Old World Finches and Allies				
Carpodacus purpureus	Purple Finch	We-etch (k)[4] Waw[4]	We-ets[4] We-we-ets[4]		
Carpodacus sp.	Finch	We-etch (k)[4] Waw[4]	We-ets[4] We-we-ets[4]		
--	Grosbeak	Wah-pum-wer-rah-ka (k)[4] Gus-se-nav (k)[4]	Ker-re-tsawt[4] Kan-now we-tse-its[4]		
Family Hirundinidae	Swallows				

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 16 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Hirundo pyrrhonota	Cliff Swallow	Pah-sah-rok-pets[4]	Wah-pas-so-pe[4]		
Hirundo rustica	Barn Swallow	Tim-pow-we-ger-rit (k)[4] Tim-pah-ro-we-it[4]	Pas-ser-ro-pe'ts[4]		
Tachycineta thalassina	Violet-green Swallow	Pas-ser-ro-it (k)[4]	Pan-no-av[4]		
Family Laniidae	Shrikes				
Lanius ludovicianus	Loggerhead Shrike	Tah-tso-noint (k)[4] Tah-cho-noint[4]	Tun-dun-nois[4]		
Lanius sp.	Shrike	Tah-tso-noint (k)[4] Tah-cho-noint[4]	Tun-dun-nois[4] NF[f]		
Family Laridae	Gulls, Terns, Allies				
Larus sp.	Gull	Tosa payamputsi (white gull)[5] Che-yu[ch 4]	Pi-yam'b[4] NF[b]		
Family Mimidae	Mockingbirds and Thrashers				
Mimus polyglottos	Northern Mockingbird	Yamp[b]			
Mimus sp.	Mockingbird	Yampa[5] Yamp (k)[4]	Yahmp[4] Yam'p[4]		
Toxostoma sp.	Thrasher	Sah-wah-goo-et (k)[4]	Mo-e-pah-num-bits[4]		
Family Muscicapidae	Old World Flycatchers and Allies				

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site
(Page 17 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Sialia sp.	Bluebird	Shok´-wai´ants (k)[6] Nung-un´-chots (lv)[6] Saxwang wintsi´ts[5]	San-nap-po-chet (k)[4] Sa-kwahn at-so-its[4] Sah-wah-wits[4]		
Turdus migratorius	American Robin	Angka-kwaa´nangwants[5] Se-kon kno-av (k)[4] Sin-kum[4]	Sko-we-che-it[4] Se-kin-kon-av[4] Say-kung-quav[7]		
Turdus sp.	Robin			Sue-gwee-cok-coo[8]	
Family Paridae	Chickadees and Titmice				
Parus gambeli	Mountain Chickadee	Tse-gut (k)[4]	Mo-che-et[4]		
Family Pelecanidae	Pelicans				
Pelecanus erythrorhynchos	American White Pelican	Pa-go-moo-e-nav (k)[4]			
Family Phalacrocoracidae	Cormorants				
Phalacrocorax sp.	Cormorant	Pa-at-kut (k)[4]	Pah-wung zits[4]		
Family Phasianidae	Pheasants, Grouse, Quail				
Callipepla gambelii	Gambel's Quail	Akar[b]			
--	Quail	Ka´-ka (k)[6]	Ka-ka (lv)[6]		Tounga-ah-hah[8]
Family Picidae	Woodpeckers and Wrynecks				
Colaptes auratus	Northern Flicker	Un-ka-kwo-nau-ants (k)[6]	Kah-kwah-nah-ahts[4]		

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 18 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
		Anyka-kwanangwav[5] Un-kah (k)[4]	Kwah-nah-vant[4] Ungkakwa-nangwav[b] Kwar-nah-kits[4]		
Colaptes sp.	Flicker	Angka-qua-no-wúnco[7]			
Melanerpes lewis	Lewis' Woodpecker	Po-wah-che-nint (k)[4] Ahn-kah-pi-ah we-tse[4]	So-wan-nat[4]		
Picoides villosus	Hairy Woodpecker	Peep-e-wor-et (k)[4]	Pe-pe-po-wunts[4]		
--	Woodpecker	Piipung′ wantsi[5] Pe-po-wuntz (s)[4]	Pe-po wantz (k)[4] Peep-wunts[7]	Du-ga-hâi[6]	
Family Podicipedidae	Grebes				
Podilymbus sp.	Grebe	Koo-hoot-kit (k)[4]			
Family Rallidae	Rails, Gallinules, Coots				
Fulica americana	American Coot	Sah-sit (k)[4] Sahts[4]	Ke-yu^{ch} [4] Sats[4]		
Family Recurvirostridae	Avocets and Stilts				
Himantopus mexicanus	Black-necked Stilt	Too-we-e-yoot (k)[4]			
Recurvirostra americana	American Avocet	Tuviyuyu′tsi[5] Koo-weet (k)[4]	Mi-an Koo-wit[4]		
Family Sittidae					
Sitta sp.	Nuthatch	Kan-ka-rik-ket (k)[4] To-pah-we-kent[4]	Yu-ve-nants[4]		
Family Strigidae	Typical Owls				

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 19 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Athene cunicularia	Burrowing Owl	Muku'uts[f]		Ku´-hu[6]	
Bubo virginianus	Great Horned Owl	Mo´-puts (k)[6] Mo-o´-puts (lv)[6] Moopʉts[5] Mo-puts (k)[4]	Moo-oo-put[4] Mo-o-puts[4] Moo-e-pwits[4] Muupʉts[b]		
--	Owl	Muuputsi[f] Muku´uts[f] Wah-now-kwits (k)[4] Wanakwitsi[5]	Am-mo-puts[4] Mo-se-ah-kaw-bits[4] Ahn-kah-re Mo-put (k)[4]	Mu-hu[6] Muum-bitch[8]	Moohoo[8]
Family Trochilidae	Hummingbirds				
--	Hummingbird	Mu´-tu-chats (k)[6] Mootuchats[5] Mo-te-tcheh (k)[4] Mo-too-tsahts[4]	Ah-to-e-tsets[4] Moo-tin-zits[4] Mutuchʉts[b]	Bi'si'i[c] Pi-a-gun´to-wit-si[6] Sung´-o-wit-si[6]	Pish-coot[8]
Family Troglodytidae	Wrens				
Catherpes mexicanus	Canyon Wren	Tumpikia hoxotsi[5] Tim-pe-ah-soot (k)[4] Tim-pe-its[4]	Timp-pe-ke yah-hots[4] Toom-pe-tah ah-bit[4] Tom-pike-aw-sauts[7]		
Salpinctes obsoletus	Rock Wren	Too-ching-ing[4] Tʉmpikixots[b]	NF[c]		
Troglodytes sp.	House Wren	Wu-nat tim-be ro-put (k)[4]	T'kes-se chim-mits[4]		
Family Tyrannidae	Tyrant Flycatchers				

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 20 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
Tyrannus verticalis	Western Kingbird	Chʉxʉ´uvi[5] Che-goo-ritch (k)[4]	Wahts-koo-its[4] Too-pe-wats[4]		
Sayornis saya	Say's Phoebe	Chu-huv[7]			
Amphibians					
--	Frog	Wah´-gah´-tsets (lv)[4] Wah-raht´ (k)[4]	Hah´-pah wah´-ah-tuts (c)[4]	Pah-woo´-go´ (ps)[4] Wah´-ko-ah[4] Bi´-yah-qwat-sah[4] Pi´-ah guz-zah[4]	Yha-gua-zah[8]
Arachnids					
--	Scorpion	Wah´-wah-tsets (lv)[4] Wahm´-bah-kwits (c)[4]	Tah-wur´-rum-kwe-pitch (k)[4]	Woo´-vah-tah (ps)[4] Gwe´-buntz[4] Kwe´-bentz[4]	
--	Spider	Mo-kwam´-be (lv)[4] Hoo-kwahmp´ (c)[4]	Mo-kwahmp´ (k)[4]	Ku´-kwats[6] So-wats´ (ps)[4] Ah´-mah-so´-ans[4] So´-wants[4] So-ar´-rah[4]	NF[8]
--	Tarantula	Nŭ´-e-saw´-bits (lv)[4] We-gaht´-sawt k)[4]	Noo´-wĕ-saw´-pig (c)[4]	Nah´-soo-waht´ (ps)[4] Nah´-we-tsoi'm-bitch[4] Nă´-soo-ar´-rah[4]	
Insects					
Mutillidae sp.	Velvet ant				Togo[8]
--	Ant	T'siev (wood)[c] Tuhsiev (wood)[c]	Ahng-ahv´ (black) (k)[4] Ahng-e-ve (black) (lv)[4]	Hu-wīt´ (large red)[6] To´-ats (small black)[6]	Ah-see-ah[8]

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 21 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
		Tu'siev[c] Tas´-se-av (lv)[4] Ang-av´ (c)[4] Tas-se´-av (k)[4] Wahnts (red) (c)[4] Pas-se´-av (red) (k)[4]	On´-tat (black) (c)[4] Tas´-se´-ev (red) (lv)[4]	A´-ni (mound building)[6] Ani'e (wood)[c] On'nee (wood)[c] Ta´-siv-av[6] Un-kav´-tu-si (red)[6] Tas´-se-wuts-tse (ps)[4] Ah´-ne[4] Ho´-we-dah[4] Hó-e-dah[4] Tun-gah´-vitch (black) (ps)[4] Ho´-we-dah (black)[4] Too-kah-pe´-pah (red)[4]	
--	Beetle	Kan-nav´-ve-tets (lv)[4] We-po´-set (c)[4]	Wēv-haht (k)[4]	Shun-goo´-ah (ps)[4] Pe´-bos´-se[4]	Huga-pish-ah[8]
--	Bumblebee	See-moo´-rahm (lv)[4] Se´-moo-rahmp (k)[4]	Sho-em´ mo-ro-ram (c)[4]	O´-be-wo[4] Be´-hah-moo[4]	
--	Butterfly	As´-se-wuts (lv)[4], Ah´-se-ruts´ (c)[4]	Yas´-se-wut (k)[4]	Ah´-se-wer-run´ (ps) Ă-ă´-per-rum I´-yup-pur-ruq´-ă Ap´-per-roo´-ge Wi´-ah-bos´-se	
--	Centipede	Sing-ump (k)[4]			
--	Cricket	Mă-kaht´-sah-roo´-bit (lv)[4] Chĕ-roots´ (k)[4]	Sow-wah´-ar-rum (c)[4]	Thin´-ă-pitch (ps)[4]	

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 22 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
--	Dragonfly	We-wing´-ga-rits (lv)[4] We-win´-koo-rets (c)[4]	Ah´-witch (k)[4]	Pă-ran´-doo-no (ps)[4] He´-tso-saw[4] Bah´-qah-mo´-anz[4] Pah´-ran-do´-ro[4]	
--	Flea	Po´-ahv (k)[4]			
--	Fly	Mo´-pits (lv)[4] Mo´-bits (c)[4]	Mo´-pitch-ă (k)[4]	Mo-e´-ve-hah (ps)[4] Ah´-ne-moi[4] Ah´-nah-woi´[4] Mo´-pits[6] Mu´-īv[6] A´-nīv (sand)[6]	Mu'e-vee-ha[8]
--	Grasshopper	At´-tah-kah-peets (lv)[4] Ah´-tah-kah-bits´ (c)[4]	Ar´-ron-kah´-pit (k)[4]	Ah-tung´-ge (ps)[4] Ah´-ting[4] Ah´-tunq-que[4] At´-tan´-ge´[4]	
--	Lice	Se-ap´-pit (k)[4]		Bo´-see-ĕts (ps)[4]	Pooh-ze-ah[8]
--	Louse			Pu-si´-a[6]	
--	Mosquito	Mo-oo´-av´-ve (lv)[4] Mo´-av (c)[4]	Mo-ahv´ (k)[4]	Mo´-vo[6] Mo-avw[6] Wah-war´-rah (ps)[4] Maw´-paw[4] Ahng-ē´-ve[4]	NF[8]
--	Moth	Moo-goo´-run-zits (lv)[4] Mo-goo´-ro-tsats (c)[4]	Mo-woo´-ran-tut (k)[4]	Pe-ag´-gah moo-rung-we (ps)[4] Pe-ag´-gah[4] Pe´-ag´-gah[4]	
--	Stink Bug			Ku´-i-tsat[6]	

Table B-1. One Hundred and Seventy American Indian Traditional Use Animals Present on the Nevada Test Site (Page 23 of 23)

Scientific Name	Common Name	Southern Paiute Ethnic Group Names		Western Shoshone Ethnic Group Names	Owens Valley Ethnic Group Names
--	Tick				Pooh-ze-ah[g]
--	Worm	Pĕ-av´ (k)[4]		Pish-shă-war´-rah (ps)[4] Wo´-ah-be[4] Woo-ah´-be[4]	
--	Yellowjacket	We-koots (lv)[4]	Pah-watch´-av (k)[4]	Pi´-yah (ps)[4] O´-hah ben[4] Pi´-nah[4] Be´-hah-moo[4]	

[1] Work done by Powell between 1867-1880: (Fowler and Matley 1979)
[2] Work done by Euler between 1956-1966: (Euler 1966)
[3] Work done by Palmer before 1946: (Palmer 1978)
[4] Work done by Merriam between 1902-1935: (Merriam 1979)
[5] Work done by Sapir in 1910: (Sapir 1910)
[6] Work done by Powell in 1873: (Fowler and Fowler 1971)
[7] Work done by Presnall in 1936: (Presnall 1936)
[8] Work done by Train between 1935-1941: (Train 1957)
[9] Handbook of North American Indians-Great Basin (vol. 11, "Owens Valley Paiute") 1989

[a] Stoffle, Austin, Halmo, and Banks (1996)
[b] Stoffle, Halmo, Evans, and Austin (1994)
[c] Stoffle et al. (1994)
[d] Stoffle et al. (1989)
[e] Stoffle, Halmo, Evans, and Olmsted (1990)
[f] Stoffle and Dobyns (1982)
Stoffle and Dobyns (1983a)
Stoffle, Dobyns, and Evans (1983)
[g] Names by CGTO members; April 1996 NTS-EIS meeting.

NF = Not found; mentioned in text but no Indian name given.
(c) = Chemehuevi
(k) = Kaibab
(lv) = Las Vegas
(mp) = Moapa Paiute
(p) = Pahrump Paiute
(ps) = Panamint Shoshone

This Page Intentionally Left Blank

Attachment C

AN AMERICAN INDIAN CONSULTATION MODEL

This Page Intentionally Left Blank

ATTACHMENT C

AN AMERICAN INDIAN CONSULTATION MODEL

This attachment has been reviewed and edited by the American Indian Writers Subgroup from the original source entitled, "A Consultation Model" by Richard Stoffle. This original article was published in Sacred Sites Protection Strategies - Legacy Project, a preliminary report prepared for the National Park Service and the U.S. Army Environmental Center, edited by Vine Deloria, Jr., and Richard Stoffle, produced by the Bureau of Applied Research in Anthropology, University of Arizona, in 1994.

Attachment C presents an American Indian consultation model, a version of which was originally developed for the U.S. Department of Defense Legacy Project (Deloria and Stoffle [eds.], 1994). This model is based to a great extent on the history of consultation relationships between DOE/NV and tribes and organizations for the Yucca Mountain Project and the NTS, and also includes published and unpublished information on American Indian consultation procedures across the country. As such, it describes nine ideal steps for developing a consultation relationship with American Indians who are culturally affiliated with lands held by a DOE facility. These steps are suggested on the basis of the past history of consultations sponsored by DOE/NV and on an analysis of other consultation relationships. Examples of relationships between American Indians and other federal agencies are used throughout so that the model will be as instructive as possible. These steps suggest how a process might occur, but they need not always be followed to achieve an acceptable consultation. Instead the nine steps suggest a logical sequence of decisions and actions that normally would be involved in developing a consultation relationship. It is important that the DOE works with the involved Indian tribes to design a consultation relationship reflecting their needs, the needs of the involved DOE facility, and the protection requirements of the cultural resources under consideration. The ideal steps are:

Step 1: Defining Consultation

Step 2: Establishing Cultural Affiliation

Step 3: Contacting the Tribes

Step 4: Having An Orientation Meeting

Step 5: Forming A Consultation Committee

Step 6: Conducting Site Visits

Step 7: Developing Mitigation Recommendations

Step 8: Maintaining Ongoing Interactions and Monitoring

Step 9: Bringing a Consultation Process to Closure.

These consultation steps are discussed in their logical sequence of occurrence. The first consultation step is to decide what type of consultation relationship is desired. The second step is to specify, using cultural and historical research, which American Indian people or peoples have traditional ties to DOE lands. The third step is to establish government-to-government relationships between formally recognized American Indian tribes and American Indians with special federal standing and the DOE. The fourth step is to have an orientation meeting, where DOE begins to meet and talk with American Indians. The fifth step is to form an American Indian consultation committee and establish mutually agreed upon procedures for its operation. The sixth step is to bring American Indian cultural resource experts to the DOE lands so that traditional cultural resources can be identified, related to sites, and initial management recommendations can be made. Mitigation recommendations are the seventh step, followed by ongoing interactions and monitoring as the eighth step. Finally, because some consultation relationships do not last, the ninth step involves bringing the consultation relationship to a closure.

The following model for developing a consultation relationship is presented here on the assumption that there is no pre-existing relationship. While DOE/NV facilities currently have consultation relationships with American Indians, there are specific programs and activities, such as the Transportation Study, which have yet to enter into formal consultation with tribal governments. Thus, at the suggestion of the American Indian Writers Subgroup, this consultation model was edited and formatted as an attachment to Appendix G, so that it can be used as a guide for future DOE and American Indian consultation processes.

C.1 Defining Consultation

"Consultation" is a term that is commonly used to describe a process by which American Indian peoples with traditional ties are identified and brought into discussions about cultural resources on DOE lands. Consultation involves a fundamental decision on the part of the DOE to share some decisionmaking with American Indians. American Indians are asked to share in the decision to identify resources needing protection. They are also asked to share in the decision to prioritize which cultural resources will be protected first. Indian people are asked to share in the decision to select from among a variety of management practices those that most appropriately protect the cultural resources in the context of other resource uses. Indian people are asked to share in the long-range planning and monitoring of these cultural resources and lands that hold them.

According to scholars who study consultation (Cernea, 1991; Dobyns, 1951; Parenteau, 1988), the quality and success of the consultation process depends directly on the degree to which decisionmaking power is shared. Arnstein's (1969) studies demonstrate that any consultation process can be characterized as falling on a scale from 1 to 8 where participation without shared power is called "manipulation" and where sharing power, even to the point of negotiating with the agency, is called "partnership." The primary decision that a DOE facility must make is how much decisionmaking power can and will be shared with Indian people. Once the range of decisionmaking sharing is established, it should be clearly identified at the outset of the consultation so that it can become a part of the American Indian people's decision to participate in the consultation.

C.1.1 General Consultation

More U.S. federal agencies (including the DOE) are becoming involved in general consultation with American Indians. This establishes a permanent relationship with American Indian groups that have cultural ties to the lands and resources managed or affected by the federal agency or DOE facility. General consultation should be based on extensive research concerning cultural resources that Native groups identify as being located on lands of concern. Cultural resource studies should consider at least the following (1) archaeology sites, (2) petroglyphs, (3) human burials, (4) traditional cultural properties, (5) plants, (6) animals, (7) minerals, and (8) water. Cultural resource studies also can consider impacts to American Indian cultural practices (like a traditional healing ceremony) that are not tied to specific places. Each of these cultural resources should become the subject of a separate study so that Native groups can contribute persons with special knowledge about the topic. General consultation should be based on a strong information foundation.

A major advantage of general consultation is that it can occur in the absence of a specific project proposal, which is evaluated under specific laws and, usually, as part of an environmental impact statement. Often, the laws that govern specific project studies add third parties to discussions between the DOE and American Indian peoples, which can confuse and limit discussions. General consultation occurs when it is desired by the DOE and the Indian people and is not limited by time or issue. It is the perfect environment for discussing a complex relationship designed to protect cultural items of greatest significance. Another advantage of general consultation is that it produces a strong information base for identifying cultural resources for both the DOE and American Indian people.

Through various cultural studies, the Indian people have developed a set of recommendations that suggest how to best manage these resources. Most American Indian cultural resources located on or affected by the DOE will become known through the process of general consultation. This will reduce the number of times that DOE activities will have to be stopped and modified because of unanticipated discoveries of cultural resources. If DOE activities were to impact cultural resources not previously identified, procedures would be in place for informing the Native people about the discovery, and those Native people would have procedures in place for helping the DOE minimize adverse impacts to the newly discovered cultural resources.

General consultation is the only way to build true and stable partnerships between U.S. federal agencies and American Indians. Often, project-driven environmental assessments bring federal agencies and Native people together, and afterwards they decide to move to general consultation as a means of resolving problems before projects precipitate specific cultural resource decisions. Native people approach cultural resource management from what has been termed "holistic conservation" (Stoffle and Evans, 1990). They respond positively to holistic studies that bring into consideration as many factors as possible, so the DOE can better understand the complex inter-relationship between cultural resources and other aspects of Native lifeways. Interestingly, the new U.S. federal initiative for "ecosystem management" closely reflects the philosophical orientation of Indian people. According to Gore (1993) "... some people now define themselves in terms of an ecological criterion rather than a political subdivision." For example, the people of the Aral Sea and the Amazonian Rain Forest define themselves in terms of these all-important ecosystems. In March 1994, 18 U.S. federal agencies demonstrated their ecosystem management activities to the U.S. Congress (Morrissey et al., 1994). Native people have responded in a positive way to federal agencies who are willing to consider cultural resources from an ecosystem perspective.

C.1.2 Specific Consultation

There is always the need for conducting specific consultation regarding cultural resource issues associated with DOE facilities and activities. For example, when general consultation has identified all types of cultural resources, ground-disturbing activities may unexpectedly unearth a human burial or an object of great Native ceremonial significance. The DOE may wish to use some portion of their reserve lands for an activity that was not considered during general consultation. Also, the U.S. Congress may pass new laws regarding the management of cultural resources that potentially would alter the existing relationship between the American Indian people and the DOE. One such law is the Native American Graves Protection and Repatriation Act (1990), which specifically requires certain types of information to flow between the DOE as a federal land manager and American Indian people with ties to those lands.

Specific consultation is limited by the scope of the specific law that is being complied with and the proposed activity that is being evaluated. Native people often are frustrated by specific consultations because they are limited to those project-specific issues and cultural resources that are being assessed. The DOE's responses are too often limited by third parties who legally participate in the assessment. Nonetheless, a series of specific consultations can produce the foundation from which to build general consultation. For a DOE facility that currently lacks any kind of relationship with American Indian peoples, general consultation is recommended as the initial step in the consultation process.

C.2 Establishing Cultural Affiliation

There are many ways that American Indians have established cultural affiliations to lands held or affected by the DOE. At the general level, American Indians established these ties because they lived on the land long enough for a culturally shared connection to occur. The basic question asked regarding cultural affiliation is, "What American Indian peoples or ethnic groups lived here?"

The nature of the relationship between American Indians and the land is cultural. The concept of culture (LeVine and Schweder, 1984) implies that a phenomena (1) is shared in that it represents a consensus on a wide variety of meanings among members of an interaction community, (2) that it is connected and ultimately comprehensible only as a part of a larger organization of beliefs, norms, and values, and (3) that people who share a culture make sense of new information in terms of a cultural rationale founded on a single collective formula. Simply, the connection between American Indians and lands held or affected by DOE facilities is abstract, complex, and non-trivial. Assessing this relationship is best accomplished by professionals trained in the study of cultural systems, in consultation with potentially culturally affiliated American Indian people.

Most laws, regulations, and guidelines that cause federal land-holding agencies to consult with American Indians do not define what is meant by the term "cultural affiliation." Some laws do define this concept; for example, the term is defined very specifically by the Native American Graves Protection and Repatriation Act. It is important to note that when a DOE facility adopts a broad definition of cultural affiliation for most kinds of cultural resource studies, they can still narrow the consultation process when needed for the Native American Graves Protection and Repatriation Act and then resume American Indian interactions based on the broader definition. Flexibility is needed when establishing consultation relationships with American Indians.

Cultural affiliation of DOE/NV facilities was established at the onset of the Yucca Mountain Project (Stoffle, 1987). Sixteen tribes belonging into three ethnic groups (Western Shoshone, Southern Paiute, and Owens Valley Paiute) were found to be culturally affiliated with Yucca Mountain and the NTS. A decade of consultation with these ethnic groups forms the foundation of a successful relationship between the DOE/NV and American Indians.

C.3 Contacting the Tribes

Cultural affiliation studies basically establish which American Indian ethnic groups potentially have traditional, aboriginal, or historic period ties to lands held or affected by the DOE. The term "ethnic group" means people who share a common culture. Perhaps an example will serve to clarify the complexity of moving from ethnic affiliation to that of contemporary American Indian organizations which actually would be contacted about the consultation.

Officially, the U.S. government prefers to deal with American Indian groups on a government-to-government basis. The well-established federal position was recently reaffirmed by the President in a memorandum of April 29, 1994, entitled Government-to-Government Relations With American Indian Tribal Governments. The National Congress of American Indians, which is the National Association of Tribal Chairs, also supports government-to-government relationships. Such a relationship recognizes the "dependent nations-within-the-nation" status of American Indian tribes (Deloria, 1985). This relationship should be the foundation of all consultation. The consultation will be incomplete, as discussed above, without a procedure for additional ethnic group inputs from non-tribal government sources. It is suggested, therefore, that federally unrecognized Native groups, American Indian organizations, and pan-Indian organizations be added to the consultation when it can be demonstrated that they do represent special ethnic group perspectives relevant to the cultural resource management issues of concern to the DOE facility. Finally, individuals from the Native ethnic group who otherwise would not be able to share important cultural insight, can be added to the consultation as "interested parties." The recommendations of interested parties and non-tribal Indian organizations, however, must be subsumed under the recommendations of the officially recognized tribal governments.

C.4 Having an Orientation Meeting

Contacting potential culturally affiliated tribes and American Indian organizations should be conducted in a manner appropriate to the consultation. If it is to be a project-specific consultation, the information given to Native people should reflect that project. On the other hand, if a general consultation is desired, then a very different essay and set of materials is needed. Although project-specific consultation can lead to a mutual decision to begin general consultation, the orientation meeting should have a clear purpose and deal only with the issues actually under consideration at the time.

In general, letters, maps, and diagrams appropriate to the issues to be discussed should accompany the initial communication with American Indian groups and tribes. Such letters describe the agency that is making the contact and the purpose of the contact. Recently, a video letter was used to inform almost 24 tribes about an assessment of cultural affiliation and concerns for Chaco Culture National Historical Park (Stoffle et al., 1994c). The video letter was about 17 minutes long and began with the park superintendent discussing the goals of the study. This was followed by photos of places in the park which were the focus of the study. Clear instructions for becoming involved in the study closed the video. The video letter was well-received by the American Indian government leaders, who said it permitted them to make an informed decision about whether or not to send representatives to the park.

Letters alone generally are inadequate for most tribal governments to gain sufficient understanding of an issue under discussion so that the government can respond to a project. Many letters therefore are not answered. Follow-up telephone calls are always necessary to provide further information, but most tribal governments require that a consultation request for their people's time, and perhaps, tribal resources, be made in person. Cultural resource specialists and agency personnel should meet with tribal councils (or their officially chosen representatives) to explain the project and answer questions.

The members of tribal governments and American Indian organizations tend to be unfamiliar with the legal aspects of cultural resource questions, although they generally believe decisions about such issues to be highly significant. This presents an information gap problem for most Native government leaders. One solution to the information gap is for the U.S. federal agency to invite government leaders to visit a portion of the study area as part of an orientation meeting. During the meeting, government leaders can learn firsthand about what is being discussed and have the opportunity to exchange cultural resource views and strategies with other Native leaders. The Native government's need-to-know before making key cultural resource decisions should be respected and addressed in the consultation process.

C.5 Forming a Consultation Committee

The decision to form an American Indian consultation committee has been the key to the success of the consultation when many tribes and American Indian groups are culturally affiliated with DOE/NV lands under consideration. The consultation committee stands as a meta-organization between the tribal governments and the federal agency managers. The committee is composed of and chaired by Indian people. As such, the consultation committee is able to resolve certain issues relating to the process of consulting. In the early stages of consultation, for example, the committee may resolve issues such as how many days are needed to complete an ethnobotany study, or it may decide how best to prepare progress reports to be submitted back to Native governments. By meeting together and acting in unison, native people belonging to different tribes and ethnic groups are able to draw on common information and to speak with a single voice. The clarity and consistency of the American Indian requests will influence the DOE's ability to respond effectively and acceptably.

The consultation committee may be asked to resolve problems that would otherwise be impossible for either the DOE or the tribal governments. After the consultation committee understands both the laws that are driving the consultation process and the management needs of the DOE, the committee may be asked to determine when sufficient information has been collected so that recommendations can be made to both the tribes and the agency. If there are disagreements among the tribes or ethnic groups, the consultation committee can be asked to resolve these in closed executive session. Halmo (1994) has recently studied the benefits of a consultation committee participating with the DOE to understand the cultural resource impacts of the underground atomic testing program on the NTS. He concludes that this program's success came largely because of the consultation committee's efforts to adjust the process to meet the needs of 3 major ethnic groups represented by 16 tribes and 3 Indian organizations.

The NTS American Indian Religious Freedom Act compliance program was initiated by the DOE/NV in 1990. The goal of the program was to bring the agency into compliance with the provisions of the NTS American Indian Religious Freedom Act, which was passed in 1978. Compliance was to be achieved by establishing consultation relationships with tribal governments and Indian organizations whose members have historic and current cultural ties to the lands in south-central Nevada that had been withdrawn from the public domain by the U.S. government in the 1950s for purposes of testing atomic weapons. The NTS American Indian Religious Freedom Act compliance program was to document tribal and ethnic concerns for cultural resources that would potentially be adversely affected by ground-disturbing activities associated with the national program of underground nuclear weapons testing.

Sixteen tribes representing three American Indian ethnic groups (Western Shoshone, Southern Paiute, and Owens Valley Paiute) were identified as having such ties to NTS lands. Five Indian ethnic and pan-Indian organizations also have been consulted during the program. This work (Stoffle et al., 1994b) built on theYucca Mountain Project.

Meetings included representatives of each of the involved tribes and Indian organizations, the DOE/NV, and the University of Arizona ethnographic research team. The first three years of the program culminated in two mitigation meetings, out of which tribal representatives submitted a series of recommendations to the DOE/NV regarding continued consultation, strategies for protecting the various categories of cultural resources, and tribal participation in future cultural resource planning, fieldwork, and policy formulation.

The DOE/NV favorably responded to the tribal recommendations, and accepted the vast majority of them with standard stipulations such as contingencies in funding and schedule. The result of this program has been that the DOE/NV currently has what may be one of the most comprehensive American Indian consultation program in the United States.

C.5.1 DOE/NV and Indian Consultation

While U.S. federal cultural resource laws require government-to-government relationships, DOE/NV consults with federally recognized tribes, unrecognized tribal groups, and Indian organizations such as the Las Vegas Indian Center, and pan-ethnic associations. Thus, the open policy of DOE/NV moves beyond the letter of the cultural resource laws to reflect their spirit. The DOE/NV has been engaged in a continuous program of consultation with these 19 Indian corporate organizations for 8 years.

The nature of the consultation process led this program to be successful from both a human relations and policy standpoint. One feature of that success has been the coalescence of several tribes and Indian organizations into a group that could speak with one voice (Halmo, 1994) when talking to the DOE/NV. Several features in the consultation process including systematic, regular social interaction, combined with a respect for Indian autonomy in decisionmaking, has shaped the context that allowed a new corporate group to evolve.

C.5.2 The Consolidated Group of Tribes and Organizations

Indian tribal governments are inundated with projects, requests, and paperwork, all needing attention. Many tribal government officials, therefore, simply do not have the time or energy to be involved in every activity that affects various aspects of the lives of their people. For this reason, officials appoint representatives and confer responsibility to them to participate in the project, obtain information, and keep the tribal council up to date on the progress of the project.

Tribal representatives involved in DOE/NV consultation decided by consensus to "incorporate" themselves as a unit, called the Consolidated Group of Tribes and Organizations (CGTO) to more accurately reflect the group's corporatism in representing the interests of 16 tribes and 3 Indian organizations (Halmo, 1994). In taking this action, members bear the responsibility for representing the interests of not only their own tribes, but of all the other tribes and Indian organizations involved in the CGTO. Today, the DOE/NV explicitly recognizes the CGTO as the vehicle for consultation. Consultation presently occurs directly with the members of the CGTO with the approval of tribal leaders who are fully cognizant that duly appointed individuals represent their interests regarding cultural resources on the NTS.

The CGTO emerged from existing tribes and American Indian organizations who collectively conceived and created it. The CGTO is not, however, a homogeneous, harmonious collection of individuals who uniformly share the same conventional understandings. Members of the group have contending and sometimes conflicting interests regarding the cultural resources located on what can best be described as the intertribal lands that are now incorporated as the NTS. In mitigating the disposition of NTS cultural resources, however, Indian rather than tribal-specific concerns are represented by the CGTO. CGTO members have decided to take action in concert and speak with a common voice whenever such an action is appropriate; this seems the best way to influence DOE/NV policies.

Face-to-face meetings were an important component of the consultation strategy and were routinely scheduled throughout the duration of the NTS American Indian Religious Freedom Act compliance program. These meetings provided the context in which representatives of no less than 19 contending groups, including 16 Indian tribes, 3 Indian organizations, and the DOE/NV, each with its own agendas and interests, could negotiate and reach compromise solutions that were acceptable to all involved parties. Such intimate forms of consultation are likely to bring about the formation of new corporate groups that have the purpose of resolving issues and defending common interests in cultural preservation.

C.5.3 American Indian Monitors

As a result of CGTO recommendation, Indian monitors from each of the involved ethnic groups have participated in data recovery activities at archaeological sites that were slated for ground-disturbing activities. As part of the American Indian monitors program, Indian monitors received training in archaeological survey, collection, and analytical techniques. The most recent monitoring effort has resulted in the formal distribution by the DOE/NV of a monitors report of activities to each of the involved tribes and organizations.

C.5.4 The Native American Graves Protection and Repatriation Act Subgroup

That the CGTO will continue to function in the future is evidenced by the fact that the NTS American Indian Religious Freedom Act compliance program opened the door to other phases of consultation such as that concerning archaeological materials related to the Native American Graves Protection and Repatriation Act.

A Native American Graves Protection and Repatriation Act "subgroup" was appointed by the CGTO in March 1994. This was the first time that the CGTO had appointed a subgroup to conduct any significant business and, therefore, marked a point at which sufficient confidence was reached in both the DOE/NV and the CGTO itself. The six members of the Native American Graves Protection and Repatriation Act subgroup represent the Owens Valley Paiute, Western Shoshone, and Southern Paiute ethnic groups. The subgroup evaluated and selected potential Native American Graves Protection and Repatriation Act items from among the 450,000 items in the NTS collection for Native American Graves Protection and Repatriation Act consultation with representatives of the 16 involved tribes.

The new challenge of Native American Graves Protection and Repatriation Act was successfully met by the members of the subgroup in a series of three meetings. The subgroup selected about 200 items that are potentially (1) unassociated funerary objects or (2) sacred objects as these concepts are defined in the legislation. The subgroup also structured the Native American Graves Protection and Repatriation Act viewing procedures so that consultation occurred in a culturally appropriate manner.

The CGTO served in a review and advisory capacity to their respective tribes regarding Native American Graves Protection and Repatriation Act recommendations on the disposition of items from the NTS collection. In the future, the CGTO will be involved in studies of Traditional Cultural Properties, animals, petroglyphs, and other types of cultural resources on the NTS.

C.5.5 The American Indian Writers Subgroup

Stimulated by the success of the Native American Graves Protection and Repatriation Act subgroup, DOE/NV agreed to sponsor the formation of an AIWS which produced Appendix G as well as text for direct inclusion in Volume 1 of the NTS EIS. Public response to this unique DOE initiative has been highly positive and may open the door to future participation of Indian people in the production of EISs throughout the country. A detailed description of the formation and function of the AIWS is provided in Appendix G.

C.5.6 Future Subgroups

To continue with the American Indian Religious Freedom Act compliance program, the DOE/NV has funded a rock art study, which will begin in the summer of 1996. A rock art subgroup will be in charge of the site selection and research design for future site visits by American Indian elders.

C.6 Conducting Site Visits

"What is out there?" This is the fundamental question that must be addressed in any consultation. The answer will not come directly from tribal governments, but they will send cultural experts who can identify various cultural resources located on DOE lands. Native government leaders can appoint representatives to a consultation committee, and during the operation of that committee, a Native based inventory of cultural resources can be planned.

American Indian cultural resource studies should be conducted separately, whenever possible, because tribes and Native groups will send different types of cultural specialists depending on what is to be studied. The Native person who can speak at length about archaeological sites may know little about the traditional use of plants. A Native person who specializes in fishing ceremonies may have little knowledge of petroglyphs and curing ceremonies. Native cultures, like all cultures, are differentially held in the minds of specialists.

The term "study" is used to separate research that is needed to prepare a cultural resource inventory from what are sometimes described as American Indian "tours." Occasionally, federal agencies will simply bring American Indians to the lands under discussion and ask them individually or in a group what is out there. These tours are usually organized and conducted by agency personnel who are not professionally trained in scientific methods associated with cultural resource studies. The agency tour guides rarely have a hypothesis about what resources may be present and so, naively believe, that they can simply ask for information and the American Indian will completely share all pertinent information. American Indian tours were more common decades ago before there was an extensive body of research about how to conduct studies with American Indians and what to expect from such studies.

C.6.1 Forming a Study Design

Since American Indians have become aware of the quality of information that is needed to make convincing policy recommendations on federal lands, they are demanding to participate in the formulation of study designs that are culturally and scientifically valid. A recent analysis of American Indian research studies suggests that the design of the study can directly influence the findings and the recommendations (Stoffle and Evans, 1990). An analysis of 11 projects suggests that Indian people will have greater impacts on land use decisions if the study design permits them to identify and select for special protection those places, plants, and archaeology sites that have the highest cultural significance; this process has been called "cultural triage" (Stoffle and Evans, 1990). When it is difficult for Indian people to demonstrate how to move from cultural concerns to land management recommendations that protect the most cultural items, it becomes the responsibility of the scientist to help make this translation. For example, it is possible to calculate the cultural significance of individual Indian plants so that specific places where the plants grow can be assigned value, and protection can be afforded to those places with the highest plant scores (Stoffle et al., 1990b).

C.6.2 Defining Basic Concepts

It is essential that all parties to a study agree on what is to be studied. It is common for Indian people, agency personnel, and study scientists to assign different meanings to the same term. One of the most commonly misunderstood terms is "sacred." This report devoted three earlier chapters towards explaining and illustrating the concept of sacred, especially regarding those places of great cultural significance such as the origin mountain of an Indian ethnic group. The concept of sacred is really a non-Indian concept that creates a division between the sacred and the profane. Most Indian people do not believe such a division exists. Indian cultures, and there are hundreds of variations, contain many ceremonies designed to assure proper behavior towards and communication with the natural environment, other humans, and the supernatural. These ceremonies literally translate everything touched by an Indian person into a sacred object. For example, a Shoshone Indian woman who makes willow baskets will keep the shavings that have been produced by smoothing the split willows. Eventually, she prays over these shavings and returns them to a natural area near her camp. The Shoshone woman considers these willow shavings as sacred. Indian people also have ceremonies associated with great life transitions—birth, first menses, death—that use and create sacred objects that are more generally recognized by others, such as Euroamericans. Finally, there are sacred objects that are specifically defined by U.S. federal laws such as Native American Graves Protection and Repatriation Act. So the concept "sacred" could refer in any given discussion to many categories of items, some defined by law, some defined and mutually recognized by Indian and non-Indian alike, and some exclusively perceived as sacred by Indian people.

Great care must be taken in the formulation of study concepts and when discussing the meaning of these concepts with Native government representatives. If someone asks a Native person to come to DOE lands and identify places and things that are sacred, this person is likely to respond that all is sacred. If on the other hand, the Indian person is asked to identify which objects in a museum collection are needed in a current religious ceremony as defined by Native American Graves Protection and Repatriation Act, the person will be able to make a discriminate decision. The answer is often framed by the question, but it can also be influenced by the amount of time the Native person has to share her/his cultural resource perspective and her/his confidence that deeper cultural resource insights will have more protective influence than simple "holistic conservation" statements.

C.6.3 Assuring Participation

The federal agency must approach the study of cultural resources with caution when seeking American Indian participation in land management decisions. This is because American Indians will weigh the potential benefits from increased protection against the potential that if cultural resources become known they will be threatened. A Kaibab Paiute elder, for example, indicated that he wanted to protect traditional trails, but that he would not reveal their location because once known they could be followed to previously undiscovered Indian camps. Native people often say that revealing Indian plant usages causes the plants to be taken by non-natives who profit from sale of the plants. The curing power associated with certain places can be reduced if the place and its function becomes known to other ethnic groups, including other Indian people. Agency personnel should be aware that Native experts who are sent to identify cultural resources are subject to ethical conflicts, emotional stress, and even fear of reprisal. Indian experts express concern about violating traditional norms against sharing knowledge with outsiders. Concern is also expressed over how other tribal members and even future generations of tribal members will evaluate the sharing of information. Basically, the question they ask is whether or not more good than harm will come from sharing cultural knowledge (Greaves, 1994).

When American Indian tribes and organizations send experts to represent cultural concerns, they expect that the shared information will be used to set policies to better protect cultural resources. To accomplish this, the identifications of the experts must be systematically recorded so they can be written into a scientifically and ethnically acceptable report. In general, interviews should be conducted in private so that the Native person does not have to share the information with others. An interview form should be prepared in advance with the assistance of the consultation committee or informed Native people so that similar questions are asked of each expert and there is a place to record their answers. Tape recorders can be used as backup, but only used with the expert's permission. Experts' confidentiality should be assured, unless they wish to go on the record regarding some aspect of the study.

Group interviews can be conducted when individual interviews are either not desired or impossible to conduct. Group interviews tend to produce "consensus data" which means that members of the group discuss possible answers and provide one answer to the interviewer. The weakness of group interviews is that some people are not willing to express their opinions in the presence of others. The strength of group interviews is that people have the opportunity to talk over a response while in the field. Focus group interviews are a special type of group interview and they require special preparation and training for the focus group facilitator.

C.6.4 Presenting the Findings

The report presenting the findings of the consultation process being discussed should be more than a pure description of what was said by the Native experts. Some attempt should be made to translate the thoughts of Native experts into information that can be used by federal agency land managers. In general, Native concerns should be contextualized by providing findings from published historical and ethnographic literature that demonstrate how the expressed cultural concerns fit into the overall culture of the ethnic group. Translation into management information and contextualization will help achieve the goals of building American Indian concerns into land management policies.

The report should receive a technical review by the Native experts and members of the consultation committee before being sent for draft review by the federal agency. This will assure that the report does not contain information that should not be revealed, and that the information it does contain is accurate. When the technical review is complete the report should be given a draft review by the federal agency. Then the draft report should be sent to the American Indian group or tribal government for official review and approval. Final reports should be available to other federal agencies seeking to achieve similar goals and in need of case data for developing or refining their own consultation processes. The public has a right to know about significant land management decisions made by federal agencies, even if these are in consultation with American Indians and have some element of confidentiality that will continue to be respected. The final report and perhaps portions of the information (not the data) used to make the decision (Ruppert, 1994) should be available to the public.

C.7 Developing Native Mitigation Recommendations

Cultural resource technical reports should focus on the cultural resources under study and should not attempt to make government-level policy recommendations. Technical reports are the basis for proceeding with mitigation discussions and eventual recommendations from the American Indian governments to the DOE. Policy decisions occur after the Native recommendations are combined with what the land management agency can and will do to incorporate American Indian recommendations. It is important that this point in the decisionmaking process has been thoroughly considered by the agency before the consultation began (See Section C.1, Defining Consultation.)

Native policy recommendations should derive from three sources: (1) Native experts during the on-site interviews, (2) consultation committee, and (3) Native organizations and tribal governments. These three sources of recommendations represent a hierarchy of decisionmaking authority that is inversely related to the degree of information about the resource. Native experts are knowledgeable about the cultural resource and, because of their on-site experiences, are aware of factors that could have either adverse or positive impacts on its protection. Native experts are charged by their tribes and organizations with identifying what is out there and making preliminary recommendations. The report should consolidate all Native expert recommendations by place and resource, and these should be presented to the consultation committee. Committee members have a long-term relationship with the project and are generally aware of what is possible in terms of resource management on the DOE facility. It is up to them to consider the recommendations of the Native expert; if possible, resolve conflicting recommendations and add recommendations. The final cultural resource decision recommendations in a government-to-government relationship belongs to the tribal council and advisory board of a Native organization. They tend to follow the advice of their appointed Native experts and consultation committee members; however, they can add or modify recommendations.

Recommendations that have passed with some consensus through this hierarchy of Native decisionmaking should be seriously considered by the DOE facility. The strength of the recommendations depends, in part, on whether or not they remain within federal laws that govern land management decisions by the DOE facility. In addition, the Native recommendations should be within the agreed upon limits of power sharing decided upon by the facility when the consultation process began. If the recommendations are within these limits, then credible cultural resource recommendations should be adopted by the DOE facility.

C.8 Maintaining Ongoing Interactions and Monitoring

"Partnership" is a term often used to described the desired outcomes of consultation relationships between American Indians and DOE facilities. Partnerships require shared power, mutual respect, and mechanisms for sustaining a long-term relationship. Partnerships can be established when the American Indian people and the DOE facility establish (1) mutual trust, (2) a common knowledge base, (3) a cultural resource management plan, and (4) a monitoring plan.

C.8.1 Mutual Trust

When people get to know each other through face-to-face interactions, they create a basis of understanding that can be used to establish what is called "trust." The term "trust" is not being used here to refer to the legal "trust relationship" that exists between the U.S. government and American Indian peoples. Instead, the term "trust" is used as it is more generally understood, as confidence in the honesty, integrity, reliability and justice of another person or organization.

People do meet, but the DOE and American Indian consultation occurs within the context of government-to-government relationships. One of the great dynamics of mutual trust is differences between the people and the agency relationships. First and foremost, Indian people must believe that their participation in consultation is more likely to protect cultural resources than would saying nothing at all. Decisionmaking should be shared (insofar as it is appropriate and possible), and the decisions must have some identifiable positive impacts (see C.8.4, Monitoring Plan below).

Trust derives from the history of relationships between the DOE facility and its personnel, and American Indians. This history may go back to a time when the Indian people were at odds with the federal government during the nuclear testing era. Trust also derives from more recent interactions about DOE facility policies like the transportation of low-level radioactive waste and the location of waste repositories. It is important to address these issues early in the consultation process. In fact, it is likely that Indian people will raise these issues as stipulations before they are willing to proceed with consultation. Concerns about past relationships are often raised in holistic conservation statements made by Native elders and leaders in early consultation meetings. Stipulations are not debatable by the DOE, which instead will have its own stipulations it may wish to express at this time. Trust cannot be negotiated. Trust can emerge from long-term interactions especially when consultation begins with clearly expressed stipulations. Trust must be earned and mutually shared.

Any consultation relationship will depend, in part, on the individuals involved. Friendly and professional relationships have the potential of overcoming any negative historic relationships between the American Indian people and the DOE. Unfortunately, personnel change in both Native organizations and DOE facilities. Mechanisms should be in place to assure that consultation partnerships can survive personnel change.

C.8.2 A Common Knowledge Base

A primary goal for every DOE and American Indian consultation is to create or contribute to a common knowledge base that is shared by both. Native groups send their most knowledgeable experts to the DOE facility to identify cultural resources. These thoughts should not be lost. Federal agencies cannot afford to forget what has been told to them by Native groups. Similarly, most DOE facilities have initial archaeology, botany, and animal studies that can be shared and used by Native groups. The challenge is to develop a single, shared pool of information that can be used by both the DOE and the Indian people to know what is out there and to understand what is happening to it.

Geographic information systems are being used by many federal agencies and Native groups to inventory and keep track of resources distributed across an extensive landscape. Geographic information systems are expensive and difficult to use, but innovative interactive multimedia data systems that can draw on some similar information systems components are being developed. An ideal data base could be used simultaneously by the Native people at their homes and the DOE facility. This is likely to require that a multimedia program be developed that can use and make easily accessible the products of the geographic information systems data analysis. The geographic information systems and multimedia system should be updated easily when new information comes from Native expert visits or science studies. It should contain photos, video, sound clips, maps, and text. Finally the geographic information systems and multimedia system should restrict access to certain portions of the database to reflect both the DOE and the Native concerns for selective distribution of data and information.

C.8.3 Cultural Resource Management Plan

Federal facilities produce overall land-use plans usually including specific plans for wildlife, plants, and cultural resources. An American Indian cultural resource management component could be developed in each of these plans. Possibly more difficult, but nonetheless important, would be to include American Indian cultural resource management comments in discussions of minerals and water.

The recommendations produced by the hierarchy of American Indian decisions (experts, consultation committee, tribal governments) should be organized to reflect how the information can be incorporated into facility management plans. Early coordination with the consultation committee should produce both information and recommendations that fit how the facility manages natural and cultural resources.

C.8.4 Monitoring Plan

There must be some way of knowing whether or not American Indian consultation has influenced the condition of cultural resources contained on the DOE facility. Because it is impossible to constantly monitor all cultural resources located on DOE lands, monitoring timeframes and monitoring locations must be chosen. Basically, the timeframe questions are: How fast are culturally significant changes occurring to any specific cultural resource? Does the quality, quantity, or distribution of medicine plants change seasonally, annually, or over a period of years? Damage due to erosion or vandalism to archaeology sites may be occurring sporadically; monitoring should occur at least once a year, and more sensitive sites monitored more often.

Monitoring locations should be decided in terms of how well they represent a certain cultural resource. Monitoring samples should be selected with full input from the Indian people. Monitoring techniques will vary, from ground level photography of petroglyph panels to remotely sensed data from satellites showing the distribution of plants. When ground disturbance is to occur, Native monitors may be hired to oversee activities. The results of all monitoring efforts should be provided to the members of the consultation committee and Native sporadically; monitoring should occur at least once a year, and more sensitive sites monitored more often.

Monitoring locations should be decided in terms of how well they represent a certain cultural resource. Monitoring samples should be selected with full input from the Indian people. Monitoring techniques will vary, from ground level photography of petroglyph panels to remotely sensed data from satellites showing the distribution of plants. When ground disturbance is to occur, Native monitors may be hired to oversee activities. The results of all monitoring efforts should be provided to the members of the consultation committee and Native governments at regular intervals. Regular feedback on the condition of cultural resources is the only way to maintain an ongoing relationship with Indian people.

C.9 Closing a Consultation

Today, most U.S. land-managing agency initiatives to establish American Indian consultation relationships are intended to be ongoing because Native people's views will become part of the information base for making, monitoring, and adjusting on-going land management decisions. Still, some consultations are designed to end. These may be project-specific consultations designed to provide a narrow range of findings for the evaluations of a project or action proposal. Sometimes the DOE facility itself is closing. Whatever the reason for termination, how it occurs has implications for both the involved Indian people and the U.S. federal agency.

C.9.1 Making Analogs

Anyone who has made a presentation before a tribal council or Native governmental body has experienced some council or audience member standing up and talking at length about some other project that occurred many years in the past that did not end in a positive way. Most presenters want to say, "That is not what I am talking about, it occurred a long time ago and I (or my agency) was not involved." The point presented by the American Indian, however, is well taken; "We have seen your kind before and here is the summation of those experiences." In most cases, Native people lump most federal agencies together, so the mistakes of one agency are transferred to another.

"Project analogs" is the technical term used to discuss the process of evaluation of a current proposal in terms of past proposals. For example, during the social impact assessment of the Superconducting Super Collider for the state of Michigan it was discovered that local people responded to this new and quite unique proposal in terms of how the involved state and federal agencies had behaved with past projects (Stoffle et al., 1987). The proposed collider, a massive and generally positive project, was being evaluated in terms of how the Michigan Department of Natural Resources had conducted a public access for hunters program, how a state utility had handled a cross-county pipeline project, how a cement company had dealt with air pollution, and how state politicians had proposed a prison for the area. These small-scale and highly localized projects were not similar in any respect to the Super Collider proposal, but the local people drew upon them as historic analogs for deciding whether or not to trust the state of Michigan and private business, and support the Superconducting Super Collider proposal.

C.9.2 Maintaining Positive Relations

Relations between the DOE and American Indians began 50 years ago and is often recounted as a history of adversarial relationships. All lands currently held or affected by DOE facilities once belonged to an American Indian ethnic group. Nonetheless, many Indian people have been employed by DOE facilities and have begun to establish positive relationships with Native people focussed on cultural resources. It is important at this moment in the history of relations between American Indians and the DOE to create positive analogs. So each effort is important. No positive action of the DOE will go unrewarded, because American Indians respond well to being involved in decisions about their traditional resources. There are small and terminal consultations, but each has the potential of being a positive analog. The remaining chapters of this report bring together many of these successes.

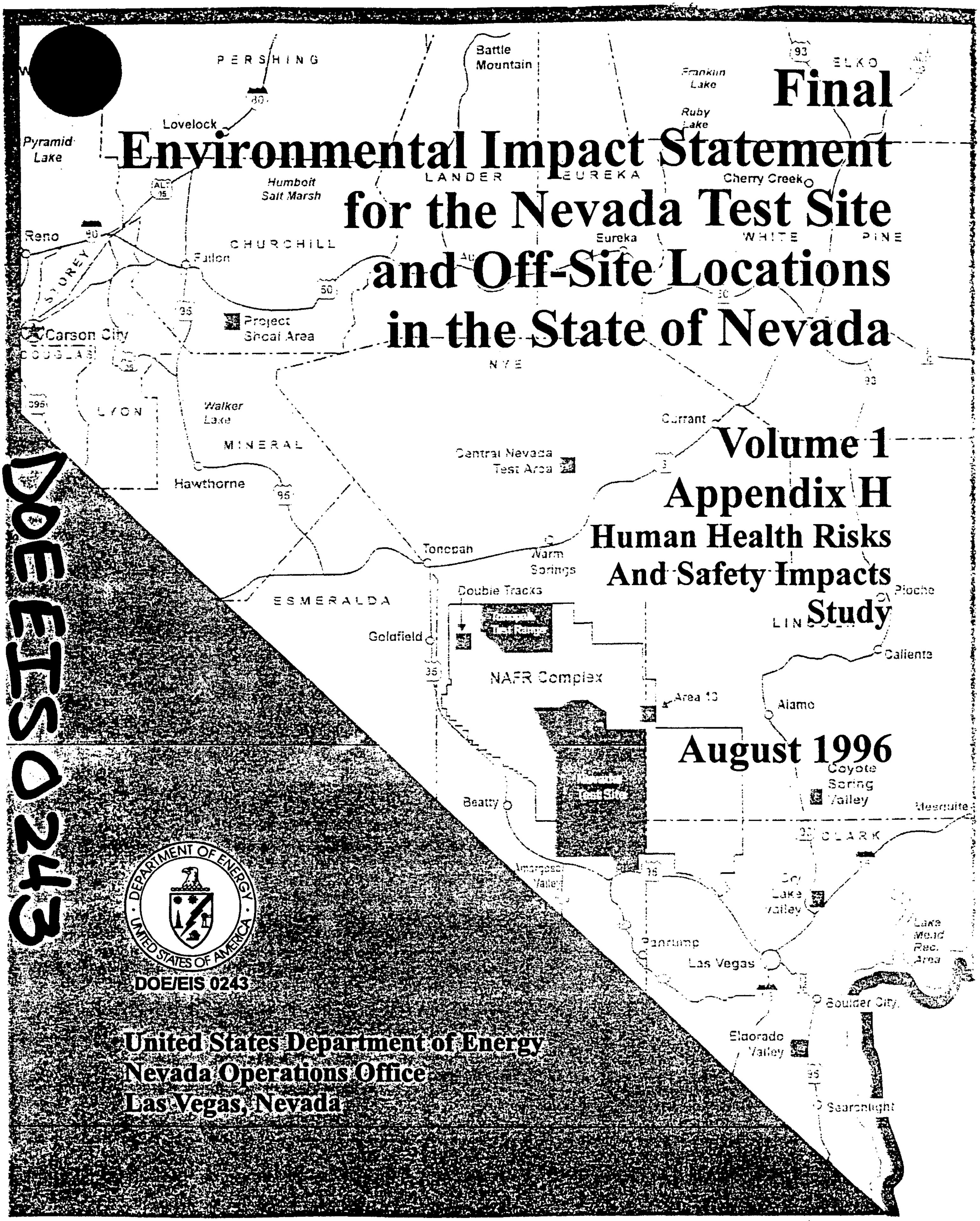
This Page Intentionally Left Blank

*U.S. GOVERNMENT PRINTING OFFICE: 1996-785-718

Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada

Volume 1
Appendix H
Human Health Risks And Safety Impacts Study

August 1996



DOE EIS 0243

DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA

DOE/EIS 0243

United States Department of Energy
Nevada Operations Office
Las Vegas, Nevada

Final
Environmental Impact Statement

for
the Nevada Test Site and Off-Site Locations in the State of Nevada

Volume 1

Appendix H

U.S. Department of Energy
Nevada Operations Office
Las Vegas, Nevada

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

BEEF	Big Explosives Experimental Facility
Ci	curie
CNTA	Central Nevada Test Area
DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy, Nevada Operations Office
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
ERPG	Emergency Response Planning Guideline
HE	high explosive
HEPA	high efficiency particulate air
HLW	high-level waste
ICRP	International Commission for Radiological Protection
LCF	latent cancer fatality
LLW	low-level waste
MEI	maximally exposed individual
MW	mixed waste
NAFR Complex	Nellis Air Force Range
NEPA	National Environmental Policy Act
NTS	Nevada Test Site
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated byphenols
pCi	picocurie
pCi/L	picocuries per liter
rad	radiation absorbed dose
RCRA	Resource Conservation & Recovery Act
R&D	research and development
rem	roentgen equivalent man
SNF	spent nuclear fuel
TTR	Tonopah Test Range

GLOSSARY

Absorbed dose. The energy imparted to matter by ionizing radiation per unit mass of irradiated material. The unit of absorbed dose is the rad, which equals 100 ergs per gram.

Alpha particle. A positively charged particle ejected spontaneously from the nuclei of some radioactive elements. It is identical to a helium nucleus that has a mass number of 4 and an electronstatic charge of +2.

Aquifer. A body of rock that contains enough saturated permeable material to transmit groundwater and to yield significant quantities of groundwater to wells and springs.

Background radiation. Radiation arising from radioactive material other than that directly under consideration. Radiation from cosmic sources and from radioactive materials that are naturally occurring in the environment. Background radiation due to cosmic rays and natural radioactivity is always present.

Baseline. The initial environmental conditions against which the environmental consequences of various alternatives are evaluated.

Beta particle. A charged particle emitted from a nucleus during radioactive decay, with a mass equal to 1/1837 that of a proton. A negatively charged beta particle is identical to an electron. A positively charged beta particle is called a positron.

Carcinogens. Substances known to cause cancer in humans, or are known to cause cancer in animals and therefore may be capable of causing cancer in humans.

Collective effective dose equivalent (person-rem). A summation of the radiation doses received by individuals in an exposed population dose. See population dose.

Consequence. The situation or effect produced as a result of something occurring.

Cumulative impact. The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individual minor actions that may be collectively significant over a period of time.

Curie (Ci). A unit of radiation that describes the number of atoms undergoing nuclear transformations per unit time. The curie is equal to 37 billion (i.e., 3.7×10^{10}) disintegrations per second.

Direct impact. Effects resulting solely from the proposed program.

Direct effects. Beneficial or deleterious impacts that are caused by an action and occur at the same time and place.

Dispersion factor. A numerical term that accounts for the reduction in the concentration of a contaminant through natural mixing and dispersion in the atmosphere, surface water, or groundwater.

Dose (or radiation dose). A generic term that means absorbed dose, or effective dose equivalent, as defined elsewhere in this glossary.

Dose conversion factor. Any factor that is used to change an environmental measurement to dose in the units of concern. Frequently used as the factor that expresses the committed effective dose equivalent to a person from the intake (inhalation or ingestion) of a unit activity of a given radionuclide.

Dose-response relationship. A curve showing the percentage of organisms with observable toxic effects to the dose administered.

Dose to health effect correlation factor. A numerical term that estimates the probability that a health effect will occur as a result of exposure to a unit quantity of radiation or hazardous chemicals. Also referred to as health risk factor. Example: 0.0005 latent cancer fatality per rem of radiation dose received by the general population. If a population received a collective dose of 2,000 person-rem, the estimated number of latent cancer fatalities is estimated as (2,000 person-rem) x (0.0005 latent cancer fatality per rem) = 1 latent cancer fatality.

Effective dose equivalent. The sum over specified tissues of 1) the products of the dose equivalent in a tissue and 2) the weighting factor for that tissue. It is the amount of damage to the exposed individual's body as a result of radiation exposure.

Environmental Impact Statement. A detailed written statement that helps public officials to make decisions that are based on understanding of environmental consequences and to take actions that protect, restore, and enhance the environment.

Environmental transport medium. The object that transfers the source term to a human (i.e., the air, water, food chain, etc.)

Eolian. Applied to deposits arranged by the wind. Wind blown.

Ergs. A measure of energy. One erg is equivalent to 1 x 10-7 joules.

Exposure route. The method by which a contaminant may reach a person.

Fatal cancers. Cancers for which the cure rate is low and for which the period between diagnosis and death is usually short.

Fiscal year. A 12-month period of time to which the annual budget applies and at the end of which its financial position and the result of its operations are determined. Clark County, the city of Las Vegas, the city of North Las Vegas, Nye County, the towns of Tonopah and Pahrump, and the Clark County School District and Nye County School District fiscal years run from July 1 through the following June 30. Federal fiscal years are from October 1 through the following September 30.

Fissile. Capable of undergoing fission by interaction with thermal (slow) neutrons. The three primary fissile materials are uranium-233, uranium-235, and plutonium-239.

Fission. A nuclear transformation characterized by the splitting of a nucleus and the simultaneous release of energy.

Fugitive dust. Particulate matter composed of soil. Fugitive dust may include emissions from haul roads, wind erosion of exposed soil surfaces, and other activities in which soil is either removed or redistributed.

Fugitive emissions. Emissions released directly into the atmosphere that could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening.

Gamma ray. Short wavelength electromagnetic radiation, with no mass, that is emitted from the nucleus.

Genetic disorders. Serious disabilities that may be transferred to offspring of parents that have been exposed to mutagens.

Groundwater. Subsurface water within the zone of saturation.

Half-life. The length of time required for an initial amount of radioactive substance to be reduced down to ½ of its original amount due to radioactive decay.

High-level waste (HLW). Highly radioactive waste that results from the reprocessing of spent nuclear fuel, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation.

Human environment. The natural and physical environment and the relationship of people with the environment.

Human receptor. The person or group of people that can be or is exposed to the contaminant.

Hydrocarbons. Any of a vast family of compounds containing hydrogen and carbon. May include many organic compounds in various combinations. Most fossil fuels are composed predominately of hydrocarbons.

Latency. A term used to describe the period of time between the point of exposure and the resulting effect of the exposure on the human body.

Latent cancer fatality. A fatal cancer with a delayed onset of up to twenty years, or longer, from the time of exposure to the time of manifestation in the individual.

Low-level waste (LLW). Radioactive waste not classified as high-level waste, transuranic waste, or spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium. Test specimens of irradiated fissionable material may be classified as LLW, provided the concentration of transuranic elements is less than 100 nanocuries per gram.

Maximum individual dose. A radiation dose received by a hypothetical individual whose location and habits are such that the dose received is the maximum expected to result from some given operation or accident.

Mitigation. Actions and decisions that (1) avoid impacts altogether by not taking a certain action or parts of an action, (2) minimize impacts by limiting the degree or magnitude of an action, (3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment, (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action, or (5) compensate for an impact by replacing or providing substitute resources or environments.

Mixed waste. Waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the Resource Conservation and Recovery Act, respectively.

Mutagenicity. The capability of a substance to cause permanent alteration of genetic material within living cells contained in the human body.

Noncarcinogens. Substances that may not be known to cause cancer, but may be capable of causing harm, such as invoking mutagenicity in a human.

Nonfatal cancers. Cancers for which the fatality rates may be low, but for which there can be either physical or psychological reasons for a reduced quality of life.

Notice of Intent. A notice that an environmental impact statement will be prepared and considered.

Nuclear testing. An underground nuclear weapons test of either a single underground nuclear explosion or two or more underground nuclear explosions conducted at the NTS within an area delineated by a circle having a diameter of two kilometers and conducted within a total period of time of 0.1 second. The yield of a test shall be the aggregate yield of all explosions in the test.

Person-rem. The collective total dose to a population. Person-rem is calculated by summing the individual doses of each member of the population.

Picocurie (pCi). One trillionth of a curie, (i.e., $1x10^{-12}$ Ci) (also see Curie).

Population dose (person-rem). A summation of the radiation dose received by individuals in an exposed population. Equivalent to collective dose.

Probability. A number expressing the likelihood of occurrence of a specific event.

Quality factor. A measure of the relative biological effectiveness of a given type of radiation. This is directly related to the linear energy transfer of that radiation, i.e., the energy deposited per unit of path length (keV per micron).

Radiation. The spontaneous emission of particles and energy from unstable atoms that occurs as these unstable atoms decay.

Radiation absorbed dose (Rad). The amount of energy absorbed by a material.

Radiation detriment. Adverse effects due to radiation exposure, not including latent cancer fatalities.

Radioactive decay. The process in which a nucleus emits radiation and undergoes spontaneous transformation into one or more different nuclei.

Radioactive waste. Solid, liquid, or gaseous material that contains radioactive nuclides regulated under the Atomic Energy Act of 1954, as amended, and is of negligible economic value given the cost of recovery.

Risk. A quantitative expression of possible loss that considers both the probability that a hazard causes harm and the consequences of that event.

Roentgen. A unit of radiation that measures the amount of ionizations in air produced by gamma energy per unit time.

Roentgen equivalent man (Rem). The number of ionizations in air that translates to a similar dose for a person.

Scenario. A proposed situation or sequence of events.

Scope. Consists of the range of actions, alternatives, and impacts to be considered in an environmental impact statement.

Source term. The contaminant(s) released to the environment.

Specific activity. A unit mass of radioactive material (i.e., 1 curie per gram).

Spent fuel. Nuclear reactor fuel that, through nuclear reactions, has been sufficiently depleted of fissile material to require its removal from the reactor.

Stockpile stewardship. The science and technology aspects of ensuring the safety, security, and reliability of the stockpile, including research and development to provide the technologies required for stockpile management. This includes a program of activities to maintain confidence in the safety, reliability, and performance of the Nation's nuclear weapons.

Storage. The collection and containment of waste or spent nuclear fuel in such a manner as not to constitute disposal of the waste or spent nuclear fuel for the purposes of awaiting treatment or disposal capacity.

Threshold concept. A concept that suggests most toxic substances will produce no effect on a biological organism, if the substances are given in small enough amounts.

Transuranic waste. Radioactive waste containing 100 nanocuries per gram or more of alpha-emitting radionuclides that have an atomic number greater than 92, and half-lives greater than 20 years.

Transuranic radionuclide. Any radionuclide having an atomic number greater than 92.

Uptake. The sorption of a substance into and onto an organism during an exposure to that substance.

Waste acceptance criteria. The requirements specifying the characteristics of waste and waste packaging acceptable to a waste receiving facility and the documents and processes the generator needs to certify that waste meets applicable requirements.

Waste management. The planning, coordination, and direction of those functions related to generation, handling, treatment, storage, transportation, and disposal of waste, as well as associated surveillance and maintenance activities.

Waste management facility. All contiguous land, structures, other appurtenances, and improvements on the land, used for treating, storing, or disposing of waste or spent nuclear fuel.

Watershed. The land area that drains into a stream or river.

X-ray. A bundle of high energy with no mass. Similar to a gamma ray, except for its origin and, in general, its energy level.

SUMMARY

Proposed changes in the Nevada Test Site (NTS) operations, as well as the U.S. Department of Energy (DOE) policy of reviewing sitewide National Environmental Policy Act (NEPA) documents, have resulted in the need for the U.S. Department of Energy, Nevada Operations Office (DOE/NV) Operations Office to prepare a new Environmental Impact Statement (EIS) for the NTS. This report has been prepared to assess the human health and safety impacts from operations expected to be carried out under each of the four alternatives defined in the NTS EIS. These alternatives are:

- Alternative 1, Continue Current Operations (No Action)
- Alternative 2, Discontinue Operations
- Alternative 3, Expanded Use
- Alternative 4, Alternate Use of Withdrawn Lands

Five program areas are evaluated to the extent that they apply to each of the four NTS EIS alternatives. These are defense, environmental restoration, waste management, nondefense research and development, and work for others. In addition to these five program areas, site support services, such as fire protection and communications needed to support each of these program areas, are also evaluated.

This assessment was accomplished by evaluating effects upon human health of radiological, chemical, and toxicological substances, as well as physical hazards associated with construction, maintenance, and operations activities. To perform this assessment, scenarios (proposed situations and events envisioned to occur as a result of the implementation of one of the EIS alternatives) were created. The scenarios were then evaluated for human health and safety impacts on workers as well as the public.

The results of this study are presented in three parts: 1) the risks associated with the subsurface migration of tritium-contaminated groundwater; 2) the risks associated with activities performed under NTS EIS alternatives and program areas; and 3) the health and safety impacts of the maximum reasonably foreseeable accidents under each alternative.

Risks Associated with Migration of Tritium-Contaminated Groundwater. Tritium-contaminated groundwater exists in the subsurface as a result of past underground testing of nuclear weapons. Underground weapons tests were performed within the NTS and at two offsite locations, the Project Shoal Area and the Central Nevada Test Area. The migration of tritium-contaminated groundwater from test locations within the NTS is estimated to be maximized for the flow path from Pahute Mesa to Oasis Valley. Based on the combined results of studies performed by various authors, the estimated range of peak tritium concentrations at the closest uncontrolled use area varies from 5×10^{-4} pCi/L arriving 150 years after the beginning of migration to 3,800 pCi/L arriving in 25 to 94 years. These concentrations are well below the U.S. Environmental Protection Agency (EPA) maximum allowable tritium concentration in drinking water of 20,000 pCi/L. The hypothetical maximally exposed public individual at this location is estimated to have a lifetime probability of contracting a fatal cancer between 8×10^{-13} (about one in one trillion) and 1×10^{-5} (about 1 in 100,000).

The migration of tritium-contaminated groundwater from the test location at the Project Shoal Area could result in peak concentrations of 280 to 720,000 pCi/L arriving at the controlled area boundary 71 to 206 years after the test. Although no public wells currently exists at this location, a hypothetical individual consuming well water at this location for a standard lifetime of 70 years would have a lifetime probability of contracting a fatal cancer between 2×10^{-10}

(about one in five billion) and 2×10^{-3} (about 1 in 500). At the nearest existing public well, a hypothetical maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 4×10^{-24} (essentially zero) and 2×10^{-7} (about one in five million).

The migration of tritium-contaminated groundwater from the test location at the Central Nevada Test Area was predicted to have reached a peak concentration of about 1.2×10^{8} pCi/L at the southern boundary approximately 8 to 15 years after the test (between the years 1976 and 1983). This predicted concentration has not been confirmed by groundwater sampling and analysis. No public well currently exists at the boundary of the Central Nevada Test Area. But if a well did exist, a hypothetical individual consuming well water at this location for a standard lifetime of 70 years around the time of peak tritium concentrations would have a lifetime probability of contracting a fatal cancer between 1.4×10^{-5} (about one in 70,000) and 5.5×10^{-3} (about one in 200). At the nearest existing public well, a hypothetical maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 1.7×10^{-24} (essentially zero) and 3.2×10^{-10} (about one in three billion).

Risks Associated with Activities Performed Under NTS EIS Alternatives and Program Areas. In general, human health risks under each of the alternatives are expected to be dominated by occupational injuries to workers engaged in activities such as construction, maintenance, excavation, etc. By conducting activities for ten years under the various alternatives listed in the NTS EIS, it is estimated that the following number of injuries and fatalities would occur: Alternative 1 - 204 injuries and 3 fatalities; Alternative 2 - 3 injuries and no fatalities; Alternative 3 - 775 injuries and 9 fatalities; and Alternative 4 - 104 injuries and 1 fatality. The Waste Management Program had the greatest number of human health risks associated with it, when compared to all other program areas. It is unlikely that a single fatal cancer or other detrimental health effect would occur as a result of radiation exposure to workers or the public under any of the NTS EIS alternatives. Hazardous chemical spills could result in noncancer health effects to workers in operations conducted under Alternatives 1, 3 and 4.

Impacts Associated with the Maximum Reasonably Foreseeable Accident. The maximum reasonably foreseeable accidents associated with activities under the NTS EIS Alternatives would be as follows:

<u>Alternative 1</u>

The maximum reasonably foreseeable radiological accident involves a non-nuclear explosion in an Area 27 nuclear weapons storage magazine. The accident has a probability of 1×10^{-7} per year and could result in injuries or deaths to nearby workers due to the physical impacts of the explosion or delayed radiation health effects. Radiation exposure from the accident could result in 6 latent cancer fatalities in the worker population at the next nearest facility, and from 3 to 55 latent cancer fatalities in the offsite population within 50 miles.

The maximum reasonably foreseeable chemical accident involves an airplane crash into the Liquid Gaseous Fuel Spill Test Facility. The accident has a probability of 1×10^{-7} per year and could result in injuries or deaths to nearby workers due to the physical impacts of the crash or toxic effects of chemicals. Workers at the next nearest facility could experience non-life threatening health effects from exposure to airborne chemicals. The off-site population within 50 miles could experience up to 3 latent cancers as a result of this accident.

<u>Alternative 2</u>

The maximum reasonably foreseeable radiological accident involves a failure of an artillery fired test assembly at the Tonopah Test Range. The accident has a probability of 1×10^{-7} per year. Nearby workers would be under cover when the device fired, but up to 6 latent cancer fatalities could occur in workers at the next nearest facility. The off-site population within 50 miles would have an increased likelihood of 0.009 to 0.16 of a single latent cancer fatality.

The maximum reasonably foreseeable chemical accident involves a multi-container fire at the Area 5 hazardous waste storage unit prior to final shipment of these wastes off-site. The accident has a probability of 8×10^{-5} per year. Workers immediately downwind of the fire could be exposed to life-threatening air concentrations of hazardous chemicals. The off-site population within 50 miles would not be expected to experience any non-cancer health effects, and the likelihood of a single cancer in the population would increase by 0.002 to 0.004.

Alternative 3

The maximum reasonably foreseeable accidents for Alternative 3 are the same as those described for Alternative 1.

Alternative 4

The maximum reasonably foreseeable radiological accident involves an airplane crash into the Area 5 transuranic waste storage unit. The accident has a probability of 6×10^{-7} per year and could result in injuries or deaths to nearby workers due to the physical impacts of the crash or delayed radiation health effects. The worker population at the next nearest facility would have an increased likelihood of 0.04 of a single latent cancer fatality. The off-site population within 50 miles could experience 1 to 13 latent cancer fatalities.

The maximum reasonably foreseeable chemical accident is the same as that described for Alternative 1 (airplane crash into the Liquid Gaseous Fuel Spill Test Facility).

This Page Intentionally Left Blank

1.0 INTRODUCTION

1.1 Purpose

The Nevada Test Site (NTS) is a multi-facility site that supports a diverse range of U.S. Department of Energy (DOE) mission objectives. Although the principal mission of the NTS has been to conduct nuclear weapons-related tests, and more recently to maintain a readiness to conduct nuclear tests, the NTS also supports other DOE activities. These activities include various types of research and development, as well as operations associated with radioactive waste management, and environmental restoration programs.

In recent years, changes in nuclear testing policy have occurred in the international community. These policy changes have resulted in the pursuit of additional DOE and non-DOE activities being proposed for siting at the NTS. These proposed changes in NTS operations, as well as the DOE's policy of reviewing sitewide National Environmental Policy Act (NEPA) documents, have resulted in the need for the U.S. Department of Energy Nevada Operations Office (DOE/NV) to prepare a new Environmental Impact Statement (EIS) for the NTS. It is the intent that this EIS serve as a support tool for policy makers and stakeholders; by providing an evaluation of the potential environmental impacts associated with various alternative uses of the NTS and its resources, being considered by the DOE.

This study follows DOE's EIS guidance *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements* (DOE, 1993), for assessing human health and safety impacts. This assessment was accomplished by evaluating effects upon human health from radiological, chemical, and toxicological substances; as well as physical hazards associated with construction, maintenance, and operations activities. To perform this assessment scenarios, proposed situations and events envisioned to occur as a result of the implementation of one of the EIS alternatives), were created. The scenarios were then evaluated for human health and safety impacts on workers as well as the public.

Each scenario was evaluated for its impacts upon human health and safety, using a three-fold approach. First, for each scenario, a detrimental effect (deemed 'consequence') upon human health and safety, that could foreseeably result from an action or the lack of action was assessed. Second, the likelihood that a specific detrimental effect could materialize under each scenario (deemed 'probability') was estimated. Numerical values were then assigned to both the consequence and probability parameters, illustrating each parameter's relative degree of importance with regard to this human health and safety evaluation. Third, the values assigned to the parameters of consequence and probability were multiplied together, creating a parameter value that is known as 'risk'. This value denotes the amount of risk that is associated with each scenario. It is this value that will assist decision makers in making relative comparisons between the EIS alternatives that are directly associated with each of the scenarios.

However, it is important to note that the sole parameter of 'risk' may not always fully communicate the magnitude of potential adverse consequences, because the consequences are weighted by the probability. As such, in this study accident scenarios that were assumed to inflict the maximum impact to human health and safety, are presented in terms of their separate components of consequence and probability. These accident scenarios, referred to as maximum reasonably foreseeable accidents, illustrates the maximum consequences that are reasonably foreseeable in the event that an accident actually occurs.

1.2 Scope of Study

The public scoping period for the NTS EIS began with the publication of the Notice of Intent (to prepare an EIS) on August 10, 1994. During the scoping period and in subsequent meetings with the DOE, some members of the public, elected officials, American Indian tribal governments, and private issue-advocacy groups expressed concern about the DOE's ongoing and expanding radioactive waste and nuclear materials management activities at the NTS. These groups asked the DOE to provide more information about the potential risks to human health that may be associated with the proposed alternatives. This report addresses those concerns as they relate to the specific alternatives identified in the NTS EIS. This report, however, does not address risks to human health that are associated with transportation activities or routine air emissions from NTS activities. Transportation issues are evaluated separately in Appendix I of the NTS EIS. Air quality impacts to human health are discussed in Chapter 5.0 of the NTS EIS document.

1.2.1 Alternatives Evaluated

Because the NTS EIS covers actions that are currently ongoing or proposed for the NTS between 1996 and 2005, this evaluation examines human health and safety impacts from activities conducted for a period of no more than 10 years.

The four alternatives, as they are identified in the NTS EIS, are:

Alternative 1	Continue Current Operations (No Action)
Alternative 2	Discontinue Operations
Alternative 3	Expanded Use
Alternative 4	Alternate Use of Withdrawn Lands

Alternative 1 is defined as the continuation of ongoing DOE and interagency programs, activities, and operations at the NTS and other associated areas within the State of Nevada. The No Action Alternative would also allow for continuation of past operations, as required.

Under Alternative 2 all current and planned program activities and operations would be discontinued. Only monitoring and other functions necessary for human health, safety, and security would be maintained.

Under Alternative 3 utilization of the NTS and its resources would be expanded to support national programs, both of a defense and non-defense nature.

Implementation of Alternative 4 would involve discontinuing all defense-related activities and most Work for Others programs. Certain programs and activities that are not included as responsibilities within the scope of the current NTS mission are also evaluated. This alternative could include other activities that would be dependent upon future land-use designations and withdrawal status, such as the relinquishment of portions of land from the NTS.

1.2.2 Program Areas Evaluated

Examined in the EIS are programs and activities, including those associated with the realignment of the national DOE mission as they relate to the DOE-utilized sites examined in this EIS. Five program areas and support infrastructure are evaluated, to the extent that they apply to each of the four alternatives. These program areas are briefly described below:

- Defense Program - The primary missions of defense programs are the stockpile stewardship and the maintenance of readiness to conduct underground nuclear tests.
- Waste Management - This program provides for the safe and permanent disposal of waste through disposal on the NTS, or at off-site commercial waste treatment/disposal facilities.
- Environmental Restoration - The goal of this program is to identify contaminated areas, and to remediate or contain those contaminated areas that might pose a risk to human health or the environment.
- Nondefense Research and Development - This program includes original research efforts by the DOE, universities, industry, and other federal agencies.

- Work for Others - This program provides for the use of NTS areas and facilities by other groups and agencies other than the DOE, for activities such as military training exercises.

- Site support activities - Included in this program area are the infrastructure activities and functions required to support all operations being conducted at the NTS. These functions include; environmental monitoring, security surveillance, communications, utilities services, and general building and road maintenance.

1.2.3 Sites Evaluated

The NTS EIS examines existing and potential impacts to the environment that have, or could result from current and proposed DOE operations in southern Nevada. The DOE-utilized sites examined in this EIS are the NTS and the Tonopah Test Range (TTR) (which are both surrounded by portions of the Nellis Air Force Range [NAFR Complex]), the Central Nevada Test Area (CNTA), the Project Shoal Area, Coyote Spring Valley, Dry Lake Valley, and Eldorado Valley (Figure H-1).

It should be noted that although all of these sites have been evaluated initially, not all geographical locations are expected to be impacted by each program or alternative. Table 1-1 provides a matrix of the geographical sites potentially affected by specific programs being performed under the various alternatives.

1.3 Organization of This Document

The purpose of this report is to provide an assessment of human health risks and safety performed under the various alternatives being considered in the NTS EIS. Chapter 1 focuses on the purpose and need for an assessment of human health risks and safety impacts resulting from NTS operations. The remaining chapters describe how this assessment has been performed, as well as providing the assessment's results. In particular:

- Chapter 2 provides a discussion on general risk assessment concepts and how they are used to provide a measure of human health risks. The methodology used to perform the analysis is also outlined in this section.

- Chapter 3 defines the various site operations, as they pertain to each program area/alternative combination.

- Chapter 4 outlines routine operation scenarios and accident scenarios used in the evaluation of the various program area/alternatiave combinations.

- Chapter 5 provides the numerical results of the analysis, as well as a brief discussion of the findings for each alternative.

- Chapter 6 presents conclusions from this study, including potential prevention and mitigation measures to reduce risk.

- Chapter 7 provides a list of documents containing information that was utilized for this study, or documents containing additional information that may be of interest to the public.

- Attachment A is a detailed summary of reasonably foreseeable accidents evaluated for each alternative and program area.

Figure H-1. NTS and Selected Areas of Interest

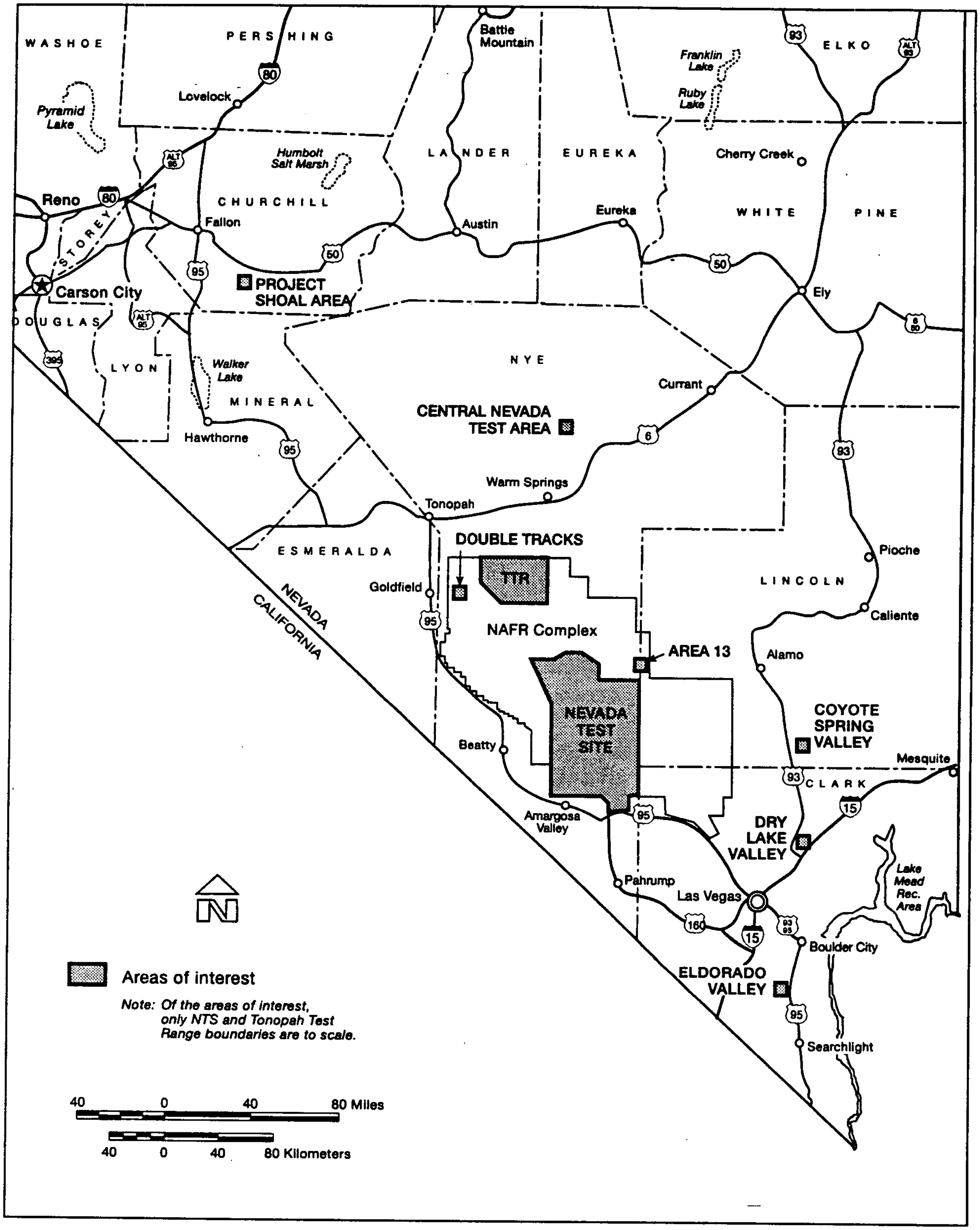


Table 1-1. Matrix of Alternatives Versus Programs Applicable to Each Site

	Defense	Waste Management	Environmental Restoration	Nondefense Research and Defense	Work for Others	Site Support Activities
Alternative #1 No Action - Continue Current Operations	NTS TTR	NTS	NTS CNTA Project Shoal Area TTR NAFR Complex	NTS	NTS TTR	NTS TTR
Alternative #2 Discontinue Operations	TTR	No DOE/NV Activities	No DOE/NV Activities	No DOE/NV Activities	TTR	NTS TTR
Alternative #3 Expanded Use	NTS TTR	NTS	NTS CNTA Project Shoal Area TTR NAFR Complex	NTS Coyote Spring Valley Eldorado Valley Dry Lake Valley TTR	NTS TTR	NTS TTR
Alternative #4 Alternate Use of Withdrawn Lands	TTR	NTS	NTS CNTA Project Shoal Area TTR NAFR Complex	NTS Coyote Spring Valley Eldorado Valley Dry Lake Valley TTR	TTR	NTS TTR

This Page Intentionally Left Blank

2.0 RISK ASSESSMENT CONCEPTS AND METHODOLOGY

Risk assessment is the quantitative process of estimating the consequences to human health resulting from a release of contaminants to the environment. This risk assessment study focuses on the assessment of both radiological and chemical contaminants and their effects upon human health, as well as risks posed to human safety from occupational hazards. A brief discussion on the general concepts of risk assessment; as well as specifics concerning radiological, chemical, and safety assessments are presented below.

2.1 General Risk Assessment Concepts

Risk assessment is a multidisciplinary subject requiring the identification of events with the potential for a failure that could lead to an undesirable outcome (scenario), the prediction of contaminant types subject to release and their concentrations, the description of environmental transport (the identification of potential exposure pathways) the calculation of internal and external dose, and the extrapolation of this dose to human health effects. The purpose of a risk assessment is to illustrate the relationship between the types and quantities of contaminants released, and the effects they are expected to have on human health. The risk assessment process follows the contaminant of interest from its point of origin along various pathways in the environment. In addition, the risk assessment process is used to evaluate the various mechanisms that enable the transport of the contaminant to a human. These transport mechanisms can be either air, water, soil, or food. Once the contaminant's transport mechanism and the amount of contamination the human can be exposed to (the source term) are determined, the dose (the actual amount of contamination that the human's body will be subjected to) and the resulting risk to human health can be calculated.

2.1.1 Source Term and Its Link to Human Dose

The source term is a description of the chemical, radioactive, and toxic constituents that a human has the potential to be exposed to in a given scenario. The source term must not only identify the contaminants of concern, but their expected concentrations as well. The identification of the source term is a significant part of the risk assessment process. It is significant not only because the effect of each contaminant will be assessed for its impact upon human health, but multiple effects created from the presence of a combination of contaminants will also have to be evaluated.

The primary mechanisms used to transport the source term within the environment are air, surface water, and groundwater. To assess the degree to which a contaminant may become mobile in an environment, a few key parameters must be defined. These parameters include the contaminants chemical form, solubility in air and water, and physical state (e.g., liquid, solid, or gas). One main objective of a risk assessment is to predict the concentrations of contaminants that will reach humans, either through direct paths (e.g., inhalation, absorption), or indirect paths (e.g., consumption of contaminated water). Environmental transport modeling is used to estimate the amount of contamination present in a transport mechanism (e.g., air, water, soil, or food), and estimate the amount of contamination that is available to a person.

Human consumption rates of various food/water commodities as well as human metabolic rates are important links between the source term that is available to a human, and the actual intake dose to which the human body may be subjected. Once the human dose has been calculated, the detriment to human health can be estimated by multiplying this number by one or more risk factors. A risk factor is a numerical correlation between a dose, and the effect it will have on a human. Risk factors are based largely on epidemiological data, primarily from studies examining radiological and chemical health effects.

2.1.2 Radiological Effects

Radionuclides present in air, water, soil, or food can be inhaled/ingested into the human body, becoming incorporated into tissues and organs, causing resulting in internal irradiation of body organs. In addition, humans can be exposed to radionuclides as their skin absorbs radiation that is being emitted from external sources. Topics discussed here will include radioactive particles, radioactive decay, fission, fusion, and radioactive waste categories, as well as the terminology associated with the assessment of radiological exposure.

2.1.2.1 Nuclear Reactions: Radioactive Decay, Fission, and Fusion. All matter is composed of atoms. Through natural or man-made processes, atoms of elements can be placed into an unstable state. When an atom is in an unstable state, its nucleus (made up of protons and neutrons) will release energy in order to regain its stability. This alteration occurs as a result of either the radioactive decay, fission, or fusion process.

Radioactive decay is a process whereby the nuclei (plural of nucleus) of unstable atoms release or emit energy to regain their stability. This energy is emitted in the form of alpha particles, beta particles, or gamma rays, termed ionizing radiation. As this energy passes through a material, it can change the chemical structure as well as the behavior of the material's atoms. It is through this process of chemical structural change that radiation can lead to biological damage in humans. The level of damage is dependant upon several factors, including the amount of energy taken in by the human body.

Fission is the process whereby a large nucleus (e.g., uranium-235) splits into two fragments, resulting in the release of energy. In each fission neutrons are released. These neutrons may go on to produce fissions of nearby nuclei. If a neutron goes on to cause additional fissions and the process is repeated again and again, the effect is a self-sustained chain reaction. This condition is termed as the attainment of 'criticality.' When the energy released in the process of fission is controlled (as it is within a nuclear reactor), its use can be beneficial. Much of the low-level waste that has been shipped to the NTS from other DOE sites contains radioactivity that was generated from the operation of nuclear reactors. The fission process is also one of the fundamental nuclear reactions that may be involved when an underground nuclear weapons test is conducted.

Fusion is the process whereby two light nuclei (e.g., isotopes of hydrogen such as deuterium and tritium) collide and fuse together to form one heavier nucleus and one lighter nucleus. In the process, mass is converted to energy. This nuclear reaction is the process that energizes the sun. The amount of energy released per pound of heavy hydrogen is about four times as much as the amount of energy released per pound of uranium or plutonium in a fission reaction. The fusion process is another nuclear reaction that may be involved when an underground nuclear weapons test is conducted.

The processes of radioactive decay, fission, and fusion produce three main types of ionizing radiation: alpha particles, beta particles, and gamma rays. None of these can be detected by our senses. Each type of radiation can have a different level of energy, and thus have varying abilities to penetrate and harm the human body. Because each type of radiation poses a unique hazard to human tissue, individual characteristics must be noted when assessing radiological impacts upon human health.

2.1.2.2 Units of Measure. The biological effects of ionizing radiation vary according to the type of radiation, the dose received, and the type of cell affected. Any dose of radiation can damage body cells. However, at low radiation levels, such as those administered to patients receiving x-rays or those that may be received by workers handling radioactive wastes, damage to the cells is so slight that they can usually either repair themselves or be replaced by the regeneration of healthy cells. Special standards of measurement are used to gauge radiation and its effects. The most common units associated with radiological properties are the curie, picocurie, roentgen, radiation absorbed dose (rad), roentgen equivalent man (rem), person-rem, and effective dose equivalent. For purposes of radiation protection and the calculation of population dose, one must also know the half-lives of all radionuclides that make up the source term. Definitions of these terms are provided below.

- *A curie (Ci)* - is a unit of radiation that describes the numbers of atoms undergoing radioactive decay in a period of time. One curie is equal to 37 billion disintegrations per second.
- *A picocurie (pCi)* - is one trillionth of a curie ($1x10^{-12}$ Ci).
- *Roentgen*- measures the amount of energy (or ionization) produced by gamma radiation.
- *Radiation absorbed dose (rad)* - is the amount of energy absorbed by a material.
- *Roentgen equivalent man (rem)* - is used to equate the biological damage done to organisms resulting from radiation. The unit rem is used, regardless of the type of ionizing radiation being evaluated. Neither the roentgen nor the rad gives an indication of biological damage.
- *Person-rem* - is defined as the collective total dose to a population. Person-rem is calculated by summing the individual doses of each member of the population. For example, if 100 workers each received 0.1 rem, then the collective dose would be 10 person-rem (100 persons x 0.1 rem).
- *Effective dose equivalent* - measures the amount of damage to the exposed individual's body as a result of the radiation exposure. The effective dose equivalent can be used to estimate the exposed individual's risk of health effects. Effective dose equivalent takes into account variables, such as the different susceptibilities of certain body tissues to different forms of radiation. The effective dose equivalent is often referred to simply as 'dose,' and is measured in units of rem.
- *A radiological half-life* - is the length of time required for an initial amount of a radioactive substance to be reduced down to ½ of its original amount, due to radioactive decay.

Human exposures are often classified into two categories, acute exposure and chronic exposure. An acute exposure is a large dose that is received by an individual over a few hours or less. With chronic exposure an individual is exposed to small doses repeatedly, over a long period of time (months to years). It is the general consensus that there is no threshold for radiation induced health effects based on the linear non-threshold hypothesis.

2.1.2.3 Radioactive Waste Types. Natural and man-made radiation area is produced on earth many ways. Natural forms of radiation include background radiation, such as the decay of naturally-occurring radioactive elements located in the earth's crust. In addition, radioactivity exists naturally within the human body. It comes mostly from potassium, which is an essential element for human health. Scientists have also deliberately created sources of ionizing radiation as a result of conducting various practices. These practices include nuclear-power generation of electricity, diagnostic and therapeutic medical techniques, non-destructive testing of pipes and welds, and the production and testing of nuclear weapons. These practices result in the generation of radioactive waste.

The DOE manages various types of radioactive wastes, generated in a large part due to weapons production and nuclear-power production research programs. Radioactive waste is defined as a solid, liquid, or gaseous material that contains radioactive nuclides regulated under the Atomic Energy Act of 1954, as amended, and is of negligible economic value given the cost of recovery. Such wastes may be classified as low-level, mixed wastes, transuranic or high level. Descriptions of these waste types that are managed by DOE/NV are provided below.

- Low-Level Waste (LLW) - Radioactive waste not classified as high-level waste, transuranic waste, spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium. Test specimens of irradiated fissionable material may be classified as LLW, provided the concentration of transuranic elements is less than 100 nanocuries per gram.

- Mixed Waste (MW) - Waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the Resource Conservation and Recovery Act of 1954 as amended, respectively.

- Transuranic Waste - Radioactive waste containing 100 nanocuries per gram or more of alpha-emitting radionuclides that have an atomic number greater than 92, and half-lives greater than 20 years.

- The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing of any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation. This will make the document consistent with the waste definitions found in Section 2.4.2 of Volume 1, Chapter 2.

2.1.3 Chemical Effects

When certain natural or man-made materials or substances have harmful effects that are not random, the materials or substances are described as toxic (Ottoboni, 1991). Specific chemicals or biological substances may be labeled as toxic for many reasons, including such things as their ability to cause cancer; to harm or destroy tissue or organs; or to harm systems within the body, such as reproductive, immune, blood-forming, or nervous systems. A brief discussion on the types of toxic substances is provided below:

- Carcinogens are substances known to cause cancer in humans, or are known to cause cancer in animals and therefore may be capable of causing cancer in humans. Examples of human carcinogens include asbestos, benzene, and vinyl chloride (Kamrin, 1988). Cancers for which the cure rate is low and for which the period between diagnosis and death is usually short, are termed *fatal cancers*. Cancers for which the fatality rates may be low, but for which there can be either physical or psychological reasons for a reduced quality of life, are termed nonfatal cancers.

- Noncarcinogens are substances that may not be known to cause cancer, but may be capable of causing harm, such as invoking mutagenicity in a human. Mutagenicity is the capability of a substance to cause permanent alteration of genetic material within living cells contained in the human body. Serious disabilities that may be transferred to offspring of parents that have been exposed to mutagens are termed genetic disorders. Latency is a term used to describe the period of time between the point of exposure and the resulting effect of the exposure on the human body.

Even though chemical or biological substances may be determined to be toxic, many factors influence whether the inhalation or ingestion of a particular substance may have a toxic effect on a human. These factors include:

- How much of the substance the person comes into contact with, and

- Whether the person inhales or ingests the substance in a short period of time (an acute exposure), or inhales or ingests relatively small amounts of the substance repeatedly, over long periods of time (a chronic exposure).

Scientists determine a substance's toxic effect (known as toxicity) by performing controlled tests on biological organisms. During these tests specific parameters are examined to measure the toxicity of a substance on a biological organism. These parameters include the dose-response relationship, and the threshold concept.

- Dose-response Relationship - The dose-response relationship is a curve showing the percentage of organisms with observable toxic effects versus the dose administered. This curve is established as a result of controlled tests on biological organisms. Once a dose is administered, it is increased until all of the biological organisms being tested are affected, and then is decreased until none of the biological organisms being tested are affected.

- Threshold Concept - The threshold concept suggests that most toxic substances will produce no effect on a biological organism if the substances are given in small enough amounts. Thus, the threshold can be defined as the largest amount of a particular substance that will not affect an organism.

2.1.4 Exposure Pathways

The magnitude of a human's exposure to a contaminant, whether it be radiological or chemical, is dependent on how the contaminant travels throughout the environment. The sequence of events which enables the contaminant to reach a person after it has been released into the environment is termed the 'exposure pathway.'

Exposure pathways can be both numerous and varied. In some cases exposure pathways are relatively simple, such as the direct exposure to radiation. In other cases exposure pathways may be complex processes. For example; radioactive particles may be released into the air due to an explosion, they then may fall out of the air and be deposited onto grass, the grass may then be eaten by a cow, radionuclides ingested by the cow may be transferred into its milk, which is then consumed by humans.

Normal and emergency operations at some DOE facilities have the potential to expose workers and members of the public to radioactive or toxic materials. To maintain high levels of safety, specialists analyze exposure scenarios possible for normal operations and accidents. The materials involved and any protective measures in place, that may lessen the consequences, are considered when evaluating these scenarios. The following list describes the four conditions that must exist to form a scenario, by which radioactive or toxic materials can be transported through the environment to workers or the public:

- Source Term - The contaminant(s) released to the environment.

- Environmental Transport Medium - Air, surface water, groundwater, or the food chain.

- Exposure Route - The method by which a contaminant may reach a person.

- Human Receptor - The person or group of people that can be or is exposed to the contaminant.

Using these elements in an example, one scenario might involve gases containing a contaminant (the source term) released from a stack. These gases are transported by the wind (the environmental transport medium). The air containing the contaminants is inhaled (the exposure route) by a worker (the human receptor). No matter which exposure pathway a scenario involves, local environmental factors such as the density of the region's population, its sources of water, agricultural practices, and weather patterns, may play a big role in determining whether or not the contaminant will reach a human receptor.

2.1.5 Occupational Risks

Human health can be at risk not only from radiological and chemical substances, but can also be at risk from physical hazards that are routinely present at a place of work, or from accidents that may happen during the course of performing routine activities at work.

Routine occupational hazards have the potential to inflict bodily injury upon personnel that are performing normal day-to-day work activities. Examples of these hazards may include electrical shock, slipping or falling, falling objects and hazards normally associated with various types of equipment usage. Scenarios portraying routine occupational activities are examined to estimate the risks associated with performing these activities.

Occupational hazards that may occur as a result of an accident are also examined. Examples of occupational hazards that may occur as a result of an accident may include bodily injuries resulting from equipment malfunctions due to a design flaw or due to human error; material spills or leaks; or accidents resulting from natural phenomenon, such as tornados or earthquakes. Scenarios portraying occupational hazards associated with accidents are also examined to estimate the risks associated with performing routine operations within unstable environments.

2.2 Risk Assessment Methodology

This study takes a two-fold approach to the assessment of human health risks and safety impacts. First, human health risks are calculated for proposed activities within each EIS alternative. As noted earlier, risk is defined as the product of probability and consequence. The sum of the risks for all activities within an alternative is the total risk associated with that alternative. The systematic evaluation of risk across all alternatives allows decision makers to make relative comparisons among alternatives on the basis of risk. Although useful as a decision-making tool to discriminate among alternatives, risk by itself does not convey information on the magnitude of adverse consequences in the event that an accident actually occurs. Therefore, to supplement the assessment of risks, the second part of this assessment evaluates the probability and consequences of the maximum reasonably foreseeable accident within each alternative. This allows for the identification of maximum impacts that could be expected if an accident actually occurs.

To evaluate human health risk, three components; scenario, likelihood, and consequence must be identified. The first component, the scenario is made up of either one basic failure event or an initial failure event, followed by subsequent failures that lead to an outcome which may or may not be desirable. The second component, likelihood describes how often the scenario is expected to occur. Likelihood may be expressed as a probability, which is a subjective expression of the belief that something will, or will not, occur (e.g., there is a 70 percent chance of showers tomorrow). Probability is a unitless number and is always between zero and one. Likelihood may also be expressed as a frequency or rate, e.g., 0.07 injuries from construction accidents per year. The third component needed to evaluate human health risks is consequence which is the results of a scenario. To evaluate consequences, specific hazards within the scenario must be defined. For example, to evaluate the consequences of a release of hazardous material, the source term (what substance is released, how much is released, and what form it takes) must be defined and its dispersion predicted. From the exposure caused by the release, a dose is calculated. That dose leads to a predicted health effect, which is the consequence.

Based on DOE guidance (DOE, 1993), events having a probability of occurrence that is more than once in 10 million years (1×10^{-7} per year) are considered to be reasonably foreseeable, and need to be examined to satisfy the purposes of a NEPA review. The accident with the highest consequences to human health having a probability of occurrence greater than or equal to 1×10^{-7} per year is defined as the maximum reasonably foreseeable accident.

2.2.1 Scenario Development

Scenarios that contribute to the risk of proposed activities under the EIS alternatives include both routine operations and accidents. In either case, the identification of scenarios important to human health risk begins with the identification of the principal activities associated with each alternative and the hazards specific to those activities. For example, construction activities may not involve radiological hazards, but instead involve occupational hazards that could result in injuries or fatalities to workers. Section 3 of this report identifies the operations proposed for each program area under each of the four EIS alternatives. These operations are the basis for the identification of hazards and the development of risk scenarios used in this study.

Scenarios for routine operations are not initiated by the failure of any safety system or procedure. In these scenarios, the activity itself involves risk which is managed within acceptable limits as defined by current standards for worker and public safety. Routine operations scenarios include events that could result in exposure of workers or the public to levels of radiation and/or toxic materials within regulatory limits.

Accident scenarios are developed based on the assessment of the hazards associated with specific activities and the engineered designs and safety systems in place to prevent hazards from impacting the health and safety of workers and the public. Accident scenarios require the failure of one or more safety systems or design features to result in an adverse health risk beyond the risk associated with routine operations. For example, a worker handling a drum of radioactive material is exposed to radiation within controlled limits during routine operations, but a handling accident that breaches the drum (a design feature) could result in release of radioactivity from the drum and expose the worker to radiation higher than normal (controlled limits) levels. In addition, if the high efficiency particulate air (HEPA) filters on the building ventilation system (a safety system) also fail, airborne radioactivity could be released to the environment above normal operating levels and result in potential radiation exposure to other workers or members of the public. Section 4.1 of this report summarizes the scenarios used for assessing risk from routine operations and accidents for each EIS alternative.

The general categories of accidents that are reasonably foreseeable for the types of activities proposed in the NTS EIS include construction accidents, mechanical upsets (e.g., forklift accidents), spills involving radioactive or chemically hazardous materials, fires, and explosions. A potential accidental venting of radionuclides from an underground nuclear-yield test is also evaluated. The occurrence of any accident requires an initiating event that causes the failure of design features or safety systems. The initiating event can be operations related, such as human error or equipment failure; or it can be an external event, such as an earthquake, high winds, or a flood.

2.2.2 Probability Analysis

An analysis of probability is not needed for routine operations scenarios because the events are assumed to occur. Therefore, the probability of routine operations scenarios is always 100 percent.

Accident scenarios require an initiating event that is accompanied by the failure of one or more safety systems or design features. Determination of the probability of an accident scenario requires the calculation of individual probabilities for the initiating event, and the failure probabilities of the safety features designed to prevent the accident. For example, the probability of an earthquake (the initiating event) in the vicinity of a radioactive waste storage facility may be once in 1000 years (1×10^{-3} per year). The probability that the earthquake is of sufficient magnitude to cause the building structure to fail and allow a release of radioactivity into the environment may be one out of 10 earthquakes (0.1). The probability that waste drums are breached (a design failure) from falling or crushing forces may be one out of ten (0.1). Because the total probability of this accident scenario is the product of the individual event probabilities that make up the scenario, the probability of this scenario occurring is calculated as $P = (1 \times 10^{-3}$ per year$) \times (0.1) \times (0.1) = 1 \times 10^{-5}$ per year, or once in 100,000 years.

Data for the calculation of accident scenario probabilities are derived from a variety of sources and include scientific studies of natural phenomena hazards, structural design guidelines for nuclear facilities, equipment failure rates, and accident statistics that have been compiled over many years by the DOE and other government agencies.

2.2.3 Consequence Analysis

The activities proposed under the NTS EIS alternatives could result in human health consequences occurring as a result of normal operations or accidents. These consequences may result from either physical hazards (e.g., construction accidents, industrial accidents) or material hazards (e.g., exposure to radioactive or toxic materials). The principal consequences of routine operations include small increases in the likelihood of cancer or other detrimental health effects to workers and the public from exposure to regulated amounts of radiation or toxic materials. The consequences of accident scenarios may include injuries or fatalities to workers from physical hazards, as well as increased likelihood of cancer or other detrimental health effects to workers and the public from accidental releases of radioactive or toxic materials.

The analysis of consequences for releases of radioactive or toxic materials is a multiple-step process. For a given scenario, the analyst first determines the material at risk (which is the amount of radioactive or toxic material affected in the scenario). In the case of an airborne release scenario, the event will cause some fraction of the material at risk to become airborne. Release fractions have values between zero and 100 percent depending on the physical and chemical properties of the material and the type of accident (e.g., spill, fire, explosion, etc.). The product of the material at risk and the release fraction is the amount of material that actually becomes airborne this airborne material is referred to as the source term. The source term may be reduced by mechanisms such as filtration, gravitational settling, radioactive decay, or other factors depending on the path the material must travel to reach a human receptor.

Once the source term is developed, the analyst must assess the possible exposure pathways through which the material could impact workers or the public. The exposure pathways identified as being of most importance to risk in this study were inhalation of airborne contamination, ingestion of contaminated well water, and direct exposure to radiation. Other pathways that were evaluated include absorption of contamination through skin contact, consumption of contaminated crops, livestock, and milk.

For most scenarios, a transport mechanism is required to move the radioactive or toxic material from its source to a location where a person could be exposed. For example, building ventilation and wind can result in the atmospheric transport of contamination. Infiltration of precipitation into contaminated soil and eventually the groundwater can result in subsurface transport of contamination. The transport and dispersion of contaminants released were modeled using computer programs designed to simulate the atmospheric and hydrologic characteristics of the region. The result of this atmospheric or groundwater transport modeling is a dispersion factor. This dispersion factor is used to calculate the amount of contaminants that a human receptor could be exposed to downwind or downstream from the point of the release by accounting for natural processes of mixing and dispersal in the atmosphere or groundwater.

In the accident scenario, it is assumed that the human receptor is exposed by inhaling contaminated air or ingesting contaminated groundwater. The dose (the amount of radiation or chemical substance that a person receives) is calculated based on the concentration of the contaminated material taken into the body by breathing air or drinking water, as well as an average individual's breathing rate/ingestion rate, and the duration of the exposure. Potential health effects are estimated by multiplying the dose by health risk factors developed by the International Commission on Radiological Protection (ICRP, 1991) and the Environmental Protection Agency in *Health Effects Assessment Summary Tables (HEAST), FY-1995 Annual* (EPA 1995a), and in the *Integrated Risk Information System (IRIS) (For Microcomputers)* (EPA, 1995b).

Exposure to direct radiation is a pathway of importance principally for workers who work in close proximity to sources of radiation. Worker exposure by this pathway is estimated based on previous records of occupational radiation exposure for workers engaged in similar work activities, and estimates of the number of workers expected to be involved in each program activity. For example, if workers engaged in waste handling activities have previously received average individual doses of 0.1 rem per year, 10 workers would be estimated to receive a collective dose of 1 person-rem per year (0.1 x 10), or 10 person-rem in 10 years.

Consequences of accidents involving physical impacts to workers include injuries or fatalities, and are estimated using accident statistics developed by the U.S. Department of Labor and other sources.

2.2.4 Health Effect Risk Factors

Potential human health effects from exposure to radiation are estimated using risk factors developed by the ICRP, (1991) and are shown in Table 2-1. The predominant risk from radiation exposure is death from cancer. Radiation-induced cancers may have a latency period, that is a delayed onset of up to 20 years or longer. Therefore, this health effect is referred to as latent cancer fatality (LCF). Radiation exposure can also result in other detrimental health effects such as non-fatal cancers and genetic effects.

In this study, these other health effects are collectively referred to as radiation detriment. High doses of radiation in short periods of time can produce other health effects, including death. Potential human health effects from exposure to toxic chemical materials may include cancer as well as a wide range of other health effects depending on the toxicology of the material. Cancer risks are estimated using risk factors developed by the EPA. Risk factors are values used to estimate the potential of an individual developing cancer as a result of exposure to a carcinogenic substance (EPA, 1995a; EPA, 1995b). Noncancer health effects are evaluated in terms of a hazard index. Most noncancer health effects have a threshold dose which is the amount of a particular toxic substance below which no adverse effect has been observed. The hazard index is calculated by dividing the estimated dose by the threshold dose.

Because the methodology used to estimate the non-carcinogenic effects of hazardous substances is based on the assumption of linear time-independent dose response, Emergency Response Planning Guideline (ERPG) values associated with each chemical substance were defined. The ERPG values were used to identify any immediate health effects that could occur as a result of an acute exposure to a chemical substance.

2.2.5 Modeling of Risks from Subsurface Radioactivity

Residual radioactivity from underground nuclear weapons tests remains at various locations on the NTS and at two offsite test areas. Tritium, a radioactive isotope of hydrogen, is the material of principal concern because of its mobility in the form of water and its higher concentration compared to other radionuclides. The migration of tritium from underground test areas to locations outside the current control of the U.S. government has been evaluated in several studies: *Risk-Based Screening Analysis of Ground Water Contaminated By Radionuclides Introduced At The Nevada Test Site (NTS)* (Daniels et al., 1993); *A Fracture/Porous Media Model of Tritium Transport In The Underground Weapons Testing Area, Nevada Test Site* (GeoTrans, 1995); *Exposure Assessment of Groundwater Transport of Tritium From The Shoal Site* (Chapman et al., 1995); and *Exposure Assessment of Groundwater Transport of Tritium From The Central Nevada Test Area* (Pohlmann et al., 1995). The first two studies evaluated tritium migration from underground test sites located within the NTS boundaries. The other studies evaluated tritium migration from underground test sites in Nevada at the Shoal and Central Nevada Test Areas, which are located off of the NTS in Churchill and Nye counties, respectively. For efficiency and because of differences in scale, different model codes were used in these evaluations. The MC_TRANS model was used for the NTS; and for the off-site locations, the approach detailed in Daniels et al. (1993), was employed Both models account for standard transport phenomenon (advection, dispersion, decay, sorption, and mass transfer). The transport analysis in the GeoTrans study included an evaluation of the effects of matrix diffusion (the movement of radionuclides from fractures into the unfractured rock). Such an approach is considered appropriate for the regional scale NTS model, because it is known that

Table 2-1. Risk of Latent Cancer Fatalities and Other Detrimental Health Effects from Exposure to Radiation[a,b,c]

Population[d]	Latent Cancer Fatality	Radiation Detriment[e]
Workers	0.0004	0.00016
General Public	0.0005	0.00023

[a] When applied to an individual, units are lifetime probability of latent cancer fatalities per rem (or 1,000 millirem) of radiation dose. When applied to a population of individuals, units are excess number of cancers per person-rem of radiation dose.
[b] Source: ICRP (1991).
[c] For individual doses greater than 20 rem or 10 rem/hour dose rate, the ICRP risk factors for LCF and other detriment are doubled (ICRP, 1991).
[d] The difference between the worker risk and the general public risk is attributable to the fact that the general population includes more individuals in sensitive age groups (that is, less than 18 years of age and over 65 years of age).
[e] Radiation detriment includes health effects such as nonfatal cancers and genetic effects.

transport through many miles of fractured rock is necessary before any transport to site boundaries could occur. Given the differences between the types of sites, the nature of transport at each site, and the numerical solutions used, the results of the two different models provide comparable results. Additional evaluations of key transport characteristics are underway as part of the Environmental Restoration Program for the underground testing areas.

2.2.5.1 Underground Test Locations Within NTS Boundaries. Transport of tritium from test locations on the NTS has been evaluated in a number of recent studies. Daniels et al. (1993) and Andricevic et al. (1994) examined the groundwater flow path from Pahute Mesa to Oasis Valley and performed a screening assessment of potential risks to a hypothetical member of the public at the nearest uncontrolled area boundary in Oasis Valley. A more recent study conducted by GeoTrans (1995) also examined the flow path from Pahute Mesa to Oasis Valley, evaluated flow paths from Pahute Mesa to Amargosa Valley, and from Yucca Flat to the boundary of the NTS south of Mercury, Nevada. Each of the three studies based their radioactivity source terms on a compilation of observed concentrations in test cavity samples. The maximum observed concentration of tritium was 7.6 x 10^9 pCi/L obtained from the Cambric shot cavity in 1977. Other samples that have been collected had lower concentrations. Daniels et al. (1993) and Andricevic et al. (1994) assumed all groundwater at the source is contaminated to the highest observed tritium concentration of 7.6 x 10^9 pCi/L, while GeoTrans (1995) assumed an average groundwater concentration of tritium at the source of 1 x 10^9 pCi/L.

Daniels et al. (1993) and Andricevic et al. (1994) calculated potential human health risks associated with ingestion of tritium-contaminated groundwater over a 70-year lifetime. The committed effective dose to the maximally exposed individual was calculated by summing over the 70-year exposure period the products of the annual estimate of tritium concentration in groundwater, the age-related annual intake of tap water, and the age-specific dose conversion factor for each year of a 70-year lifespan. The risk of fatal cancer from the lifetime committed effective dose was calculated using the risk factor of 5 x 10^{-4} latent fatal cancer per rem (ICRP, 1991). Details of the human health risk calculations can be found in Daniels et al. (1993).

GeoTrans (1995) calculated tritium concentrations at potential receptor locations but did not calculate human health risk. This EIS estimated the committed effective dose to the maximally exposed individual by assuming ingestion of tritium-contaminated groundwater over a 70-year lifetime at the maximum concentrations calculated in GeoTrans (1995). The following equation was used for this calculation:

$$D_{70} = C \times I \times T \times \Phi$$

where,

D_{70} = Dose from 70-years ingestion of tritium in water (rem)
C = Tritium concentration in well water (pCi/L)
I = Annual residential water consumption (L/yr)
T = Exposure time (yr)
Φ = Internal dose conversion factor for tritium (rem/pCi)

Health effect risks from the estimated doses were calculated using the risk factors for the general public listed in Table 2-1.

2.2.5.2 Underground Test Locations Outside NTS Boundaries. Assessment of the groundwater transport of tritium from two off-site test locations, the Shoal site and the Central Nevada Test Area, were performed by the Desert Research Institute (Chapman et al., 1995; Pohlmann et al., 1995). Both assessments calculate the transport of tritium in groundwater from the test locations to the boundary of the current DOE land withdrawal, where no wells currently exist, and to the first existing wells along the flowpaths. Exposure scenarios assume an individual drinks contaminated water for 70 years around the time of peak tritium concentration.

The committed effective dose to the maximally exposed individual was calculated by summing over the 70-year exposure period the products of the annual estimate of tritium concentration in groundwater, the age-related annual intake of tap water, and the age-specific dose conversion factor for each year of a 70-year lifespan. The risk of fatal cancer from the lifetime committed effective dose was calculated using the risk factor of 5×10^{-4} latent fatal cancer per rem (ICRP, 1991). Details of the human health risk calculations can be found in (Daniels et al., 1993).

The health risks calculated by these two assessments are included in the results presented in Section 5 of this study.

2.2.6 Modeling of Risks from Routine Operations and Accident Scenarios

Section 4 of this study identifies the scenarios used for the estimation of risks for routine operations and accidents. This study evaluates 33 types of scenarios and calculates human health risks using the three components of risk (scenario, probability, and consequence) discussed earlier.

The detailed methodology for risk to workers associated with normal occupational radiation exposure; and the risk of physical injury or fatality to workers due to equipment accidents, falls, hoisting and rigging, and other activities is described in *Summary of the Human Health Risks for Safety Impacts Study for the Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996).

The methodology for risk to workers and the public associated with reasonably foreseeable accidental release of radioactivity or hazardous chemicals is summarized in Attachment A and described in detail in *Accident Assessments For Nevada Test Site Facilities And Off-Site Locations* (SAIC, 1996). The accident assessment followed a systematic approach to identify all facilities and operations involving radioactive material or hazardous chemicals associated with the four proposed alternatives, the five program areas, and the NTS and offsite locations. Attachment A summarizes the methods used to select and model the consequences of reasonably foreseeable accidents, and provides tables showing the probability and consequence of each postulated accident by alternative, program area, and location.

This Page Intentionally Left Blank

3.0 NORMAL SITE OPERATIONS BY ALTERNATIVES

The NTS has been involved in supporting DOE as well as other national-security related research, development, testing programs, and waste management. General descriptions of programs and activities that accompany these policies are presented in Section 3.1 below. Individual programs and activities that are associated with each of the four alternatives being evaluated in the NTS EIS are identified in Section 3.2.

3.1 Programs and Activities Associated with the NTS

The NTS plays a major role in the implementation of DOE policies by participating in full partnership with the scientific and academic communities, business and industry, and community groups. The ways in which the NTS fulfills this role, through the programs and activities are discussed below.

For management purposes, the projects and activities at the NTS have been categorized into five program areas. These are defense, environmental restoration, waste management, nondefense research and development, and work for others. In addition to these five program areas; services, such as fire protection and communications needed to support each of these program areas, are placed into a sixth category of Infrastructure.

3.1.1 Defense Program

The primary missions of the Defense Program at the NTS involve helping to ensure the safety and reliability of the nation's nuclear weapons stockpile. The NTS has a long history in participating in the nation's stockpile stewardship program. This stewardship program includes maintaining the readiness and capability to conduct underground nuclear weapons tests, and to conduct such tests if so directed by the President. A potential accident associated with an underground nuclear-yield test is considered in the human health risk assessment for Alternatives 1 and 3.

Although there have been no underground nuclear tests conducted at the NTS since entering into the test-ban passed by Congress, research and weapons test verification activities have been conducted in the past at the Project Shoal Area, the Central Nevada Test Area, the Nellis Air Force Range, the Tonopah Test Range (TTR), and the NTS. This past testing resulted in a release of radioactive contaminants into the surrounding environment. Currently, the DOE is working in cooperation with other agencies to define remediation and clean-up levels for these geographical areas. These activities are included within the Environmental Restoration Program.

3.1.2 Environmental Restoration

The goal of the Environmental Restoration Program is to ensure that risks to the environment and to human health and safety, as posed by inactive and surplus facilities and sites, are eliminated or reduced to protective levels. Specific investigations and risk assessments are being conducted to determine the extent of contamination, the potential human health or environmental exposure to that contamination, and to compare that exposure to established standards for protection of human health and the environment.

Prior to the early 1980s, the major focus of environmental restoration was the decontamination of testing areas for future use, and the identification of contaminated areas that required restricted access. Starting in the 1980s, environmental restoration at the NTS grew significantly as compliance with the nation's environmental statutes was enforced. Environmental site characterizations, remediations, and closures were primarily driven by the Resource Conservation and Recovery Act (RCRA). During this time, underground storage tanks and PCBs were removed, and hazardous waste disposal trenches were closed. The DOE remains committed to the goal of cleaning up contaminated areas to safeguard human health. Ongoing assessments to identify and remediate contamination will continue in pursuit of this goal. The shift in emphasis from weapons development, testing, and production to environmental restoration has resulted in a much greater volume of waste being generated. This generation of waste has created a continuing need for the evolvement of the Nevada Test Site's Waste Management Program.

3.1.3 Waste Management

The NTS presently serves as a disposal site for low-level waste and as a storage site for a limited amount of transuranic mixed wastes. A formalized Waste Management Program at NTS was started in 1961. The management of radioactive wastes generated at the NTS and other DOE-approved facilities across the United States has been an ongoing mission of the NTS. Wastes have been and are generated as a result of a variety of DOE activities including nuclear energy research, defense programs, and more recently, as a result of environmental restoration programs. The DOE has a need to continue a practical, cost-effective, and environmentally sound means of radioactive waste disposal.

3.1.4 Nondefense Research and Development

The DOE has historically supported a variety of research and development activities at the NTS and other sites in Nevada in cooperation with universities, industry, and other federal agencies. Examples of this include:

- The National Environmental Research Park Program, supports environmental research activities at the NTS, such as research on the safety aspects of handling, shipping, and storing hazardous fluids and liquefied gaseous fuels.
- The Corporation for Solar Technology and Renewable Resources, with funding provided by the DOE, is studying the feasibility of locating and constructing a solar energy facility within the state of Nevada.
- Although the Tonopah Test Range provides research and development test support for DOE-funded weapons projects, it represents a unique test environment both in location and capabilities, and is available for use by other government agencies and their contractors.

3.1.5 Work for Others

The Work for Others Program, hosted by the DOE, includes the shared use of certain facilities and resources with other federal agencies. Historically, this has been done when these agencies require a large, remote, and secured area, such as that offered by the NTS. Typical users of the past have utilized the NTS to conduct training exercises and research and development projects.

The NTS has also played a key role in the areas of nuclear nonproliferation and verification of associated international treaties. Sensitive isotope analysis techniques, derived from nuclear chemistry applications to tests, are being developed for treaty monitoring and intelligence analysis. Development is being advanced by the analysis of underground test residue conducted within environmental studies at the NTS. Additionally, nonnuclear high-explosive experiments at the NTS support design calculations for technologies aimed at disarming nuclear devices. The performance of research in the area of hydrodynamics, is also performed under Work for Others Programs.

3.1.6 Site Support Activities

The various programs being conducted at the NTS require a number of support services. These services include transportation, communication, utilities, monitoring, security systems, as well as equipment and personnel to render facility construction and maintenance services.

3.2 Programs by Alternative

The implementation of each alternative will have varying affects upon the programs taking place at the NTS. Table 3-1 identifies activities carried out under each of the major program areas. The following sections summarize which programs will be carried out under each of the proposed alternatives.

Table 3-1. Comparison of Program Activities for the Alternatives (Page 1 of 4)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Stockpile Stewardship - Maintain Readiness to Test - Conduct Underground Nuclear Weapons Testing (if directed) - Conduct Dynamic Experiments, including Subcritical Experiments, and Hydrodynamic Tests - Conduct Conventional High-Explosive Testing - Destroy Damaged Nuclear Weapons **Nuclear Emergency Response** - Nuclear Emergency Search Team - Federal Radiological Monitoring and Assessment Center - Aerial Measuring System - Accident Response Group - Radiological Assistance Program - Internal Emergency Management Program **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests	**Stockpile Stewardship** - Discontinue All Activities **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests	**Stockpile Stewardship** - Maintain Readiness to Test - Conduct Underground Nuclear Weapons Testing (if directed) - Conduct Dynamic Experiments, including Subcritical Experiments, and Hydrodynamic Tests - Conduct Conventional High-Explosive Testing - Construct Nuclear Weapons Simulators - National Ignition Facility (if selected in Stockpile Stewardship and Management Programmatic EIS) - Destroy Damaged Nuclear Weapons **Stockpile Management** - Store Nuclear Weapons - Disassemble Nuclear Weapons - Assemble Nuclear Weapons - Modify and Maintain Nuclear Weapons - Test Weapons Components for Quality Assurance - Provide Interim Storage of Pits **Nuclear Emergency Response** - Nuclear Emergency Search Team - Federal Radiological Monitoring and Assessment Center - Aerial Measuring System - Accident Response Group - Radiological Assistance Program - Internal Emergency Management Program **Storage and Disposition of Weapons-Usable Fissile Materials** - Store Weapons-Usable Fissile Material - Disposition Weapons-Usable Fissile Material - Construct New or Modify Tunnel Complexes - Increase Robotic Technology Experiment - Construct New or Modify Existing Structures - Heavy Industrial Facility **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests	**Stockpile Stewardship** - Discontinue All Activities **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests

Table 3-1. Comparison of Program Activities for the Alternatives (Page 2 of 4)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Area 3 Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste Closure: - Disposal Crater Complex UE3ax/bl - Disposal Crater Complex UE3ah/at **Area 5** Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste - Nevada Generated Mixed Waste - Greater Confinement Waste Storage: - Nevada Generated Mixed Waste - Transuranic Waste - Mixed Transuranic Waste - Hazardous Waste Closure Activities: - Close Designated Low-Level Waste Disposal Units - Close Designated Mixed Waste Disposal Units - Close Designated Greater Confinement Disposal Units **Area 6** Storage Activities: - PCB Waste Disposal Activities: - Hydrocarbon Landfill **Area 11** Treatment Activities: - Explosive Ordnance Disposal Unit	No Activity	**Area 3** Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste Closure: - Disposal Crater Complex UE3ax/bl - Disposal Crater Complex UE3ah/at Construction: - Future Low-Level Waste Disposal Pit - Building 3-302 (expansion) - Area 3 Truck Decon Station **Area 5** Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste - Nevada Generated Mixed Waste - Greater Confinement Waste Storage: - Nevada Generated Mixed Waste - Transuranic Waste - Mixed Transuranic Waste - Hazardous Waste Facility Construction Activities: - Breaching and Sampling Facility - Real-Time Radiography - Transuranic Waste Certification Facility - Transuranic Waste Handling and Loading Facility - Mixed Waste Storage Pad - Mixed Waste Disposal Units - Low-Level Waste Disposal Units - Greater Confinement Disposal Units - Hazardous Waste Storage Pad (expansion) - Water Supply Line - Access Control Building - Maintenance Building - 5-01 Road Reconstruction (may not be necessary) - 5-07 Road Reconfiguration (may not be necessary) - 500-Year Flood Protection - Low-Level Waste Storage Facility - Fire Protection Utilities - Telephone System Closure Activities: - Close Designated Low-Level Waste Disposal Units - Close Designated Mixed Waste Disposal Units - Close Designated Greater Confinement Disposal Units Treatment Facility: - Cotter Concentrate Mixed Waste **Area 6** Storage Activities: - PCB Waste Treatment Activities: - Low-Level Liquid Waste Treatment Facility - Mixed Liquid Waste Treatment Facility Disposal Activities: - Hydrocarbon Landfill **Area 11** Treatment Activities: - Explosive Ordnance Disposal Unit	**Area 3** Disposal: - Nevada Generated Low-Level Waste Closure: - Disposal Crater Complex UE3ax/bl - Disposal Crater Complex UE3ah/at **Area 5** Disposal: - Nevada Generated Low-Level Waste Storage: - Transuranic Waste - Mixed Transuranic Waste - Hazardous Waste Closure Activities: - Close Designated Low-Level Waste Disposal Units - Close Designated Mixed Waste Disposal Units - Close Designated Greater Confinement Disposal Units Facility Construction Activities: - Water Supply Line - Access Control Building - Maintenance Building - 5-07 Road Reconfiguration - 500-Year Flood Protection - Fire Protection Utilities - Telephone System Treatment Facility: - Cotter Concentrate Mixed Waste **Area 6** Storage Activities: - PCB Waste Treatment Activities: - Low-Level Liquid Waste Treatment Facility Disposal Activities: - Hydrocarbon Landfill **Area 11** Treatment Activities: - Explosive Ordnance Disposal Unit

Table 3-1. Comparison of Program Activities for the Alternatives (Page 3 of 4)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Underground Test Area Corrective Action Unit - Continue Groundwater Monitoring - Continue Drilling Characterization Wells - Evaluate and Implement Remediation Strategies **Soils Media Corrective Action Unit and Part of NAFR Complex** - Continue Studies to Identify, etc. Alternate Remedial Measures - Remove Contaminated Soils on NTS and Nellis Lands - Dispose of Contaminated Soils in Permitted Facilities - Select Alternate Remedial Action Method and Implement **Industrial Sites Corrective Action Unit** - Characterize and Dispose of Environmental Restoration Sites - Continue Field Program to Identify Sites - Dispose of Waste in Approved Facilities - Continue to Characterize and Remediate the Resource Conservation and Recovery Act Industrial Sites **Decontamination and Decommissioning Facilities** - Continue Remediation Action and Planning **Defense Nuclear Agency Sites** - Continue Operations to Stop Contaminant Migration - Characterize and Remediate Contaminated Muck Piles and Ponds - Select and Implement Alternate Remedial Action or Redesign **Tonopah Test Range** - Continue Characterization and Remediation **Central Nevada Test Area** - Continue Characterization and Remediation **Project Shoal Area** - Continue Characterization and Remediation	No Activity	**Underground Test Area Corrective Action Unit** - Continue Groundwater Monitoring - Continue Drilling Characterization Wells - Evaluate and Implement Remediation Strategies - Intensify Groundwater Monitoring - Accelerate, Evaluate, and Implement Remediation Strategies - Alternate Uses May Require Stricter Cleanup Levels **Soils Media Corrective Action Unit and Part of NAFR Complex** - Continue Studies to Identify, etc. Alternate Remedial Measures - Remove Contaminated Soils on NTS and Nellis Lands - Dispose of Contaminated Soils in Permitted Facilities - Activities Would Accelerate Above Present Levels - After Studies, Select Alternate Remedial Action Method and Implement - Alternate Uses May Require Stricter Cleanup Levels **Industrial Sites Corrective Action Unit** - Characterize and Disposition Environmental Restoration Sites - Continue Field Program to Identify Sites - Continue to Characterize and Remediate the Resource Conservation and Recovery Act Industrial Sites - Activities Would Accelerate Above Present Levels - Alternate Uses May Require Stricter Cleanup Levels **Decontamination and Decommissioning Facilities** - Accelerate Remedial Actions - Alternative May Require Clean Closure, Not Closure In Place **Defense Nuclear Agency Sites** - Accelerate Operations to Stop Radiation and Hazardous Contaminated Migration - Select and Implement Alternate Remedial Action or Redesign - Alternate Uses May Require Stricter Cleanup Levels - Characterize and Remediate Contaminated Muck Piles and Ponds. **Tonopah Test Range** - Accelerate Characterization and Remediation of Site **Central Nevada Test Area** - Accelerate characterization and remediation **Project Shoal Area** - Continue Characterization and Remediation - Accelerate Characterization and Remediation of Site	**Underground Test Area Corrective Action Unit** - Continue Groundwater Monitoring - Continue Drilling Characterization Wells - Evaluate and Implement Remediation Strategies - Intensify Groundwater Monitoring - Accelerate, Evaluate, and Implement Remediation Strategies - Alternate Uses May Require Stricter Cleanup Levels **Soils Media Corrective Action Unit and Part of NAFR Complex** - Continue Studies to Identify, etc. Alternate Remedial Measures - Remove Contaminated Soils on NTS and Nellis Lands - Dispose of Contaminated Soils in Permitted Facilities - Activities Would Accelerate Above Present Levels - After Studies, Select Alternate Remedial Action Method and Implement - Alternate Uses May Require Stricter Cleanup Levels **Industrial Sites Corrective Action Unit** - Characterize and Disposition Environmental Restoration Sites - Continue Field Program to Identify Sites - Continue to Characterize and Remediate the Resource Conservation and Recovery Act Industrial Sites - Activities Would Accelerate Above Present Levels - Alternate Uses May Require Stricter Cleanup Levels **Decontamination and Decommissioning Facilities** - Accelerate Remedial Actions - Alternative May Require Clean Closure, Not Closure In Place **Defense Nuclear Agency Sites** - Accelerate Operations to Stop Radiation and Hazardous Contaminated Migration - Select and Implement Alternate Remedial Action or Redesign - Alternate Uses May Require Stricter Cleanup Levels - Characterize and Remediate Contaminated Muck Piles and Ponds. **Tonopah Test Range** - Accelerate Characterization and Remediation of Site **Central Nevada Test Area** - Accelerate characterization and remediation **Project Shoal Area** - Continue Characterization and Remediation - Accelerate Characterization and Remediation of Site

Table 3-1. Comparison of Program Activities for the Alternatives (Page 4 of 4)

Nondefense Research and Development Program

Alternative 1	Alternative 2	Alternative 3	Alternative 4
- Establish Solar Enterprise Zone - Spill Test Facility - Alternate Fuel Demonstration Project (16 vehicles) - Technology Development (normal) - Environmental Research Park	- No Activity	- Establish Solar Enterprise Zone - Construct and Operate Solar Production Facilities - Spill Test Facility - Alternate Fuel Demonstration Project (16 vehicles plus fueling station) - Technology Development (expanded) - Environmental Research Park	- Establish Solar Enterprise Zone - Construct and Operate Solar Production Facilities - Spill Test Facility - Alternate Fuel Demonstration Project (16 vehicles) - Technology Development (expanded) - Environmental Research Park

Work for Others Program

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Treaty Verification - Threshold Test Ban Treaty - Peaceful Nuclear Explosion Treaty - Chemical Weapons Convention Treaty - Treaty on Open Skies **Nonproliferation Projects** **Counterproliferation Research and Development** - Dipole Hail - Big Explosives Experimental Facility - Cut and Cover **Conventional Weapons Demilitarization** **Nondefense Research and Development** - Conduct Munitions Research and Development - Training Exercises	- No Activity	**Increased activity levels for:** **Treaty Verification** - Threshold Test Ban Treaty - Peaceful Nuclear Explosion Treaty - Chemical Weapons Convention Treaty - Treaty on Open Skies **Nonproliferation Projects** **Counterproliferation Research and Development** - Dipole Hail - Big Explosives Experimental Facility - Cut and Cover **Conventional Weapons Demilitarization** **Nondefense Research and Development** - Conduct Munitions Research and Development - Training Exercises	**Treaty Verification** - Treaty on Open Skies No Activity - Increased Use of Airspace by DoD

Site Support Activities

Alternative 1	Alternative 2	Alternative 3	Alternative 4
No change in: - Facilities - Services - Utilities - Communications	- Facilities (cold standby) - Services (minimal) - Utilities (minimal) - Communications (minimal) **Tonopah Test Range** - Maintain Site Support for Stockpile Stewardship	**Expand as necessary:** - Facilities - Services - Utilities - Communications	**Modify as Necessary:** - Facilities - Services - Utilities - Communications

3.2.1 Programs Under Alternative 1 - Continue Current Operations

Under Alternative 1, the DOE would continue to support ongoing program operations, but no new initiatives would be pursued. Stockpile stewardship and maintaining a state of readiness to conduct underground nuclear tests would continue under the scope of defense programs. Work for Others program activities would continue at present levels. The National Environmental Research Park Program would continue to support environmental research activities at the NTS. Research on the safety aspects of handling, shipping, and storing hazardous fluids and liquefied gaseous fuels would continue at the Spill Test Facility. The Corporation for Solar Technology, with funding provided by the DOE, would continue to study the feasibility of locating and constructing a solar energy facility in the State of Nevada; and the Environmental Restoration and Waste Management Programs would continue to conduct research and development focused on overcoming major obstacles to progress in cleaning up the DOE sites, and handling the waste generated from these activities.

3.2.2 Programs Under Alternative 2 - Discontinue Operations

Under this Alternative, operations at the NTS would be severely limited. Only services required to continue the protection of human health and safety would be performed. These services would include environmental monitoring operations, as well as the continuance of communications, utilities, security, and transportation services on a modest scale.

3.2.3 Programs Under Alternative 3 - Expanded Use

The implementation of this alternative would not only result in the continuation of current programs, but would result in the expansion of scope for many of these programs. For environmental restoration programs this would mean the expansion of current remediation activities. The Waste Management Program would be expanded to include the construction of a number of facilities to enable a wider range of waste management activities to be performed at the NTS. Defense programs would be expanded to include activities such as the storage and disposition of fissile materials, tritium recycling, and the construction of a facility that would enable the stockpile of nuclear weapons to be managed at a higher level. Work for Others program activities would expand based on the requirements needs of other groups and agencies to use the NTS. For the Nondefense Research and Development Program implementation of this alternative would mean the construction and operation of Solar Production Facilities, and expansion of the Alternate Fuel Demonstration Project. Because of the increased operations and activity, the infrastructure and support services would have to be increased accordingly.

3.2.4 Programs Under Alternative 4 - Alternate Use of Withdrawn Lands

This alternative would result in the discontinuation of most of the activities being performed under defense programs, but would increase activities under Waste Management and Environmental Restoration Programs. Activities that would be pursued under these programs include acceleration of remediation activities, as well as construction of waste characterization and treatment facilities. Under the Nondefense Research and Development Program the construction and operation of the Solar Production Facilities would also be performed. Infrastructure and support services would have to be increased accordingly.

This Page Intentionally Left Blank

4.0 RISK ASSESSMENT SCENARIOS BY ALTERNATIVES

The activities described in Section 3.0 of this study were examined to identify the routine operations and potential accidents important to the assessment of human health risk. For existing activities, the study reviewed operational records, safety analysis reports, and previous environmental impact statements or environmental assessments to identify activities most important to safety and risk. For new activities, the identification of activities most important to safety and risk was performed by conducting a review of planning documents, preliminary design data (where available), and by comparison with similar activities for existing operations and facilities. The result of this identification process is the development of specific scenarios that can be analyzed quantitatively to estimate the human health risks associated with both routine operations and accidents.

Section 4.1 identifies the scenarios developed for routine operations and accidents. Section 4.2 summarizes the program activities proposed under each NTS EIS alternative and the scenarios used to quantify the human health risks associated with those activities. The results of the risk assessment are presented in Section 5.0 of this study.

4.1 Scenarios for Routine Operations and Accidents

Activities expected to be performed during routine operations whose effects may be detrimental to human health or safety were included in several scenarios. These activities included radioactive materials operations, waste handling, waste packaging, waste treatment, construction, decontamination and decommissioning, maintenance, and excavation. They were proposed to result in the direct exposure of personnel to low levels of radiation or the inhalation by personnel of small amounts of radioactive materials and chemicals, up to limits identified by DOE and Occupational Safety and Health Administration (OSHA) safety guidelines.

Three broad categories of accident scenarios are evaluated in this study. First, scenarios are developed for occupational accidents that could result in worker injuries or fatalities during waste handling, construction, maintenance, excavation, or decontamination and decommissioning operations. Second, scenarios are developed to assess impacts to workers and the public from accidental releases of radioactive material. Third, scenarios are developed to assess impacts to workers and the public from accidental releases of carcinogenic and toxic chemicals. The accident scenarios selected in this study cover a range of reasonably foreseeable accidents, from high probability accidents with low consequences to low probability accidents with higher consequences. See Table 4-1 for Routine Operations and Accident Scenarios.

4.2 Scenarios by Program Areas and Alternatives

Tables 4-2 through 4-5 identify the scenarios that are used in this study to assess the human health risks associated with activities under each program are for each of the four NTS EIS alternatives. Scenario GW1 is a future scenario that is not expected to have impacts within the 10-year time frame of this EIS. This scenario is independent of any of the four NTS EIS alternatives and does not appear in Tables 4-2 through 4-5. The results of this scenario are reported in Section 5.1 of this study.

Table 4-1. Routine Operations and Accident Scenarios

Identification Number	Scenario Description
HR1	Radioactive materials operations - routine radiation exposure to workers
DPR1	P-Tunnel: mechanical release of Pu during handling
DPR2	DAF: explosion invoking 55 lb. HE and 5 kg PU
DPR3	TTR: mechanical release of Pu from test assembly
DPR4	TTR: failure of artillery fired atomic projectile during firing
DPR5	NTS Area 27: explosion in interim stored nuclear weapons
DPR6	Accidental venting from an underground test
DPH1	TTR: explosion of rocket test assembly containing DU and Be
DPH2	TTR: rocket propellant storage area fire
WMR1	NTS Area 5: explosion/fire in two TRU waste containers
WMR2	NTS Area 5: explosion/fire in multiple TRU waste containers
WMR3	NTS Area 5: airplane crash into TRU waste storage unit
WMH1	NTS Area 5: explosion/fire in two hazardous waste containers
WMH2	NTS Area 5: explosion/fire in multiple hazardous waste containers
WMH3	NTS Area 5: airplane crash into hazardous waste storage unit
ERR1	Environmental restoration waste spill in Pu-contaminated soil (evaluated for both TTR and NTS)
ERR2	Environmental restoration waste fire in Pu-contaminated soil (evaluated fsor both TTR and NTS)
ERR3	Airplane crash into environmental restoration site containing Pu-contaminated soil (evaluated for both TTR and NTS
ERH1	Fire involving one container-equivalent in composite hazardous environmental restoration site at NTS
ERH2	Fire involving multiple container-equivalents in composite hazardous environmental restoration site NTS
ERH3	Airplane crash into composite hazardous environmental restoration site at NTS
NDRDH1	LGFSTF: spill of one container of hazardous chemicals
NDRDH2	LGFSTF: tank failure
NDRDH3	LGFSTF: airplane crash into tank farm area
WFOR1	BEEF: 100 Ci tritium release
WFOR2	BEEF: 1,000 Ci tritium release
WFOH1	BEEF: heavy metal release
WFOH2	BEEF: Be and DU release
OR1	Operational accident - worker injury or fatality during waste handling accident involving forklift.
OR2	Operational accident - worker injury or fatality during waste handling accident not involving forklift.
OR3	Operational accident - worker injury or fatality during construction, decontamination and decommissioning, or maintenance activities.
EP1	Excavation and processing - worker injury or fatality during remediation of a contaminated site
GW1	Consumption of tritium-contaminated drinking water by member of the public

Table 4-2. Routine Operations and Accidents Scenarios, Alternative 1 (Page 1 of 2)

Program Area/Activities	Scenario Identification Number	
	Routine	Accidents
Defense Programs		
• Stockpile Stewardship	HR1	DPR2,DPR5, DPR6, OR3
• Nuclear Emergency Response	HR1	OR3
• Tonopah Test Range Stockpile Stewardship	HR1	DPR3,DPR4,DPH1,DPH2 OR3
Waste Management		
• Area 3		
- Disposal	HR1	OR1, OR2,
- Closure	HR1	OR3
• Area 5		
- Disposal	HR1	OR1, OR2
- Storage	HR1	WMR1,WMR2,WMR3 WMH1,WMH2,WMH3
- Facility construction activities	HR1	OR3
- Closure activities	HR1	OR3
• Area 6		
- Storage activities	HR1	a
- Disposal activities	HR1	a
• Area 11		
- Treatment activities	HR1	a
Environmental Restoration		
• Underground Test Area Sites	HR1	OR3, EP1
• Soils Media Sites	HR1	ERR1,ERR2,ERR3,ERH1, ERH2,ERH3, OR3, EP1
• Industrial Sites	HR1	ERR1,ERR2,ERR3,ERH1, ERH2,ERH3, OR3, EP1
• D&D Facilities	HR1	ERR1,ERR2,ERR3,ERH1, ERH2,ERH3, OR3, EP1
• Defense Nuclear Agency Sites	HR1	OR3, EP1
• Tonopah Test Range	HR1	ERR1,ERR2,ERR3, OR3, EP1
• Central Nevada Test Area	HR1	OR3, EP1
• Project Shoal Area	HR1	OR3, EP1
Nondefense R&D		
• Establish Solar Enterprise Zone	HR1	OR3
• Spill Test Facility	HR1	NDRDH1,NDRDH2, NDRDH3
• Environmental Research Park	HR1	a

Table 4-2. Routine Operations and Accidents Scenarios, Alternative 1 (Page 2 of 2)

Program Area/Activities	Scenario Identification Number	
	Routine	Accidents
Work for Others		
• Treaty Verification	HR1	[a]
• Non-Proliferation Projects	HR1	[a]
• Counter Proliferation Research & Development	HR1	WFOH1, OR3
• Conventional Weapons Demilitarization	HR1	OR3
• Defense Research and Development	HR1	OR3
Site Support Activities		
• Utilities	HR1	[a]
• Communications	HR1	[a]
• Transportation Systems	HR1	[a]
• On-Site Support	HR1	OR3
• Landlord-Related Construction & Maintenance	HR1	OR3

[a] No reasonably foreseeable accidents important to human health risk identified.

Table 4-3. Routine Operations and Accident Scenarios, Alternative 2

Program Area/Activities	Scenario Number	
	Routine	Accidents
Defense Programs		
• Tonopah Test Range Stockpile Stewardship	HR1	DPR3,DPR4,DPH1,DPH2
Waste Management		
• Area 5 Storage Phase out	[a]	WMR1,WMR2,WMH1, WMH2
Environmental Restoration		
• No Activities	[a]	[a]
Nondefense R&D		
• No Activities	[a]	[a]
Work for Others		
• No Activities	[a]	[a]
Infrastructure		
• Utilities	HR1	[b]
• Communications	HR1	[b]
• On-Site Support	HR1	OR3

[a] Not applicable - no activities.
[b] No reasonably foreseeable accidents important to human health risk identified.

Table 4-4. Routine Operations and Accident Scenarios, Alternative 3 (Page 1 of 2)

Program Area/Activities	Scenario Number	
	Routine	Accidents
Defense		
• Stockpile Stewardship	HR1	DPR2,DPR6, OR3
• Stockpile Management	HR1	DPR5, OR3
• Nuclear Emergency Response	HR1	
• Tritium Supply and Recycling	HR1	OR3
• Storage and Disposition to Weapons Usable Fissile Materials	HR1	DPR1, OR3
• Construct New or Modify Tunnel Complexes	HR1	OR3
• Increased Robotic Technology Experiment	HR1	OR3
• Construct New or Modify Existing Structures	HR1	OR3
• Tonopah Test Range Stockpile Stewardship	HR1	DPR3,DPR4,DPH1,DPH2 OR3
Waste Management		
• Area 3		
- Disposal	HR1	OR1, OR2
- Closure	HR1	OR3
- Construction	HR1	OR3
• Area 5		
- Disposal	HR1	OR1, OR2
- Storage	HR1	WMR1,WMR2,WMR3, WMH1,WMH2,WMH3
- Facility construction activities	HR1	OR3
- Closure activities	HR1	OR3
- Treatment facility	HR1	OR3
• Area 6		
- Storage activities	HR1	a
- Treatment activities	HR1	OR3
- Disposal activities	HR1	a
• Area 11		
- Treatment activities	HR1	a
Environmental Restoration		
• Underground Test Area Sites	HR1	OR3, EP1
• Soils Media Sites	HR1	ERR1, ERR2, ERR3, ERH1, ERH2, ERH3, OR3, EP1
• Industrial Sites	HR1	ERR1, ERR2, ERR3, ERH1, ERH2, ERH3 OR3, EP1

Table 4-4. Routine Operations and Accident Scenarios, Alternative 3 (Page 2 of 2)

Program Area/Activities	Scenario Number	
	Routine	Accidents
• D&D Facilities	HR1	ERR1,ERR2,ERR3,ERH 1,ERH2,ERH3, OR3, EP1
• Defense Nuclear Agency Sites	HR1	OR3, EP1
• Tonopah Test Range	HR1	OR3, EP1
• Central Nevada Test Area	HR1	ERR1, ERR2, ERR3, OR3, EP1
• Project Shoal Area	HR1	OR3, EP1
Nondefense Research and Development		
• Establish Solar Enterprise Zone	HR1	OR3
• Construct and Operate Solar Production Facilities	HR1	OR3
• Spill Test Facility	HR1	NDRDH1, NDRDH2, NDRDH3
• Alternate Fuel Demonstration Project	HR1	OR3
• Environmental Research Park	HR1	[a]
Work for Others		
• Treaty Verification	HR1	[a]
• Non-Proliferation Projects	HR1	[a]
• Counter Proliferation Research & Development	HR1	WFOR1, WROR2, WFOH1, WFOH2, OR3
• Conventional Weapons Demilitarization	HR1	OR3
• Defense Research and Development	HR1	OR3
Site Support Activities		
• Utilities	HR1	[a]
• Communications	HR1	[a]
• Transportation Systems	HR1	[a]
• On-Site Support	HR1	OR3
• Landlord-Related Construction & Maintenance	HR1	OR3

[a] No reasonably foreseeable accidents important to human health risk identified.

Table 4-5. Routine Operations and Accident Scenarios, Alternative 4 (Page 1 of 2)

Program Area/Activities	Scenario Number	
	Routine	Accidents
Defense Programs		
• Tonopah Test Range Stockpile Stewardship	HR1	DPR3, DPR4, DPH1, DPH2
Waste Management		
• Area 3		
- Disposal	HR1	OR1, OR2
- Closure	HR1	OR3
• Area 5		
- Disposal	HR1	OR1, OR2
- Storage	HR1	WMR1, WMR2, WMR3, WMH1, WMH2, WMH3
- Facility construction activities	HR1	OR3
- Closure activities	HR1	OR3
- Treatment facility	HR1	OR3
• Area 6		
- Storage activities	HR1	b
- Treatment activities	HR1	OR3
- Disposal activities	HR1	b
• Area 11		
- Treatment activities	HR1	b
Environmental Restoration		
• Underground Test Area Sites	HR1	OR3, EP1
• Soils Media Sites	HR1	ERR1, ERR2, ERR3, ERH1, ERH2, ERH3 OR3, EP1
• Industrial Sites	HR1	ERR1, ERR2, ERR3, ERH1, ERH2, ERH3 OR3, EP1
• Decontamination and Decommissioning Facilities	HR1	ERR1, ERR2, ERR3, ERH1, ERH2, ERH3 OR3, EP1
• Defense Nuclear Agency Sites	HR1	OR3, EP1

Table 4-5. Routine Operations and Accident Scenarios, Alternative 4 (Page 2 of 2)

Program Area/Activities	Scenario Number	
	Routine	Accidents
• Tonopah Test Range	HR1	ERR1, ERR2, ERR3, OR3, EP1
• Central Nevada Test Area	HR1	OR3, EP1
• Project Shoal Area	HR1	OR3, EP1
Nondefense Research and Development		
• Establish Solar Enterprise Zone	HR1	OR3
• Construct and Operate Solar Production Facilities	HR1	OR3
• Spill Test Facility	HR1	NDRDH1, NDRDH2, NDRDH3
• Alternate Fuel Demonstration Project	HR1	OR3
• Environmental Research Park	HR1	[b]
Work for Others		
• No Activities	[a]	[a]
Site Support Activities		
• Utilities	HR1	[b]
• Communications	HR1	[b]
• Transportation Systems	HR1	[b]
• On-Site Support	HR1	OR3
• Landlord-Related Construction & Maintenance	HR1	OR3

[a] Not applicable - No activities.
[b] No reasonably foreseeable accidents important to human health risk identified.

This Page Intentionally Left Blank

5.0 RESULTS OF THE HUMAN HEALTH AND SAFETY ANALYSIS

The results of the human health risks and safety impacts study are presented in three parts. First, the risks to the public associated with the subsurface migration of tritium-contaminated groundwater from past underground test locations. Next, the risks associated with NTS program activities are presented for each proposed NTS EIS alternative. Finally, the safety impacts of the maximum reasonably foreseeable accidents for each program area and each alternative are discussed.

5.1 Risks to the Public from Subsurface Radioactivity

Tritium-contaminated groundwater exists in the subsurface as a result of past underground testing of nuclear weapons. The proposed NTS EIS alternatives are expected to result in little change to the amount of subsurface contamination that is present, even if underground testing resumes. As such, the results of the risk assessment for scenarios involving ingestion of contaminated well water by the public are identical for each alternative and are presented separately. These impacts to the public are not expected to occur within the 10-year timeframe addressed in the scope of the NTS EIS. For NTS workers tritium is not detectable in on-site drinking water wells. The existing monitoring programs and controls preclude inadvertent consumption of contaminated well water by workers.

Table 5-1 summarizes the results of the analysis of tritium migration to public lands and the potential risks to a hypothetical individual who consumes contaminated well water for a standard lifetime of 70 years.

For underground tests conducted within the NTS boundaries, groundwater modeling studies have been performed by Daniels et al. (1993), and GeoTrans (1995). Both of these studies evaluated the migration of tritium from test locations on Pahute Mesa to Oasis Valley. In addition, the GeoTrans study examined migration flow paths from Pahute Mesa to Amargosa Valley and from Yucca Flat to the boundary of the NTS south of Mercury, Nevada. The results of the GeoTrans analysis showed that for two of the modeled flow paths, Pahute Mesa to Amargosa Valley and Yucca Flat to Mercury, tritium concentrations in uncontrolled areas are never expected to exceed 1×10^{-4} pCi/L, which is well below the limit of detection (about 1 pCi/L) of present-day analytical equipment. (Note: the predicted tritium concentrations presented in this Appendix represent incremental increases above the natural background level of tritium which is in the range of 1 to 10 pCi/L).

The migration of tritium-contaminated groundwater from Pahute Mesa to Oasis Valley approximates the maximum health risks to a public individual. However, the results of studies by Daniels et al. (1993) and GeoTrans (1995) for this flow path provide mixed results. In the earlier study performed by Daniels et al. (1993), estimates of peak tritium concentrations in groundwater ranged from 890 pCi/L to 3,800 pCi/L at the nearest uncontrolled area boundary in Oasis Valley. These concentrations are above the natural background level of tritium but are below the EPA's maximum allowable tritium concentration in drinking water of 20,000 pCi/L. At approximately the same location, GeoTrans (1995) estimated peak tritium concentrations in the range of 5×10^{-4} pCi/L to 0.1 pCi/L. The results by Daniels et al. (1993). are higher due to the preliminary, or screening, basis of their calculations. For example, both studies base their source terms on shot cavity samples, but Daniels et al. (1993) assumed all groundwater at the source is contaminated to the highest observed tritium concentration of 7.6×10^{9} pCi/L, while GeoTrans (1995) assumed an average concentration of tritium at the source of 1×10^{9} pCi/L. Other assumptions used by Daniels et al. (1993) were conservative, or worst case, estimates that would lead to somewhat higher concentration and risk estimates than the average case estimates used by GeoTrans (1995).

Table 5-1. Health risks to a Maximally Exposed Public Individual[a] from Subsurface Radioactivity

Test Location	Receptor Location	Peak Conc. (pCi/L) at Receptor Location	Arrival Time[b] of Peak Conc. (yr)	Dose (rem)	Radiation LCF[c]	Radiation Detriment[d]
Pahute Mesa[e]	Oasis Valley closest uncontrolled use area[f]	$5x10^{-4}$ to 3,800	25 to 150	$7.7x10^{-3}$ to $1.6x10^{-9}$	$1x10^{-5}$ to $8x10^{-13}$	$5x10^{-6}$ to $4x10^{-13}$
Pahute Mesa[f]	Amargosa Valley closest uncontrolled use area[g]	Less than $1x10^{-4}$	Not estimated	Less than $3.3x10^{-10}$	Less than $1.6x10^{-13}$	Less than $7.5x10^{-14}$
Yucca Flat[f]	NTS boundary south of Mercury[g]	Less than $1x10^{-4}$	Not estimated	Less than $3.3x10^{-10}$	Less than $1.6x10^{-13}$	Less than $7.5x10^{-14}$
Project Shoal Area[h]	Eastern boundary[g]	280 to 720,000	71 to 206	$4x10^{-7}$ to 4	$2x10^{-10}$ to $2x10^{-3}$	$9x10^{-11}$ to $9x10^{-4}$
Project Shoal Area[h]	Nearest public well	0.1 to 20,000	88 to 278	$8x10^{-21}$ to $4x10^{-4}$	$4x10^{-24}$ to $2x10^{-7}$	$2x10^{-24}$ to $9x10^{-8}$
Central Nevada Test Area[i]	Boundary[g]	$1.2x10^{8}$	8 to 15	$2.8x10^{-2}$ to $1.1x10^{1}$	$1.4x10^{-5}$ to $5.5x10^{-3}$	$6.4x10^{-6}$ to $2.5x10^{-3}$
Central Nevada Test Area[i]	Nearest public well	$5x10^{-15}$ to 0.9	117 to 410	$3.4x10^{-21}$ to $6.4x10^{-7}$	$1.7x10^{-24}$ to $3.2x10^{-10}$	$7.8x10^{-25}$ to $1.5x10^{-10}$

a The maximally exposed public individual is a hypothetical person assumed to obtain all their drinking water from a well at the receptor location for a lifetime of 70 years, centered around the time of peak tritium concentration in the well water.

b Time period from the underground test date to the arrival of the peak tritium concentration in well water at the receptor location.

c Lifetime probability that the hypothetical individual will experience latent cancer fatality from the radiation dose received.

d Lifetime probability that the hypothetical individual will experience other detrimental health effects from the radiation dose received.

e Results for upper end of range based on (Daniels et al., 1993); results for lower end of range based on analysis performed by (GeoTrans, 1995).

f Results based on analysis performed by (GeoTrans, 1995).

g No public well currently exists at these locations.

h Results based on analysis performed by (Chapman et al., 1995).

i Results based on analysis performed by (Pohlmann et al., 1995).

Based on the combined results from the studies performed by Daniels et al. (1993) and GeoTrans (1995), the estimated range of peak tritium concentrations at the closest uncontrolled use area varies from 5×10^{-4} pCi/L arriving 150 years after the beginning of migration to 3,800 pCi/L arriving in 25 to 94 years. The hypothetical maximally exposed public individual at this location is estimated to have a lifetime probability of contracting a fatal cancer between 8×10^{-13} (about one in one trillion) and 1×10^{-5} (about one in 100,000). Table 5-1 also shows the results of analysis for underground test locations outside NTS boundaries. For both the Project Shoal Area and the Central Nevada Test Area, health effects were estimated using scenarios that have hypothetical receptors at the boundary of the test areas, where no public wells currently exist, and receptors at the nearest existing well.

Health impacts to the public from Project Shoal subsurface radioactivity have been estimated by Exposure Assessment of Groundwater Transport from the Shoal Site (Chapman et al.,1995) based on future predictions of tritium concentrations in well water. Future tritium concentrations were predicted at the nearest existing public well, and at the boundary of the Project Shoal Area where no public wells currently exist. These impacts are not expected to occur within the 10-year time frame of the NTS EIS. The public exposure scenarios assume that a hypothetical individual consumes contaminated well water for 70 years centered around the time of peak tritium concentration in well water. Calculations were performed for both eastward and westward groundwater flow because of the uncertainty in flow direction at the Project Shoal Area. The calculations also considered variability in key groundwater modeling parameters such as flow velocity and hydraulic conductivity. Accounting for the uncertainties in modeling parameters resulted in a large range of predicted tritium concentrations and potential health effects. For example, considering eastward flow to a hypothetical well at the boundary of the Project Shoal Area (the transport pathway with the highest concentrations), calculated peak tritium concentrations vary from 280 pCi/L, arriving 206 years after the test, to 720,000 pCi/L arriving 71 years after the test. For comparison, the EPA's maximum allowable tritium concentration in drinking water is 20,000 pCi/L. The hypothetical maximally exposed public individual at this location is estimated to have a lifetime probability of contracting a fatal cancer between 2×10^{-10} (about one in five billion) and 2×10^{-3} (about one in 500). At the nearest existing public well, a hypothetical maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 4×10^{-24} (essentially zero) and 2×10^{-7} (about one in five million). Table 5-1 shows the predicted range of health effects for both the hypothetical well at the eastern Project Shoal Area boundary and the nearest existing public well.

Health impacts affecting the public from the Central Nevada Test Area subsurface radioactivity have been estimated by (Pohlmann et al., 1995), based on future predictions of tritium concentrations in well water, and assuming that a public well could be installed at the southern boundary of the Central Nevada Test Area. At the existing public well nearest to the Central Nevada Test Area, the tritium concentrations are never expected to exceed 1 picocurie per liter, and the highest concentration will not reach the well until at least 117 years after the test date (about the year 2085). The maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 1.7×10^{-24} (essentially zero) and 3.2×10^{-10} (about one in three billion). Near the southern boundary of the Central Nevada Test Area, where no public well currently exists, tritium concentrations are predicted to have reached a peak of about 1.2×10^{8} pCi/L approximately 8 to 15 years after the test (between 1976 and 1983). If a public well were to be drilled at a location near the southern boundary of the Central Nevada Test Area, and assuming a peak tritium concentration of about 1.2×10^{8} pCi/L, it is estimated that the maximally exposed public individual would have a lifetime probability of contracting a fatal cancer between 1.4×10^{-5} (about one in 70,000) and 5.5×10^{-3} (about one in 200). The predicted impacts to a hypothetical individual near the southern boundary of the Central Nevada

Test Area are based on a peak tritium concentration calculated to have passed the boundary in about 1983. By the year 1996, the peak tritium concentration would have traveled further downgradient and would be reduced by a combination of radioactive decay and diffusion. Radioactive decay would result in a 50 percent reduction by the year 1996, and additional reductions in peak concentration would result from diffusion within the aquifer. These predicted tritium concentrations near the southern boundary of the Central Nevada Test Area have not been confirmed by groundwater sampling and analysis.

5.2 Risks from NTS Program Activities

Detailed results of the human health risk and safety impacts analysis are provided in DOE/NV (1996) and SAIC (1996). A summary of the results of these studies is presented in this section. Results are provided for each NTS EIS alternative and for each NTS program area, with the exception of the results of the scenarios for ingestion of contaminated well water by the public.

5.2.1 Alternative 1

Table 5-2 summarizes the results of the risk analysis for NTS program activities proposed under Alternative 1. The results of this analysis indicate that under Alternative 1, human health risks are expected to be dominated by occupational injuries and fatalities to workers engaged in activities such as construction, maintenance, excavation, etc. Over the 10-year period evaluated by the NTS EIS, about 204 occupational injuries and 3 fatalities are expected as a result of performing all NTS activities. Most of the injuries and fatalities are expected to be associated with Waste Management Program activities. In contrast, the risks associated with occupational exposure to radiation are smaller. The probability that a single latent cancer fatality will occur in the entire worker population as a result of the radiation exposure received over 10 years is estimated to be about 0.12 (or about 1 in 8). The probability of any other de/trimental health effect occurring in the worker population is estimated to be about 0.047 (about 1 in 21).

The probability that accidental occupational exposure to hazardous chemicals over 10 years could result in a single cancer in the entire worker population is estimated to be about 4.1×10^{-6} (1 in 240,000). An accidental occupational exposure to life-threatening concentrations of noncarcinogenic chemicals has a probability of occurrence of 0.58 during the 10 years evaluated in the EIS. The public health risks presented in Table 5-2 represent risks from reasonably foreseeable accidents that could result in the release of radioactive and chemically hazardous material to the environment. The probability of a single latent cancer fatality in the offsite population being caused as a result of radiological accidents at the NTS over the 10 years evaluated by the EIS is about 5.5×10^{-5} (1 in 18,000). The probability of any other detrimental health effect occurring in the off-site population is estimated to be about 2.5×10^{-5} (about 1 in 40,000). Should DOE be directed by the President to conduct underground nuclear-yield testing under Alternative 1, the probability of a single latent cancer fatality in the offsite population being caused as a result of radiological accidents over the 10 years evaluated by the EIS would be about 0.0055 (about one in 180). The probability of any other detrimental health effect occurring in the offsite population would be about 0.0025 (about one in 400).

The probability that accidental releases of hazardous chemicals over the 10 years evaluated in the EIS could result in a single cancer in the off-site population is estimated to be about 2.3×10^{-4} (1 in 4,000). No noncancer health effects from accidental releases of hazardous chemicals would be expected in the off-site population.

5.2.2 Alternative 2

Table 5-3 summarizes the results of the risk analysis for NTS Program activities proposed under Alternative 2. Under Alternative 2, all operations at the NTS would cease except for security and environmental monitoring functions necessary for human health, safety and security. Minimal human health impacts are estimated for the five major program areas because all projects and activities are discontinued. Transuranic and

Table 5-2. Health Risks to Workers and the Public from Program Activities, Alternative 1

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[d]	Chemical Hazard Index[d]
Defense										
NTS (without testing)	6.8	0.012	0.032	0.012	e	e	$4.0x10^{-6}$	$1.8x10^{-6}$	e	e
NTS (with testing)	--	--	(0.034)	(0.013)	e	e	(0.0054)	(0.0025)	e	e
TTR	2.5	0.0044	0.0025	0.0010	$8.4x10^{-12}$	$1.8x10^{-5}$	$9x10^{-9}$	$4.1x10^{-9}$	$1x10^{-10}$	$9.6x10^{-7}$
Waste Management	153	2.9	0.020	0.0081	$5.2x10^{-7}$	0.48	$5.1x10^{-5}$	$2.3x10^{-5}$	$2.0x10^{-5}$	$3.8x10^{-6}$
Env. Restoration										
NTS	10	0.031	0.0085	0.0034	$3.0x10^{-7}$	0.14	$2.3x10^{-10}$	$1.1x10^{-10}$	$6.0x10^{-6}$	$2.4x10^{-6}$
TTR	0.0049	$9.7x10^{-4}$	$2.4x10^{-4}$	$1.3x10^{-4}$	e	e	$1.2x10^{-9}$	$5.7x10^{-10}$	e	e
Project Shoal	$1.6x10^{-4}$	$3.1x10^{-5}$	$1.7x10^{-5}$	$9.0x10^{-6}$	e	e	f	f	e	e
CNTA	$1.6x10^{-4}$	$3.1x10^{-5}$	$1.7x10^{-5}$	$9.0x10^{-6}$	e	e	f	f	e	e
Nondefense Research and Development	1.9	0.0033	0.0031	0.0013	$3.2x10^{-6}$	0.58	f	f	$1.9x10^{-4}$	$1.5x10^{-4}$
Work for Others	11	0.019	0.0055	0.0022	$6.1x10^{-8}$	$4.4x10^{-3}$	f	f	$2.9x10^{-7}$	$1.9x10^{-8}$
Site Support Activities	19	0.033	0.046	0.018	e	e	f	f	e	e
Total (without testing)	**204**	**3**	**0.12**	**0.047**	**$4.1x10^{-6}$**	**0.58**	**$5.5x10^{-5}$**	**$2.5x10^{-5}$**	**$2.3x10^{-4}$**	**$1.5x10^{-4}$**
(with testing)			**(0.15)**	**(0.059)**			**(0.0055)**	**(0.0025)**		

[a] Number of radiation-induced latent cancer fatalities in the exposed population associated with activities conducted over the 10- year period of analysis.
[b] Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with activities conducted over 10-year period of analysis.
[c] Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with activities conducted over the 10-year period of analysis.
[d] A hazard index of greater than one indicates that the non-cancer chemical effects could be life-threatening to individuals exposed for one hour or more.
[e] No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified.
[f] No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.

Table 5-3. Health Risks to Workers and the Public from Program Activities, Alternative 2

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[d]	Chemical Hazard Index[d]
Defense										
NTS	e	e	e	e	e	e	e	e	e	e
TTR	2.5	0.0044	0.0025	0.0010	8.4×10^{-12}	1.8×10^{-5}	9.0×10^{-9}	4.1×10^{-9}	1.0×10^{-10}	9.6×10^{-7}
Waste Management	h	h	0.016	0.0064	5.2×10^{-7}	0.48	4.7×10^{-5}	2.1×10^{-5}	2.0×10^{-5}	3.8×10^{-4}
Env. Restoration										
NTS	e	e	e	e	e	e	e	e	e	e
TTR	e	e	e	e	e	e	e	e	e	e
Project Shoal	e	e	e	e	e	e	e	e	e	e
CNTA	e	e	e	e	e	e	e	e	e	e
Nondefense Research and Development	e	e	e	e	e	e	e	e	e	e
Work for Others	e	e	e	e	e	e	e	e	e	e
Site Support Activities	e	e	0.0025	0.0010	f	f	g	g	f	f
Total	**2.5**	**0.0044**	**0.021**	**0.0084**	**5.20×10^{-7}**	**0.48**	**4.7×10^{-5}**	**2.1×10^{-5}**	**2.0×10^{-5}**	**4.8×10^{-4}**

[a] Number of radiation-induced latent cancer fatalities in the exposed population associated with activities conducted over the 10- year period of analysis.
[b] Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with activitiesconducted over the 10-year period of analysis.
[c] Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with activities conducted over the 10-year period of analysis.
[d] A hazard index of greater than one indicates that the non-cancer chemical effects could be life-threatening to individuals exposed for one hour or more.
[e] No activities.
[f] No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified.
[g] No reasonably foreseeable scenarios resulting in exposure to radiation have been identified.
[h] No routine operations anticipated, only shipment and disposal of current waste inventory.

hazardous wastes would continue to be stored until arrangements could be made to ship these materials off-site. Consequently, accident scenarios associated with storage and handling of these wastes could be considered a reasonably foreseeable accident scenario for the Waste Management Program under Alternative 2. Site support activities related to security and environmental monitoring functions are expected to result in occupational exposure to radiation. About 3 occupational injuries and no fatalities are expected as a result of NTS activities for this alternative. The probability that a single latent cancer fatality will occur in the entire worker population as a result of the radiation exposure received over the 10 years evaluated in the EIS is estimated to be 0.021 (or about 1 in 47). The probability of any other detrimental health effect occurring in the worker population is estimated to be 0.0084 (about 1 in 120).

The probability that accidental occupational exposure to hazardous chemicals over the 10 years evaluated in the EIS could result in a single cancer in the entire worker population is estimated to be about 5.2×10^{-7} (about 1 in 2 million). An accidental occupational exposure to life-threatening concentrations of noncarcinogenic chemicals has a probability of occurrence of 0.48 during the 10 years evaluated in the EIS.

The probability of a single latent cancer fatality in the offsite population being caused as a result of radiological accidents at the NTS and off-site areas over the 10 years evaluated by the EIS is about 4.7×10^{-5} (about 1 in 20,000). The probability of any other detrimental effect occurring in the off-site population is estimated to be about 2.1×10^{-5}

The probability that accidental releases of hazardous chemicals over the 10 years evaluated in the EIS could result in a single cancer in the off-site population is estimated to be about 2×10^{-5} (1 in 50,000). No noncancer health effects from accidental releases of hazardous chemicals would be expected in the off-site population.

5.2.3 Alternative 3

Table 5-4 summarizes the results of the risk analysis for NTS program activities proposed under Alternative 3. As with Alternative 1, the results of the analysis indicate that human health risks under Alternative 3 are expected to be dominated by occupational injuries and fatalities to workers engaged in activities such as construction, maintenance, excavation, etc. Over the 10-year period evaluated in the NTS EIS, about 775 occupational injuries and 9 fatalities are expected for all NTS activities. Most of the injuries and fatalities are expected to be associated with Waste Management Program activities. In contrast, the risks associated with occupational exposure to radiation are smaller. The probability that a single latent cancer fatality will occur in the entire worker population as a result of the radiation exposure received over the 10 years evaluated in the EIS is estimated to be about 0.13 (or about 1 in 8). The probability of any other detrimental health effect occurring in the worker population is estimated to be about 0.051 (about 1 in 20).

The probability that accidental occupational exposure to hazardous chemicals over 10 years could result in a single cancer in the entire worker population is estimated to be about 4.1×10^{-6} (1 in 240,000). An accidental occupational exposure to life-threatening concentrations of noncarcinogenic chemicals has a probability of occurrence of 1 during the 10 years evaluated in the EIS.

The public health risks presented in Table 5-4 represent risks from reasonably foreseeable accidents that could result in the release of radioactive and chemically hazardous material to the environment. The probability of a single latent cancer fatality in the off-site population as a result of radiological accidents at the NTS over the 10 years evaluated by the EIS is about 5.6×10^{-5} (about one in 18,000). The probability of any other detrimental health effect occurring in the off-site population is estimated to be about 2.5×10^{-5} (about 1 in 43,000). If the DOE is directed by the President to conduct underground nuclear-yield testing under Alternative 3, the probability of a single latent cancer fatality in the off-site population being caused as a result of radiological accidents over the 10 years evaluated by the EIS would be about 0.0055 (about one in 180). The probability of any other detrimental health effect occurring in the off-site population would be about 0.0025 (about one in 400).

Table 5-4. Health Risks to Workers and the Public from Program Activities, Alternative 3

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[d]	Chemical Hazard Index[d]
Defense										
NTS (without testing)	65	0.12	0.051	0.020	f	f	4.4×10^{-6}	2.0×10^{-6}	f	f
NTS (with testing)	--	-	0.053	0.021	f	f	(0.0054)	(0.0025)	f	f
TTR	2.6	0.0046	0.0028	0.0011	8.4×10^{-12}	1.8×10^{-5}	9.0×10^{-9}	4.1×10^{-9}	1.0×10^{-10}	9.6×10^{-7}
Waste Management	467	8.7	0.0025	0.0010	5.2×10^{-7}	0.48	5.1×10^{-5}	2.3×10^{-5}	2.0×10^{-5}	3.8×10^{-6}
Env. Restoration[e]										
NTS	11	0.035	0.0096	0.0036	3.0×10^{-7}	0.14	2.3×10^{-10}	1.1×10^{-10}	6.0×10^{-6}	2.4×10^{-6}
TTR	0.0054	0.0011	2.6×10^{-4}	1.4×10^{-4}	f	f	1.2×10^{-9}	5.7×10^{-10}	f	f
Project Shoal	1.7×10^{-4}	3.4×10^{-5}	1.9×10^{-5}	7.6×10^{-6}	f	f	g	g	f	f
CNTA	1.7×10^{-4}	3.4×10^{-5}	1.9×10^{-5}	7.6×10^{-6}	f	f	g	g	f	f
Nondefense Research and Development	8.6	0.015	0.0042	0.0017	3.2×10^{-6}	0.58	g	g	1.9×10^{-4}	1.5×10^{-4}
Work for Others	11	0.019	0.0055	0.0023	8.9×10^{-8}	2.4	2.0×10^{-7}	9.2×10^{-8}	4.2×10^{-7}	6.4×10^{-7}
Site Support Activities	210	0.37	0.054	0.021	f	f	g	g	f	f
Total (without testing) (with testing	**775**	**9**	**0.13 (0.18)**	**0.051 (0.072)**	**4.1×10^{-6}**	**2.4**	**5.6×10^{-5} (0.0055)**	**2.5×10^{-5} (0.0025)**	**2.3×10^{-4}**	**1.5×10^{-4}**

[a] Number of radiation-induced latent cancer fatalities in the exposed population associated with activities conducted over the 10-year period of analysis.
[b] Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with activities conducted over the 10-year period of analysis.
[c] Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with activities conducted over the 10-year period of analysis.
[d] A hazard index of less than one indicates no chemical-induced noncancer health effects are expected to occur.
[e] Includes Environmental Restoration activities at NTS, Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area.
[f] No reasonably foreseeable scenarios resulting in worker or public exposures to carcinogenic chemicals have been identified.
[g] No reasonably foreseeable scenarios resulting in public exposures to radiation have been identified.

The probability that accidental releases of hazardous chemicals over the 10 years evaluated in the EIS could result in a single cancer in the off-site population is estimated to be about 2.3×10^{-4} (1 in 4,000). No noncancer effects from accidental releases of hazardous chemicals would be expected in the off-site population.

5.2.4 Alternative 4

Table 5-5 summarizes the results of the risk analysis for NTS Program activities proposed under Alternative 4. Under Alternative 4, no activities are expected to occur associated with Defense Programs or Work for Others Programs. The results of the analysis indicate that human health risks are expected to be dominated by occupational injuries and fatalities to workers, but the overall risks are smaller compared to Alternatives 1 and 3. Over the 10-year period evaluated by the NTS EIS, about 104 occupational injuries and 1 fatality are expected for all NTS activities. Most of the injuries and fatalities are expected to be associated with Waste Management Program activities. In contrast, the risks associated with occupational exposure to radiation are smaller. The probability that a single latent cancer fatality will occur in the entire worker population as a result of the radiation exposure received over the 10 years evaluated in the EIS is estimated to be about 0.077 (or about 1 in 13). The probability of any other detrimental health effect occurring in the worker population is estimated to be about 0.033 (about 1 in 30).

The probability that accidental occupational exposure to hazardous chemicals over the 10 years evaluated in the EIS could result in a single cancer in the entire worker population is estimated to be about 4.0×10^{-6} (1 in 250,000). An accidental occupational exposure to life-threatening concentrations of noncarcinogenic chemicals has a probability of occurrence of 0.58 during the 10 years evaluated in the EIS. The public health risks presented in Table 5-5 represent risks from reasonably foreseeable accidents that could result in the release of radioactive and chemically hazardous material to the environment. The probability of a single latent cancer fatality in the off-site population being caused as a result of radiological accidents at the NTS over the 10 years evaluated in the EIS is about 5.1×10^{-5} (about 1 in 20,000).

The probability of any other detrimental health effect occurring in the off-site population is estimated to be about 2.3×10^{-5} (about 1 in 43,000).

The probability that accidental releases of hazardous chemicals over the 10 years evaluated in the EIS could result in a single cancer in the off-site population is estimated to be about 2.3×10^{-4} (1 in 4,000). No noncancer health effects from accidental releases of hazardous chemicals would be expected in this off-site population.

5.3 Impacts from the Maximum Reasonably Foreseeable Accident

The impacts described in Section 5.2 above are a compilation of the risk from NTS program activities to workers and the public from normal operations and reasonably foreseeable accidents with a range of probabilities (Attachment A). The maximum reasonably foreseeable accidents described in this section show the highest impacts that could occur as a result of worst-case accident conditions under each proposed alternative. The objective of analyzing maximum reasonably foreseeable accident is to determine events that would produce effects that would be as severe or more severe than any other accidents that might be reasonably foreseeable under each proposed alternative.

5.3.1 Alternative 1

Defense Program. The maximum reasonably foreseeable radiological Defense Program accident at the NTS would be an explosion of high explosives associated with interim stored nuclear weapons at the Area 27 storage bunkers. This accident has a probability of occurrence of 1×10^{-7} (1 in 10 million) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion,

Table 5-5. Health Risks to Workers and the Public from Program Activities, Alternative 4

Program Area	Worker Health Risks						Public Health Risks			
	Occupational Safety Risks		Occupational Radiation Risks		Occupational Chemical Risks		Public Radiation Risks		Public Chemical Risks	
	Injuries	Fatalities	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[c]	Chemical Hazard Index[d]	Radiation LCFs[a]	Radiation Detriment[b]	Chemical Cancers[d]	Chemical Hazard Index[d]
Defense										
NTS	e	e	e	e	e	e	e	e	e	e
TTR	2.5	0.0044	0.0025	0.0010	8.4×10^{-12}	1.8×10^{-5}	9.0×10^{-9}	4.1×10^{-9}	1.0×10^{-10}	9.7×10^{-7}
Waste Management	64	0.97	0.020	0.0099	5.2×10^{-7}	0.48	5.1×10^{-5}	2.3×10^{-5}	2.0×10^{-5}	3.8×10^{-6}
Environmental Restoration										
NTS	10	0.031	0.0085	0.0034	3.0×10^{-7}	0.14	2.3×10^{-10}	1.1×10^{-10}	6.0×10^{-6}	2.4×10^{-6}
TTR	0.0049	9.7×10^{-4}	$2.4x\text{-}10^{-4}$	9.5×10^{-5}	f	f	1.2×10^{-9}	5.7×10^{-10}	f	f
Project Shoal	1.6×10^{-4}	3.1×10^{-5}	1.7×10^{-5}	6.8×10^{-6}	f	f	g	g	f	f
CNTA	1.6×10^{-4}	3.1×10^{-5}	1.7×10^{-5}	6.8×10^{-6}	f	f	g	g	f	f
Nondefense Research and Development	8.6	0.0015	g	g	3.2×10^{-6}	0.58	g	g	1.9×10^{-4}	1.5×10^{-4}
Work for Others	e	e	e	e	e	e	e	e	e	e
Site Support Activities	19	0.033	0.046	0.018	f	f	f	f	f	f
Total	**104**	**1**	**0.077**	**0.033**	**4.0×10^{-6}**	**0.58**	**5.1×10^{-5}**	**2.3×10^{-5}**	**2.3×10^{-4}**	**1.5×10^{-4}**

[a] Number of radiation-induced latent cancer fatalities in the exposed population associated with activities conducted over the 10-year period of analysis.
[b] Number of radiation-induced detrimental health effects (e.g., nonfatal cancers, genetic effects) in the exposed population associated with activities conducted over the 10-year period of analysis.
[c] Number of chemical-induced cancers (fatal and nonfatal) in the exposed population associated with activities conducted over the 10-year period of analysis
[d] A hazard index of greater than one indicates that the non-cancer chemical effects could be life-threatening to individuals exposed for one hour or more.
[e] No activities
[f] No reasonably foreseeable scenarios resulting in exposure to chemically hazardous materials have been identified.
[g] No reasonably foreseeable scenarios resulting in exposure to radiation have been identified

- Maximally exposed non-involved worker: 62,000 rem (2,700 rem in first year after exposure), acute radiation effects could
- Non-involved worker population at the nearest major facility area: 16,000 person-rem, 6.4 latent cancer fatalities, 2.6 other detrimental effects,
- Maximally exposed off-site individual at the nearest point of public access: 34 rem, 3.4×10^{-2} chance of latent cancer fatality, 1.6×10^{-2} chance of other detrimental effects,
- Population within 50 miles: 5,800 to 110,000 person rem, 3 to 55 latent cancer fatalities, 1 to 25 other detrimental effects.

No Defense Program accident resulting in measurable chemically hazardous effects at the NTS has been identified.

The maximum reasonably foreseeable radiological Defense Program accident at the Tonopah Test Range would be a failure of an artillery fired test assembly. This accident has a probability of occurrence of 1×10^{-7} (1 in 10 million) per year. The following consequences are estimated if this accident occurs:

- Involved worker: Not applicable; involved workers are under cover when the device is fired
- Maximally exposed non-involved worker: 71 rem, 0.057 chance of latent cancer fatality, 0.023 chance of other detrimental effects,
- Non-involved worker population at the nearest major facility area: 7,100 person-rem, 5.7 latent cancer fatalities, 2.3 other detrimental effect,
- Maximally exposed off-site individual at the nearest point of public access: 2.3 rem, 0.0012 chance of latent cancer fatality, 5.3×10^{-4} chance of other detrimental effects,
- Population within 50 miles: 18 to 310 person-rem, 0.009 to 0.16 chance of a single latent cancer fatality, 0.004 to 0.071 chance of any other detrimental effects.

For Defense Program hazardous chemical effects at the Tonopah Test Range, the maximum reasonably foreseeable accident would be an explosion of a rocket test assembly containing depleted uranium and beryllium. This accident has a probability of occurrence of 6×10^{-6} (1 in 170,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion,
- Maximally exposed non-involved worker: 1.4×10^{-8} chance of cancer, 0.30 noncancer hazard index for potentially life-threatening one-hour concentration,
- Non-involved worker population at the nearest major facility area: 1.4×10^{-7} chance of a single cancer, 0.30 noncancer hazard index for potentially life-threatening one-hour concentration,
- Maximally exposed off-site individual at the nearest point of public access: 4.1×10^{-7} chance of cancer, 1.0 noncancer hazard index for potentially life-threatening one-hour concentration,
- Population within 50 miles: 1.7×10^{-6} to 1.1×10^{-7} chance of a single cancer, 0.03 to 0.016 noncancer hazard index for potentially life-threatening one-hour concentration.

Waste Management Program. The maximum reasonably foreseeable radiological Waste Management Program accident at the NTS would be an airplane crash into the Area 5 transuranic waste storage unit, which has a probability of occurrence of 6×10^{-7} (1 in 1,700,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash,
- Maximally exposed non-involved worker: 3,500 rem (154 rem in the first year after exposure), 1.0 chance of cancer fatality, 1.0 chance of other detrimental effects,
- Non-involved worker population at the nearest major facility area: 99 person-rem, 0.04 chance of a single latent cancer fatality, 0.016 chance of any other detrimental effects,
- Maximally exposed off-site individual at the nearest point of public access: 3.5 rem, 1.8×10^{-3} chance of latent cancer fatality, 8.0×10^{-4} chance of other detrimental effects,
- Population within 50 miles: 1,400 to 25,000 person rem, 1 to 13 latent cancer fatalities,

0 to 6 other detrimental effects.

For Waste Management Program hazardous chemical effects, the maximum reasonably foreseeable accident would be an airplane crash into the Area 5 hazardous waste storage unit. This accident has a probability of occurrence of 1 x 10^{-7} (1 in 10 million) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash,
- Maximally exposed non-involved worker: 6.6 x 10^{-2} chance of cancer, 340 noncancer hazard index for potentially life-threatening one-hour concentration,
- Non-involved worker population at the nearest major facility area: 1.1 x 10^{-3} change of a single cancer, 0.09 noncancer hazard index for potentially life-threatening one-hour concentration,
- Maximally exposed off-site individual at the nearest point of public access: 2.4 x 10^{-5} chance of cancer, 0.013 noncancer hazard index for potentially life-threatening one-hour concentration,
- Population within 50 miles: 0.027 to 0.10 chance of a single cancer, 0.005 to 0.01 noncancer hazard index for potentially life-threatening one-hour concentration.

Environmental Restoration Program. The maximum reasonably foreseeable radiological Environmental Restoration Program accident at the NTS would be an airplane crash into the Area 13 site. This accident has a probability of occurrence of 7 x 10^{-7} (1 in 1,400,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash,
- Maximally exposed non-involved worker: 0.0011 rem, 4.4 x 10^{-7} chance of latent cancer fatality, 1.8 x 10^{-7} chance of other detrimental effects,
- Non-involved worker population at the nearest major facility area: 0.0055 person-rem, 2.2 x 10^{-6} chance of a single latent cancer fatality, 8.8 x 10^{-7} chance of any other detrimental effects,
- Maximally exposed off-site individual at the nearest point of public access: 0.0022 rem, 1.1 x 10^{-6} chance of latent cancer fatality, 5.1 x 10^{-7} chance of other detrimental effects,
- Population within 50 miles: 0.04 to 0.71 person rem, 2.1x 10^{-5} to 3.6 x 10^{-4} chance of a single latent cancer fatality, 9.4 x 10^{-6} to 1.6 x 10^{-4} chance of any other detrimental effects.

The maximum reasonably foreseeable radiological Environmental Restoration Program accident at the Tonopah Test Range would be an airplane crash into the Project Roller Coaster site, which has a probability of occurrence of 1 x 10^{-6} (1 in 1,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash,
- Maximally exposed non-involved worker: 0.012 rem, 4.8 x 10^{-6} chance of latent cancer fatality, 1.9 x 10^{-6} chance of other detrimental effects,
- Non-involved worker population at the nearest major facility area: 1.2 person-rem, 4.8 x 10^{-4} chance of a single latent cancer fatality, 1.9 x 10^{-4} chance of any other detrimental effects,
- Maximally exposed off-site individual at the nearest point of public access: 0.0034 rem, 1.7 x 10^{-6} chance of latent cancer fatality, 7.8 x 10^{-7} chance of other detrimental effects,
- Population within 50 miles: 0.2 to 3.3 person rem, 9.5 x $10^{-5}$to 1.7 x 10^{-3} chance of a single latent cancer fatality, 4.4 x 10^{-5} to 7.6 x 10^{-4} chance of any other detrimental effects.

For Environmental Restoration Program hazardous chemical effects, the maximum reasonably foreseeable accident would be an airplane crash into a hypothetical environmental restoration site consisting of a composite of hazardous sites across the NTS . This accident has a probability of occurrence of 7 x 10^{-7} (1 in 1,400,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash,
- Maximally exposed non-involved worker:

0.008 chance of cancer, 45 noncancer hazard index for potentially life-threatening one-hour concentration,

- Non-involved worker population at the nearest major facility area: 9.4×10^{-5} change of a single cancer, 0.0097 noncancer hazard index for potentially life-threatening one-hour concentration,
- Maximally exposed off-site individual at the nearest point of public access: 8.5×10^{-6} chance of cancer, 9.8×10^{-4} noncancer hazard index for potentially life-threatening one-hour concentration,
- Population within 50 miles: 1.5×10^{-3} to 3.3×10^{-3} chance of a single cancer, 6.1×10^{-4} to 6.5×10^{-4} noncancer hazard index for potentially life-threatening one-hour concentration.

No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Project Shoal Area or the Central Nevada Test Area have been identified.

Nondefense Research and Development Program. No Nondefense Research and Development Program accident resulting in measurable radiological effects at the NTS has been identified.

For Nondefense Research and Development Program hazardous chemical effects, the maximum reasonably foreseeable accident would be an airplane crash into the tank farm at the Liquid Gaseous Fuel Spill Test Facility. This accident has a probability of occurrence of 1×10^{-7} (1 in 10 million) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the crash,
- Maximally exposed non-involved worker: 1.0 chance of cancer, 1,000 noncancer hazard index for potentially life-threatening one-hour concentration,
- Non-involved worker population at the nearest major facility area: 0.054 chance of a single cancer, 0.80 noncancer hazard index for potentially life-threatening one-hour concentration,
- Maximally exposed off-site individual at the nearest point of public access: 8.8×10^{-4} chance of cancer, 0.34 noncancer hazard index for potentially life-threatening one-hour concentration,
- Population within 50 miles: 0 to 3 cancers, 0.01 to 0.19 noncancer hazard index for potentially life-threatening one-hour concentration.

Work for Others Program. No Work for Others Program accident resulting in measurable radiological effects at the NTS has been identified.

For Work for Others Program hazardous chemical effects, the maximum reasonably foreseeable accident would be a heavy metal release as a result of an unplanned detonation of a test assembly at the Big Explosives Experimental Facility. This accident has a probability of occurrence of 1×10^{-2} (1 in 100) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion,
- Maximally exposed non-involved worker: 1.8×10^{-4} chance of cancer, 0.044 noncancer hazard index for potentially life-threatening one-hour concentration,
- Non-involved worker population at the nearest major facility area: 6.1×10^{-7} chance of a single cancer, 4.0×10^{-6} noncancer hazard index for potentially life-threatening one-hour concentration,
- Maximally exposed off-site individual at the nearest point of public access: 1.4×10^{-9} chance of cancer, 1.9×10^{-7} noncancer hazard index for potentially life-threatening one-hour concentration,
- Population within 50 miles: 2.9×10^{-6} to 1.3×10^{-7} chance of a single cancer, 1.9×10^{-7} noncancer hazard index for potentially life-threatening one-hour concentration.

5.3.2 Alternative 2

Defense Program. No Defense Program activities would be conducted at the NTS under Alternative 2. The maximum reasonably foreseeable radiological Defense Program accident at the Tonopah Test Range would be the same as Alternative 1 (a failure of an artillery fired test assembly, which has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year).

For Defense Program hazardous chemical effects at the Tonopah Test Range, the maximum reasonably foreseeable accident also would be the same as Alternative 1 (an explosion of a rocket test assembly containing depleted uranium and beryllium, which has a probability of occurrence of 6×10^{-6} (1 in 170,000) per year).

Waste Management Program. Removal of transuranic and hazardous waste from the NTS under Alternative 2 was assumed to require some period of time to fully implement, and accidents could occur during the implementation period. The maximum reasonably foreseeable radiological Waste Management Program accident at the NTS would be a multi-container fire at the Area 5 transuranic waste storage unit, which has a probability of occurrence of 1×10^{-6} (1 in 1,000,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: plume rise from the fire carries the plume over close-in workers,
- Maximally exposed non-involved worker: 3.7 rem, 0.0015 chance of latent cancer fatality, 5.9×10^{-4} chance of other detrimental effects,
- Non-involved worker population at the nearest major facility area: 0.10 person-rem, 4.0×10^{-5} chance of a single latent cancer fatality, 1.6×10^{-5} chance of any other detrimental effects,
- Maximally exposed offsite individual at the nearest point of public access: 0.0036 rem, 1.8×10^{-6} chance of latent cancer fatality, 8.3×10^{-7} chance of other detrimental effects,
- Population within 50 miles: 1.5 to 26 person rem, 7.5×10^{-4} to 0.013 chance of a single latent cancer fatality, 3.5×10^{-4} to 0.006 chance of any other detrimental effects.

For Waste Management Programs hazardous chemical effects, the maximum reasonably foreseeable accident would be a multi-container fire at the Area 5 hazardous waste storage unit, which has a probability of occurrence of 8×10^{-5} (1 in 13,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: plume rise from the fire carries the plume over close-in workers
- Maximally exposed non-involved worker: 8.8×10^{-3} chance of cancer, 51 noncancer hazard index for potentially life-threatening one-hour concentration,
- Non-involved worker population at the nearest major facility area: 1.0×10^{-4} chance of a single cancer, 0.013 noncancer hazard index for potentially life-threatening one-hour concentration,
- Maximally exposed off-site individual at the nearest point of public access: 1.2×10^{-6} chance of cancer, 0.0019 noncancer hazard index for potentially life-threatening one-hour concentration,
- Population within 50 miles: 0.002 to 0.004 chance of a single cancer, 0.0019 noncancer hazard index for potentially life-threatening one-hour concentration.

Environmental Restoration Program. No Environmental Restoration Program activities would be conducted at the NTS, Tonopah Test Range, Project Shoal Area, or Central Nevada Test Area under Alternative 2.

Nondefense Research and Development Program. No Nondefense Research and Development Program activities would be conducted at the NTS under Alternative 2.

Work for Others Program. No Work for Others Program activities would be conducted at the NTS under Alternative 2.

5.3.3 Alternative 3

Defense Program. The maximum reasonably foreseeable radiological Defense Program accident at the NTS would be the same as Alternative 1 (an explosion of high explosives associated with interim stored nuclear weapons at the Area 27 storage bunkers. This accident has a probability of occurrence of 1×10^{-7} (1 in 10,000,000 per year).

No Defense Program accident resulting in measurable chemically hazardous effects at the NTS has been identified.

The maximum reasonably foreseeable radiological Defense Program accident at the Tonopah Test Range would be the same as Alternative 1 (a failure of an artillery fired test assembly). This accident has a probability of occurrence of 1×10^{-7} (1 in 10 million) per year.

For Defense Program hazardous chemical effects at the Tonopah Test Range, the maximum reasonably foreseeable accident would also be the same as Alternative 1 (an explosion of a rocket test assembly containing depleted uranium and beryllium). This accident has a probability of occurrence of 6×10^{-6} (1 in 170,000) per year.

Waste Management Program. The maximum reasonably foreseeable radiological Waste Management Program accident at the NTS would be the same as Alternative 1 (an airplane crash into the Area 5 transuranic waste storage unit). This accident has a probability of occurrence of 6×10^{-7} (1 in 1,700,000) per year.

For Waste Management Programs hazardous chemical effects, the maximum reasonably foreseeable accident would also be the same as Alternative 1 (an airplane crash into the Area 5 hazardous waste storage unit). This accident has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year.

Environmental Restoration Program. The maximum reasonably foreseeable radiological Environmental Restoration Program accident at the NTS would be the same as Alternative 1 (an airplane crash into the Area 13 site, which has a probability of occurrence of 7×10^{-7} (1 in 1,400,000) per year.

The maximum reasonably foreseeable radiological Environmetnal Restoration Program accident at the Tonopah Test Range would also be the same as alterntive 1 (an airplane crash into the Project Roller Coaster site). This accident has a probability of occurrence of 1×10^{-6} (1 in 1,000,000) per year.

For Environmental Restoration Program hazardous chemical effects, the maximum reasonably foreseeable accident would be the same as Alternative 1 (an airplane crash into a hypothetical environmental restoration site consisting of a composite of hazardous sites across the NTS). This accident has a probability of occurrence of 7×10^{-7}(1 in 1,400,000 per year).

No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Project Shoal Area or the Central Nevada Test Area have been identified.

Nondefense Research and Development Program. No Nondefense Research and Development Program accident resulting in measurable radiological effects at the NTS has been identified.

For Nondefense Research and Development Program hazardous chemical effects, the maximum reasonably foreseeable accident would be the same as Alternative 1 (an airplance crash into the tank farm at the Liquid Gaseous Fuel Spill Test Facility). This accident has a probability of (1 in 10 million) per year.

Work for Others Program. The maximum reasonably foreseeable radiological Work for Others Program accident at the NTS would be an inadvertent detonation of a test assembly at the Big Explosives Experimental Facility and release of 1,000 curies of tritium. This accident has a probability of occurrence of 3×10^{-5} (1 in 33,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion,
- Maximally exposed non-involved worker: 0.35 rem, 1.4×10^{-4} chance of latent cancer fatality, 5.6×10^{-5} chance of other detrimental effects,

- Non-involved worker population at the nearest major facility area: 0.006 person-rem, 2.4×10^{-6} chance of a single latent cancer fatality, 9.6×10^{-7} chance of any other detrimental effects,
- Maximally exposed off-site individual at the nearest point of public access: 4.7×10^{-5} rem, 2.4×10^{-8} chance of latent cancer fatality, 1.1×10^{-8} chance of other detrimental effects,
- Population within 50 miles: 0.02 to 0.35 person rem, 1.0×10^{-5} to $1.8^{-5} \times 10^{-4}$ chance of latent cancer fatality, 4.6×10^{-6} to 8.1×10^{-5} chance of other detrimental effects.

For Work for Others Program hazardous chemical effects, the maximum reasonably foreseeable accident would be a depleted uranium and beryllium release as a result of an unplanned detonation of a test assembly at the Big Explosives Experimental Facility, which has a probability of occurrence of 1×10^{-3} (1 in 1,000) per year. The following consequences are estimated if this accident occurs:

- Involved worker: fatally injured in the explosion,
- Maximally exposed non-involved worker: 8.0×10^{-4} chance of cancer, 240 noncancer hazard index for potentially life-threatening one-hour concentration,
- Non-involved worker population at the nearest major facility area: 2.8×10^{-6} chance of a single cancer, 0.023 noncancer hazard index for potentially life-threatening one-hour concentration,
- Maximally exposed offsite individual at the nearest point of public access: 6.3×10^{-9} chance of cancer, 6.4×10^{-5} noncancer hazard index for potentially life-threatening one-hour concentration,
- Population within 50 miles: 1.3×10^{-5} to 5.6×10^{-7} chance of a single cancer, 6.4×10^{-5} noncancer hazard index for potentially life-threatening one-hour concentration.

5.3.4 Alternative 4

Defense Program. No Defense Program activities would be conducted at the NTS under Alternative 4. The maximum reasonably foreseeable radiological Defense Program accident at the Tonopah Test Range would be the same as Alternative 1 (a failure of an artillery fired test assembly). This accident has a probability of occurrence of 1×10^{-7} (1 in 10 million) per year.

For Defense Programs hazardous chemical effects at the Tonopah Test Range, the maximum reasonably foreseeable accident also would be the same as Alternative 1 (an explosion of a rocket test assembly containing depleted uranium and beryllium). This accident has a probability of occurrence of 6×10^{-6} (1 in 170,000) per year).

Waste Management Program. The maximum reasonably foreseeable radiological Waste Management Program accident at the NTS would be the same as Alternative 1 (an airplane crash into the Area 5 transuranic waste storage unit). This accident has a probability of occurrence of 6×10^{-7} (1 in 1,700,000) per year.

For Waste Management Programs hazardous chemical effects, the maximum reasonably foreseeable accident would also be the same as Alternative 1 (an airplane crash into the Area 5 hazardous waste storage unit). This accident has a probability of occurrence of 1×10^{-7} (1 in 10,000,000) per year.

Environmental Restoration Program. The maximum reasonably foreseeable radiological Environmental Restoration Program accident at the NTS would be the same as Alternative 1 (an airplane crash into the Area 13 site). This accident has a probability of occurrence of 7×10^{-7} (1 in 1,400,000) per year.

The maximum reasonably foreseeable radiological Environmental Restoration Program accident at the Tonopah Test Range would also be the same as Alternative 1 (an airplane crash into the Project Roller Coaster site). This accident has a probability of occurrence of 1×10^{-6} (1 in 1,000,000) per year.

For Environmental Restoration Program hazardous chemical effects, the maximum reasonably foreseeable accident would be the same as Alternative 1 (an airplane crash into a hypothetical environmental restoration site consisting of a composite of hazardous sites across the NTS). This accident has a probability of occurrence of 7×10^{-7} (1 in 1,400,000) per year.

No Environmental Restoration Program accidents resulting in measurable radiological or chemically hazardous effects at the Project Shoal Area or the Central Nevada Test Area have been identified.

Nondefense Research and Development Program. No Nondefense Research and Development Program accident resulting in measurable radiological effects at the NTS has been identified. For Nondefense Research and Development Program hazardous chemical effects, the maximum reasonably foreseeable accident would be the same as Alternative 1 (an airplane crash into the tank farm at the Liquid Gaseous Fuel Spill Test Facility which has a probability of occurrence of occurrence of 1×10^{-7} (1 in 10 million) per year.

Work for Others Program. No Work for Others Program activities would be conducted under Alternative 4.

This Page Intentionally Left Blank

6.0 CONCLUSIONS

The goal of this study is to evaluate human health risks as a result of proposed activities associated with the four alternatives identified in the NTS EIS. The results indicate that the principal risks to human health are associated with occupational activities and the risk is borne by NTS workers. Because of the sparse population within 50 miles (80 kilometers) of the NTS and the operational safeguards associated with NTS facilities and activities, public health risks are unlikely to result in a single fatal cancer or other detrimental health effect for each of the NTS EIS alternatives.

This study concluded that worker health risks related to NTS activities are expected to be dominated by occupational safety risks, that is, events that could cause injury or death due to physical hazards in the workplace. These risks are reduced by strict adherence to DOE and OSHA safety standards, formal procedures for conduct of operations, worker training, and internal audits and assessments of work practices and procedures. Occupational safety risks are highest under Alternative 3 and lowest under Alternative 2. Alternative 1 poses the second highest occupational safety risks which are approximately 25-30 percent of the potential risks under Alternative 3. For all alternatives except Alternative 2, most of the occupational safety risk is attributed to Waste Management Program activities.

Although not trivial, worker health risks from exposure to radiation and hazardous chemicals are estimated to be low in comparison with occupational safety risks. It is unlikely that any workers will contract fatal cancers as a result of exposure to radiation or hazardous chemicals. However, involved workers, non-involved workers, and the worker population may experience non-carcinogenic health effects in the event of a hazardous chemical accident associated with the Defense, Waste Management, Environmental Restoration, and Nondefense Research and Development Program Areas. Risks from exposure to radiation and hazardous chemicals are reduced by containment of radioactive and hazardous materials, strict adherence to DOE and OSHA limits for occupational exposure to radiation and hazardous chemicals, monitoring of radiation and hazardous chemical exposure levels in the workplace, formal procedures for conduct of operations, worker training, and internal audits and assessments of work practices and procedures.

Estimated risks to the public as a result of NTS activities are lower than worker risks. Subsurface migration of tritium in groundwater is not expected to result in tritium concentrations above EPA drinking water standards at existing public wells at any time in the future. However, the results of theoretical modeling of tritiated groundwater from the Project Shoal Area and the Central Nevada Test Area suggest the need to conduct further investigations prior to installing any new public wells closer to these areas than the nearest existing public wells.

In the event that a maximum reasonably foreseeable accident actually occurred, cancer fatalities and other detrimental health effects could occur in the off-site population. However, when the probability of these accidents is considered, it is unlikely that a single fatal cancer or other detrimental health effect would occur in the off-site population as a result of accidents at the NTS.

The U.S. Department of Energy's National Safety Policy goal can be used as a guide to compare calculated risks and potential health effects (DOE 1991). This Policy goal states, in part, that the cancer fatality risk to the population with 10 miles of a DOE nuclear facility should not exceed one tenth of one percent of the sum of all cancer fatality risks from all other cases. The goal equals a risk of approximately 2×10^{-6} per year of latent cancer fatality. With the exception of an accidental venting of radionuclides from an underground nuclear test, all reasonably foreseeable accidents have risks of latent cancer fatality to the public below the Policy Goal. For an accidental venting from an underground test, the risk of latent cancer fatality to a maximally exposed member of the public at the nearest point of public access is conservatively estimated to be 3×10^{-6} per test. If DOE is directed by the President to perform underground testing under Alternatives 1 and 3, and a member of the public were to be located at the nearest point of public access during the test (boundary with Bureau of Land Management land to the north west), the Policy Goal could potentially be exceeded under worst-case conditions.

The radiation and hazardous chemical exposure estimated in this EIS for the various accident scenarios is the exposure that would be received if only limited protective actions were taken. The NTS has detailed plans for responding to accidents of the type described here, and the response activities would be closely coordinated with state and local officials. Mitigative and preventive measures that reduce or eliminate the risk of accidents to workers and members of the public include emergency procedures, routine inspection and monitoring of facility areas and material handling equipment, design criteria for facilities and material packaging, safety reviews and safety analysis by qualified review teams/committees, worker training programs, access restrictions, and controls on commercial and private flights over the NTS and off-site areas.

7.0 REFERENCES

Andricevic et al., 1994	Andricevic, R., J.I. Daniels and R.L. Jacobson, *"Radionuclide Migration Using a Travel Time Transport Approach and its Application in Risk Analysis"*, *Journal of Hydrology*, 163: 125-145, 1994.
Chapman et al., 1995	Chapman, J., K. Pohlmann and R. Andricevic, *"Exposure Assessment of Groundwater Transport of Tritium from the Shoal Site,"* Desert Research Institute, Water Resources Center, Publication #45132, 1995.
Daniels et al., 1993	Daniels, J.I., R. Andricevic, L.R. Anspaugh and R.L. Jacobson, *Risk- based Screening Analysis of Ground Water Contaminated by Radionuclides Introduced at the Nevada Test Site (NTS),* Lawrence Livermore National Laboratory Report, UCRL-ID-112789.
DOE, 1993	Department of Energy (DOE), "*Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements,*" Office of NEPA Oversight, U.S. Department of Energy, 1993.
DOE/NV, 1996	Department of Energy/Nevada Operations Office (DOE/NV), *Summary of the Transportation Risk Assessment Results for the Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada,* DOE Nevada Operations Office, Las Vegas, Nevada, 1996.
EPA, 1995a	U.S. Environmental Protection Agency (EPA), *Health Effects Assessment Summary Tables, FY-1995 Annual(HEAST),* EPA/540/R-95/036, Office of Solid Waste and Emergency Response, Washington, DC, 1995.
EPA, 1995b	U.S. Environmental Protection Agency (EPA), *Integrated Risk Information System (IRIS) (for microcomputers)*, distributed by the National Technical Information Services, Springfield, VA, 1995.
GeoTrans, Inc., 1995	GeoTrans, Inc., *A Fracture/Porous Media Model of Tritium Transport in the Underground Weapons Testing Areas, Nevada Test Site,* prepared for U.S. Department of Energy, Nevada Operations Office, 1995.
ICRP, 1991	International Commission on Radiological Protection (ICRP), 1990 *Recommendations of the International Commission on Radiological Protection*, ICRP Publication 60, Pergamon Press, Elmsford, New York, 1991.
Kamrin, 1988	Kamrin, M.A., *Toxicology--A Primer on Toxicology Principles and Applications,* Chelsea, Michigan: Lewis Publishers, Inc., 1988.
NRC, 1983	Nuclear Regulatory Commission (NRC), "*Radiological Assessment--A Textbook on Environmental Dose Analysis,*" NUREG/CR-3332, ORNL-5968, Division of Systems Integration, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, 1983.

Ottoboni, 1991	Ottoboni, M.A., *The Dose Makes the Poison: A Plain-Language Guide to Toxicology,* second edition, New York: Van Nostrand Reinhold, 1991.
Pohlmann et al., 1995	Pohlmann, K., J. Chapman and R. Andricevic, "*Exposure Assessment of Groundwater Transport of Tritium from the Central Nevada Test Area,*" Desert Research Institute, Water Resources Center, Publication #45133, 1995.
SAIC, 1996	Science Applications International Corporation, *Accident Assessments for Nevada Test Site Facilities and Off-Site Locations, May.* Science Applications International Corporation, Las Vegas, NV, June, 1996.

Attachment A to Appendix H

HUMAN HEALTH RISK ACCIDENT ANALYSIS

This Page Intentionally Left Blank

A.1 Introduction

A potential exists for accidents at facilities associated with use, storage, and disposal of radioactive and chemically hazardous materials. Accidents can be categorized into events that are abnormal (for example, spills), events a facility was designed to withstand, and events a facility was not designed to withstand (but whose consequences it may nevertheless mitigate). These categories are termed design basis, and beyond design basis accidents, respectively. Summarized in this Attachment are consequences of possible facility accidents in these categories for workers and the public. Details of assessments of the accidents are in *Accident Assessments for Nevada Test Site Facilities and Off-Site Location* (SAIC, 1996). Volume 1, Appendix I (Transportation Study) provides the assessment of transportation accidents.

An accident is a series of unexpected or undesirable events starting with an initiating event, and leading to a release of radioactive or hazardous materials within a facility or to the environment. Initiating events for accidents are defined in three broad categories: external initiators, internal initiators, and natural phenomena initiators. All types of initiators were defined in terms of those events that cause or may lead to a release of materials and energy by failure or bypass of confinement. The analyses of accidents are intended to be conservative in the sense that where uncertainties exist, assumptions that bound the potential for credible environmental consequences are used.

A.2 Methodology

Radioactive and chemically hazardous materials are involved in a wide variety of operations at the Nevada Test Site (NTS) and off-site locations; including scientific research and engineering development, waste management, and environmental restoration. The hazard of a facility to workers and the public is directly related to the quantity of radioactive or hazardous material located at a facility that could be released to the environment by an accident. Other important factors include design of confinement systems and structures, presence of energy sources such as explosives or flammable materials, and the distance to people that may be exposed to accidental releases of radioactive or hazardous materials. To obtain a perspective on potential accidents, the approach was to:

- Identify facilities with quantities of radioactive or chemically hazardous materials that could result in impacts to workers or the public under accident conditions,
- Identify potential internal, external, and natural phenomena events that could initiate accidents
- Perform independent analyses of reasonably foreseeable accidents.

To characterize potential impacts at NTS and off-site locations, accidents with a range of frequencies are reported for each proposed alternative. Three broad frequency ranges are used: abnormal events with frequencies greater than 10^{-3} per year, design basis accidents with frequencies in the range from 10^{-3} to 10^{-6} per year, and beyond design basis accidents with frequencies in the range from 10^{-7} to 10^{-6} per year. Within each frequency range, a bounding accident is determined so that any other reasonably foreseeable accident within a frequency range would be expected to have smaller consequences. The results are point estimates of maximum reasonably foreseeable accidents by frequency category rather than a cumulative assessment of all possible accidents in each category. Possible causes, assumptions, likelihood of occurrence, and consequences are discussed for the bounding accident within each frequency category analyzed. Details on the analyses, including supporting references, are given in (SAIC, 1996).

A.3 Accident Screening and Selection Process

Many types of postulated events could lead to an accidental release of radioactive or hazardous material, or both. Some of these postulated events have the potential for only local (within controlled site boundaries) consequences with no potential for a release that would have consequences for a member of the public at the nearest site boundary.

Internal and external initiators associated with a wide range of activities not necessarily covered in existing safety analyses were considered. For example, potential radiological accident scenarios initiated by construction activities associated with constructing new facilities or modifying existing facilities (as proposed under the various alternatives) were postulated. Typically, events involved in the construction of new facilities would act as external initiators while events involved in modifying existing facilities would act as internal initiators. Examples of construction or industrial-type events considered included fires, confinement impacts or puncture events, equipment failure, terrorism, and human error.

Five major program areas are conducted at the NTS and off-site areas. Each facility in the five program areas were screened for quantities of radioactive and hazardous material (including materials in inventory) that have the potential for being involved in a substantive release and thus worthy of consideration. Initiating events were defined in three broad categories: external initiators, internal initiators, and natural phenomena initiators.

- External initiators originate outside the facility and may impact the ability of the facility to maintain confinement of radioactive or hazardous material. These may be related to fires and explosions nearby, or caused by events at co-located facilities.

- Internal initiators (for example, equipment failures or human error) originate within a facility and are a result of operating the facility.

- Natural phenomena initiators include weather-related and seismic events. All types of initiators were defined in terms of those events that cause or may lead to a release of materials by failure of confinement or a bypass of confinement.

Seismic events (see Environmental Impact Statement Volume 1, Section 4) were found to be the most likely common-cause initiators with the potential to cause releases at more than one facility and involve more than one material type. Thus, some individual impacts presented herein for seismically initiated accidents could be additive. However, because the screening methods focused on facilities with the largest inventories rather than all possible facilities, summing impacts from the assessed seismic accidents could be misleading and was not attempted. No cases were found where an accident in one facility could cause an accident in a co-located facility.

Each facility area was screened for initiating events with the potential to cause nonnegligible consequences. Only those locations identified with substantial quantities of materials were considered. Accidents with bounding consequences were assessed as discussed below.

A.4 Analysis of Accident Consequences

For health effects to occur, an accident must involve (a) a direct radiation exposure or (b) a loss of confinement of the hazardous and/or radioactive material and a release of some fraction of the material to the immediate environment. For the latter, the material must then be transported to people. Emergency preparedness plans discussed in Volume 1, Section 7.11, Occupational and Public Health and Safety, can be invoked to reduce human exposures for scenarios where time is available to take action. The quantities of materials that reach people, and the ways the materials interact with human beings are important factors in determining health effects.

In determining the consequences (radiological and toxicological) associated with the postulated maximum reasonably foreseeable accidents, the following definitions were used:

- Involved Worker. The involved worker is defined as an individual directly involved in facility operations at the time of the accident, and within 100 meters (328 feet) of the point of release.
- Noninvolved Worker. The noninvolved worker is defined as an on-site individual located greater than 100 meters (328 feet) from the point of release.
- Worker Population. The worker population is defined as the population of workers (both involved and noninvolved) within the path of the plume with the wind assumed blowing toward the nearest populated on-site facility area.
- Nearest Public Access. The nearest public access is the location of the nearest point of land to the release location where members of the public have unrestricted access and could be present.
- Maximally Exposed Individual (MEI). The MEI is defined as a hypothetical individual located at the nearest public access.
- Off-Site Population. The off-site population is defined as the collective sum of individuals located within an 80-kilometer (50-mile) radius of the facility and within the path of the plume with the wind blowing in the most populous direction.

The ways radioactive material reach human beings, how it is absorbed and retained in the body, and the resulting health effects have been studied in great detail. The International Commission on Radiological Protection has made specific recommendations for quantifying these health effects. This organization is the recognized body for establishing standards for protecting workers and the public from the effects of radiation exposure. Health effects include acute damage (up to and including death) and latent effects, including cancers and genetic damage. An INEL-developed computer code, *The Radiological Safety Analysis Computer Program (RSAC-5), WINCO-1123* (Wenzel, 1993), estimates potential radiation doses to maximally exposed individuals or population groups from accidental releases of radionuclides. This computer code uses well-established scientific and engineering principles as the basis for the various calculational steps. The code has been validated to accepted standards for this kind of computer software.

For hazardous materials, several government agencies recommend quantifying health effects as threshold values of concentrations in air or water that cause short-term effects. The long-term health consequences of exposure to hazardous materials are not as well understood as those for radiation. Thus, the potential health effects reported here for hazardous materials are more qualitative than for radioactive materials. EPIcode™ (*Emergency Prediction Information Manual*) (Homann, 1988) was used to estimate human health effects associated with the release of chemically hazardous materials.

A.5 Accident Impacts

A.5.1 Impacts from Alternative 1, Continue Current Operations (No Action)

The accident impacts from Alternative 1 are summarized in Table A.5.1-1 (radiological accidents) and Table A.5.1-2 (hazardous chemical accidents).

A.5.2 Impacts from Alternative 2, Discontinue Operations

The accident impacts from Alternative 2 are summarized in Table A.5.2-1 (radiological accidents) and Table A.5.2-2 (hazardous chemical accidents).

A.5.3 Impacts from Alternative 3, Expanded Use

The accident impacts from Alternative 3 are summarized in Table A.5.3-1 (radiological accidents) and Table A.5.3-2 (hazardous chemical accidents).

A.5.4 Impacts from Alternative 4, Alternate Use of Withdrawn Lands

The accident impacts from Alternative 4 are summarized in Table A.5.4-1 (radiological accidents) and Table A.5.4-2 (hazardous chemical accidents).

Table A.5.1-1 Nevada Test Site and Off-Site Areas Radiological Facility Accident Probabilities and Consequences

(Page 1 of 2)

Alternative 1							
Accident	**Frequency (events/yr)**	**Involved Worker**	**Noninvolved Worker**	**Worker Population**	**Maximally Exposed Individual***	**Population, Neutral 50% Meteorology**	**Population, Stable 95% Meterology**
Defense Program							
Accidental venting from an underground test	3x10^{-3}/test	N/A[a]	1.6 rem 6.7x10^{-4} LCF 2.6x10^{-4}Det.	1.6x10^{1} pers. rem 6.6x10^{-3} LCF 2.6x10^{-3} Det.	2.0 rem 1.0x10^{-3}LCF 4.6x10^{-4}Det.	3.6x10^{2} pers. rem 1.8x10^{-1} LCF 8.3x10^{-2} Det.	N/A
Area 27 explosion in interim stored nuclear weapons	1 x10^{-7}	N/A[a]	6.2x10^{4} rem 1.0 LCF 1.0 Det.	1.6 pers. rem 6.4 LCF 2.6 Det.	3.4x10^{1}rem 3.4x10^{-2} LCF 1.6x10^{-2} Det.	5.8x10^{3} pers. rem 2.9 LCF 1.3 Det.	1.1x10^{5} pers. rem 5.5x10^{1} LCF 2.5x10^{1} Det.
DAF explosion involving 55 lb. HE and 5 kg Pu	2x10^{-6}	N/A[b]	1.2x10^{3} rem 9.6x10^{-1} LCF 3.8x10^{-1}Det.	1.1x10^{2} pers. rem 4.4x10^{-2} LCF 1.8x10^{-2} Det.	1.9x10^{-1} rem 9.3x10^{-5} LCF 4.3x10^{-5} Det.	1.1x10^{2} pers. rem 5.5x10^{-2} LCF 2.5x10^{-2} Det.	1.9x10^{3} pers. rem 9.5x10^{-1} LCF 4.4x10^{-1} Det.
TTR test assembly mechanical release of Pu	1x10^{-6}	N/A[a]	1.3x10^{-2} rem 5.2x10^{-6} LCF 2.1x10^{-6} Det.	2.6x10^{-1} pers. rem 1.0x10^{-4} LCF 4.2x10^{-5} Det.	6.7x10^{-3} rem 3.4x10^{-6} LCF 1.5x10^{-6} Det.	5.4x10^{-4} pers. rem 2.7x10^{-7} LCF 1.2x10^{-7} Det.	9.4x10^{-3} pers. rem 4.7x10^{-6} LCF 2.2x10^{-6} Det.
TTR artillery fired test assembly failure	1x10^{-7}	N/A	7.1x10^{1} rem 5.7x10^{-2} LCF 2.3x10^{-2} Det.	7.1x10^{3} pers. rem 5.7 LCF 2.3 Det.	2.3 rem 1.2x10^{-3} LCF 5.3x10^{-4} Det.	1.8x10^{1} pers. rem 9.0x10^{-3} LCF 4.1x10^{-3} Det.	3.1x10^{2} pers. rem 1.6x10^{-1} LCF 7.1x10^{-2} Det.
Waste Management Program							
Area 5 TRU waste release - two container fire/explosion	1x10^{-2}	7.4x10^{1} rem 5.9x10^{-2} LCF 3.4x10^{-2} Det.	2.3 rem 9.2x10^{-4} LCF 3.7x10^{-4} Det.	6.5x10^{-2} pers. rem 1.6x10^{-1} LCF 6.4x10^{-2} Det.	2.3x10^{-3} rem 1.2x10^{-6} LCF 5.3x10^{-7} Det.	9.3x10^{-1} pers. rem 4.7x10^{-4} LCF 2.1x10^{-4} Det.	1.6x10^{1} pers. rem 8.0x10^{-3} LCF 3.7x10^{-3} Det.
Area 5 TRU waste release - five container fire/explosion	1x10^{-6}	N/A[c]	3.7 rem 1.5x10^{-3} LCF 5.9x10^{-4} Det.	1.0x10^{-1} pers. rem 4.0x10^{-5} LCF 1.6x10^{-5} Det.	3.6x10^{-3} rem 1.8x10^{-6} LCF 8.3x10^{-6} Det.	1.5 pers. rem 7.5x10^{-4} LCF 3.5x10^{-4} Det.	2.6x10^{1} pers. rem 1.3x10^{-2} LCF 6.0x10^{-3} Det.
Area 5 TRU waste airplane crash	6x10^{-7}	N/A[b]	3.5x10^{3} rem 1.0 LCF 1.0 Det.	9.9x10^{1} pers. rem 4.0x10^{-2} LCF 1.6x10^{-2} Det.	3.5 rem 1.8x10^{-3} LCF 8.0x10^{-4} Det.	1.4x10^{3} pers. rem 7.0x10^{-1} LCF 3.2x10^{-1} Det.	2.5x10^{4} pers. r 1.3x10^{1} LCF 5.8 Det.
Environmental Restoration Program							
NTS Area 13 single container spill	3x10^{-2}	3.0x10^{-3} rem 1.2x10^{-6} LCF 4.8x10^{-7} Det.	1.5x10^{-8} rem 6.0x10^{-12} LCF 2.4x10^{-12} Det.	7.5x10^{-8} pers. rem 3.3x10^{-6} LCF 1.3x10^{-6} Det.	6.0x10^{-9} rem 3.0x10^{-12} LCF 1.4x10^{-12} Det.	5.6x10^{-7} pers. rem 2.8x10^{-10} LCF 1.3x10^{-10} Det.	9.7x10^{-6} pers. rem 4.9x10^{-9} LCF 2.2x10^{-9} Det.
TTR Project Roller Coaster site single container spill	3x10^{-2}	3.0x10^{-3} rem 1.2x10^{-3} LCF 4.8x10^{-4} Det.	1.2x10^{-7} rem 4.8x10^{-11} LCF 1.9x10^{-11} Det.	1.2x10^{-5} pers.rem 3.3x10^{-6} LCF 1.3x10^{-6} Det.	3.4x10^{-8} rem 1.7x10^{-11} LCF 7.8x10^{-12} Det.	1.9x10^{-6} pers. rem 9.5x10^{-10} LCF 4.4x10^{-10} Det.	3.3x10^{-5} pers. rem 1.7x10^{-8} LCF 7.6x10^{-9} Det.
NTS Area 13 multiple container fire	4x10^{-6}	N/A[c]	1.4x10^{-7} rem 5.6x10^{-11} LCF 2.2x10^{-11} Det.	7.0x10^{-7} pers. rem 2.8x10^{-10} LCF 1.1x10^{-10} Det.	2.4x10^{-7} rem 1.2x10^{-10} LCF 5.5x10^{-11} Det.	5.1x10^{-6} pers. rem 2.6x10^{-9} LCF 1.2x10^{-9} Det.	8.8x10^{-5} pers. rem 4.4x10^{-8} LCF 2.0x10^{-8} Det.
TTR Project Roller Coaster site multiple container fire	4x10^{-6}	N/A	1.1x10^{-6} rem 4.4x10^{-10} LCF 1.8x10^{-10} Det.	1.1x10^{-4} pers. rem 4.4x10^{-8} LCF 1.8x10^{-8} Det.	3.1x10^{-7}rem 1.6x10^{-10} LCF 7.1x10^{-11} Det.	1.7x10^{-5} pers. rem 8.5x10^{-9} LCF 3.9x10^{-9} Det.	3.0x10^{-4} pers. rem 1.5x10^{-7} LCF 6.9x10^{-8} Det.
TTR Project Roller Coaster site airplane crash	1x10^{-6}	N/A	1.2x10^{-2} rem 4.8x10^{-6} LCF 1.9x10^{-6} Det.	1.2 pers. rem 4.8x10^{-4} LCF 1.9x10^{-4} Det.	3.4x10^{-3} rem 1.7x10^{-6} LCF 7.8x10^{-7} Det.	1.9x10^{-1} pers. rem 9.5x10^{-5} LCF 4.4x10^{-5} Det.	3.3 pers. rem 1.7x10^{-3} LCF 7.6x10^{-4} Det.
NTS Area 13 airplane crash	7x10^{-7}	N/A	1.1x10^{-3} rem 4.4x10^{-7} LCF 1.8x10^{-7} Det.	5.5x10^{-3} pers. rem 2.2x10^{-6} LCF 8.8x10^{-7} Det.	2.2x10^{-3} rem 1.1x10^{-6} LCF 5.1x10^{-7} Det.	4.1x10^{-2} pers. rem 2.1x10^{-5} LCF 9.4x10^{-6} Det.	7.1x10^{-1} pers. rem 3.6x10^{-4} LCF 1.6x10^{-4} Det.

Table A.5.1-1 Nevada Test Site and Off-Site Areas Radiological Facility Accident Probabilities and Consequences

(Page 2 of 2)

Accident	Frequency (events/yr)	Involved Worker	Noninvolved Worker	Worker Population	Maximally Exposed Individual*	Population, Neutral 50% Meteorology	Population, Stable 95% Meterology
Alternative 1							
Nondefense Research and Development Program							
No radiological activities	--	--	--	--	--	--	--
Work for Others Program							
No radiological activities	--	--	--	--	--	--	--

[a] Involved workers under cover or evacuated prior to event
[b] Involved workers fatally injured in crash or explosion
[c] Plume rise carries source term over and above nearby worker.

*at the nearest point of public access

Table A.5.1-2 Chemical Accident Probabilities and Consequences (Page 1 of 2)

Alternative 1							
Accident	**Frequency (events/yr)**	**Involved Worker**	**Noninvolved Worker**	**Worker Population**	**Maximally Exposed Individual[a]**	**Population, Neutral 50% Meteorology**	**Population, Stable 95% Meterology**
Defense Program							
TTR Area 9 - Release of DU and Be from Rocket Test Assembly	$6x10^{-6}$	N/A[b]	$1.4x10^{-8}$ CR $8.8x10^{1}$ERPG1 3.0ERPG2 $3.0x10^{-1}$ERPG3	$1.4x10^{-7}$ CR $8.8x10^{1}$ERPG1 3.0ERPG2 $3.0x10^{-1}$ERPG3	$4.1x10^{-7}$ CR $2.7x10^{2}$ERPG1 $1.0x10^{1}$ERPG2 1.0ERPG3	$1.7x10^{-6}$ CR 1.3ERPG1 $1.6x10^{-1}$ERPG2 $1.6x10^{-2}$ERPG3	$1.1x10^{-7}$ CR $2.4x10^{1}$ERPG1 $3.0x10^{-1}$ERPG2 $3.0x10^{-2}$ERPG3
TTR Area 9 - Fire in Rocket Propellant Storage Building	$1.6x10^{-6}$	N/A[d]	N/A[c] CR 8.3ERPG1 $1.0x10^{-1}$ERPG2 $1.0x10^{-2}$ERPG3	N/A[c] CR 8.3ERPG1 $1.0x10^{-1}$ERPG2 $1.0x10^{-2}$ERPG3	N/A[c] CR $2.5x10^{1}$ERPG1 $3.2x10^{-1}$ERPG2 $3.2x10^{-2}$ERPG3	N/A[c] CR $7.6x10^{-2}$ERPG1 $9.4x10^{-4}$ERPG2 $9.4x10^{-5}$ERPG3	N/A[c] CR 1.2ERPG1 $1.4x10^{-2}$ERPG2 $1.4x10^{-3}$ERPG3
Waste Management Program							
NTS HWSU - Waste Handling	$3x10^{-2}$	$7.2x10^{-1}$ CR $3.8x10^{5}$ERPG1 $3.8x10^{4}$ERPG2 $3.8x10^{3}$ERPG3	$4.1x10^{-3}$ CR $2.2x10^{-1}$ERPG1 2.2ERPG2 $2.2x10^{1}$ERPG3	$4.4x10^{-5}$ CR $4.3x10^{-1}$ERPG1 $4.3x10^{-2}$ERPG2 $4.3x10^{-3}$ERPG3	$4.3x10^{-3}$ CR $3.8x10^{-2}$ERPG1 $3.8x10^{-3}$ERPG2 $3.84x10^{-4}$ERPG3	$1.7x10^{-3}$ CR N/A ERPG[e]	$1.7x10^{-4}$ CR N/A ERPG[e]
NTS HWSU - Fire in Waste	$8x10^{-5}$	N/A[d]	$8.8x10^{-3}$ CR $8.5x10^{3}$ERPG1 $5.1x10^{2}$ERPG2 $5.1x10^{1}$ERPG3	$1.0x10^{-4}$ CR 3.8ERPG1 $1.3x10^{-1}$ERPG2 $1.3x10^{-2}$ERPG3	$1.2x10^{-6}$ CR $8.6x10^{-1}$ERPG1 $1.9x10^{-2}$ERPG2 $1.9x10^{-3}$ERPG3	$3.5x10^{-3}$ CR N/A ERPG[e]	$1.7x10^{-3}$ CR N/A ERPG[e]
NTS HWSU - Airplane Crash into Waste	$1x10^{-7}$	N/A[b]	$6.6x10^{-2}$ CR $6.2x10^{4}$ERPG1 $3.4x10^{3}$ERPG2 $3.4x10^{2}$ERPG3	$1.1x10^{-3}$ CR $1.6x10^{1}$ERPG1 $8.9x10^{-1}$ERPG2 $8.9x10^{-2}$ERPG3	$2.4x10^{-5}$ CR 2.3ERPG1 $1.3x10^{-1}$ERPG2 $1.3x10^{-2}$ERPG3	$2.7x10^{-2}$ CR $8.3x10^{-1}$ERPG1 $4.5x10^{-2}$ERPG2 $4.5x10^{-3}$ERPG3	$1.0x10^{-1}$ CR 1.7ERPG1 $9.6x10^{-2}$ERPG2 $9.6x10^{-3}$ERPG3
Environmental Restoration Program							
NTS Area 5 - Waste Handling	$1.1x10^{-1}$	$1.8x10^{-1}$ CR $1.8x10^{5}$ERPG1 $1.0x10^{4}$ERPG2 $1.0x10^{3}$ERPG3	$1.1x10^{-3}$ CR $1.1x10^{3}$ERPG1 $6.1x10^{1}$ERPG2 6.1ERPG3	$2.6x10^{-5}$ CR $2.9x10^{-1}$ERPG1 $1.6x10^{-2}$ERPG2 $1.8x10^{-3}$ERPG3	$4.1x10^{-7}$ CR $3.8x10^{-2}$ERPG1 $2.2x10^{-3}$ERPG2 $2.2x10^{-4}$ERPG3	$4.5x10^{-4}$ CR N/A ERPG[e]	$1.3x10^{-3}$ CR N/A ERPG[e]
NTS Area 5 - Fire in Staged Waste	$8.0x10^{-5}$	N/A[d]	$4.5x10^{-3}$ CR $3.1x10^{3}$ERPG1 $2.5x10^{2}$ERPG2 $2.5x10^{1}$ERPG3	$4.9x10^{-5}$ CR $7.0X10^{-1}$ERPG1 $5.2x10^{-2}$ERPG2 $5.2x10^{-3}$ERPG3	$5.0x10^{-7}$ CR $8.4x10^{-2}$ERPG1 $5.0x10^{-3}$ERPG2 $5.0x10^{-4}$ERPG3	$1.8x10^{-3}$ CR N/A ERPG[e]	$4.3x10^{-4}$ CR N/A ERPG[e]
NTS Area 5 - Airplane Crash into Staged Waste	$7.0x10^{-7}$	N/A[b]	$8.1x10^{-3}$ CR $5.6x10^{3}$ERPG1 $4.5x10^{2}$ERPG2 $4.5x10^{1}$ERPG3	$9.4x10^{-5}$ CR 1.3ERPG1 $9.7x10^{-2}$ERPG2 $9.7x10^{-3}$ERPG3	$8.5x10^{-6}$ CR $1.5x10^{-1}$ERPG1 $9.8x10^{-3}$ERPG2 $9.8x10^{-4}$ERPG3	$3.3x10^{-3}$ CR $7.6x10^{-2}$ERPG1 $6.1x10^{-3}$ERPG2 $6.1x10^{-4}$ERPG3	$1.5x10^{-3}$ CR $1.0x10^{-1}$ERPG1 $6.5x10^{-3}$ERPG2 $6.5x10^{-4}$ERPG3

Table A.5.1-2 Chemical Accident Probabilities and Consequences (Page 2 of 2)

Alternative 1							
Accident	**Frequency (events/yr)**	**Involved Worker**	**Noninvolved - Worker**	**Worker Population**	**Maximally Exposed Individual***	**Population, Neutral 50% Meteorology**	**Population, Stable 95% Meterology**
Nondefense Research and Development Program							
NTS LGFSTF - Spill at Chemical Storage Pad	$1.7x10^{-2}$	$1.4x10^{-2}$ CR $4.0x10^{5}$ERPG1 $2.7x10^{3}$ERPG2 $2.7x10^{2}$ERPG3	$1.4x10^{-4}$ CR $4.0x10^{3}$ERPG1 $2.7x10^{1}$ERPG2 2.7ERPG3	$1.7x10^{-5}$ CR 3.2ERPG1 $2.1x10^{-2}$ERPG2 $2.1x10^{-3}$ERPG3	$2.7x10^{-7}$ CR 1.3ERPG1 $8.8x10^{-3}$ERPG2 $8.8x10^{-4}$ERPG3	$8.5x10^{-5}$ CR $2.1x10^{-2}$ERPG1 $1.4x10^{-4}$ERPG2 $1.4x10^{-5}$ERPG3	$1.0x10^{-3}$ CR $7.6x10^{-1}$ERPG1 $5.1x10^{-3}$ERPG2 $5.1x10^{-4}$ERPG3
NTS LGFSTF - Tank Failure at Tank Farm	$1.0x10^{-4}$	$1.9x10^{-1}$ CR $2.2x10^{6}$ERPG1 $4.3x10^{3}$ERPG2 $4.3x10^{2}$ERPG3	$1.9x10^{-3}$ CR $2.2x10^{4}$ERPG1 $4.3x10^{1}$ERPG2 4.3ERPG3	$2.2x10^{-4}$ CR $1.6x10^{1}$ERPG1 $3.2x10^{-2}$ERPG2 $3.2x10^{-3}$ERPG3	$3.6x10^{-6}$ CR 6.9ERPG1 $1.4x10^{-2}$ERPG2 $1.4x10^{-3}$ERPG3	$8.7x10^{-4}$ CR $2.7x10^{-1}$ERPG1 $5.4x10^{-4}$ERPG2 $5.4x10^{-5}$ERPG3	$1.4x10^{-2}$ CR 3.9ERPG1 $7.9x10^{-3}$ERPG2 $7.9x10^{-4}$EPPG3
NTS LGFSTF - Airplane Crash at Tank Farm	$1.0x10^{-7}$	N/A[b]	3.3 CR $5.2x10^{6}$ERPG1 $1.0x10^{4}$ERPG2 $1.0x10^{3}$ERPG3	$5.4x10^{-2}$ CR $4.0x10^{3}$ERPG1 8.0ERPG2 $8.0x10^{-1}$ERPG3	$8.8x10^{-4}$ CR $1.7x10^{3}$ERPG1 3.4ERPG2 $3.4x10^{-1}$ERPG3	$2.1x10^{-1}$ CR $6.5x10^{1}$ERPG1 $1.3x10^{-1}$ERPG2 $1.3x10^{-2}$ERPG3	3.4 CR $9.2x10^{2}$ERPG1 1.9ERPG2 $1.9x10^{-1}$ERPG3
Work for Others Program							
NTS BEEF - Heavy Metal Release	$1.0x10^{-2}$	N/A[b]	$1.8x10^{-4}$ CR $2.3x10^{1}$ERPG1 $4.4x10^{-1}$ERPG2 $4.4x10^{-2}$ERPG3	$6.1x10^{-7}$ CR $2.1x10^{-3}$ERPG1 $4.0x10^{-5}$ERPG2 $4.0x10^{-6}$ERPG3	$1.4x10^{-9}$ CR $9.7x10^{-5}$ERPG1 $1.9x10^{-6}$ERPG2 $1.9x10^{-7}$ERPG3	$2.9x10^{-6}$ CR N/A ERPG[e]	$1.3x10^{-7}$ CR N/A ERPG[e]

[a] Individual cancer risk is expressed as the increased probability of developing cancer. Population cancer risk is expressed as the increased number of cancers within the population
[b] N/A - Physical impacts of the event dominate consequences to involved workers
[c] No RfC is available in either IRIS or HEAST for chemicals of concern
[d] N/A - Plume rise from the fire carries the source term over and above nearby workers
[e] N/A - ERPG hazard indices are significantly below 1.0 at 20 km. All other public exposures occur at distances >20 km.

*at the nearest point of public access

Table A.5.2-1 Nevada Test Site and Off-Site Areas Radiological Facility Accident Probabilities and Consequences

Alternative 2							
Accident	**Frequency (events/yr)**	**Involved Worker**	**Noninvolved Worker**	**Worker Population**	**Maximally Exposed Individual***	**Population, Neutral 50% Meteorology**	**Population, Stable 95% Meterology**
Defense Program							
TTR test assembly mechanical release of Pu	$1x10^{-6}$	N/A[a]	$1.3x10^{-2}$ rem $5.2x10^{-6}$ LCF $2.1x10^{-6}$Det.	$2.6x10^{-1}$ pers. rem $1.0x10^{-4}$ LCF $4.2x10^{-5}$ Det.	$6.7x10^{-3}$ rem $3.4x10^{-6}$LCF $1.5x10^{-6}$Det.	$5.4x10^{-4}$ pers. rem $2.7x10^{-7}$ LCF $1.2x10^{-7}$ Det.	$9.4x10^{-3}$ pers. rem $4.7x10^{-6}$ LCF $2.2x10^{-6}$ Det.
TTR artillery fired test assembly failure	$1 x10^{-7}$	N/A[a]	$7.1x10^{1}$ rem $5.7x10^{-2}$ LCF $2.3x10^{-2}$ Det.	$7.1x10^{3}$ pers. rem 5.7 LCF 2.3 Det.	2.3 rem $1.2x10^{-3}$ LCF $5.3x10^{-4}$ Det.	$1.8x10^{1}$ pers. rem $9.0x10^{-3}$ LCF $4.1x10^{-3}$ Det.	$3.1x10^{2}$ pers. rem $1.6x10^{-1}$ LCF $7.1x10^{-2}$ Det.
Waste Management Program							
Area 5 TRU waste release - two container fire/explosion	$1x10^{-2}$	$7.4x10^{1}$ rem $5.9x10^{-2}$ LCF $3.4x10^{-2}$ Det.	2.3 rem $9.2x10^{-4}$ LCF $3.7x10^{-4}$ Det.	$6.5x10^{-2}$ pers. rem $1.6x10^{-1}$ LCF $6.4x10^{-2}$ Det.	$2.3x10^{-3}$ rem $1.2x10^{-6}$ LCF $5.3x10^{-7}$ Det.	$9.3x10^{-1}$ pers. rem $4.7x10^{-4}$ LCF $2.1x10^{-4}$ Det.	$1.6x10^{1}$ pers. rem $8.0x10^{-3}$ LCF $3.7x10^{-3}$ Det.
Area 5 TRU waste release - five container fire/explosion	$1x10^{-6}$	N/A[b]	3.7 rem $1.5x10^{-3}$ LCF $5.9x10^{-4}$ Det.	$1.0x10^{-1}$ pers. rem $4.0x10^{-5}$ LCF $1.6x10^{-5}$ Det.	$3.6x10^{-3}$ rem $1.8x10^{-6}$ LCF $8.3x10^{-7}$ Det.	1.5 pers. rem $7.5x10^{-4}$ LCF $3.5x10^{-4}$ Det.	$2.6x10^{1}$ pers. rem $1.3x10^{-2}$ LCF $6.0x10^{-3}$ Det.
Environmental Restoration Program							
No environmental restoration activities	--	--	--	--	--	--	--
Nondefense Research and Development Program							
No radiological activities	--	--	--	--	--	--	--
Work for Others Program							
No radiological activities	--	--	--	--	--	--	--

[a] Involved workers under cover or evacuated prior to event

[b] Plume rise carries source term over and above nearby workers.

*at the nearest point of public access

Table A.5.2-2 Chemical Accident Probabilities and Consequences

Alternative 2							
Accident	**Frequency (events/yr)**	**Involved Worker**	**Noninvolved Worker**	**Worker Population**	**Maximally Exposed Individual***	**Population, Neutral 50% Meteorology**	**Population, Stable 95% Meterology**
Defense Program							
TTR Area 9 - Release of DU and Be from Rocket Test Assembly	6×10^{-6}	N/A[b]	1.4×10^{-8} CR 8.8×10^{1}ERPG1 3.0ERPG2 3.0×10^{-1}ERPG3	1.4×10^{-7} CR 8.8×10^{1}ERPG1 3.0ERPG2 3.0×10^{-1}ERPG3	4.1×10^{-7} CR 2.7×10^{2}ERPG1 1.0×10^{1}ERPG2 1.0ERPG3	1.7×10^{-6} CR 1.3ERPG1 1.6×10^{-1}ERPG2 1.6×10^{-2}ERPG3	1.1×10^{-7} CR 2.4×10^{1}ERPG1 3.0×10^{-1}ERPG2 3.0×10^{-2}ERPG3
TTR Area 9 - Fire in Rocket Propellant Storage Building	1.6×10^{-6}	N/A[d]	N/A[c] CR 8.3ERPG1 1.0×10^{-1}ERPG2 1.0×10^{-2}ERPG3	N/A[c] CR 8.3ERPG1 1.0×10^{-1}ERPG2 1.0×10^{-2}ERPG3	N/A[c] CR 2.5×10^{1}ERPG1 3.2×10^{-1}ERPG2 3.2×10^{-2}ERPG3	N/A[c] CR 7.6×10^{-2}ERPG1 9.4×10^{-4}ERPG2 9.4×10^{-5}ERPG3	N/A[c] CR 1.2ERPG1 1.4×10^{-2}ERPG2 1.4×10^{-3}ERPG3
Waste Management Program							
NTS HWSU - Waste Handling	3×10^{-2}	7.2×10^{-1} CR 3.8×10^{5}ERPG1 3.8×10^{4}ERPG2 3.8×10^{3}ERPG3	4.1×10^{-3} CR 2.2×10^{-1}ERPG1 2.2ERPG2 2.2×10^{1}ERPG3	4.4×10^{-5} CR 4.3×10^{-1}ERPG1 4.3×10^{-2}ERPG2 4.3×10^{-3}ERPG3	4.3×10^{-3} CR 3.8×10^{-2}ERPG1 3.8×10^{-3}ERPG2 3.8×10^{-4}ERPG3	1.7×10^{-3} CR N/A ERPG[e]	1.7×10^{-4} CR N/A ERPG[e]
NTS HWSU - Fire in Waste	8×10^{-5}	N/A[d]	8.7×10^{-3} CR 8.5×10^{3}ERPG1 5.1×10^{2}ERPG2 5.1×10^{1}ERPG3	1.0×10^{-4} CR 3.8ERPG1 1.3×10^{-1}ERPG2 1.3×10^{-2}ERPG3	1.2×10^{-6} CR 8.6×10^{-1}ERPG1 1.9×10^{-2}ERPG2 1.9×10^{-3}ERPG3	3.5×10^{-3} CR N/A ERPG[e]	1.7x10[illegible] CR N/A ERPG[e]
Environmental Restoration Program							
N/A[e]							
Nondefense Research and Development Program							
N/A[e]							
Work for Others Program							
N/A[e]							

[a] Individual cancer risk is expressed as the increased probability of developing cancer. Population cancer risk is expressed as the increased number of cancers within the population

[b] N/A - Physical impacts of the event dominate consequences to involved workers

[c] No RfC is available in either IRIS or HEAST for chemicals of concern

[d] N/A - Plume rise from the fire carries the source term over and above nearby workers.

[e] N/A - No activities proposed for this program under this alternative.

*at the nearest point of public access

Table A.5.3-1 Nevada Test Site and Off-Site Areas Radiological Facility Accident Probabilities and Consequences

(Page 1 of 2)

Alternative 3							
Accident	**Frequency (events/yr)**	**Involved Worker**	**Noninvolved Worker**	**Worker Population**	**Maximally Exposed Individual***	**Population, Neutral 50% Meteorology**	**Population, Stable 95% Meterology**
Defense Program							
Accidental venting from an underground test	$3x10^{-3}$/test	N/A[a]	1.6 rem $6.7x10^{-4}$ LCF $2.6x10^{-4}$Det.	$1.6x10^{1}$ pers. rem $6.6x10^{-3}$ LCF $2.6x10^{-3}$ Det.	2.0 rem $1.0x10^{-3}$LCF $4.6x10^{-4}$ Det.	$3.6x10^{2}$ pers. rem $1.8x10^{-1}$ LCF $8.3x10^{-2}$ Det.	N/A
P-Tunnel mechanical release of plutonium during handling	$1 x10^{-3}$	$1.5x10^{2}$ rem $1.2x10^{-1}$ LCF $4.8x10^{-2}$ Det.	4.5 rem $1.8x10^{-3}$ LCF $7.2x10^{-4}$ Det.	$5.4x10^{2}$ pers. rem $4.3x10^{-1}$ LCF $1.7x10^{-1}$ Det.	$3.5x10^{-4}$ rem $1.8x10^{-7}$ LCF $8.1x10^{-8}$ Det.	$7.0x10^{-2}$ per. rem $3.5x10^{-5}$ LCF $1.6x10^{-5}$ Det.	1.2 pers. rem $6.0x10^{-4}$ LCF $2.8x10^{-4}$ Det.
DAF explosion involving 55 lb. HE and 5 kg Pu	$2x10^{-6}$	N/A[b]	$1.2x10^{3}$ rem $9.6x10^{-1}$ LCF $3.8x10^{-1}$Det.	$1.1x10^{2}$ pers. rem $4.4x10^{-2}$ LCF $1.8x10^{-2}$ Det.	$1.9x10^{-1}$ rem $9.3x10^{-5}$ LCF $4.3x10^{-5}$ Det.	$1.1x10^{2}$ pers. rem $5.5x10^{-2}$ LCF $2.5x10^{-2}$ Det.	$1.9x10^{3}$ pers. rem $9.5x10^{-1}$ LCF $4.4x10^{-1}$ Det.
TTR Test Assembly mechanical release of Pu	$1x10^{-6}$	N/A[b]	$1.3x10^{-2}$ rem $5.2x10^{-6}$ LCF $2.1x10^{-6}$ Det.	$2.6x10^{-1}$ pers. rem $1.0x10^{-4}$ LCF $4.2x10^{-5}$ Det.	$6.7x10^{-3}$ rem $3.4x10^{-6}$ LCF $1.5x10^{-6}$ Det.	$5.4x10^{-4}$ pers. rem $2.7x10^{-7}$ LCF $1.2x10^{-7}$ Det.	$9.4x10^{-3}$ pers. rem $4.7x10^{-6}$ LCF $2.2x10^{-6}$ Det.
Area 27 explosion in interim stored nuclear weapons	$1x10^{-7}$	N/A[b]	$6.2x10^{4}$ rem 1.0 LCF 1.0 Det.	$1.6x10^{4}$ pers. rem 6.4 LCF 2.6 Det.	$3.4x10^{1}$ rem $3.4x10^{-2}$ LCF $1.6x10^{-2}$ Det.	$5.8x10^{3}$ pers. rem 2.9 LCF 1.3 Det.	$1.1x10^{5}$ pers. rem $5.5x10^{1}$ LCF $2.5x10^{1}$ Det.
TTR artillery fired test assembly failure	$1x10^{-7}$	N/A[a]	$7.1x10^{1}$ rem $5.7x10^{-2}$ LCF $2.3x10^{-2}$ Det.	$7.1x10^{3}$ pers. rem 5.7 LCF 2.3 Det.	2.3 rem $1.2x10^{-3}$ LCF $5.3x10^{-4}$ Det.	$1.8x10^{1}$ pers. rem $9.0x10^{-3}$ LCF $4.1x10^{-3}$ Det.	$3.1x10^{2}$ pers. rem $1.6x10^{-1}$ LCF $7.1x10^{-2}$ Det.
Waste Management							
Area 5 TRU waste release - two container fire/explosion	$1x10^{-2}$	$7.4x10^{1}$ rem $5.9x10^{-2}$ LCF $3.4x10^{-2}$ Det.	2.3 rem $9.2x10^{-4}$ LCF $3.7x10^{-4}$ Det.	$6.5x10^{-2}$ pers. rem $1.6x10^{-1}$ LCF $6.4x10^{-2}$ Det.	$2.3x10^{-3}$ rem $1.2x10^{-6}$ LCF $5.3x10^{-7}$ Det.	$9.3x10^{-1}$ pers. rem $4.7x10^{-4}$ LCF $2.1x10^{-4}$ Det.	$1.6x10^{1}$ pers. rem $8.0x10^{-3}$ LCF $3.7x10^{-3}$ Det.
Area 5 TRU waste release - five container fire/explosion	$1x10^{-6}$	N/A[c]	3.7 rem $1.5x10^{-3}$ LCF $5.9x10^{-4}$ Det.	$1.0x10^{-1}$ pers. rem $4.0x10^{-5}$ LCF $1.6x10^{-5}$ Det.	$3.6x10^{-3}$ rem $1.8x10^{-6}$ LCF $8.3x10^{-6}$ Det.	1.5 pers. rem $7.5x10^{-4}$ LCF $3.5x10^{-4}$ Det.	$2.6x10^{1}$ pers. rem $1.3x10^{-2}$ LCF $6.0x10^{-3}$ Det.
Area 5 TRU waste airplane crash	$6x10^{-7}$	N/A[b]	$3.5x10^{3}$ rem 1.0 LCF 1.0 Det.	$9.9x10^{1}$ pers. rem $4.0x10^{-2}$ LCF $1.6x10^{-2}$ Det.	3.5 rem $1.8x10^{-3}$ LCF $8.0x10^{-4}$ Det.	$1.4x10^{3}$ pers. rem $7.0x10^{-1}$ LCF $3.2x10^{-1}$ Det.	$2.5x10^{4}$ pers. rem $1.3x10^{1}$ LCF 5.8 Det.
Environmental Restoration Program							
NTS Area 13 single container spill	$3x10^{-2}$	$3.0x10^{-3}$ rem $1.2x10^{-6}$ LCF $4.8x10^{-7}$ Det.	$1.5x10^{-8}$ rem $6.0x10^{-12}$ LCF $2.4x10^{-12}$ Det.	$7.5x10^{-8}$ pers. rem $3.3x10^{-6}$ LCF $1.3x10^{-6}$ Det.	$6.0x10^{-9}$ rem $3.0x10^{-12}$ LCF $1.4x10^{-12}$ Det.	$5.6x10^{-7}$ pers. rem $2.8x10^{-10}$ LCF $1.3x10^{-10}$ Det.	$9.7x10^{-6}$ pers. rem $4.9x10^{-9}$ LCF $2.2x10^{-9}$ Det.
TTR Project Roller Coaster site single container spill	$3x10^{-2}$	$3.0x10^{-3}$ rem $1.2x10^{-3}$ LCF $4.8x10^{-4}$ Det.	$1.2x10^{-7}$ rem $4.8x10^{-11}$ LCF $1.9x10^{-11}$ Det.	$1.2x10^{-5}$ pers.rem $3.3x10^{-6}$ LCF $1.3x10^{-6}$ Det.	$3.4x10^{-8}$ rem $1.7x10^{-11}$ LCF $7.8x10^{-12}$ Det.	$1.9x10^{-6}$ pers. rem $9.5x10^{-10}$ LCF $4.4x10^{-10}$ Det.	$3.3x10^{-5}$ pers. rem $1.7x10^{-8}$ LCF $7.6x10^{-9}$ Det.
NTS Area 13 multiple container fire	$4x10^{-6}$	N/A[c]	$1.4x10^{-7}$ rem $5.6x10^{-11}$ LCF $2.2x10^{-11}$ Det.	$7.0x10^{-7}$ pers. rem $2.8x10^{-10}$ LCF $1.1x10^{-10}$ Det.	$2.4x10^{-7}$ rem $1.2x10^{-10}$ LCF $5.5x10^{-11}$ Det.	$5.1x10^{-6}$ pers. rem $2.6x10^{-9}$ LCF $1.2x10^{-9}$ Det.	$8.8x10^{-5}$ pers. rem $4.4x10^{-8}$ LCF $2.0x10^{-8}$ Det.
TTR Project Roller Coaster site multiple container fire	$4x10^{-6}$	N/A[c]	$1.1x10^{-6}$ rem $4.4x10^{-10}$ LCF $1.8x10^{-10}$ Det.	$1.1x10^{-4}$ pers. rem $4.4x10^{-8}$ LCF $1.8x10^{-8}$ Det.	$3.1x10^{-7}$ rem $1.6x10^{-10}$ LCF $7.1x10^{-11}$ Det.	$1.7x10^{-5}$ pers. rem $8.5x10^{-9}$ LCF $3.9x10^{-9}$ Det.	$3.0x10^{-4}$ pers. rem $1.5x10^{-7}$ LCF $6.9x10^{-8}$ Det.
TTR Project Roller Coaster site airplane crash	$1x10^{-6}$	N/A[b]	$1.2x10^{-2}$ rem $4.8x10^{-6}$ LCF $1.9x10^{-6}$ Det.	1.2 pers. rem $4.8x10^{-4}$ LCF $1.9x10^{-4}$ Det.	$3.4x10^{-3}$ rem $1.7x10^{-6}$ LCF $7.8x10^{-7}$ Det.	$1.9x10^{-1}$ pers. rem $9.5x10^{-5}$ LCF $4.4x10^{-5}$ Det.	3.3 pers. rem $1.7x10^{-3}$ LCF $7.6x10^{-4}$ Det.
NTS Area 13 airplane crash	$7x10^{-7}$	N/A[b]	$1.1x10^{-3}$ rem $4.4x10^{-7}$ LCF $1.8x10^{-7}$ Det.	$5.5x10^{-3}$ pers. rem $2.2x10^{-6}$ LCF $8.8x10^{-7}$ Det.	$2.2x10^{-3}$ rem $1.1x10^{-6}$ LCF $5.1x10^{-7}$ Det.	$4.1x10^{-2}$ pers. rem $2.1x10^{-5}$ LCF $9.4x10^{-6}$ Det.	$7.1x10^{-1}$ pers. rem $3.6x10^{-4}$ LCF $1.6x10^{-4}$ Det.

Table A.5.3-1 Nevada Test Site and Off-Site Areas Radiological Facility Accident Probabilities and Consequences

(Page 2 of 2)

Alternative 3							
Accident	**Frequency (events/yr)**	**Involved Worker**	**Noninvolved Worker**	**Worker Population**	**Maximally Exposed Individual***	**Population, Neutral 50% Meteorology**	**Population, Stable 95% Meterology**
Nondefense Research and Development Program							
No radiological activities	–	–	–	–	–	–	–
Work for Others Program							
BEEF 100 Ci tritium release	$2x10^{-2}$	1.0 rem $4.0x10^{-4}$ LCF $1.6x10^{-4}$ Det.	$3.5x10^{-2}$ rem $1.4x10^{-5}$ LCF $5.6x10^{-6}$ Det.	2.9 pers. rem $1.2x10^{-3}$ LCF $4.6x10^{-4}$ Det.	$4.7x10^{-6}$ rem $2.4x10^{-9}$ LCF $1.1x10^{-9}$ Det.	$2.0x10^{-3}$ pers. rem $1.0x10^{-6}$ LCF $4.6x10^{-7}$ Det.	$3.5x10^{-2}$ pers. rem $1.8x10^{-5}$ LCF $8.1x10^{-6}$ Det.
BEEF 1,000 Ci tritium release	$3x10^{-5}$	N/A[b]	$3.5x10^{-1}$ rem $1.4x10^{-4}$ LCF $5.6x10^{-5}$ Det.	$6.0x10^{-3}$ pers. rem $2.4x10^{-6}$ LCF $9.6x10^{-7}$ Det.	$4.7x10^{-5}$ rem $2.4x10^{-8}$ LCF $1.1x10^{-8}$ Det	$2.0x10^{-2}$ pers. rem $1.0x10^{-5}$ LCF $4.6x10^{-6}$ Det.	$3.5x10^{-1}$ pers. rem $1.8x10^{-4}$ LCF $8.1x10^{-5}$ Det.

[a] Involved workers under cover or evacuated prior to event.
[b] Involved workers fatally injured in crash or explosion
[c] Plume rise carries source term over and above nearby workers.

*at the nearest point of public access

Table A.5.3-2 Chemical Accident Probabilities and Consequences

(Page 1 of 2)

Alternative 3							
Accident	**Frequency (events/yr)**	**Involved Worker**	**Noninvolved Worker**	**Worker Population**	**Maximally Exposed Individual[a]**	**Population, Neutral 50% Meteorology**	**Population, Stable 95% Meterology**
Defense Program							
TTR Area 9 - Release of DU and Be from Rocket Test Assembly	6x10^{-6}	N/A[b]	1.4x10^{-4} CR 8.8x10^{1}ERPG1 3.0ERPG2 3.0x10^{-1}ERPG3	1.4x10^{-7} CR 8.8x10^{1}ERPG1 3.0ERPG2 3.0x10^{-1}ERPG3	4.1x10^{-7} CR 2.7x10^{2}ERPG1 1.0x10^{1}ERPG2 1.0ERPG3	1.7x10^{-6} CR 1.3ERPG1 1.6x10^{-1}ERPG2 1.6x10^{-2}ERPG3	1.1x10^{-7} CR 2.4x10^{1}ERPG1 3.0x10^{-1}ERPG2 3.0x10^{-2}ERPG3
TTR Area 9 - Fire in Rocket Propellant Storage Building	1.6x10^{-6}	N/A[d]	N/A[c] CR 8.3ERPG1 1.0x10^{-1}ERPG2 1.0x10^{-2}ERPG3	N/A[c] CR 8.3ERPG1 1.0x10^{-1}ERPG2 1.0x10^{-2}ERPG3	N/A[c] CR 2.5x10^{1}ERPG1 3.2x10^{-1}ERPG2 3.2x10^{-2}ERPG3	N/A[c] CR 7.6x10^{-2}ERPG1 9.4x10^{-4}ERPG2 9.4x10^{-5}ERPG3	N/A[c] CR 1.2ERPG1 1.4x10^{-2}ERPG2 1.4x10^{-3}ERPG3
Waste Management Program							
NTS HWSU - Waste Handling	3x10^{-2}	7.2x10^{-1} CR 3.8x10^{5}ERPG1 3.8x10^{4}ERPG2 3.8x10^{3}ERPG3	4.1x10^{-3} CR 2.2x10^{-1}ERPG1 2.2ERPG2 2.2x10^{1}ERPG3	4.4x10^{-5} CR 4.3x10^{-1}ERPG1 4.3x10^{-2}ERPG2 4.3x10^{-3}ERPG3	4.3x10^{-3} CR 3.8x10^{-2}ERPG1 3.8x10^{-3}ERPG2 3.84x10^{-4}ERPG3	1.7x10^{-3} CR N/A ERPG[e]	1.7x10^{-4} CR N/A ERPG[e]
NTS HWSU - Fire in Waste	8x10^{-5}	N/A[d]	8.8x10^{-3} CR 8.5x10^{3}ERPG1 5.1x10^{2}ERPG2 5.1x10^{1}ERPG3	1.0x10^{-4} CR 3.8ERPG1 1.3x10^{-1}ERPG2 1.3x10^{-2}ERPG3	1.2x10^{-6} CR 8.6x10^{-1}ERPG1 1.9x10^{-2}ERPG2 1.9x10^{-3}ERPG3	3.5x10^{-3} CR N/A ERPG[e]	1.7x10^{-3} CR N/A ERPG[e]
NTS HWSU - Airplane Crash into Waste	1x10^{-7}	N/A[b]	6.6x10^{-2} CR 6.2x10^{4}ERPG1 3.4x10^{3}ERPG2 3.4x10^{2}ERPG3	1.1x10^{-3} CR 1.6x10^{1}ERPG1 8.9x10^{-1}ERPG2 8.9x10^{-2}ERPG3	2.4x10^{-5} CR 2.3ERPG1 1.3x10^{-1}ERPG2 1.3x10^{-2}ERPG3	2.7x10^{-2} CR 8.3x10^{-1}ERPG1 4.5x10^{-2}ERPG2 4.5x10^{-3}ERPG3	1.0x10^{-1} CR 1.7ERPG1 9.6x10^{-2}ERPG2 9.6x10^{-3}ERPG3
Environmental Restoration Program							
NTS Area 5 - Waste Handling	1.1x10^{-1}	1.8x10^{-1} CR 1.8x10^{5}ERPG1 1.0x10^{4}ERPG2 1.0x10^{3}ERPG3	1.1x10^{-3} CR 1.1x10^{3}ERPG1 6.1x10^{1}ERPG2 6.1ERPG3	2.6x10^{-5} CR 2.9x10^{-1}ERPG1 1.6x10^{-2}ERPG2 1.8x10^{-3}ERPG3	4.1x10^{-7} CR 3.8x10^{-2}ERPG1 2.2x10^{-3}ERPG2 2.2x10^{-4}ERPG3	4.5x10^{-4} CR N/A ERPG[e]	1.3x10^{-3} CR N/A ERPG[e]
NTS Area 5 - Fire in Staged Waste	8.0x10^{-5}	N/A[d]	4.5x10^{-3} CR 3.1x10^{3}ERPG1 2.5x10^{2}ERPG2 2.5x10^{1}ERPG3	4.9x10^{-5} CR 7.0X10^{-1}ERPG1 5.2x10^{-2}ERPG2 5.2x10^{-3}ERPG3	5.0x10^{-7} CR 8.4x10^{-2}ERPG1 5.0x10^{-3}ERPG2 5.0x10^{-4}ERPG3	1.8x10^{-3} CR N/A ERPG[e]	4.3x10^{-4} CR N/A ERPG[e]
NTS Area 5 - Airplane Crash into Staged Waste	7.0x10^{-7}	N/A[b]	8.1x10^{-3} CR 5.6x10^{3}ERPG1 4.5x10^{2}ERPG2 4.5x10^{1}ERPG3	9.4x10^{-5} CR 1.3ERPG1 9.7x10^{-2}ERPG2 9.7x10^{-3}ERPG3	8.5x10^{-6} CR 1.5x10^{-1}ERPG1 9.8x10^{-3}ERPG2 9.8x10^{-4}ERPG3	3.3x10^{-3} CR 7.6x10^{-2}ERPG1 6.1x10^{-3}ERPG2 6.1x10^{-4}ERPG3	1.5x10^{-3} CR 1.0x10^{-1}ERPG1 6.5x10^{-3}ERPG2 6.5x10^{-4}ERPG3
Nondefense Research and Development Program							
NTS LGFSTF - Spill at Chemical Storage Pad	1.7x10^{-2}	1.4x10^{-2} CR 4.0x10^{5}ERPG1 2.7x10^{3}ERPG2 2.7x10^{2}ERPG3	1.4x10^{-4} CR 4.0x10^{3}ERPG1 2.7x10^{1}ERPG2 2.7ERPG3	1.7x10^{-5} CR 3.2ERPG1 2.1x10^{-2}ERPG2 2.1x10^{-3}ERPG3	2.7x10^{-7} CR 1.3ERPG1 8.8x10^{-3}ERPG2 8.8x10^{-4}ERPG3	8.5x10^{-5} CR 2.1x10^{-2}ERPG1 1.4x10^{-4}ERPG2 1.4x10^{-5}ERPG3	1.0x10^{-3} CR 7.6x10^{-1}ERPG1 5.1x10^{-3}ERPG2 5.1x10^{-4}ERPG3
NTS LGFSTF - Tank Failure at Tank Farm	1.0x10^{-4}	1.9x10^{-1} CR 2.2x10^{6}ERPG1 4.3x10^{3}ERPG2 4.3x10^{2}ERPG3	1.9x10^{-3} CR 2.2x10^{4}ERPG1 4.3x10^{1}ERPG2 4.3ERPG3	2.2x10^{-4} CR 1.6x10^{1}ERPG1 3.2x10^{-2}ERPG2 3.2x10^{-3}ERPG3	3.6x10^{-6} CR 6.9ERPG1 1.4x10^{-2}ERPG2 1.4x10^{-3}ERPG3	8.7x10^{-4} CR 2.7x10^{-1}ERPG1 5.4x10^{-4}ERPG2 5.4x10^{-5}ERPG3	1.4x10^{-2} CR 3.9ERPG1 7.9x10^{-3}ERPG2 7.9x10^{-4}ERPG3
NTS LGFSTF - Airplane Crash at Tank Farm	1.0x10^{-7}	N/A[b]	3.3 CR 5.2x10^{6}ERPG1 1.0x10^{4}ERPG2 1.0x10^{3}ERPG3	5.4x10^{-2} CR 4.0x10^{3}ERPG1 8.0ERPG2 8.0x10^{-1}ERPG3	8.8x10^{-4} CR 1.7x10^{3}ERPG1 3.4ERPG2 3.4x10^{-1}ERPG3	2.1x10^{-1} CR 6.5x10^{1}ERPG1 1.3x10^{-1}ERPG2 1.3x10^{-2}ERPG3	3.4 CR 9.2x10^{2}ERPG1 1.9ERPG2 1.9x10^{-1}ERPG3

Table A.5.3-2 Chemical Accident Probabilities and Consequences (Page 2 of 2)

Alternative 3							
Accident	**Frequency (events/yr)**	**Involved Worker**	**Noninvolved Worker**	**Worker Population**	**Maximally Exposed Individual***	**Population, Neutral 50% Meteorology**	**Population, Stable 95% Meterology**
Work for Others Program							
NTS BEEF - Heavy Metal Release	$1.0x10^{-2}$	N/A[b]	$1.8x10^{-4}$ CR $2.3x10^{1}$ERPG1 $4.4x10^{-1}$ERPG2 $4.4x10^{-2}$ERPG3	$6.1x10^{-7}$ CR $2.1x10^{-3}$ERPG1 $4.0x10^{-5}$ERPG2 $4.0x10^{-6}$ERPG3	$1.4x10^{-9}$ CR $9.7x10^{-5}$ERPG1 $1.9x10^{-6}$ERPG2 $1.9x10^{-7}$ERPG3	$2.9x10^{-6}$ CR N/A ERPG[e]	$1.3x10^{-7}$ CR N/A ERPG[e]
NTS BEEF - Depleted Uranium Beryllium, & Heavy Metal Release	$1.0x10^{-3}$	N/A[b]	$8.0x10^{-4}$ CR $1.0x10^{5}$ERPG1 $2.4x10^{3}$ERPG2 $2.4x10^{2}$ERPG3	$2.8x10^{-6}$ CR 9.9ERPG1 $2.3x10^{-1}$ERPG2 $2.3x10^{-2}$ERPG3	$6.3x10^{-9}$ CR $2.8x10^{-2}$ERPG1 $6.4x10^{-4}$ERPG2 $6.4x10^{-5}$ERPG3	$1.3x10^{-5}$ CR N/A ERPG[e]	$5.6x10^{-7}$ CR N/A ERPG[e]

[a] Individual cancer risk is expressed as the increased probability of developing cancer. Population cancer risk is expressed as the increased number of cancers within the population

[b] N/A - Physical impacts of the event dominate consequences to involved workers

[c] No RfC is available in either IRIS or HEAST for chemicals of concern

[d] N/A - Plume rise from the fire carries the source term over and above nearby workers

[e] N/A - ERPG hazard indices are significantly below 1.0 at 20 km. All other public exposures occur at distances >20 km.

*at the nearest point of public access

Table A.5.4-1 Nevada Test Site and Off-Site Areas Radiological Facility Accident Probabilities Consequences

Alternative 4							
Accident	**Frequency (events/yr)**	**Involved Worker**	**Noninvolved Worker**	**Worker Population**	**Maximally Exposed Individual***	**Population, Neutral 50% Meteorology**	**Population, Stable 95% Meterology**
Defense Program							
TTR test assembly mechanical release of Pu	1x10^{-6}	N/A[a]	1.3x10^{-2} rem 5.2x10^{-6} LCF 2.1x10^{-6}Det.	2.6x10^{-1} pers. rem 1.0x10^{-4} LCF 4.2x10^{-5} Det.	6.7x10^{-3} rem 3.4x10^{-6}LCF 1.5x10^{-6}Det.	5.4x10^{-4} pers. rem 2.7x10^{-7} LCF 1.2x10^{-7} Det.	9.4x10^{-3} pers. rem 4.7x10^{-6} LCF 2.2x10^{-6} Det.
TTR artillery fired test assembly failure	1 x10^{-7}	N/A[a]	7.1x10^{1} rem 5.7x10^{-2} LCF 2.3x10^{-2} Det.	7.1x10^{3} pers. rem 5.7 LCF 2.3 Det.	2.3 rem 1.2x10^{-3} LCF 5.3x10^{-4} Det.	1.8x10^{1} pers. rem 9.0x10^{-3} LCF 4.1x10^{-3} Det.	3.1x10^{2} pers. rem 1.6x10^{-1} LCF 7.1x10^{-2} Det.
Waste Management Program							
Area 5 TRU waste release - two container fire/explosion	1x10^{-2}	7.4x10^{1} rem 5.9x10^{-2} LCF 3.4x10^{-2} Det.	2.3 rem 9.2x10^{-4} LCF 3.7x10^{-4} Det.	6.5x10^{-2} pers. rem 1.6x10^{-1} LCF 6.4x10^{-2} Det.	2.3x10^{-3} rem 1.2x10^{-6} LCF 5.3x10^{-7} Det.	9.3x10^{-1} pers. rem 4.7x10^{-4} LCF 2.1x10^{-4} Det.	1.6x10^{1} pers. rem 8.0x10^{-3} LCF 3.7x10^{-3} Det.
Area 5 TRU waste release - five container fire/explosion	1x10^{-6}	N/A[c]	3.7 rem 1.5x10^{-3} LCF 5.9x10^{-4} Det.	1.0x10^{-1} pers. rem 4.0x10^{-5} LCF 1.6x10^{-5} Det.	3.6x10^{-3} rem 1.8x10^{-6} LCF 8.3x10^{-6} Det.	1.5 pers. rem 7.5x10^{-4} LCF 3.5x10^{-4} Det.	2.6x10^{1} pers. rem 1.3x10^{-2} LCF 6.0x10^{-3} Det.
Area 5 TRU waste airplane crash	6x10^{-7}	N/A[b]	3.5x10^{3} rem 1.0 LCF 1.0 Det.	9.9x10^{1} pers. rem 4.0x10^{-2} LCF 1.6x10^{-2} Det.	3.5 rem 1.8x10^{-3} LCF 8.0x10^{-4} Det.	1.4x10^{3} pers. rem 7.0x10^{-1} LCF 3.2x10^{-1} Det.	2.5x10^{4} pers. rem 1.3x10^{1} LCF 5.8 Det.
Environmental Restoration Program							
NTS Area 13 single container spill	3x10^{-2}	3.0x10^{-3} rem 1.2x10^{-6} LCF 4.8x10^{-7} Det.	1.5x10^{-8} rem 6.0x10^{-12} LCF 2.4x10^{-12} Det.	7.5x10^{-8} pers. rem 3.3x10^{-6} LCF 1.3x10^{-6} Det.	6.0x10^{-9} rem 3.0x10^{-12} LCF 1.4x10^{-12} Det.	5.6x10^{-7} pers. rem 2.8x10^{-10} LCF 1.3x10^{-10} Det.	9.7x10^{-6} pers. rem 4.9x10^{-9} LCF 2.2x10^{-9} Det.
TTR Project Roller Coaster site single container spill	3x10^{-2}	3.0x10^{-3} rem 1.2x10^{-3} LCF 4.8x10^{-4} Det.	1.2x10^{-7} rem 4.8x10^{-11} LCF 1.9x10^{-11} Det.	1.2x10^{-5} pers.rem 3.3x10^{-6} LCF 1.3x10^{-6} Det.	3.4x10^{-8} rem 1.7x10^{-11} LCF 7.8x10^{-12} Det.	1.9x10^{-6} pers. rem 9.5x10^{-10} LCF 4.4x10^{-10} Det.	3.3x10^{-5} pers. 1.7x10^{-8} L 7.6x10^{-9} De
NTS Area 13 multiple container fire	4x10^{-6}	N/A[c]	1.4x10^{-7} rem 5.6x10^{-11} LCF 2.2x10^{-11} Det.	7.0x10^{-7} pers. rem 2.8x10^{-10} LCF 1.1x10^{-10} Det.	2.4x10^{-7} rem 1.2x10^{-10} LCF 5.5x10^{-11} Det.	5.1x10^{-6} pers. rem 2.6x10^{-9} LCF 1.2x10^{-9} Det.	8.8x10^{-5} pers. rem 4.4x10^{-8} LCF 2.0x10^{-8} Det.
TTR Project Roller Coaster site multiple container fire	4x10^{-6}	N/A[c]	1.1x10^{-6} rem 4.4x10^{-10} LCF 1.8x10^{-10} Det.	1.1x10^{-4} pers. rem 4.4x10^{-8} LCF 1.8x10^{-8} Det.	3.1x10^{-7} rem 1.6x10^{-10} LCF 7.1x10^{-11} Det.	1.7x10^{-5} pers. rem 8.5x10^{-9} LCF 3.9x10^{-9} Det.	3.0x10^{-4} pers. rem 1.5x10^{-7} LCF 6.9x10^{-8} Det.
TTR Project Roller Coaster site airplane crash	1x10^{-6}	N/A[b]	1.2x10^{-2} rem 4.8x10^{-6} LCF 1.9x10^{-6} Det.	1.2 pers. rem 4.8x10^{-4} LCF 1.9x10^{-4} Det.	3.4x10^{-3} rem 1.7x10^{-6} LCF 7.8x10^{-7} Det.	1.9x10^{-1} pers. rem 9.5x10^{-5} LCF 4.4x10^{-5} Det.	3.3 pers. rem 1.7x10^{-3} LCF 7.6x10^{-4} Det.
NTS Area 13 airplane crash	7x10^{-7}	N/A[b]	1.1x10^{-3} rem 4.4x10^{-7} LCF 1.8x10^{-7} Det.	5.5x10^{-3} pers. rem 2.2x10^{-6} LCF 8.8x10^{-7} Det.	2.2x10^{-3} rem 1.1x10^{-6} LCF 5.1x10^{-7} Det.	4.1x10^{-2} pers. rem 2.1x10^{-5} LCF 9.4x10^{-6} Det.	7.1x10^{-1} pers. rem 3.6x10^{-4} LCF 1.6x10^{-4} Det.
Nondefense Research and Development Program							
No radiological activities	--	--	--	--	--	--	--
Work for Others Program							
No radiological activities	--	--	--	--	--	--	--

[a] Involved workers under cover or evacuated prior to event
[b] Involved workers fatally injured in crash or explosion
[c] Plume rise carries source term over and above nearby worker.

*at the nearest point of public access

Table A.5.4-2 Chemical Accident Probabilities and Consequences (Page 1 of 2)

Alternative 4							
Accident	**Frequency (events/yr)**	**Involved Worker**	**Noninvolved Worker**	**Worker Population**	**Maximally Exposed Individual***	**Population, Neutral 50% Meteorology**	**Population, Stable 95% Meterology**
Defense Program							
TTR Area 9 - Release of DU and Be from Rocket Test Assembly	$6x10^{-6}$	N/A[b]	$1.4x10^{-8}$ CR $8.8x10^{1}$ERPG1 3.0ERPG2 $3.0x10^{-1}$ERPG3	$1.4x10^{-7}$ CR $8.8x10^{1}$ERPG1 3.0ERPG2 $3.0x10^{-1}$ERPG3	$4.1x10^{-7}$ CR $2.7x10^{2}$ERPG1 $1.0x10^{1}$ERPG2 1.0ERPG3	$1.7x10^{-6}$ CR 1.3ERPG1 $1.6x10^{-1}$ERPG2 $1.6x10^{-2}$ERPG3	$1.1x10^{-7}$ CR $2.4x10^{1}$ERPG1 $3.0x10^{-1}$ERPG2 $3.0x10^{-2}$ERPG3
TTR Area 9 - Fire in Rocket Propellant Storage Building	$1.6 x10^{-6}$	N/A[d]	N/A[c] CR 8.3ERPG1 $1.0x10^{-1}$ERPG2 $1.0x10^{-2}$ERPG3	N/A[c] CR 8.3ERPG1 $1.0x10^{-1}$ERPG2 $1.0x10^{-2}$ERPG3	N/A[c] CR $2.5x10^{1}$ERPG1 $3.2x10^{-1}$ERPG2 $3.2x10^{-2}$ERPG3	N/A[c] CR $7.6x10^{-2}$ERPG1 $9.4x10^{-4}$ERPG2 $9.4x10^{-5}$ERPG3	N/A[c] CR 1.2ERPG1 $1.4x10^{-2}$ERPG2 $1.4x10^{-3}$ERPG3
Waste Management Program							
NTS HWSU - Waste Handling	$3x10^{-2}$	$7.2x10^{-1}$ CR $3.8x10^{5}$ERPG1 $3.8x10^{4}$ERPG2 $3.8x10^{3}$ERPG3	$4.1x10^{-3}$ CR $2.2x10^{-1}$ERPG1 2.2ERPG2 $2.2x10^{1}$ERPG3	$4.4x10^{-5}$ CR $4.3x10^{-1}$ERPG1 $4.3x10^{-2}$ERPG2 $4.3x10^{-3}$ERPG3	$4.3x10^{-3}$ CR $3.8x10^{-2}$ERPG1 $3.8x10^{-3}$ERPG2 $3.84x10^{-4}$ERPG3	$1.7x10^{-3}$ CR N/A ERPG[e]	$1.7x10^{-4}$ CR N/A ERPG[e]
NTS HWSU - Fire in Waste	$8x10^{-5}$	N/A[d]	$8.8x10^{-3}$ CR $8.5x10^{3}$ERPG1 $5.1x10^{2}$ERPG2 $5.1x10^{1}$ERPG3	$1.0x10^{-4}$ CR 3.8ERPG1 $1.3x10^{-1}$ERPG2 $1.3x10^{-2}$ERPG3	$1.2x10^{-6}$ CR $8.6x10^{-1}$ERPG1 $1.9x10^{-2}$ERPG2 $1.9x10^{-3}$ERPG3	$3.5x10^{-3}$ CR N/A ERPG[e]	$1.7x10^{-3}$ CR N/A ERPG[e]
NTS HWSU - Airplane Crash into Waste	$1x10^{-7}$	N/A[b]	$6.6x10^{-2}$ CR $6.2x10^{4}$ERPG1 $3.4x10^{3}$ERPG2 $3.4x10^{2}$ERPG3	$1.1x10^{-3}$ CR $1.6x10^{1}$ERPG1 $8.9x10^{-1}$ERPG2 $8.9x10^{-2}$ERPG3	$2.4x10^{-5}$ CR 2.3ERPG1 $1.3x10^{-1}$ERPG2 $1.3x10^{-2}$ERPG3	$2.7x10^{-2}$ CR $8.3x10^{-1}$ERPG1 $4.5x10^{-2}$ERPG2 $4.5x10^{-3}$ERPG3	$1.0x10^{-1}$ CR 1.7ERPG1 $9.6x10^{-2}$ERPG2 $9.6x10^{-3}$ERPG3
Environmental Restoration Program							
NTS Area 5 - Waste Handling	$1.1x10^{-1}$	$1.8x10^{-1}$ CR $1.8x10^{5}$ERPG1 $1.0x10^{4}$ERPG2 $1.0x10^{3}$ERPG3	$1.1x10^{-3}$ CR $1.1x10^{3}$ERPG1 $6.1x10^{1}$ERPG2 6.1ERPG3	$2.6x10^{-5}$ CR $2.9x10^{-1}$ERPG1 $1.6x10^{-2}$ERPG2 $1.8x10^{-3}$ERPG3	$4.1x10^{-7}$ CR $3.8x10^{-2}$ERPG1 $2.2x10^{-3}$ERPG2 $2.2x10^{-4}$ERPG3	$4.5x10^{-4}$ CR N/A ERPG[e]	$4.3x10^{-3}$ CR N/A ERPG[e]
NTS Area 5 - Fire in Staged Waste	$8.0x10^{-5}$	N/A[d]	$4.5x10^{-3}$ CR $3.1x10^{3}$ERPG1 $2.5x10^{2}$ERPG2 $2.5x10^{1}$ERPG3	$4.9x10^{-5}$ CR $7.0x10^{-1}$ERPG1 $5.2x10^{-2}$ERPG2 $5.2x10^{-3}$ERPG3	$5.0x10^{-7}$ CR $8.4x10^{-2}$ERPG1 $5.0x10^{-3}$ERPG2 $5.0x10^{-4}$ERPG3	$1.8x10^{-3}$ CR N/A ERPG[e]	$4.3x10^{-4}$ CR N/A ERPG[e]
NTS Area 5 - Airplane Crash into Staged Waste	$7.0X10^{-7}$	N/A[b]	$8.1x10^{-3}$ CR $5.6x10^{3}$ERPG1 $4.5x10^{2}$ERPG2 $4.5x10^{1}$ERPG3	$9.4x10^{-5}$ CR 1.3ERPG1 $9.7x10^{-2}$ERPG2 $9.7x10^{-3}$ERPG3	$8.5x10^{-6}$ CR $1.5x10^{-1}$ERPG1 $9.8x10^{-3}$ERPG2 $9.8x10^{-4}$ERPG3	$3.3x10^{-3}$ CR $7.6x10^{-2}$ERPG1 $6.1x10^{-3}$ERPG2 $6.1x10^{-4}$ERPG3	$1.5x10^{-3}$ CR $1.0x10^{-1}$ERPG1 $6.5x10^{-3}$ERPG2 $6.5x10^{-4}$ERPG3

Table A.5.4-2 Chemical Accident Probabilities and Consequences (Page 2 of 2)

Alternative 4								
Accident	**Frequency (events/yr)**	**Involved Worker**	**Noninvolved Worker**	**Worker Population**	**Maximally Exposed Individual***	**Population, Neutral 50% Meteorology**	**Population, Stable 95% Meterology**
Nondefense Research and Development Program								
NTS LGFSTF - Spill at Chemical Storage Pad	$1.7x10^{-2}$	$1.4x10^{-2}$ CR $4.0x10^{5}$ERPG1 $2.7x10^{3}$ERPG2 $2.7x10^{2}$ERPG3	$1.4x10^{-4}$ CR $4.0x10^{3}$ERPG1 $2.7x10^{1}$ERPG2 2.7ERPG3	$1.7x10^{-5}$ CR 3.2ERPG1 $2.1x10^{-2}$ERPG2 $2.1x10^{-3}$ERPG3	$2.7x10^{-7}$ CR 1.3ERPG1 $8.8x10^{-3}$ERPG2 $8.8x10^{-4}$ERPG3	$8.5x10^{-5}$ CR $2.1x10^{-2}$ERPG1 $1.4x10^{-4}$ERPG2 $1.4x10^{-5}$ERPG3	$1.0x10^{-3}$ CR $7.6x10^{-1}$ERPG1 $5.1x10^{-3}$ERPG2 $5.1x10^{-4}$ERPG3
NTS LGFSTF - Tank Failure at Tank Farm	$1.0x10^{-4}$	$1.9x10^{-1}$ CR $2.2x10^{6}$ERPG1 $4.3x10^{3}$ERPG2 $4.3x10^{2}$ERPG3	$1.9x10^{-3}$ CR $2.2x10^{4}$ERPG1 $4.3x10^{1}$ERPG2 4.3ERPG3	$2.2x10^{-4}$ CR $1.6x10^{1}$ERPG1 $3.2x10^{-2}$ERPG2 $3.2x10^{-3}$ERPG3	$3.6x10^{-6}$ CR 6.9ERPG1 $1.4x10^{-2}$ERPG2 $1.4x10^{-3}$ERPG3	$8.7x10^{-4}$ CR $2.7x10^{-1}$ERPG1 $5.4x10^{-4}$ERPG2 $5.4x10^{-5}$ERPG3	$1.4x10^{-2}$ CR 3.9ERPG1 $7.9x10^{-3}$ERPG2 $7.9x10^{-4}$ERPG3
NTS LGFSTF - Airplane Crash at Tank Farm	$1.0x10^{-7}$	N/A[b]	3.3 CR $5.2x10^{6}$ERPG1 $1.0x10^{4}$ERPG2 $1.0x10^{3}$ERPG3	$5.4x10^{-2}$ CR $4.0x10^{3}$ERPG1 8.0ERPG2 $8.0x10^{-1}$ERPG3	$8.8x10^{-4}$ CR $1.7x10^{3}$ERPG1 3.4ERPG2 $3.4x10^{-1}$ERPG3	$2.1x10^{-1}$ CR $6.5x10^{1}$ERPG1 $1.3x10^{-1}$ERPG2 $1.3x10^{-2}$ERPG3	3.4 CR $9.2x10^{2}$ERPG1 1.9ERPG2 $1.9x10^{-1}$ERPG3
Work for Others Program							
N/A[f]							

[a] Individual cancer risk is expressed as the increased probability of developing cancer. Population cancer risk is expressed as the increased number of cancers within the population
[b] N/A - Physical impacts of the event dominate consequences to involved workers
[c] No RfC is available in either IRIS or HEAST for chemicals of concern
[d] N/A - Plume rise from the fire carries the source term over and above nearby workers.
[e] N/A - ERPG hazard indices are significantly below 1.0 at 20 km. All other public exposures occur at distances >20 km
[f] N/A - No activities performed under this program for this alternative.

*at the nearest point of public access

A.6 References

SAIC, 1996	Science Applications Intentional Corporation, Accident Assessments for Nevada Test Site Facilities and Off-Site Locations. Science Applications International Corporation, Las Vegas, NV, June 1996.
Homann, 1988	Homann Associates, Inc., 1988, *EPIcode™(Emergency Prediction Information Manual),* Fremont, CA
Wenzel,1993	Wenzel, D.R., *The Radiological Safety Analysis Computer Program (RSAC-5), WINCO-1123,* Westinghouse Idaho Nuclear Company, Inc., Idaho Falls, Idaho

This Page Intentionally Left Blank

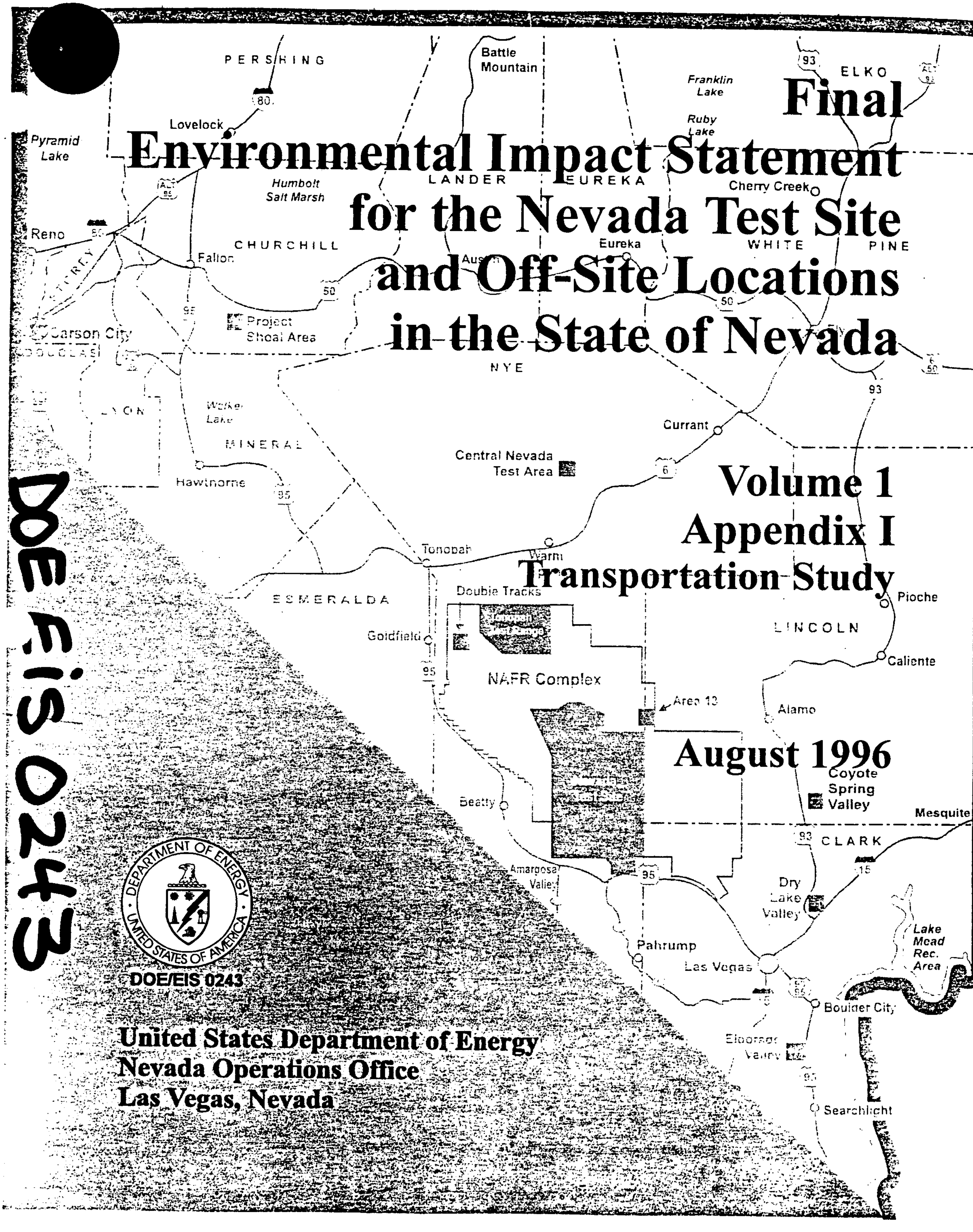
*U.S. GOVERNMENT PRINTING OFFICE: 1996-785-718

Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada

Volume 1
Appendix I
Transportation Study

August 1996

DOE EIS 0243



DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA

DOE/EIS 0243

United States Department of Energy
Nevada Operations Office
Las Vegas, Nevada

Final
Environmental Impact Statement

for
the Nevada Test Site and Off-Site Locations in the State of Nevada

Volume 1

Appendix I

U.S. Department of Energy
Nevada Operations Office
Las Vegas, Nevada

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

Attachments

List of Figures

List of Tables

TABLE OF CONTENTS (continued)

List of Tables (continued)

ACRONYMS

AT/SST	Armored Tractor/Safe-Secure Trailer
ac	acres
ADROIT	Potential risk associated with Defense Programs Transportation Activities
ANL-E	Argonne National Laboratory - East
BAPL	Bettis Atomic Power Laboratory
Bq	Becquerel
CGTO	Consolidated Group of Tribes and Organizations
dBa	a weighted decibel
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy, Nevada Operations Office
EIS	Environmental Impact Statement
EM	Emergency Materials
EPA	U.S. Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FORTRAN	A computer programming language for problems that can be addressed in algebraic terms
g	gram
Hz	hertz
HIGHWAY	A computer program used for evaluating routes for transporting hazardous materials in the United States
hours/yr	hours per year
INEL	Idaho National Engineering Laboratory
KAPL	Knolls Atomic Power Laboratory
km	kilometer
LANL	Los Alamos National Laboratory
LCF	Latent cancer fatality
LLNL	Lawrence Livermore National Laboratory
LLW	Low-Level Waste
m^2	square meters
m^3	cubic meters
ERPG	Emergency response planning guidelines
m	meter
mi	mile
yd	yard
NAFR Complex	Nellis Air Force Range

ACRONYMS (continued)

nCi	nanocurie
NTS	Nevada Test Site
PSC	Public Service Commission
ORNL	Oak Ridge National Laboratory
PEIS	Programmatic Environmental Impact Statement
PORTS	Portsmouth Gaseous Diffusion Plant
RFETS	Rocky Flats Environmental Technology Site
SLAC	Stanford Linear Accelerator
Spaghetti Bowl	U.S. 15/95 Interchange in Las Vegas
SRS	Savannah River Site
RADTRAN	A computer code combining user-determined meteorological, demographic, transportation, packaging, and material factors with health physics data to calculate the expected radiological consequences and accident risk of transporting radioactive materials
VOC	Volatile Organic Compound

This Page Intentionally Left Blank

SUMMARY

This report has been prepared to address local transportation issues concerning current and potential operations at the Nevada Test Site (NTS), to document the results of the NTS transportation risk analysis, and to provide information and supporting documentation for the Environmental Impact Statement (EIS) for the NTS and Off-Site Locations in the State of Nevada. Four alternatives are evaluated in the NTS EIS: Alternative 1, Continue Current Operations, (No Action); Alternative 2, Discontinue Operations; Alternative 3, Expanded Use; and Alternative 4, Alternate Use of Withdrawn Lands. The transportation risk analysis estimated the health risk from highway transportation of DOE-generated low-level waste, mixed waste, and defense-related nuclear materials for each of the four alternatives.

Stakeholders have identified transportation, health, and safety issues as their paramount concern. In response to these concerns, the U.S. Department of Energy, Nevada Operations Office (DOE/NV) solicited and received input from the public through public meetings and in meetings with federal, state, and local organizations; and commissioned a transportation study. The stakeholders and U. S. Department of Energy (DOE) established the Transportation Protocol Working Group and Big Group to further discuss issues associated with NTS transportation activities. The Transportation Protocol Working Group submitted over 20 recommendations to the DOE concerning the transportation of low-level waste to the NTS. These recommendations covered areas such as information gathering and dissemination; emergency response communications, equipment, and training; operating procedures; and route selection. The recommendations of the Transportation Protocol Working Group are discussed in Chapter 2.

The DOE/NV has also begun a comprehensive study to assess the potential social and cultural effects on American Indian people from the transportation of low-level waste and mixed waste. The study will focus on the American Indian people who reside along three of the primary routes previously evaluated for risk in the NTS EIS. The DOE is committed to having the study reflect the full range of American Indian options.

As part of its mission related to Defense Program, the DOE maintains and operates a special fleet of trucks and trailers used to transport Category II or higher nuclear material between Department of Defense (DoD) and DOE sites in a safe and secure manner. The DOE/Albuquerque Operations Office, Transportation Safeguards Division is responsible for the operation and maintenance of these safe-secure trailers and support vehicles. Since the establishment of this program in 1974, the DOE/Transportation Safeguards Division has accumulated more than 120 million kilometers (km) (75 million miles) of over-the-road experience transporting DOE-owned nuclear materials without an accident that resulted in a release of radioactive material.

Another significant program managed by the DOE that includes transportation activities is the Environmental Restoration/Waste Management Program. Two low-level waste management sites for the DOE complex are presently located at the NTS. Two additional missions which would expand operations at the NTS are under consideration: the addition of the disposal of low-level mixed waste from off-site generators, and the expansion of current disposal facilities to receive significantly more waste. Expansion of these programs would result in an increased need for support services in the areas of shipping, handling, and disposal of hazardous materials. Interstate transportation of low-level waste is also an integral part of these expanded missions.

This study used two different models to calculate risk: (1) potential risk associated with Defense Programs Transportation Activities (ADROIT), and (2) a computer code combining user-determined meteorological, demographic, transportation, packaging, and material factors with health physics data. This second model

(RADTRAN-like) was used to calculate the expected radiological consequences and accident risk of transporting radioactive material for waste management activities. Because of national security concerns associated with special nuclear material, the DOE developed ADROIT to define the potential risk associated with Defense Program transportation activities. A RADTRAN-like model was used to calculate the risk associated with the Waste Management and Environmental Restoration Program. This model was used based on the stakeholder request to see each step in the process. This model is comprised of a combination of spreadsheet, and a computer programming language for problems that can be addressed in algebraic terms (FORTRAN) numbers. A detailed discussion of the model is contained in the *Summary of the Transportation Risk Assessment Results for the Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996).

The results of the transportation risk analysis show that the human health risks from transportation operations are low under any alternative, and are not significant contributors to the total risk from all operations under these alternatives. The expected number of occurrences of cargo-related health effects were calculated for both incident-free and accident scenarios for radioactive and hazardous cargo. Vehicle-related health effects of traffic fatalities and injuries were also calculated. The maximum reasonably foreseeable accidents for low-level waste and mixed waste transportation were assessed. There are no maximum reasonably foreseeable Defense Program accidents that would result in a radioactive release. The total human health risk is dominated by vehicle-related deaths, injuries, and illness and even those numbers are low. Radiation-induced fatalities and illnesses result predominantly from incident-free exposures; however, the expected number of latent cancer fatalities is extremely small in either case.

Of particular interest locally were the in-state risks of low-level and mixed waste transportation. As far as in-state routes are concerned, vehicle-related fatalities and injuries dominate the risk, followed by incident-free radiation-induced fatalities. The risks along all in-state routes are very low, and, are within the uncertainty bands of the analysis. These risks are so similar, that it is not meaningful to rank routes solely on the basis of risk. The results indicate that routing decisions need not rely solely on the health risks as they are all similar, and all are low; however, certain routes do exhibit small risk reductions over others and could be used as a risk management tool. Reduction of total risk can be achieved mainly by selecting the route from a given generator site with the lowest vehicle-related risks.

Risk is not the only concern in the transportation of radioactive and hazardous waste to the NTS. Consequently, the DOE will continue to interact with the stakeholders to ensure that local concerns are brought to the attention of carriers selecting routes; will ensure that full government-to-government consultation with American Indian tribal governments occurs; and will continue to conduct all operations, including shipping, in a safe manner.

1.0 INTRODUCTION

1.1 Purpose and Scope

The NTS is a multiple-facility site that supports a diverse range of DOE mission objectives. Although the principal mission of the NTS has been to conduct nuclear tests, and more recently, to maintain a readiness to conduct nuclear tests, the NTS has also supported other DOE activities in the waste management, environmental restoration, non-defense research and development, and work for others program. This report was written to address the local issues concerning these and potential future operations and to provide information and supporting documentation to the NTS EIS, particularly by summarizing the transportation risk analysis.

Four alternatives have been identified for evaluation in the NTS EIS:

- Alternative 1, Continue Current Operations (No Action)
- Alternative 2, Discontinue Operations
- Alternative 3, Expanded Use
- Alternative 4, Alternate Use of Withdrawn Lands.

Alternative 1 is defined as the continuation of ongoing DOE and interagency programs, activities, and operations at NTS. It also includes the provision for continuing past operations such as; maintaining and conducting nuclear weapons tests, and disposal of waste generated from some outside sources.

Alternative 2 represents one end of the spectrum of options considered in the EIS. This alternative would result in site closure, with the exception of required activities in support of site security and environmental monitoring. All current programs, including waste receipt and disposal activities, would be discontinued.

Under Alternative 3, use of the NTS and its resources would be expanded to support national programs of both a defense and nondefense nature. This would mean a significant increase in opportunities for use of the NTS and its capabilities and resources in support of ongoing and new Defense, Nondefense Research and Development and Work for Others Programs activities. The increase in activities would result in increased highway transport of hazardous materials and waste to and from the NTS.

Alternative 4 places new environmental and economic-based activities at the NTS. Under this alternative, potential new programs and activities would depend on future mission requirements, land-use designations, and withdrawal status at the NTS. One key feature of this alternative, as defined in the NTS EIS, is that the DOE would stop all defense-related activities, including most of those under the Work for Others Program. Waste management operations would continue in support of ongoing DOE/NV operations and activities.

The current mission of the NTS is to maintain readiness to test nuclear weapons. Under Alternative 3, Expanded Use, the mission of the NTS would increase to include many stockpile stewardship responsibilities, such as weapons assembly and disassembly, and storage of plutonium pits and other highly enriched nuclear material. This mission requires the transport of special nuclear material to the NTS. Transportation scenarios have been developed for these activities and modeled to define the risk associated with the transportation of special nuclear material. The type of weapons, specified routes, and other associated information is classified for reasons of national security.

As part of its Defense Program mission, the DOE maintains and operates a special fleet of trucks and trailers used to transport Category II or higher nuclear material between DoD and DOE sites in a safe and secure manner. The DOE Albuquerque

Operations Office, Transportation Safeguards Division is responsible for the operation and maintenance of these safe-secure trailers and supporting vehicles. Since the establishment of this program in 1974, the DOE Transportation Safeguards Division has accumulated more than 120 million km (75 million miles) of over-the-road experience in transporting DOE-owned nuclear materials without any accident that resulted in a release of radioactive material.

The DOE is responsible for managing and operating complex-wide radioactive Waste Management and Environmental Restoration Program activities. These programs provide for the comprehensive management of all DOE-generated radioactive waste, as well as some non-DOE defense-related wastes. As part of these programs, two low-level management sites are located at the NTS. In accordance with the provisions established in the Atomic Energy Act of 1954, the NTS has received radioactive waste for disposal from the DOE and the DoD generators since 1976.

This current mission of managing DOE and DoD low-level waste is under consideration for expansion within the DOE complex. Two potential expansions of the DOE/NV mission are; the addition of the disposal of low-level mixed waste from off-site generators on the NTS, and expansion of the current disposal facilities to receive significantly more low-level waste. Generator sites are shown on the map of the United States in Figure 1-1. Future defense mission activities at the NTS could also include storage and/or production of special nuclear materials. Expansion of these programs would result in an increased need for support services in the areas of shipping, management, and disposal of hazardous material.

During the scoping period for the NTS EIS and in subsequent meetings with the DOE, some members of the public, elected officials, and private issue advocacy groups expressed concern about the DOE's ongoing and expanding radioactive waste and nuclear materials management activities at NTS. These stakeholders asked the DOE to provide them with more information about the potential risks to human health associated with transporting radioactive waste and nuclear materials. Stakeholders were particularly interested in local transportation issues, such as the routing of radioactive shipments in and around southern Nevada metropolitan areas, and the potential for using rail systems as an option to highway transport. A map depicting the NTS, nearby states, and the regional highway system is given in Figure 1-2.

The transportation risk analysis in this study estimated the health risk in terms of both vehicle-related death and injuries and cargo-related deaths and illness such as; latent cancer fatalities from highway transportation of DOE-generated low-level waste, mixed waste, defense-related nuclear materials, and bulk shipments of hazardous chemicals for each of the four alternatives. The study also assesses the nonradiological risk (vehicle emissions) of health effects associated with all DOE transportation activities. Rail and intermodal transportation options were not evaluated in the risk analysis, but have been included in Attachment E. The environmental consequences of highway transportation and on-site operations are discussed in Chapter 5 of the Final NTS EIS.

The remainder of this chapter provides background information, and a summary of the results, and conclusions of the transportation risk analysis. Chapter 2 contains a discussion of stakeholders concerns and recommendations issues. Chapter 3 summarizes the transportation risk analysis for Defense, Waste Management, and Environmental Restoration Program. References are provided in Chapter 4. Six attachments provide additional details and supporting information for this study.

Several changes have occurred between publication of the Transportation Study in the NTS Draft EIS and publication in the Final EIS. The Transportation Protocol Working Group's recommendations have been added to Chapter 2. This chapter has also been revised to remove any implication that full government-to-government consultation with American Indian tribes has occurred. A discussion of past and planned

Figure 1-1. NTS EIS Transportation Study Waste Generator Locations

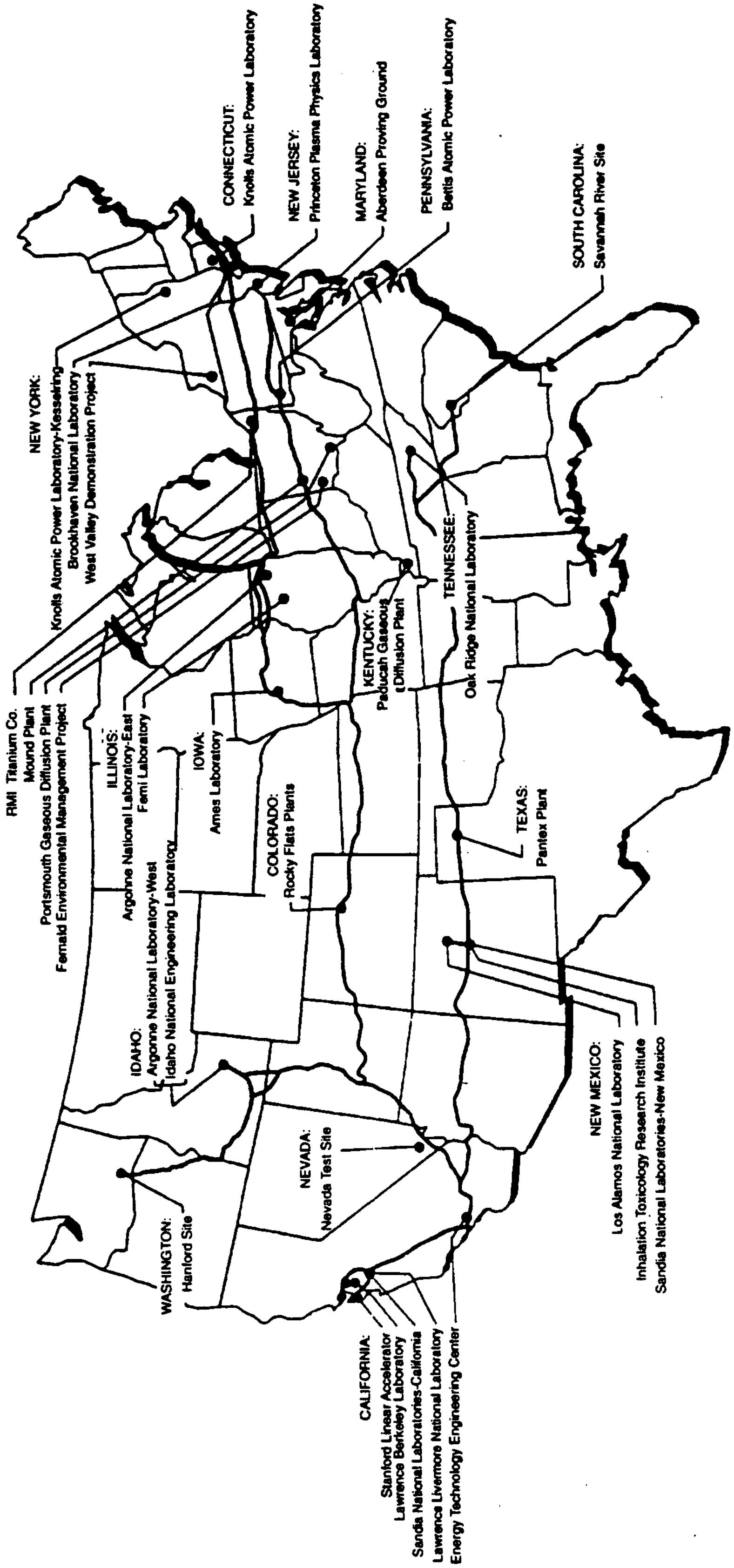
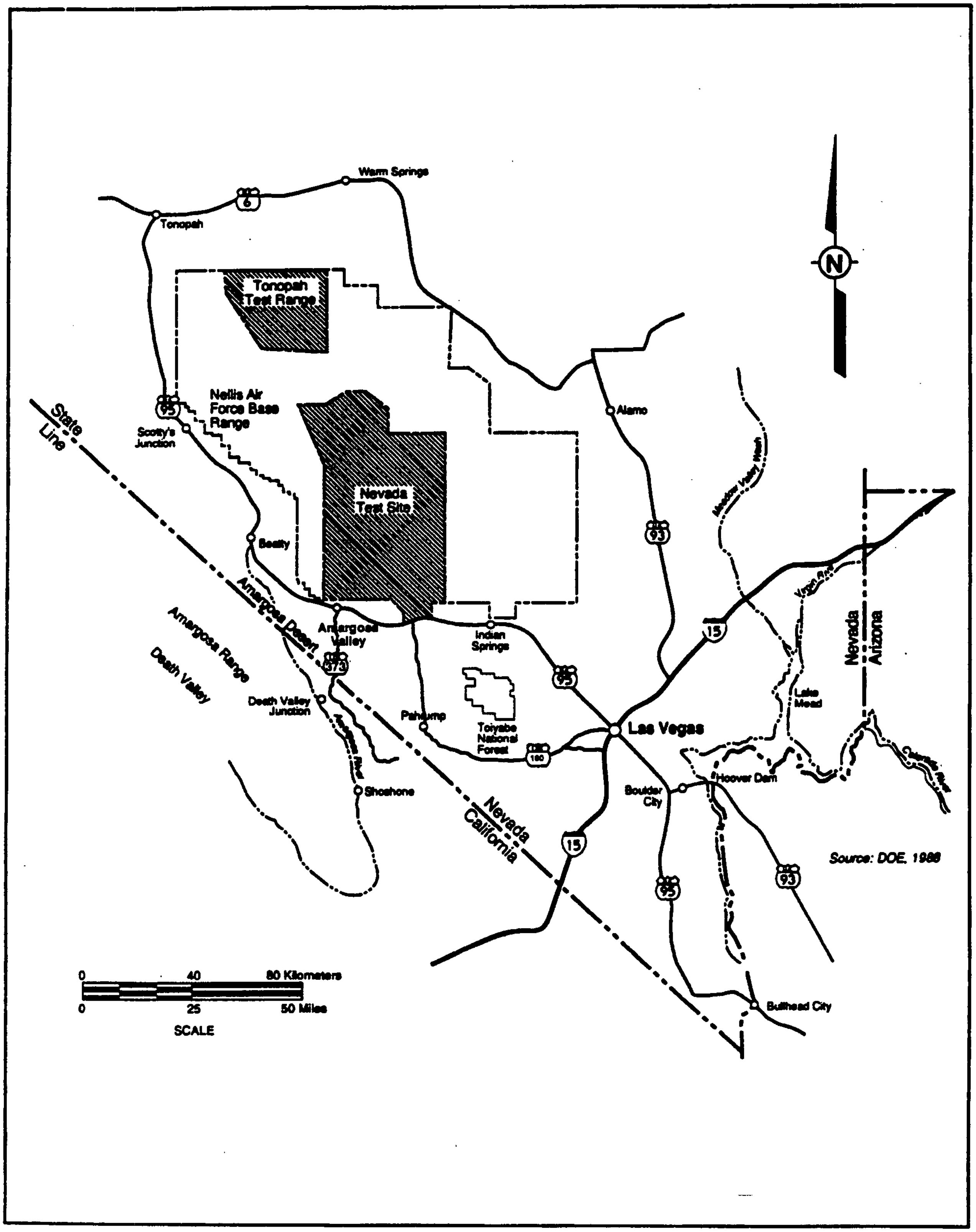


Figure 1-2. NTS Map



American Indian involvement in low-level waste transportation issues has been added.

In response to concerns that the transportation risk code, RADTRAN, was not used in this analysis to calculate the transportation risk, a study (IT Corp, 1995a) was conducted to compare the results generated by RADTRAN to those generated by the model used in this analysis. The results of that comparison are summarized in Section 3.3.1 of this study.

Chapter 3 includes sites specific Defense Program analyses, hazardous material and waste (radioactive low-level, mixed and hazardous) analysis, and maximum foreseeable accidents. An NTS-specific analysis of the risk of the transportation of defense-related nuclear materials has been conducted and the results of that analysis have been added in Section 3.2. Several waste management transportation activity scenarios have also been added (Section 3.3): incident-free nonradiological health effects, incident-free maximum individual doses, the maximum reasonably foreseeable accident, and the risk from transportation of low-level waste (contaminated soil) from the Tonopah Test Range to the NTS for disposal. A hazardous chemicals shipment transportation risk analysis has also been added.

In addition, a number of minor mathematical errors have been corrected. These corrections do not significantly increase the risk results, or do they affect any of the conclusions.

1.2 Background Information

A sitewide EIS is required by the DOE's implementing regulations for the National Environmental Policy Act, to evaluate the environmental impact associated with DOE activities and programs, including current proposed activities. The NTS EIS provides a means to evaluate the potential effects of changes in operations and changes in the site's missions, as well as an opportunity to consider the total effects of reasonably foreseeable activities. An EIS is also required for any federal actions that have the potential for significant environmental impact. Through the Record of Decision, the DOE will make important decisions regarding the mission of the NTS.

Stakeholders identified transportation, health, and safety issues as a paramount concern during the NTS EIS scoping process. The DOE conducts transportation operations in accordance with the requirements of the U.S. Department of Transportation and applicable U.S. Nuclear Regulatory Commission regulations (Attachment A), in accordance with their own orders, and it holds an excellent transportation record, DOE, (1993a). Under Alternatives 1 and 3, the Defense Program activities continue interstate transportation of special nuclear materials to the NTS. Much of the waste identified in Chapter 4 of the NTS Final EIS is generated by DOE and DoD facilities outside the State of Nevada. Therefore, interstate transportation of low-level radioactive waste is an integral part of the Waste Management Program, and those associated activities have the potential to increase under Alternative 3.

In response to similar concerns throughout the DOE complex, the DOE is funding several studies designed to provide additional information on transportation risks and alternative modes of transporting various types of waste. The DOE's Idaho National Engineering Laboratory is evaluating the costs and risks associated with alternative modes of spent nuclear fuel transportation, including intermodal and rail options.

The proposed action of formulating and implementing an integrated Waste Management Program is evaluated in the *Draft Waste Management Programmatic EIS (DOE, 1995c)* that would include consolidating existing waste management operations, and establishing a waste transportation network. This Programmatic EIS contains a transportation risk assessment which identifies human health effects in terms of the expected number of fatalities and injuries. However, it would not be appropriate to compare these results to the NTS transportation risk results because different assumptions were used. For example, the Waste Management EIS assesses effects over 20 years, and the NTS study assesses effects for only 10 years. Furthermore, the assumptions used to develop the alternatives in each EIS are different, including assumptions about volumes of waste, and different models were used to calculate the risk. However, the results of both studies indicate that transportation risks are very low.

The DOE/NV has also solicited and received input from the public through public meetings and meetings with federal, state, local governments, and other organizations. The transportation risk analysis draft outline and preliminary draft input were provided to participants of the general transportation meetings. Comments were received during these meetings and incorporated, as appropriate. From this, a group of concerned stakeholders, called the "Big Group", was identified to meet on a regular basis to focus on general transportation issues. Additionally, a Transportation Protocol Working Group was created to focus on technical issues.

The DOE met with the Consolidated Group of Tribes and Organizations (CGTO), and gave a brief presentation on transportation issues. The DOE/NV officials later visited three tribal governments and gave presentations on transportation issues that could affect tribal lands or interests. No further studies or any consultations were conducted. A comprehensive study has been initiated to assess the potential social and cultural effects on American Indian people from the transportation of low-level and mixed waste.

1.3 Summary of Results

The DOE has over four decades of experience in the safe transportation of hazardous materials and waste. Although accidents involving vehicles containing radioactive material have occurred, no significant releases, exposures, or radiation fatalities have ever occurred. The expected number of occurrences of cargo-related health effects were calculated for both incident-free and accident scenarios for radioactive and hazardous cargo. Vehicle-related health effects of traffic fatalities and injuries were also calculated. Results of the transportation risk analysis are discussed in Sections 3.2.3 and 3.3.4.

1.3.1 Defense Program

The DOE has evaluated and reported the risks (consequences and probabilities) associated with transporting Defense Program nuclear material in the *Defense Programs Transportation Risk Assessment: Probabilities and Consequences of Accidental Disposal of Radioactive Material Arising from Off-Site Transportation of Defense Program Material,* (SNL/NM, 1994). The annual risk for shipping various cargos was evaluated based on many factors including, but not limited to; the transportation mode, how often and how far each cargo must be shipped, the specific route, and the population density along specific routes.

Under Alternative 1 the risk of a single latent cancer fatality (LCF) due to incident-free transportation of Defense Program nuclear materials has been calculated as 4×10^{-5}; and the nonradiological risk due to vehicle emissions is 1.85×10^{-4}. The expected number of traffic fatalities is 6×10^{-4}. The risk of a single accident-initiated LCF is 8×10^{-11}.

Defense Program activities described in Alternative 3 could include certain stockpile stewardship responsibilities (storage of plutonium pits and assembly and disassembly of components and weapons) and management of Defense Program surplus materials. This is in addition to the activities described in Alternative 1. The risk of a single LCF due to incident-free transportation is 2.14×10^{-3}, and the risk of nonradiological health effects from vehicle emissions is 4.01×10^{-3}. The expected number of traffic fatalities is 1.06×10^{-2}. The risk of a single accident-initiated LCF is 1×10^{-6}. The transportation risks for these additional activities are also being evaluated in programmatic environmental impact statements being prepared by the DOE.

1.3.2 Waste Management Program

The total human health risk associated with hazardous materials and waste transportation for the waste management activities is dominated by vehicle-related deaths and injuries, and even those numbers are low: 2 fatalities and 27 injuries in 10 years (0.2 fatalities and 2.7 injuries per year), and a 0.003 risk of nonradiological health effects due to incident-free transportation under Alternative 1; and 8 fatalities and 103 injuries in 10 years (0.7 fatalities and 10.3 injuries per year), and an 0.012 risk of nonradiological health effects due to incident-free transportation under Alternative 3. Typically, 50,000 traffic fatalities occur each year. It is evident that the 0.2 or 0.7 fatalities due to transportation operations under Alternatives 1 and 3 represent minimal increases in the national number of traffic statistics.

Radiation-induced fatalities and illnesses result predominantly from incident-free exposures; however, the expected number of latent cancer fatalities is extremely small in any case. For instance, under Alternative 1, the total number of expected LCF is 2.5×10^{-3} in 10 years, which would be 2.5×10^{-4} annually (2.5×10^{-3} equals 0.0025, or about two and one-half fatalities every 1,000 years). Of the total LCFs, 0.0025 are attributable to incident-free transportation, and only 1.1×10^{-6} to accident scenarios. Approximately 2,500 people die of cancer each year in Nevada, and transportation of radioactive waste to the NTS under Alternative 1 adds 0.00025 to that total. The results for Alternative 3 are slightly higher than those for Alternative 1, although they are still low: 0.077 (7.7×10^{-2}) LCFs in 10 years. This is primarily because of the greater quantities of waste being shipped to the NTS under the Expanded Use Alternative.

The maximum reasonably foreseeable low-level waste and mixed waste transportation accidents have a probability of occurrence of 8.08×10^{-3} (for low-level waste) and 3.23×10^{-3} (for mixed waste) under Alterative 3 for the most severe consequences of latent cancer-fatality and detriment. There are no maximum reasonably foreseeable Defense Program accidents which would cause a release of radioactive material.

1.4 Conclusions

The results of this transportation risk analysis show that the human health risks from transportation operations are low under any alternative, and are not significant contributors to the total risk from all operations under these alternatives. Along the in-state routes, vehicle-related fatalities and injuries dominate the risk because they are similarly followed by incident-free radiation-induced fatalities. The risks along all in-state routes are low, and within the uncertainty bands of the analysis; therefore, it is not meaningful to rank routes solely on the basis of risk.

Risk of course, is not the only issue of concern in the transportation of radioactive and hazardous waste to the NTS. The DOE will continue its policy of interacting with the stakeholders, ensuring that local concerns are brought to the attention of carriers selecting routes, and conducting all operations, including shipping, in a safe manner. The DOE will also begin full government-to-government consultation with the affected American Indian tribes.

This Page Intentionally Left Blank

2.0 PUBLIC ISSUES

2.1 Public Involvement

Public involvement has played a significant role in the development of this study. During the NTS EIS public scoping meetings, transportation was identified as a major concern ranking second behind issues associated with the alternatives. At the same time, local communities expressed concern over the routes used to ship low-level waste, as well as the route selection process. They also made it clear that they felt the DOE could do a better job of communicating with local governments on transportation issues.

The DOE solicited and received comments from the public during a series of transportation meetings held with federal agencies, state, and local government organizations. Specific concerns expressed included:

- Health and safety issues
- On- and off-site transportation risks
- Railroad options
- Local highway segments
- Carrier and route selection
- Applicable laws and regulations
- Emergency response and procedures
- Identification and analysis of alternative routes, monitoring shipments, packaging, and handling requirements.

These issues were repeatedly identified at various transportation meetings during the scoping period, and in comments provided on the Draft Implementation Plan for the NTS EIS. To the extent possible, the DOE intends to address these concerns in this report.

The DOE/NV has accepted responsibility for improving communications with state and local governments, as well as the public. In response to issues raised by city officials from North Las Vegas, Nevada, concerning low-level waste shipments along Craig Road, the DOE/NV met with North Las Vegas representatives in July 1994 to discuss their concerns. The news about this meeting was not well-received by other local communities, and received an unfavorable report in the media. Following this, the DOE/NV again sought to better identify and address the wide range of local concerns.

During the formal NTS EIS scoping period (August 10, 1994, through November 10, 1994), it became clear that transportation was an issue that required attention. Therefore, a separate transportation meeting "Big Group" was held on November 15, 1994, as a follow-up to an August meeting, to elicit further local government comments on specific issues and concerns to be included in this Transportation Study. An advance notice of the meeting was announced in the press so interested citizens could also attend. The meeting was attended primarily by representatives of the state, surrounding counties, and cities located near the NTS. A draft outline for the study was provided to participants at the meeting, and time was provided at the end of the meeting for public comment.

During the November meeting, several "one-on-one" meetings with the DOE/NV transportation team were requested by local representatives. These meetings (Table 2-1) offered an opportunity for the specific concerns to be heard, as well as for DOE/NV technical experts to answer questions in an informal setting. It was suggested during the first of these meetings, and supported during others, that working groups be established to focus on the technical details of the risk assessment and transportation protocol. Comments and responses from the "Big Group" meeting held April 20, 1995, are provided in Attachment C, Public Participation In The Transportation Study.

At the April 20, 1995 meeting, in addition to providing a transportation study status update, a session without DOE representatives was held and stakeholders identified the positives and negatives associated with the development and content of DOE/NV's Draft Transportation Study. When the DOE participants were invited to rejoin the

Table 2-1. Transportation meetings held on the NTS EIS Transportation Study

(Page 1 of 5)

EIS Transportation Study Meetings		
Host Organization	**Date**	**Location**
Local & County Government	August 22, 1994	DOE/NV Auditorium 2753 S. Highland Las Vegas, Nevada 89109
University of Nevada, Las Vegas Harry Reid Center	November 15, 1994	University of Nevada, Las Vegas Harry Reid Center Las Vegas, Nevada 89154
Clark County	December 6, 1994	301 E. Clark Avenue Suite 570 Las Vegas, Nevada 89101
City of Henderson	December 7, 1994	223 Lead Street Henderson, Nevada 89015
City of Las Vegas	December 12, 1994	1785 E. Sahara Avenue Suite 440 Las Vegas, Nevada 89104
City of North Las Vegas	December 13, 1994	2200 Civic Center Drive Las Vegas, Nevada 89030
Boulder City	January 5, 1995	1005 Arizona Street Boulder City, Nevada 89005
Lincoln County	January 18, 1995	Howard Hughes College of Engineering University of Nevada, Las Vegas Las Vegas, Nevada 89154
Nye County	January 26, 1995	Nuclear Repository Office Pahrump, Nevada 89041
White Pine County	February 10, 1995	Ely, Nevada 89301
Community Advisory Board for the NTS Programs	March 1, 1995	Holiday Inn Crowne Plaza Las Vegas, Nevada 89109
Esmeralda County	March 13, 1995	Esmeralda County Courthouse Goldfield, Nevada 89013
City of Laughlin	March 14, 1995	Bilbray Industries 3650 Southpoint Circle Laughlin, Nevada 89029
Southern Paiute Tribal Association	March 22, 1995	Southern Paiute Field Station St. George, Utah 84770
University of Nevada, Las Vegas Harry Reid Center	April 20, 1995	University of Nevada, Las Vegas Harry Reid Center Las Vegas, Nevada 89154

Table 2-1. Transportation meetings held on the NTS EIS Transportation Study

(Page 2 of 5)

Big Group Working Meetings		
Host Organization	**Date**	**Location**
DOE/NV	July 1994	U. S. Department of Energy Nevada Operations Office 2765 S. Highland Drive Las Vegas, Nevada 89109
DOE/NV	November 1994	University of Nevada, Las Vegas Harry Reid Center Las Vegas, Nevada 89154
DOE/NV	April 1995	University of Nevada, Las Vegas Harry Reid Center Las Vegas, Nevada 89154
DOE/NV	April 1996	U.S. Department of Energy 2621 Losee Road Bldg. C-1 Auditorium North Las Vegas, Nevada 89030
Transportation Protocol Working Group Meetings		
Host Organization	**Date**	**Location**
DOE/NV	April 6, 1995	Desert Research Institute 788 E. Flamingo Road Las Vegas, Nevada 89109
DOE/NV	April 27, 1995	Clark County Offices 301 E. Clark Avenue, #570 Las Vegas, Nevada 89101
DOE/NV	May 22, 1995	Clark County Offices 301 E. Clark Avenue, #570 Las Vegas, Nevada 89101
DOE/NV	January 11, 1996	Desert Research Institute 788 E. Flamingo Road Las Vegas, Nevada 89109
DOE/NV	February 1, 1996	U.S. Department of Energy 2621 Losee Road Bldg. C-1 Auditorium North Las Vegas, Nevada 89030
DOE/NV	March 18, 1996	Conference Call
DOE/NV	April 10, 1996	Conference Call

Table 2-1. Transportation meetings held on the NTS EIS Transportation Study

(Page 3 of 5)

Transportation Risk Working Group Meetings		
Host Organization	**Date**	**Location**
DOE/NV	May 16, 1995	U.S. Department of Energy Nevada Operations Office 2765 S. Highland Las Vegas, Nevada 89109
DOE/NV	June 15, 1995	IT Corporation 4330 S. Valley View, #114 Las Vegas, Nevada 89103
Draft Implementation Plan Meetings		
Community Advisory Board for the NTS Programs	February 1, 1995	Holiday Inn Crowne Plaza Las Vegas, Nevada 89109
DOE/NV	February 7, 1995	University of Nevada, Las Vegas Las Vegas Campus Classroom Building Complex Las Vegas, Nevada 89154
DOE/NV	February 9, 1995	University of Nevada Reno Campus Classroom Student Union Building Reno, Nevada 89557
DOE/NV	March 7, 1995	DOE/NV Auditorium 2753 S. Highland Las Vegas, Nevada 89109
DOE/NV	March 9, 1995	Reno Sparks Convention Visitors Center 4590 S. Virginia Street Reno, Nevada 89501

Scoping Period Meetings	
Date of Meeting	**Location**
September 7, 1994	Fallon Convention Center 100 Campus Way Fallon, Nevada 89046
September 8, 1994	Carson City Community Center 851 E. Williams Street Carson City, Nevada 89701
September 13, 1994	Dixie Center convention Facilities 425 South 700 East St. George, Utah 84770
September 15, 1994	Tonopah Convention Center 301 Brougher Tonopah, Nevada 89049

Table 2-1. Transportation meetings held on the NTS EIS Transportation Study

(Page 4 of 5)

Scoping Period Meetings	
Date of Meeting	**Location**
September 20, 1994	Cashman Field Convention Center 850 Las Vegas Boulevard, North Las Vegas, Nevada 89101
September 21, 1994	Bob Ruud Community Center Highway 93 Caliente, Nevada 89008
October 4, 1994	Henderson Convention Center 200 S. Water Street Henderson, Nevada 89015

Other Information Meetings		
Sponsor	**Date**	**Location**
State of Nevada Clearinghouse	August 30, 1994	State Clearinghouse II Capitol Complex Carson City, Nevada 89710
Environmental Management Community Advisory Board	October 5, 1994	Holiday Inn Crowne Plaza 4225 Paradise Road Las Vegas, Nevada 89101
Affected Units of Government	October 21, 1994	White Pine County Convention Center 150 6th Street Ely, Nevada 89301
South-Central Nevada Federal Complex Advisory Board	October 28, 1994	Tonopah Convention Center 301 Brougher Tonopah, Nevada 89049
Air & Waste Management Association	December 14, 1994	Palace Station Hotel & Casino 2411 West Sahara Las Vegas, Nevada 89102
State of Nevada Clearinghouse	December 19, 1994	Nevada State Library Capitol Complex Carson City, Nevada 89710
State, Local, Tribal, Government	February 24, 1995	Tonopah, Nevada 89049
Southern Nevada Federal Facility Community Advisory Board	February 28, 1995	Tonopah, Nevada 89049

Table 2-1. Transportation meetings held on the NTS EIS Transportation Study
(Page 5 of 5)

Sponsor	Date	Location
Other Information Meetings		
Consolidated Group of Tribal and Organizations	March 17 - 19, 1995	NTS Mercury, Nevada 89023
Paiute Tribe of Southern Utah	September 9, 1995	Tribal Headquarters 600 North 100 East Cedar City, Utah 84720
Moapa Band of Paiutes	September 14, 1995	Tribal Headquarters P.O. Box 340 Moapa, Nevada 89025
Las Vegas Paiute Tribe	September 19, 1995	Tribal Headquarters #1 Paiute Drive Las Vegas, Nevada 89109
DOE/NV	March 6, 1996	Community Advisory Board Durango High School Las Vegas, Nevada 89109
DOE/NV	March 13, 1996	Air and Waste Management Luncheon Palace State Station Hotel Las Vegas, Nevada 89101
Public Hearings		
DOE/NV	March 5, 1996	Dixie Center Convention Facilities 425 South 700 East St. George, Utah 84770
DOE/NV	March 13, 1996	Nuclear Repository Office Pahrump, Nevada 89041
DOE/NV	March 19, 1996	University of Nevada Reno Campus Classroom Student Union Building Reno, Nevada 89557
DOE/NV	March 26, 1996	Cashman Field Convention Center 850 Las Vegas Boulevard, North Las Vegas, Nevada 89101
Public Workshops		
UNLV CORE	April 8, 1996	City Hall Boulder City, Nevada 89005
UNLV CORE	April 16, 1996	Train Depot Caliente, Nevada 89008
UNLV CORE	April 23, 1996	Commissioner's Chamber Courthouse Tonopah, Nevada 89049
UNLV CORE	April 25, 1996	West Las Vegas Art Center North Las Vegas, Nevada 89030

stakeholders, the facilitator reported the results of the session. It was at this meeting that the stakeholders requested that a risk working group be formally established to review the risk assessment. The DOE/NV then formalized the Transportation Risk Working Group. This group is comprised of representatives from state and local governments and from the Community Advisory Board who expressed an interest in reviewing and understanding the technical details of transportation risk analysis.

The stakeholder Transportation Protocol Working Group met to identify, prioritize, and understand local issues and concerns associated with the transportation of low-level waste to the NTS, resulting in the Transportation Protocol Working Group's recommendations. The working group will continue to meet with DOE at a minimum of three times a year to discuss issues. This "teaming" approach has been well-accepted by community members, and has already resulted in the acquisition of more current demographic data. Suggestions have also been offered regarding how to present the information to the public in a more straight-forward and understandable manner.

In March 1995, the DOE met with the CGTO at the NTS to discuss tribal involvement in the NTS EIS. At that time a brief presentation of transportation issues was presented and it was apparent that these issues were very important to the CGTO representatives. In June, a letter was sent to the tribes and organizations of the CGTO formally announcing the intention to begin consultation to address specific transportation concerns of tribal governments. Following this, DOE/NV officials visited three tribal governments and gave a brief presentation of transportation issues that could affect tribal lands or interests.

These actions do not constitute full government-to-government consultation. Consequently, the DOE/NV will begin a comprehensive study to assess the potential social and cultural impacts to American Indian people that could occur from the transportation of low-level radioactive waste. The American Indian people who currently reside near the routes identified in the NTS EIS Transportation Risk Analysis will be the focus of this study. The proposed study provides an opportunity for a full government-to-government relationship between potentially involved tribes and the DOE/NV, and outlines DOE's ongoing commitment to make every effort to have this study reflect the full range of the American Indian perspective.

2.2 Stakeholder Issues

The DOE/NV worked with state and local governments through the Transportation Protocol Working Group to identify local issues. Five issues were identified by the group as major concerns:

- Transportation management operations (applicable laws, regulations, packaging, and handling requirements, and emergency preparedness) associated with hazardous materials and waste
- Local route segments of concern, primarily Craig Road, Hoover Dam, and Interstate 15/U.S. Highway 95 Interchange
- Routing of hazardous materials and waste
- Rail options for the NTS
- Health risk associated with transportation

An inclusive list of the issues identified and ranked by the Transportation Protocol Working Group is shown in Table 2-2. The Transportation Protocol Working Group continued to meet and submitted over 20 recommendations as comments on the NTS Draft EIS (Subsection 2.2.6).

2.2.1 Transportation Management Operations

All DOE activities are governed by DOE orders, which for transportation operations, adopt the standards of Department of Transportation regulations in *Title 49 of the Code of Federal Regulations*. Compliance with these regulations protects workers, the public, and the environment from exposure to radioactive or hazardous materials. Cargo-related incident-free risks along the Hoover Dam route are higher than those for the alternate routes because of the low speed and higher population density. Cargo-related accident risks along the Hoover Dam route are similar to those of the alternate routes because of relatively small differences in distances, and large uncertainties associated with accident risks.

One scenario of concern is the likelihood of a vehicle accident over Hoover Dam, and the possibility of a release of radioactive or hazardous material into the Colorado River, contaminating the water. The consequences of such an accident are minor. Radioactive or hazardous material present in these shipments is not present in concentrations high enough to contaminate the food chain or affect the ecosystem. Of the material spilled, some could be suspended in the water and carried downstream, but the material would be highly diluted. The remainder would likely settle to the bottom quickly. In addition, the likelihood of a release actually reaching the river is also very low. Since the likelihood of an accident is very low and related consequences are extremely minimal, the associated risk is very low.

The DOE also complies with applicable state and local regulations. Stakeholders have expressed concern about their knowledge and under standing of applicable laws and regulations, the division of responsibility, how radioactive and hazardous materials are packaged and shipped, and emergency preparedness.

The laws and regulations which apply to DOE transportation operations to, from, and on the NTS are listed in Attachment A. Packaging requirements, carrier selection criteria, driver training, liability, and on-site waste acceptance and tracking procedures are described in Attachment B.

The stakeholders also identified concerns about local rural emergency preparedness. Emergency response training and procedures are described further in Attachment D. First responder training is available to all jurisdictions within Nevada and has been taught in several Nevada counties. First-on-scene training has been made available by the DOE to fire, law enforcement, and emergency medical responders in Nevada since 1983. Because of the nature of this training, the basic courses have been presented at other locations in both southern (Las Vegas and Henderson) and northern (Reno-Sparks and Elko) Nevada. The Emergency Medical Personnel Radiological Seminar has been given in both Tonopah and Ely. The DOE is working with rural response forces to schedule training that volunteers can attend in their local areas.

2.2.2 Local Segments of Concern

Several route segments in and around the NTS present concerns regarding accident rates and the consequences of a release: Craig Road, Hoover Dam, and the Interstate 15/U.S. Highway 95 interchange (referred to locally by the name, the "Spaghetti Bowl"). The segments were included in the in-state routes in the transportation risk analysis.

Craig Road

Craig Road was suggested as a possible alternate route to avoid the Interstate 15/U.S. Highway 95 interchange. North Las Vegas provided an updated population density of 0.00045 persons per square meter for this segment of the route. However, to be conservative in calculating the cargo-related risks along this route, a value of 0.00082 persons per square meter was used. Risks due to vehicle-related traffic injuries and fatalities are slightly higher for Craig Road than for the routes which include the Interstate 15/U.S. Highway 95 interchange, primarily because of the higher accident rate for Craig Road. However, the cargo-related risk due to incident-free transportation along Craig Road is slightly lower.

Hoover Dam

A study was commissioned by the U.S. Department of the Interior (CH2M Hill, 1993) to predict truck accident rates and hazardous materials shipment accident rates for different road segments leading to, over, and from Hoover Dam. The key findings of this study indicate that while approximately 50 truck overturns are expected

Table 2-2. Results of Transportation Protocol Working Group Issue Ranking

(Page 1 of 2)

Rank	Issue	Votes to rank issues (1 = highest priority)									Total
		1	2	3	4	5	6	7	8	9	
1	Criteria that will be used to weigh issues in final recommendations for routing	30	3	10	3	2	5	30		40	123
2	Transportation safety	20	7	7	10	10	20	30	15		119
3	Training for local first responders	20	5	10	10	5	10	10		20	90
4	Potential rail access to NTS	30	10	8	3	20	15				86
5	Will the DOE ever recommend routes for low-level waste in Nevada?		8	4	3	5	1	20			41
6	Perceived risk vs. calculated risk		5	7	3	5	10				30
7	Which State of Nevada statues apply to routing and training required?		4	4	3	2	10			5	28
8	Lines and mechanisms of communication between the DOE, Transportation Protocol Working Group, state and local governments		3	3	7	2	2			10	27
9	Entire regulatory structure within state, local, federal, and tribal governments, and how they interact		4	5	1	3	2			10	25
10	Risk analysis methodology - communication - public perception of risk		9	7	3	3	2				24
11	Cost benefit analysis between rail and truck for low-level waste for total systems life cycle, based on what comes out of the EM Programmatic EIS		2	5	7	5	2				21
12	Total impacts of truck shipments (low-level waste to NTS)		6	5	3	3	2				19
13	Procedures for inspection		3	2	3	5	5				18
14	Discussion and description of existing routes as they currently exist		3	3	7	3	1				17
15	Potential safe havens (time of day, day of week)		2	2	1	5	1			5	16
16	Shipment of transuranic waste		1	7	3	2	2				15
16	Emergency routes within southern Nevada		3	2	3	5	2				15

Table 2-2. Results of Transportation Protocol Working Group Issue Ranking
(Page 2 of 2)

Rank	Issue	Votes to rank issues (1 = highest priority)									Total
		1	2	3	4	5	6	7	8	9	
16	DOE/NV current authority in managing transportation issues and limits (where should they be?)		2	2	3	2	1			5	15
16	Possible time of day limitations and restrictions on interchange areas		3	0	1	5	1			5	15
17	Relationship between the DOE/NV Transportation Study and the requirements in Section 180C National Environmental Protection Agency		1	5	7	0	1				14
18	First responder equipment		1					10			11
19	Colorado River crossing		1	0	3	5	0				9
20	Types of waste, materials, and containers		1	2	1	3	1				8
21	American Indian Resource Issues		1	0	3	0	2				6
22	Notification and exportation of commodities		1	0	1	0	2				4
23	Agency regulatory interaction		2								2
23	Vehicle operator training/license		2								2
23	Shipments, numbers, points of origin, schedule		2								2
23	Data, data sources - level of accuracy		2								2
24	Funding for roadway and staff improvements		1								1
25	Definition and detailed description of low-level waste										0

during the 10-year time frame of the NTS EIS, only 5 of those are expected to be hazardous materials shipments. Of those five hazardous materials shipments, less than one is expected to result in a spill.

Currently, approximately 825 hazardous materials shipments cross the Hoover Dam per week. The study (CH2M Hill, 1993) indicates that two spills are estimated to occur over the next 20 years on the basis of historical accident rates at the Hoover Dam. Class 7 (radioactive substances) shipments over the Hoover Dam represent only a small fraction of the total hazardous materials shipments. The volume of hazardous material shipped under Alternative 3 represents less than 3 percent of the total hazardous material shipped across Hoover Dam; therefore, using CH2M Hill predictions, no spills involving radioactive materials are expected during the next 20 years.

The study also indicated that only a small fraction of the total accidents are severe enough to cause injury or death because of the exceedingly low speed around and over the Hoover Dam. Vehicle-related injury and fatality risks along the Hoover Dam route are comparatively lower than the alternate routes to the Hoover Dam because of the lower speeds along the dam route. Cargo-related incident-free risks along the Hoover Dam route are higher than those for the alternate routes because of the low speed and higher population density. Cargo-related accident risks along the Hoover Dam route are similar to those of the alternate routes because of relatively small differences in distances, and large uncertainties associated with accident risks.

Another concern raised about this route involves trucks stopping in or near Boulder City. The proximity of Boulder City to the NTS is such that a lengthy stop would occur infrequently.

Interstate 15/U.S. Highway 95 Interchange

The Interstate 15/U.S. Highway 95 interchange is a primary route that would avoid Craig Road. Risks due to vehicle-related traffic injuries and fatalities are slightly lower for the interchange than for the alternate routes primarily became of lower accident rates due to lower speed. Cargo-related risks due to incident-free transportation are slightly higher than those of the alternate routes, because the interchange has a higher population density than the alternate routes, and because of the low rates of speed assumed for urban travel through the interchange. Cargo-related accident risk along the interchange route is similar to that of alternate routes and is subject to large uncertainties.

2.2.3 Routing

Routing has been identified as a is a major concern of the stakeholders. Routes are selected in accordance with the U.S. Department of Transportation regulations. The shipper selects the carrier, and it is the carrier's responsibility to select a route between the shipper's location and the destination that is in compliance with all applicable Department of Transportation regulations. The same regulations apply whether the carrier is a common carrier, contract carrier, or if the shipper operates its own transport vehicle. No individual, entity, organization, or jurisdiction may select or require routing that is not in compliance with these regulations. When evaluating routing options and the radiological risk of transport, the carrier must consider:

1. Known accident rates along potential routes
2. Transit time
3. Population density and activities
4. Time of day and day of the week that transport will occur

Two contracting mechanisms exist for shipping: contract carriers, who carry under a special contract; and common carriers, who carry under a bill of lading. Because of deregulation, industry and government preference is to use common carriers unless specific, tangible benefits can be realized by using contract carriers. A more detailed discussion of these contracting mechanisms is provided in Attachment B.

2.2.4 Rail Option

Although no generators currently ship, or plan to ship, material to NTS by rail, a rail access study (Attachment E) that discusses the option of using rail to transport radioactive and hazardous materials to the NTS is included for information. This NTS Rail Access Study was prepared to provide existing data to stakeholders interested in the NTS Transportation Study. This attachment was prepared without involving American Indian people, and can not be considered complete until American Indian assessments are performed and incorporated into the text of this attachment.

The primary benefit of developing the capability to transport waste to the NTS by rail or by using truck/rail intermodal systems is to reduce the number of legal-weight truck shipments of material, particularly radioactive material. The radiological and nonradiological risk to the public and the environment during transport of the materials is roughly proportional to the number of shipments. The only alternative for which rail transport would be viable to the NTS is one in which the NTS would be the sole disposal site for low-level waste for the entire DOE complex (Alternative 3). Under this alternative, the NTS would receive a projected one million cubic meters (m^3) of low-level waste over the next 10 years.

The study summarizes past rail access studies, and identified potential rail routes using the three major railroad lines that pass through Nevada: the Union Pacific (Caliente to Stateline) line, the Southern Pacific (Ogden to Reno) line, and a second Union Pacific line that runs from Salt Lake City, Utah to Winnemucca, Nevada. Rail transport is also being considered by the Yucca Mountain Site Characterization Project Office. According to DOE (1995b), four rail routes constitute the most reasonable route alternatives and they are: Caliente, Carlin, Jean, and Valley Modified . They are considered reasonable based on minimum land use conflicts, maximum use of favorable topography and federal land, avoidance of land federally withdrawn from public use, direct access to a major regional carrier, and conditions allowing design in accordance with accepted rail engineering practices.

In addition to the four potential rail routes, two concepts were discussed in the NTS rail access study, one in which NTS would be supported by truck or rail/truck intermodal shipments, and the other in which a rail spur to NTS would be constructed and used to supplement truck transportation. The effects of these alternatives on the environment and area resources were then discussed. The costs of shipping by truck, rail, and intermodal modes were also compared. No recommendations or decisions were made in the report; rather the comparison is presented to stimulate discussion of the issue.

2.2.5 Health Risks

Closely related to routing is the concern about the human health risk from exposure to ionizing radiation as a result of the transportation of hazardous materials and waste. Exposure to radiation occurs during incident-free transportation, and as a result of a vehicle accident-induced release. A transportation risk analysis was conducted to estimate the human health risks from transporting low-level waste, mixed waste, nuclear material, and bulk shipments of hazardous materials to the NTS. Risks were calculated over the entire generator-to-NTS route, for in-state routes, and for on-site transportation of the low-level waste. The national routes chosen for evaluation are described in Attachment F. The consequences evaluated were vehicle-related fatalities, injuries, and illness; and cargo-related fatalities, injuries, and illness. Cargo-related fatalities include latent cancer fatalities, and deaths from chemically induced cancers. Radiation-induced health effects, other than latent cancer fatalities, could be illness or genetic effects. Chemically induced noncancer ailments could also be possible.

Results and conclusions are summarized in Section 1.3 of this report, and described in more detail in Chapter 3.0. The results show that the greatest risk under any alternative is that of traffic-related injuries (estimated to be about 100 injuries in 10 years), followed by vehicle-related fatalities (2 and 8 in 10 years for Alternatives 1 and 3, respectively). Along the routes inside Nevada, these risks fall to less than 5 injuries and less than 1 fatality in 10 years. One human health risk of concern is radiation-induced death and injury. To put this risk in perspective, consider that while the expected number of latent cancer fatalities in the State of Nevada due to low-level waste transportation under Alternative 1 is 7.5×10^{-5}, in 1 year, an annual average of close to 2,500 cancer deaths from all causes occurred in Nevada between 1982 and 1990 (National Cancer Institute, 1990). In other words, an individual in the State of Nevada is more than 30 million times more likely ($2,500/7.5 \times 10^{-5}$) to die of cancer from any cause than to die of radiation-induced cancer from transportation of radioactive waste.

2.2.6 Transportation Protocol Working Group Recommendations

The Transportation Protocol Working Group has officially submitted, as comments on the NTS Draft EIS, recommendations that the DOE should take to respond to local concerns. The text of their submittal follows:

> These recommendations are the result of a series of discussions (by telephone, conference, and in person) among members of the Protocol Working Group, a subcommittee of the NTS Advisory Group (a.k.a., the Big Group). Representatives of the DOE/Nevada Operations Office were present all such discussions and are cognizant of the proposed action items presented in this document.
>
> These recommendations do not reflect the official positions of any local government, participating group, or individual. They are being put forth to: (1) help the participants see the areas of most concern to Protocol Working Group members, and (2) assist staff of governmental and private agencies preparing comments on the Draft EIS for the Nevada Test and Off-Site Locations in the State of Nevada. With this information, reviewers may incorporate specific recommendations into their own comments, or indicate where they disagree. This will assist the DOE/NV in understanding the importance of each recommendation to each individual commentor. In addition, we feel that DOE's perception of the importance of any recommendation will be enhanced by repetition of that recommendation in individual comment submissions. It is important to note that these recommendations may become part of the official record of the EIS only when they are submitted as comments.
>
> Protocol Working Group members expect the DOE/NV to evaluate each of these recommendations explicitly in the EIS. Further, we would like any recommendation that is accepted by the DOE/NV to be addressed in the Record of Decision as a specific, rather than a planned or to-be-developed, mitigation measure.

For the reader's convenience, the following recommended action items are grouped into three major areas that include: (1) institutional interaction/communication, (2) mitigation, and (3) route selection and selection of parking areas. The mitigation group is further subdivided into sub areas of communication, equipment, planning and training, and procedures and operations. No consensus was reached regarding route selection, with some persons opting for the specification of certain routes, others calling for development of a route-selection methodology, others calling for the development of a route-selection methodology, and still others suggesting compromise measures.

Therefore, the section on routing and parking area selection contains a brief summary of the discussions rather than specific recommendations.

Institutional Interaction/Communication

1. The DOE must specify shipment notification procedures, including: (1) state, tribal and local jurisdiction, (2) estimates of materials and volumes to be shipped, and (3) designations of points of contact for corridor jurisdictions.

2. There should be regular meetings among representatives of the DOE, corridor jurisdictions, and other stakeholders and interested entities. These meetings should be used to:

   a. Provide updates regarding ongoing and planned shipment campaigns, and reports and evaluations on past shipments (based on DOE monitoring program);

   b. Address issues that may arise when significant changes have occurred or are planned for the transportation system, and in materials and/or volumes being shipped;

c. Identify and mitigate additional impacts or concerns of local communities should transportation problems occur.

3. Interim information can be made available through postings to an internet home page, or through other electronic, hard copy, or oral communication.

In addition, the DOE should also provide:

a. A mechanism for receiving and addressing concerns that may arise between meetings; and,

b. Annual reports to include, at the minimum; identification of carriers, sources and destinations of each shipment, the number and volume of shipments of each substance, highway and rail evaluations of each shipment campaign.

Mitigations

1. Communications

The DOE must ensure that local emergency response agencies are able to identify low-level waste shipments and provide immediate notification to federal and state agencies responsible for responding to or supporting the handling of accidents.

2. Equipment

a. The DOE/NV should provide responding jurisdictions/agencies with at least two new detection instruments per jurisdiction, and ongoing calibration services in conjunction with local training in corridor communities in emergency response for incidents involving radioactive materials.

b. The DOE/NV should provide or facilitate the provision of in-vehicle radio repeater, binoculars, cellular telephones, and other equipment to corridor jurisdictions.

c. The DOE should provide preference to local public safety and emergency response agencies for the free distribution of federal surplus emergency response equipment.

3. Planning and Training

a. DOE/NV should work with corridor communities to make training opportunities as effective as possible. Consideration should be given to direct funding of training programs to the corridor communities, providing training opportunities on weekends to accommodate volunteer responders, and providing stipends to participants (See, Item 1 under Equipment).

b. The DOE should provide financial and technical assistance as necessary to ensure that corridor communities have up-to-date emergency management and evacuation plans in place.

4. Procedures and Operations

a. Transported loads should be covered or contained to prevent possible aerosol disbursement.

b. All shipments of low-level waste arriving at the NTS during off-hours should be directed to temporarily park their loads in a secure area inside the NTS gates.

c. Each truck transporting Class 7 materials should have two drivers present at all times.

d. Carriers should respond to all driver advisories and notifications of delays and make appropriate adjustments to primary routes.

e. All vehicles should be required to undergo quarterly CVSA inspections (based on enhanced Northern American standard), and should display appropriate safety inspection stickers.

Route Selection and Selection of Parking Areas

1. Members of the group were unable to reach consensus on recommended action terms regarding transportation. However, there were a number of discussions that brought out three definite positions. These were:

   a. The DOE should select specific primary routes, usually interstates, U.S. and state highways, and direct carriers to use these routes through contracts or other means. Any exception to their use would occur when drivers may make adjustments to routes based upon official advisories and notifications of delays (see Group II, Mitigation; Item 4 Procedures and Operations).

   b. The DOE should avoid the use of certain routes, segments of routes, and shipping at specific times. In this case, the DOE/NV and affected parties would agree on routes and segments of routes that cannot be used for Low-Level Waste (LLW) shipments. It was also suggested that the DOE institute policies to avoid transporting materials during holidays, peak tourist travel periods, or during special events. Examples of areas to avoid are Hoover Dam and the Spaghetti Bowl. Carriers would be prohibited by contract or other means from using certain routes, route segments, or shipping at certain times.

   c. The DOE and stakeholders should agree on a methodology for route selection. Under this option the DOE must commit in the Record of Decision to a clearly articulated process for routing LLW shipments, and to a mechanism that binds the shipper to adhering to the identified routing alternative. Two members suggested specific language for a recommendation on route selection methodology and direction to carriers.

   This suggested language and other discussion brought out the point that the DOE and stakeholders should enter into a process to establish methodologies for selecting the safest and most acceptable routes. Some working group members recommended that the U.S. Department of Transportation guidelines for routing of hazardous and radioactive materials be used to provide direction in this effort. Within this context, it was also suggested that the DOE should provide state and local jurisdictions with copies of the route and risk analyses for each carrier transporting Class 7 materials, as defined in *Radioactive Material* 49 CFR 172.403.

   d. As a compromise between Options b and c above, some working group representatives thought that option b might be put into effect and used until a methodology is agreed upon.

2. Parking Areas

The DOE/NV should work with the state and corridor jurisdictions to develop criteria for selection of safe parking areas to be used by carrier vehicles. This is related to the recommendation in Group II, Mitigation, Procedures and Operations item b, that all shipments of low-level waste arriving at NTS during off-hours be required to temporarily park loads in a secure area inside the NTS gates.

Detailed responses to specific recommendations can be found in Volume 3 of the NTS final EIS.

2.3 American Indian Issues

The study will focus on the American Indian people who reside along three of the primary routes previously evaluated for risk in this EIS.

Several comments were also received from Sovereign Nations. Responses to those specific comments can be found in Volume 3 of the final EIS.

American Indian tribes are concerned that the promised full government-to-government consultation has not taken place, and that their concerns have not been recognized. American Indian people, especially elders, express a fear of radiation as an "angry rock" which can affect people as it travels, even when safely packaged. American Indian people also express the concern that places of spiritual power are being, and could be further harmed by the transportation of radioactive and hazardous waste.

In response, the DOE has begun a comprehensive study of the potential social and cultural effects of low-level waste transportation on affected American Indian tribes.

2.4 Conclusions

During public meetings with the DOE, the stakeholders established transportation working groups to consider issues and review DOE transportation activities. Many of these issues first appeared in the transportation study of the Draft EIS. After working for several months, the Transportation Protocol Working Group developed a set of recommendations. These recommendations have been reviewed by DOE/NV management, and as a result, the DOE has begun to make decisions about what mitigating actions are required, and what actions can be taken as part of normal program activity. The DOE/NV will continue to meet with the Transportation protocol Working Group, the "Big Group," and state and local government representatives on a regular basis to address their concerns.

The DOE/NV is also beginning full government-to-government consultation on transportation issues with the affected American Indian tribes. The DOE is committed to having this study reflect the full range of American Indian options.

3.0 Transportation Risk

3.1 General Information

One of the primary concerns of the public regarding the transportation of radioactive material is the human health risk associated with exposure to ionizing radiation. To respond to these concerns, the health risks of transporting low-level waste, low-level mixed waste, nuclear material and bulk shipments of hazardous materials to and on the NTS were calculated for a transportation risk analysis.

To evaluate risk, three components must be defined. The first component is the scenario. Scenarios are made up of either one basic failure event or an initial failure event followed by subsequent failures that lead to some undesirable outcome. The second component is likelihood. Likelihood describes how often the scenario is expected to occur. Likelihood may be expressed as a probability, which is a subjective expression of the belief that something will, or will not, occur. (For example, there is a 70 percent chance of showers tomorrow.) Probability is a unit-less number and is always between zero and one. Likelihood may also be expressed as a frequency, such as a rate, e.g., 5×10^{-5} accidents per mile (mi). The third component of risk is consequence, the undesired results of the scenario. To evaluate consequences, the source term (what is released, how much, what form it takes) must be defined and then its dispersion predicted. From the exposure caused by a release, a dose is calculated, and that dose is related to a health effects. This commonly used definition of risk (the product of probability and consequence) allows the risk for a given accident scenario, i.e., to be expressed in general terms (Equation 3.1) as defined in Rhyne (1988).

Risk is expressed numerically as a combination of the likelihood and the consequences of the scenario. It may be in the form of the percentage probability of a given consequence (e.g., 0.02 percent), or the expected number of failures (which can be a whole number).

Results of a risk analysis can be used to make decisions concerning the best ways to manage the risk. To reduce risk, either the scenario frequency must be reduced by preventive measures or the consequences must be controlled by mitigating features. In transportation risk analysis, the release frequency is reduced by using safer roads with lower accident rates; taking shorter routes, which reduces the opportunity for an accident; and using strict packaging criteria and strict operating procedures, to reduce the probability of a release. Consequences, particularly radiological doses, are mitigated by using more robust packaging, reducing the exposed population, and by emergency response.

Equation 3.1 - Mathematical Definition of Transportation Risk

$$R_i = P_{1j} \times M_j \times P_{2jk} \times P_{4jm} \times P_{5jn} \times A_{jkt} \times X_{jn} \times N_{jm}$$

where:

R_i	=	Risk for a given accident scenario.
P_{1j}	=	Accident frequency, in accidents per mile on transport link j based on highway type and conditions, vehicle type, and traffic conditions.
M_j	=	Number of miles in link j.
P_{2jk}	=	Probability that the accident in link j results in accident forces of type k,e.,g., mechanical forces or thermal forces are generated.
P_{4jm}	=	Probability that release class ℓ occurs, based on the accident force type, force magnitude,and the package capability.
P_{5jn}	=	Probability that meteorological class n occurs on link j.
$A_{jk\ell}$	=	Release amount for release class ℓ.
X_{jn}	=	Health effect on the hazardous material for meteorological class n.
N_{jm}	=	Number of persons in population class m.

3.2 Defense Programs Transportation Risk Analysis

This section describes the risk assessment of transporting Defense Program nuclear material (test devices, nuclear explosives, and pits) to the NTS. The consequences of interest are incident-free radiation-induced cancer, traffic fatality and accident-initiated radiation-induced cancer and detriment in *U.S. DOE, Transportation Risk Assessment From Sandia National Laboratories to D. Howard, U.S. DOE, Nevada Test Site EIS,* (Clauss 1996). Incident-free non-radiological risk was also calculated for Defense Programs (SAIC, 1996a). The consequences of terrorist attacks are not specifically analyzed, but the radiological consequences are not believed to be greater than the maximum release scenario presented.

3.2.1 Defense Programs Transportation Risk Methodology and Data

The DOE maintains and operates a special fleet of trucks and trailers used to transport Category II or higher nuclear material between DoD sites and DOE production sites, laboratories, and test sites in a safe and secure manner. Because the DOE exclusively operates and maintains the safe-secure trailer network, the DOE is responsible for evaluating and approving the use of this network. One method of evaluation is to perform a transportation risk assessment; the model used for safe-secure trailer activities is ADROIT. This code was developed and is operated by Sandia National Laboratories.

Three different consequences are considered in the risk evaluation: intrinsic radiation; blunt trauma, burns, or both associated with transportation accidents; and dispersal of radioactive material associated with extremely severe transportation accidents.

'Intrinsic radiation' exposes members of the public along the roadway, on the roadway, and at rest stops to extremely low levels of ionizing radiation during routine travel. Although the levels are well below those at which there is any immediate or observable health effect, and are below regulatory concern, there is a small probability that an exposed individual may develop a latent cancer which may be fatal. The risk associated with intrinsic radiation is referred to as 'incident-free risk'.

In a severe transportation accident, 'blunt trauma, burns, or both' may result in fatalities to vehicle occupants, pedestrians, and bystanders. This consequence is independent of the cargo carried in the trailer. The risk associated with fatalities and injuries caused by blunt trauma and/or burns is referred to as the 'vehicle-related risk'.

Given a very severe transportation accident, radioactive materials could be dispersed into the atmosphere, which could subsequently expose members of the public in the vicinity of the accident to ionizing radiation. Although the exposure levels can be higher than those associated with intrinsic radiation (due to direct contact by inhalation), the levels are still below those that result in an immediate or observable health effect. Just as for intrinsic radiation, the primary health effect is a possible increase in latent cancer fatalities in the exposed population. The risk associated with dispersal is referred to as 'cargo-related risk'.

1. <u>Incident-Free Risk</u>

   a. Transportation of radioactive materials will result in some radiological dose to the general public along the route even under normal conditions. The incident-free risk calculation in the ADROIT code is patterned after the one used as a basis for the RADTRAN computer code *RADTRAN 4 Volume II: Technical Manual,* (Neuhauser and Kanipe, 1993) with modifications to specialize it for safe-secure trailer shipments. A simple radiation transport model is used to calculate the radiation flux intensity as a function of distance from the source. The people absorbing the dose are divided into three groups: people adjacent to the roadway on which the shipment is traveling, people traveling on the roadway in other vehicles, and people exposed during rest stops. The total dose to the public is the sum of the doses for each of these three groups.

b. For calculational purposes, each trailer is modeled as a point radiation source located at the geometric center of the trailer. The source strength of the radiation is usually given in terms of the Transportation Index (TI), which is a measure of the source strength one meter from the "package" surface. Both gamma rays and neutrons contribute to the TI, but for weapons shipments the gamma component is usually dominant. While the mechanisms that govern the transport of neutrons in air are quite different from those that govern gamma rays, the rate of absorption in air for both types of radiation is similar. For this reason, as well as to simplify the calculations, the source is modeled as 100 percent gamma radiation. This approximation leads to a conservative (overestimate) result for radiation dose (Neuhauser and Kanipe, 1993). A large fraction of the people exposed to the radiation will be protected by some environmental shielding such as automobile bodies, building walls, and shrubbery. However, the effect of this shielding is ignored in the calculations, which is also conservative.

c. Incident-free nonradiological risk was also calculated in SAIC (1996a), and nonradiological health effects are those associated with vehicle exhaust emissions.

2. <u>Vehicle-Related Risk</u>

a. The probability of fatalities due to direct effects of the accident environment (i.e., blunt trauma, burns, or both to vehicle occupants, pedestrians and bystanders) is calculated in ADROIT based on a simple event tree.

b. The annual probability of tow-aways is based on the distribution for the Armored Tractor/Safe-Secure Trailer (AT/SST) overall tow-away rate per mile, the influence factors for different operating environments, and the annual mileage in each operating environment; which is determined from the shipment projections, and the route segmentation data files. The probability of a fatal accident given a tow-away accident is sampled from a binomial distribution based on Determination of Influence Factors and Accident Rates for the Armored Tractor/Safe-Secure Trailer (Phillips et al., 1994). Given a fatal accident the number of fatalities is sampled from the multinomial distribution based on the 1980 to 1988 trucks involved in fatal accidents data (Variable 45) for tractor semitrailer accidents, (Blower, 1991; Sullivan and Massie, 1993).

There are three basic elements of the accidental dispersal risk assessment. Probabilities of release by the three mechanisms that can produce respirable-sized aerosols and specific consequence scenarios were developed based on an event tree analysis. Consequences are evaluated for each end event in the tree through an assessment which integrates dispersal calculations, route characterization, population data, and dose-health effects models to provide an estimate of excess LCFs and contaminated area. Uncertainties are evaluated by incorporating Latin hybercube sampling into the caluclations for probabilities and consequences.

3. <u>Cargo-Related Risk</u>

a. Radioactive materials transported to support Defense Program include, but are not limited to, isotopes of plutonium, uranium, thorium, and hydrogen. Other than relatively low levels of intrinsic radiation (which are considered in the incident-free risk calculation), plutonium and uranium isotopes do not pose a significant health hazard in the form in which they are transported; they must first be converted to an aerosol with respirable-size particles. Three mechanisms by which aerosol may be generated and released are considered in ADROIT: violent reaction of high explosive, oxidation in a fire, and spalling and break-up of the surface oxide layer by mechanical forces.

b. There are three basic elements of the accidental dispersal risk assessment. Probabilities of release by the three mechanisms that can produce respirable-sized aerosols, and specific consequence scenarios are developed based on an event tree analysis. Consequences are evaluated for each end event in the tree through an assessment which integrates dispersal calculations, route characterization, population data, and dose-health effects models to provide an estimate of excess latent cancer fatalities and contaminated area. Uncertainties are evaluated by incorporating Latin hybercube sampling into the calculations for probabilities and consequences.

For this analysis, ADROIT was used to calculate the probability of each accident scenario leading to a release. The operating history with the AT/SST is sufficient to define an overall tow-away accident rate. The mean estimate for the rate of tow-away accidents involving an AT/SST is 0.066 per million miles. However, the number of accidents experienced with the AT/SST is not sufficient to quantify the accident rate in the operating environments of interest, or the types and severities of accidents. Thus, general commerce data for heavy truck transportation is used as a surrogate for AT/SST data to quantify the relative accident rates in different operating environments, and the types and severities of accidents.

Human health effects are estimated in the consequence assessment. Health consequences are expressed in terms of the expected number of excess LCF produced in the exposed population. The exposed population is defined as those members of the public subject a maximum individual risk of contracting an excess latent cancer resulting in fatality (given a dispersal) greater than 1 in 10 thousand.

3.2.2 Defense Programs Transportation Risk System Description

Under Alternative 1, nuclear test devices would be transported to the NTS Nuclear test devices, high explosives, and pits would be transported to NTS under Alternative 3.

The only Defense Program shipments to and from the NTS under Alternative 1 are 10 per year from Pantex; two per year from Los Alamos National Laboratory (LANL); and two per year from Lawrence Livermore National Laboratory (LLNL), for a total of 140 shipments over the 10 year period in question. The radiological hazard from these shipments is bounded by assuming not more than 10 kg of weapons grade plutonium per container, and only one container for each AT/SST trip.

Under Alternative 3, the NTS would receive not only the test device shipments (as in Alternative 1), but also nuclear explosives. The projected number of shipments of nuclear explosives over the 10 year period is 1,587.

Under this Alternative, the NTS would be the sole location for interim storage of pits as well as being used for assembly/disassembly operations. Under this scenario, pits already stored at the Pantex Plant would be transported from Pantex to the NTS. In addition, pits would be transported between the NTS and LANL for the purpose of quality assurance and testing. The projected number of shipments over the next 10 years under this scenario is 366.

Details concerning routes are classified.

3.2.3 Defense Program Transportation Risk Results

Health effects for the transportation of Defense Program nuclear materials to the NTS were calculated for incident-free radiological effects and nonradiological effects, vehicle-related traffic fatalities and accident-initiated radiological effects (LCF). The risks were calculated for the transportation of test devices, nuclear explosives, and pits. The results of this analysis for Alternative 1 are shown in Table 3-1, in Table 3-2 for Alternative 3, and are compared in Table 3-3.

3.2.4 Defense Program Transportation Risk Conclusions

For all scenarios, between 60 and 65 percent of the collective exposure (and health risk) is received by people on the roadway. Between 30 and 35 percent is received by members of the public at rest stops. The balance of the collective exposure is received by people off the roadway. By contrast, the maximum individual dose (and risk) is received by an individual off the roadway. This is because an individual living near the roadway in Las Vegas or another town common to all the routes is assumed to be exposed to the intrinsic radiation from all the shipments, whereas the people sharing the roadway or at rest stops are not likely to include the same individuals for all (or even most) shipments.

No reasonably foreseeable (release probability greater than 10^{-7} per year) consequence (greater than 1) scenarios that would result in a release exist in the transportation of Defense Program nuclear materials to the NTS. Therefore, there are no maximum reasonably foreseeable accidents.

3.3 Waste Management Activities Transportation Risk

Waste management transportation is the risk associated with transportation of waste generated by environmental restoration and waste management programs at the NTS. This section describes the risk analysis of the transportation of low-level waste and mixed waste to the NTS. The analysis calculated both incident-free and accident-initiated risks of radiation-induced cancer and detriment; and chemical-induced cancer and noncancer health effects, as well as the expected number of traffic fatalities and injuries. Risks were calculated for the entire national route from each generator, and for 10 representative in-state routes. All results represent the risk for the entire 10 year campaign. The maximum reasonably foreseeable accident was also assessed.

3.3.1 Methodology

The risk assessment approach includes system definition, accident scenario description, frequency analysis, consequence analysis, risk evaluation, and documentation. Following this approach, the first step in the transportation risk analysis for the Waste Management Program was to identify the current and potential types of waste that would be transported to the NTS under each alternative. Representative national routes from each generator to the NTS as well as in-state routes, were selected for evaluation. The in-state routes were chosen to reflect local concerns regarding route segments. The routes chosen are not necessarily the exact routes that will be chosen by actual carriers, but represent the most likely routes on the basis of distance, accessibility, and economics. On-site transportation risk was also calculated. The maximum reasonably foreseeable accident was assessed, as were maximum individual doses.

In this transportation risk analysis, the scenarios are either incident-free transportation, which has the consequence of exposure to ionizing radiation from the contents or exposure to vehicle-exhaust emissions, or accident-initiated releases. In accident-initiated releases, a vehicle accident is the initiating event and must be followed by failure of the packaging in order to result in an actual release of the radioactive or hazardous contents. A complete list of the NTS transportation risk analysis accident scenarios can be found in DOE/NV (1996).

Table 3-1. Defense Programs Transportation Risk for Alternative 1

Consequences	Risk
Incident-free radiological effects	4×10^{-5}
Incident-free nonradiological effects	1.85×10^{-4}
Traffic fatalities	6×10^{-4}
Accident-initiated radiological effects	8×10^{-11}
Maximum exposed individual	7×10^{-8}

Table 3-2. Defense Programs Transportation Risk for Alternative 3

Consequences	Test Devices	Nuclear Explosives	Pits	Total
Incident-free radiological effects	4×10^{-5}	2×10^{-3}	1×10^{-4}	2.14×10^{-3}
Incident-free nonradiological effects	a	a	a	4.01×10^{-3}
Traffic fatalities	6×10^{-4}	8×10^{-3}	2×10^{-3}	10.6×10^{-2}
Accident-initiated radiological effects	8×10^{-11}	9×10^{-7}	1×10^{-7}	1×10^{-6}
Maximum exposed individual	7×10^{-8}	3×10^{-6}	2×10^{-7}	3.3×10^{-6}

a. Not calculated individually

Table 3-3. Comparison of Defense Programds Transportation Risks Between Alternative 1 and Alternative 3

Consequences	Alternative 1	Alternative 3
Incident-free radiological effects	4×10^{-5}	2.14×10^{-3}
Incident-free nonradiological effects	1.85×10^{-4}	4.01×10^{-3}
Traffic fatalities	6×10^{-4}	1.06×10^{-6}
Accident-initiated radiological effects	8×10^{-11}	1×10^{-6}
Maximum exposed individual	7×10^{-8}	3.3×10^{-6}

The consequences of interest in this study are vehicle-related and cargo-related. Vehicle-related consequences include traffic fatalities, traffic injuries, and incident-free nonradiological consequences. Cargo-related consequences are divided into four types:

1. Radiation-induced latent cancer fatality, i.e., a cancer occurring 20 or so years (chronic) after exposure, resulting in a fatality.

2. Radiation-induced detriment, i.e., other chronic health effects including non-fatal cancer occurring after 20 years or so, such as genetic damage or birth defect.

3. Cancer incidence 20 years or more in the future (chronic) resulting from exposure

to hazardous volatile organic compounds due to accident conditions.

4. Noncancer health effects (chronic) due to exposures to hazardous volatile organic compounds due to accident conditions (i.e., nausea, genetic effects, and central nervous system damage).

Although accident-initiated exposure levels may be higher than those associated with incident-free transportation, the levels would still be below those that result in an immediate or observable health effect; therefore, the risk of early (acute) fatality or illness is not reported. Radiological consequences for the transportation of radioactive waste were estimated for members of the public and transport crew under both normal operating conditions and accident conditions. Members of the public are considered to be persons who are within 800 meters (m) (875 yards [yd]) of the transportation corridor, persons sharing the transport corridor with the transport, and persons at rest stops. For the accident scenarios, the radiological doses were estimated for individuals located near the scene of the accident and for the population within a 61 km (50-mi) radius of the accident. Risk associated with waste handling activities are discussed in detail in Appendix H, Human Health Risks and Safety Impacts Study.

Radiological consequences are expressed in terms of person-rem (Roentgen equivalent man). The collective dose to an exposed population is calculated by summing individual doses in that population. For example, if 100 people are exposed to 300 millirem per year (mrem/yr), the collective dose would be:

(100 people x 0.3 rem) = 30 person-rem due to background radiation in a population of 100.

Assuming a linear dose-response relationship, a population dose of 30 person-rem is equivalent to 50 people receiving a dose of 600 mrem/yr.

The most significant health effects due to radiation exposure are latent cancer fatalities (LCF) and detriment (illness or injury), as defined by International Commission on Radiation Protection (ICRP 1991). In cases where the individual dose is more than 20 rem and the dose rate is greater than 10 rem in a 1-hour period, prompt effects, in addition to latent effects, may be of concern. None of the exposures resulting from the transportation of low-level waste and mixed waste to the NTS would exceed this level. For example, the dose-to-risk conversion factor for workers is 0.0004 LCF per person-rem. If a population of 100 workers received a collective dose of 30 person-rem, the estimated number of LCFs among all 100 workers would be:

(30 person - rem x 0.0004 LCF/Person - rem) = 0.012LCF

This means that there would be about 1 chance in 83 (1/0.012) that a single LCF would occur among the 100 workers as a result of the radiation exposure. Latent cancer fatalities caused by radiation exposure are cancers that take many years to develop, and may not be the actual cause of death. In addition to LCFs, other health effects, including nonfatal cancer and genetic effects, could occur.

The DOE guidance for preparing environmental impact statements recommend using a transportation risk model which is a defensible estimation method, such as the most current version of RADTRAN. The stakeholders requested that a more open modeling process be used, so they could actively review the assumptions, input data, and formulas.

The model used to perform the NTS EIS Transportation Study is a RADTRAN-like model that is more flexible and easier for the stakeholder to review and use. The model is composed of a combination of spreadsheets and FORTRAN number to assist in the evaluation of routes for the transportation of low-level waste. Being easier to review, the analysis allows stakeholders to review input data and assumptions, and contributes to the acceptance of risk values.

The NTS transportation risk model was compared to RADTRAN 4 (IT Corp., 1995a). Three sites within the DOE complex were chosen, and up to four routes were modeled for each site. The routes used were identified as those most frequently traveled. The sites used for this comparison are Lawrence Livermore National Laboratory, Pantex Plant, and Savannah River Site. Similar source terms (based on shipment inventory) were used in both models.

The primary differences between the models are in the development of the external dose rate, and in assumptions concerning shielding of the low-level waste. If a radioisotope which was present at the identified site was not present in the RADTRAN library, that radioisotope was eliminated from the radioactive source term in order to maintain compatibility of the models. Instead of the actual external dose rate based on historical data from the DOE, the Transportation Index (TI) was used in RADTRAN 4 to calculate external exposure during routine transportation. The TI is defined as the exposure rate at a distant of 1 meter from the container.

The other difference between the models is in the shielding factors used. No shielding was used in the RADTRAN calculation, resulting in a very conservative potential exposure rate. The NTS model takes into account shielding, based on real time data that has been obtained from DOE low-level waste shipments. The assumptions associated with the shielding result in NTS-model dose results that are attenuated by a factor of 10^{-2} to 10^{-4} relative to the corresponding RADTRAN 4 calculated doses.

This comparison indicates that the results are comparable given the standard assumptions. The radiation doses calculated by the two models are in general agreement. This was expected, since the equations used in the NTS model are based on RADTRAN 4 equations. As indicated, the reason for the primary difference in the dose results is the assumptions associated with shielding in the NTS model. Another factor that may account for some of the differences in the results is the difference in long-term treatment of dispersion of radioactive material from a container after an accident.

The results of a separate study calculating the risk from transporting low-level waste from Tonopah to the NTS, (IT Corp., 1995b) were incorporated into the results reported here. In addition, corrections were made to some of the results from the Draft Transportation Risk Assessment; the calculation of new results is documented in *Risk Assessment for the NTS EIS Alternatives 1 & 3 and the TTR* (SAIC, 1996d).

3.3.2 System Description

The system being evaluated consists of shipments of radioactive and hazardous materials (including wastes) to the NTS. The type and amount of waste varies under each alternative. Historically, the primary radioactive waste type accepted for disposal at the NTS has been low-level waste. Under Alternative 1, Continue Current Operations (No Action), and Alternative 3, Expanded Use, the disposal sites at the NTS would continue to accept low-level waste from both on-site and off-site generators. Mixed waste from on-site generators would also be managed under both alternatives. Definitions of other radioactive waste types are provided below for comparison and clarity.

Waste Definitions

- **Hazardous Waste** — Wastes that are designated as hazardous by the Environmental Protection Agency (EPA) or State of Nevada regulations. Hazardous waste, defined under the Resource Conservation and Recovery Act, is waste from production or operation activities that poses a potential hazard to human health or the environment when improperly treated, stored, or disposed. Hazardous wastes that appear on special EPA lists possess at least one of the following characteristics: ignitability, corrosivity, reactivity, or toxicity.

- **Mixed Waste** — Waste containing both radioactive and hazardous components, as defined by the Atomic Energy and the Resource Conservation and Recovery Act, respectively. Mixed waste intended for disposal must meet the Land Disposal

Restrictions as listed in *Land Disposal Restrictions* 40 CFR 268. Mixed waste is a generic term for specific types of mixed waste such as low-level mixed waste, and transuranic mixed waste.

- **Low-Level Mixed Waste** — Low-level waste that also includes hazardous components, as identified in, *Identification and Listing of Hazardous Waste*, 40 CFR 261, Subparts C and D.

- **Transuranic Waste** — Radioactive waste containing alpha-emitting radionuclides having an atomic number greater than 92, half-lives greater than 20 years, and in concentrations greater than 100 nanocuries (nCi) per gram.

- **Low-Level Waste** — Radioactive waste not classified as high-level waste, transuranic waste, spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic elements is less than 100 nCi per gram.

- **High-Level Waste** — The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing of and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation.

- **Classified Waste** — Weapons components and assemblies designated by the U.S. Government, pursuant to Executive Order, statute, or regulation, that require protection against unauthorized information or material disclosure for reasons of national security. Additional security and safeguards management activities are required in the handling of these materials.

Under Alternative 1, the NTS would continue to accept waste from 15 off-site generators (currently approved) and from ongoing DOE/NV environmental restoration activities. Future waste shipments would consist of both low-level waste and mixed waste. If Alternative 3 is selected, it is anticipated that waste shipments to the NTS would come from approximately 28 off-site waste generators (DOE, 1995c). Future waste received at the NTS for disposal would generally consist of low-level waste and mixed waste, the type being dependent upon the specific waste-generator site. Alternative 2, would result in closure of the NTS; therefore, no waste operations would occur. Alternative 4, Alternate Use of Withdrawn Land, would allow for only NTS-generated waste to be managed, and no off-site transport would occur. Since Alternatives 2 and 4 would eliminate the receipt and disposal of wastes generated outside the NTS, they are not considered further in this analysis. The waste generators, primary waste types, and waste shipment information associated with alternatives 1 and 3 are shown in Tables 3-4, 3-5, and 3-6.

Another aspect of a transportation system is routing. Routes evaluated in the waste management analysis were selected using the routing program *Highway 3.2–An Enhanced Highway Routing Model: Program Description, Methodology, and Revised User's Manual,* (Johnson et al., 1993). The routes evaluated may not be the actual routes used for transportation.

The HIGHWAY 3.2 program is a flexible tool for evaluating highway routes for transporting hazardous materials in the United States. The HIGHWAY database contains a computerized road atlas that describes over 240,000 miles of highways including complete description of the entire interstate system and other highways except those that parallel a nearby interstate. Many state highways and a number of local and county highways are also identified. The database also includes locations of nuclear facilities and major airports.

Table 3-4. Low-Level Waste and Mixed Waste Volumes[a] and Shipments for Alternative 1

Generator	Volume (m^3)[b]	Number of Shipments [c,d]
Aberdeen Proving Ground	790	21
Energy Technology Engineering	614	16
Environmental Management Project	84,177	2,213
Lawrence Livermore National Laboratory	1,928	51
Inhalation Toxicology Research Institute	344	9
Mound	60,027	1,578
Nevada Test Site	150,500	11,615[e]
Oak Ridge National Laboratory	26,607	699
Pantex Plant	769	20
RMI Extrusion Plant	5,528	146
Rocky Flats Environmental Technology Site	14,000	2,000
Sandia National Laboratories - California	219	6
Sandia National Laboratories - New Mexico	351	9

[a] All volumes derived from the 1994 Integrated Data Base, the Baseline Environmental Management Report (DOE, 1995a) and the Draft Waste Management Programmatic EIS (DOE, 1995c)

[b] Cubic Meter

[c] Assume containers are 4' x 4' x 7' boxes

[d] Assume 12 containers per shipment

[e] Bulk shipment; assume 13 m^3 per shipment

Table 3-5. Low-Level Waste Volumes[a] and Shipments for Alternative 1

Generator Site	10-year Volume Projection (m^3)[b]	Number of Shipments [b,c]
Aberdeen Proving Ground	790	21
Ames Laboratory	1,232	32
Argonne National Laboratory - East	11,265	296
Bettis Atomic Power Laboratory	9,775	257
Brookhaven National Laboratory	3,264	86
Energy Technology Engineering Center	614	16
Fermi Laboratory	2,165	57
Fernald Environmental Management Project	84,177	2,213
Hanford	170,891	4,492
Idaho National Engineering Laboratory and	106,934	2,811
Knolls Atomic Power Laboratory - Kesselring	15,554	409
Lawrence Berkeley Laboratory	5,099	134
Lawrence Livermore National Laboratory	1,928	51
Los Alamos National Laboratory	41,773	1,098
Inhalation Toxicology Research Institute	344	9
Mound	60,027	1,578
Nevada Test Site	150,000	11,600
Oak Ridge National Laboratory	26,607	699
Paducah Gaseous Diffusion Plant	16,996	447
Pantex Plant	769	20
Portsmouth Gaseous Diffusion Plant	63,512	1,670
Princeton Plasma Physics Laboratory	187	5
RMI Extrusion Plant	5,528	146
Rocky Flats Environmental Technology Site	14,000	2,000
Sandia National Laboratories/CA	219	6
Savannah River Site	243,901	6,411
West Valley Demonstration Project	67	2
Stanford Linear Accelerator	3,694	97
Sandia National Laboratories/NM	351	9

[a] All volumes derived from the 1994 Integrated Data Base, the Baseline Environmental Management Report (DOE, 1995a) and the Draft Waste Management Programmatic EIS (DOE, 1995c)
[b] Assumes containers are 4' x 4' x 7'
[c] Assumes 12 containers per shipment

Table 3-6. Mixed Waste Volume and Shipments for Alternative 3

Generator	Volume (m³)[b]	Number of Shipments [c,d]
Ames Laboratory	1	1
Argonne National Laboratory - East	6,700	181
Bettis Laboratory	40	1
Hanford	120,000	3,243
Idaho National Engineering Laboratory	47,390	1,281
Knolls Laboratory	150	4
Lawrence Berkeley Laboratory	4,300	116
Los Alamos National Laboratory	2,700	73
Nevada Test site (ER)[a]	500	15
Paducah Plant	600	16
Portsmouth Plant	33,754	912
RMI Extrusion Plant	25	1
Rocky Flats	63,000	9,000
Savannah River	21,300	576
West Valley	40	1

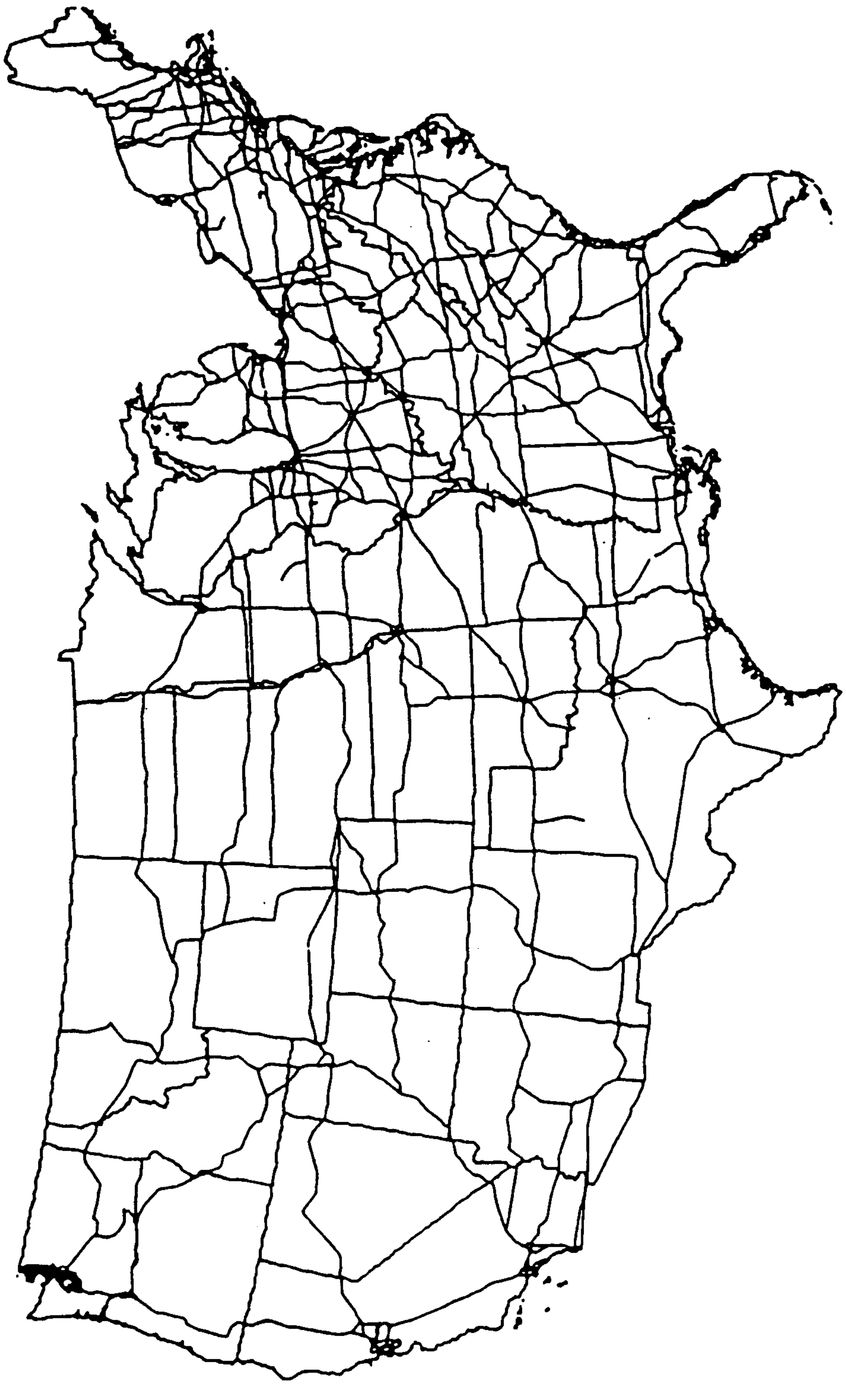
[a] Generated by the Environmental Restoration Program
[b] Cubic Meter
[c] Assume containers are 4' x 4' x 7' boxes
[d] Assume 12 containers per shipment

Several different types of transport routes may be calculated by the HIGHWAY Program, depending on a set of user- supplied constraints. HIGHWAY calculates routes by minimizing the total distance and driving time along a particular highway segment. Several user-supplied routing constraints can be imposed during the selection process. Special features of the model HIGHWAY is the ability to calculate routes that maximize the use of the interstate highway system, and the ability to select routes that bypass a specific state, city, town, or highway segment.

The HIGHWAY 3.2 Program has the capability to automatically identify alternative routes. Most routing models will produce only a single route, although different routes between the generator site and the NTS often vary only slightly in distance and estimated driving time. With the alternative routing feature, the HIGHWAY Program offers a selection between different routes of nearly equal length. It also has the capability to report route-specific population density data. The population density distribution is calculated for each highway segment in the route and is reported on a state-by-state basis. The population data used by the program are based on the 1990 U.S. Bureau of the Census block group data. A United States map showing the national interstate system is given in Figure 3-1. Specific descriptions of the generator truck routes were taken from the HIGHWAY 3.2 routing code, and are described in detail in Attachment F.

Ten in-state routes within Nevada, generated by the HIGHWAY 3.2 computer program, were identified for evaluation to allow more detailed analysis of the Nevada routes. This effort was crucial to comparing geographic areas of concern. The selection of routes within Nevada had the same

Figure 3-1. National Interstate System



parameters as the national routes, that is, interstate and state highways were used instead of local roads wherever possible. However, rather than the most direct routes being selected, alternative routes were identified specifically to avoid three geographical areas of concern: Craig Road, the Interstate 15/U.S. Highway 95 interchange, and Hoover Dam (Boulder City).

Within Nevada, the routes selected are based on the direction of approach to the NTS. Local concerns focused their analysis on specific areas such as the Hoover Dam; highway segments that had congested or seemingly higher accident probabilities, (Interstate 15/U.S. Highway 95 interchange), and segments with rapid growth, (Craig Road). In particular, one alternative route was proposed to avoid passage through Boulder City and Hoover Dam. Interstate 40 to Interstate 15 would allow shipments to approach the NTS from the south without passing through Boulder City and Hoover Dam. This alternative would allow shipments to proceed to the NTS through Pahrump, Nevada or on the U.S. Highway 95 through the Interstate 15/U.S. Highway 95 interchange. The routes are described in the following paragraphs.

NV-1, Eastern Route 7 (Figure 3-2). (Note: "Eastern Route 7" identified that the route is approached from the east, and the number relates to the specific unique designation the route was given earlier.) South on Interstate 15 (from Arizona) to Las Vegas, through the Interstate 15/U.S. Highway 95 interchange, and north on U.S. Highway 95. The length of this route is 238 (km) (148 miles [mi]). The interstate 15/U.S. Highway 95 interchange is referred to locally as the "Spaghetti Bowl". It is a location at which numerous merging vehicles routinely create congestion, traffic delays, and accidents. None of the Nevada route descriptions include a local road approximately 3.2 km (2 mi), that connects U.S. Highway 95 to the NTS entrance gate at Mercury, because it is common to all of the Nevada route alternatives; however, this local connector road was included in the risk analysis calculation.

NV-2, Eastern Route 8 (Figure 3-3). South on Interstate 15 (from Arizona) to Craig Road (SR-573), west to Rancho Drive, north on U.S. Highway 95. The length of this route is 227 km (141 mi). Craig Road is another road segment of concern to local officials. The residential growth in the adjacent areas has created congestion as well as concern for the effect of hazardous material transport to the residential population.

NV-3, Northern Route 5 (Figure 3-4). South on U.S. Highway 93 (from Idaho) to Ely, south on U.S. Highway 6 to Tonopah, south on U.S. Highway 95. The length of this route is 846 km (526 mi) the longest Nevada alternate route. It is the only Nevada route which goes through Ely and Tonopah, as well as other areas with relatively low population densities.

NV-4, Eastern Route 9 (Figure 3-5). North on U.S. Highway 93 (from Arizona) via Hoover Dam, to Las Vegas, through the Interstate 15/U.S. Highway 95 interchange, continuing north on U.S. Highway 95. The length of this route is 161 km (100 mi). Routing through the Hoover Dam/Boulder City area is also a local concern. Traffic in the area is congested by the slowdown of vehicles because of the curves and grade of the road as well as visitors entering and leaving the parking areas for the Hoover Dam.

NV-5, Eastern Route 10 (Figure 3-6). North on U.S. Highway 93 (from Arizona) via Hoover Dam, to U.S. Highway 93/U.S. Highway 95, north to State Route-146, west to Interstate 15, and north to State Route-160 to U.S. Highway 95. The length of this route is 211 km (131 mi).

NV-6, Southern Route 6 (Figure 3-7). North on U.S. Highway 95 (from California) through the Interstate 15/U.S. Highway 95 Interchange and, north on U.S. Highway 95. The length of this route is 233 km (145 mi).

NV-7, Southern Route 8 (Figure 3-8). North on U.S. Highway 95 (from California) north on State Route-146, west to Interstate 15, to State Route 160 to U.S. Highway 95. The length of this route is 283 km (176 mi).

Figure 3-2. NV-1, Eastern Route 7

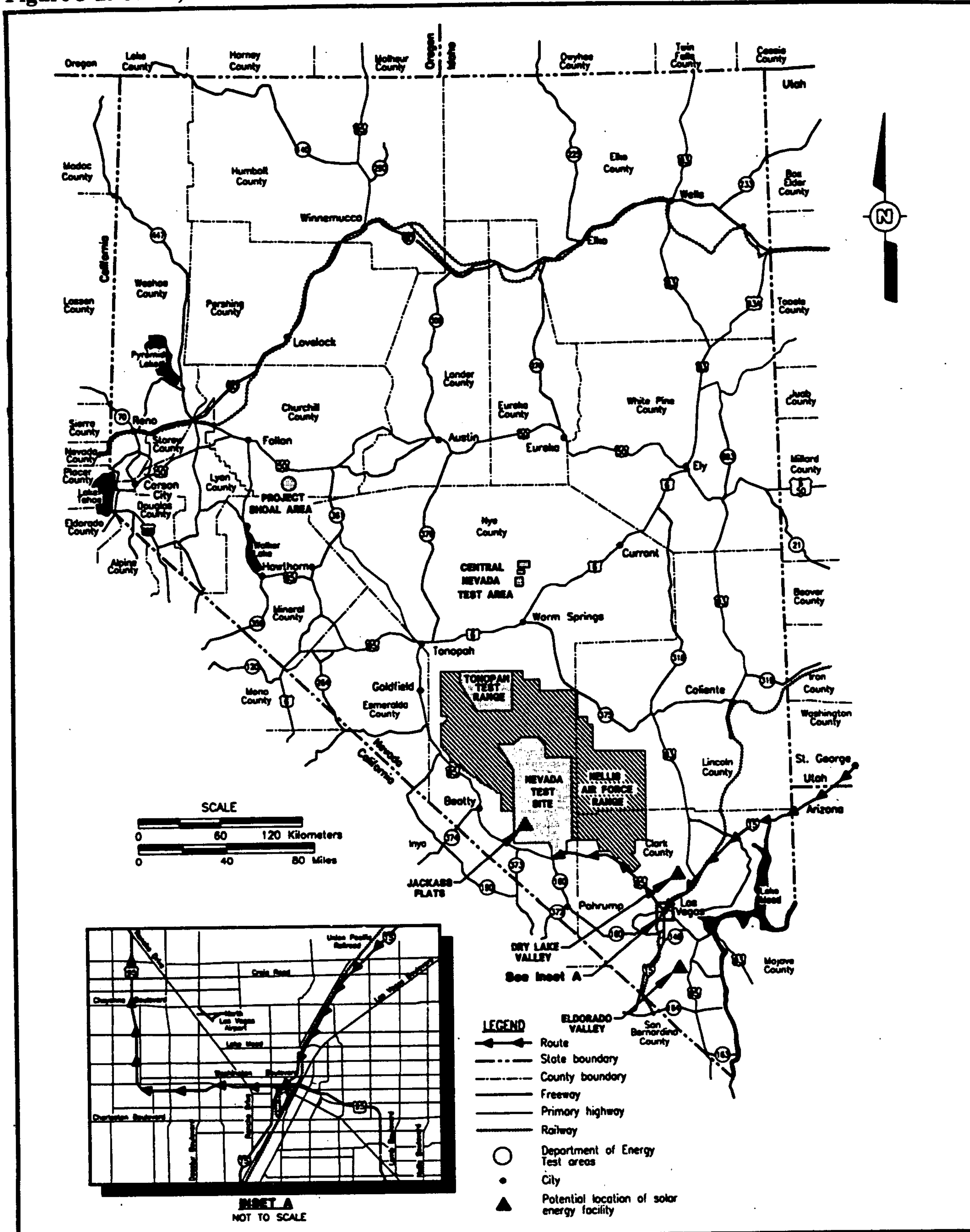


Figure 3-3. NV-2, Eastern Route 8

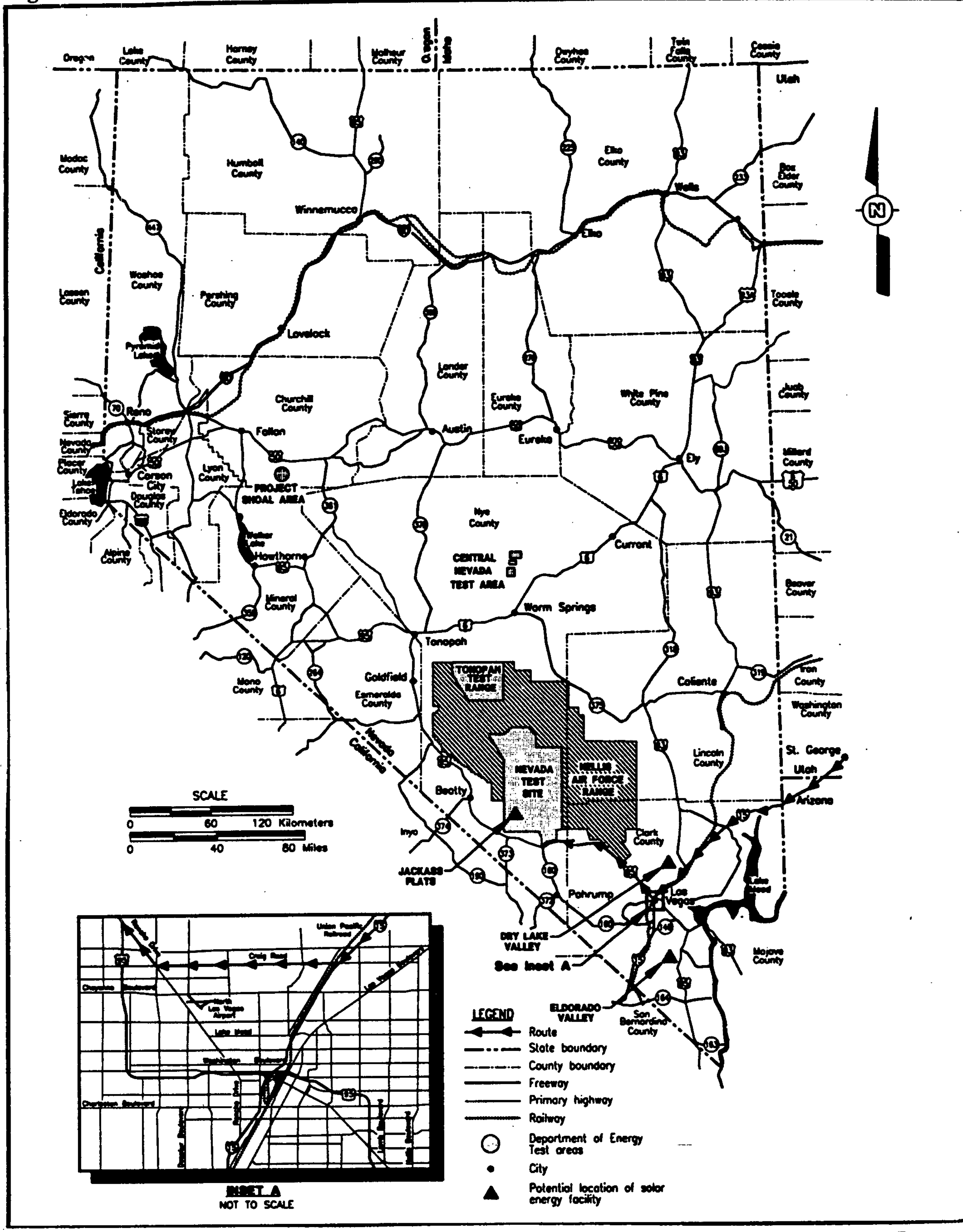


Figure 3-4. NV-3, Northern Route 5

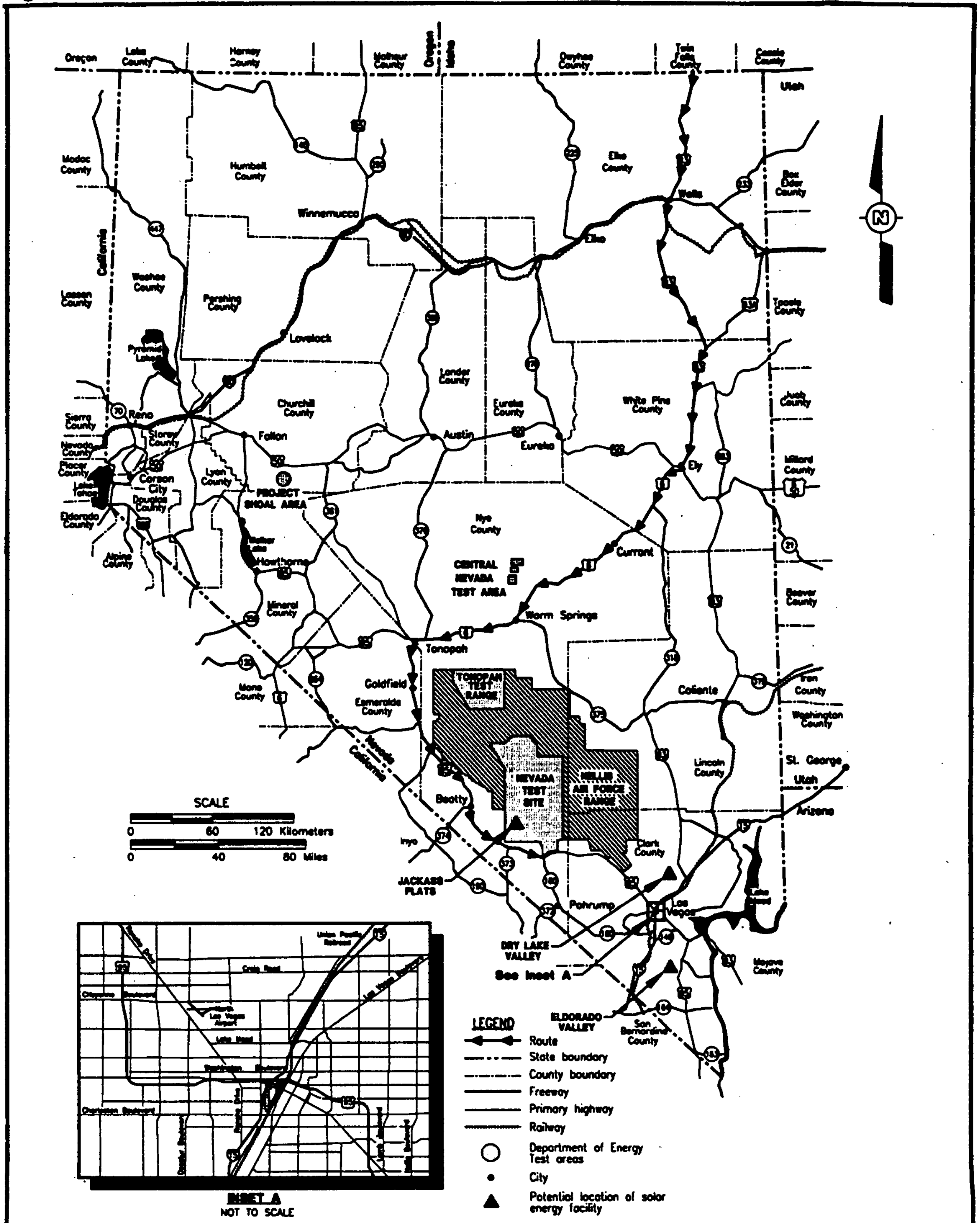


Figure 3-5. NV-4, Eastern Route 9

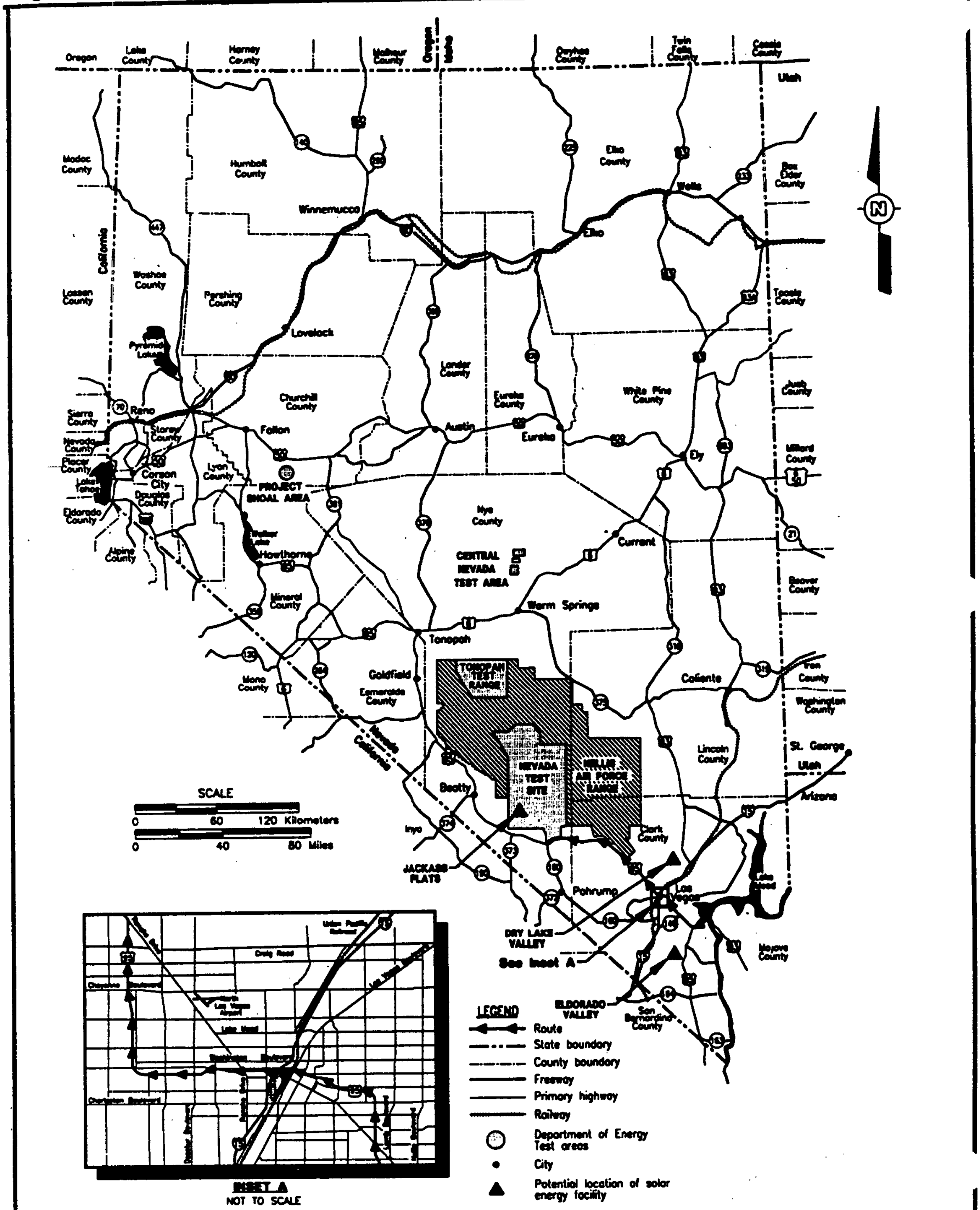


Figure 3-6. NV-5, Eastern Route 10

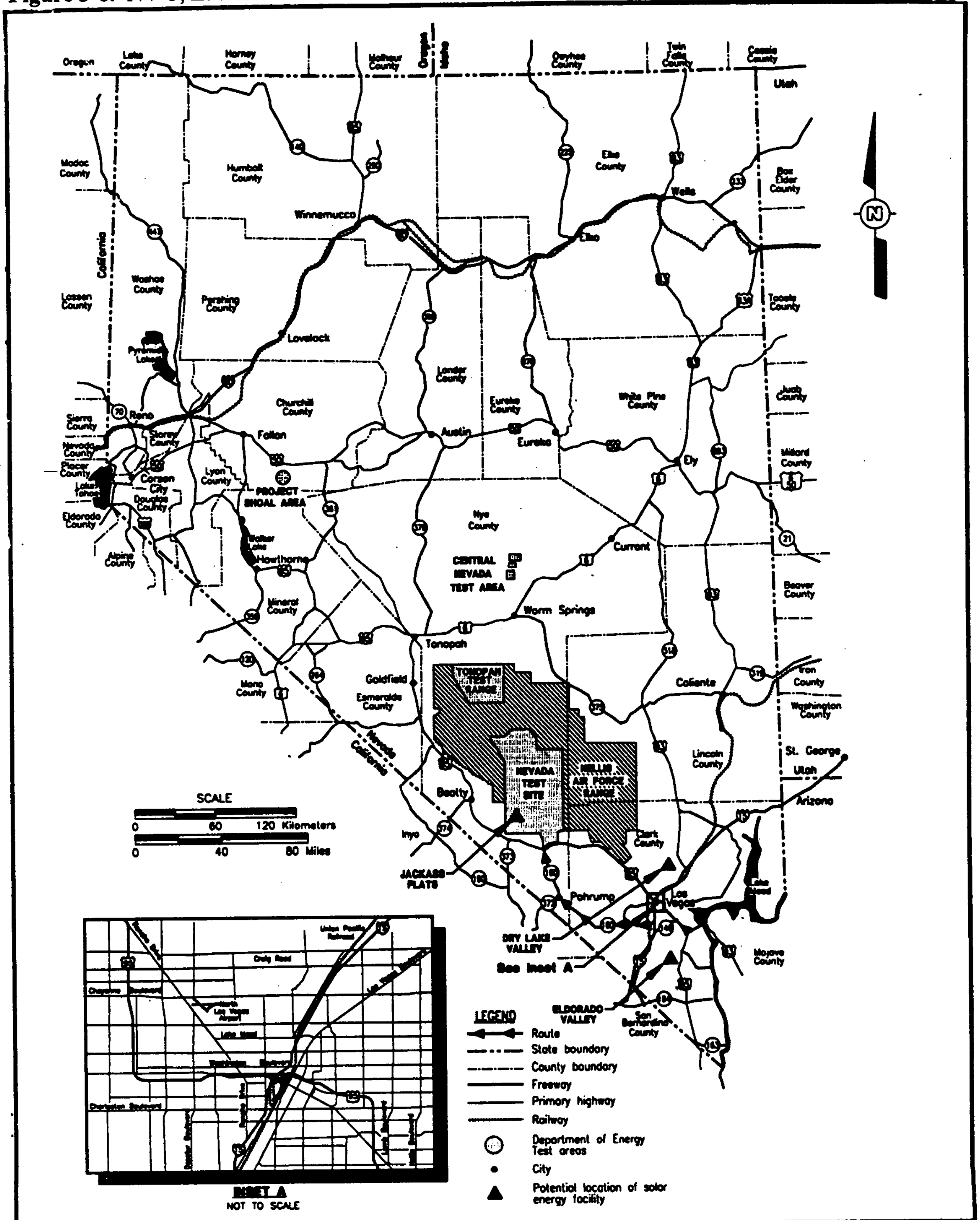


Figure 3-7. NV-6, Southern Route 6

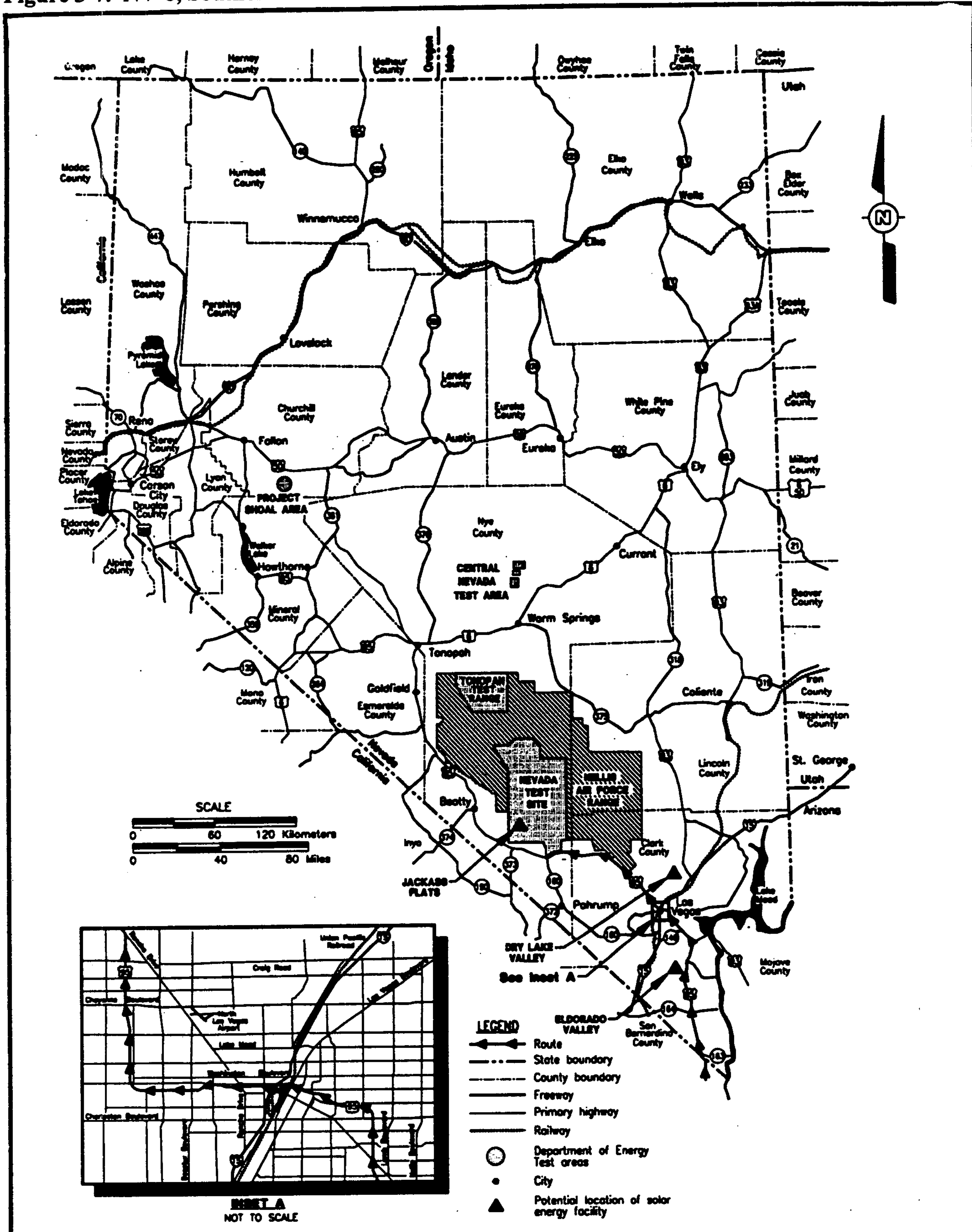
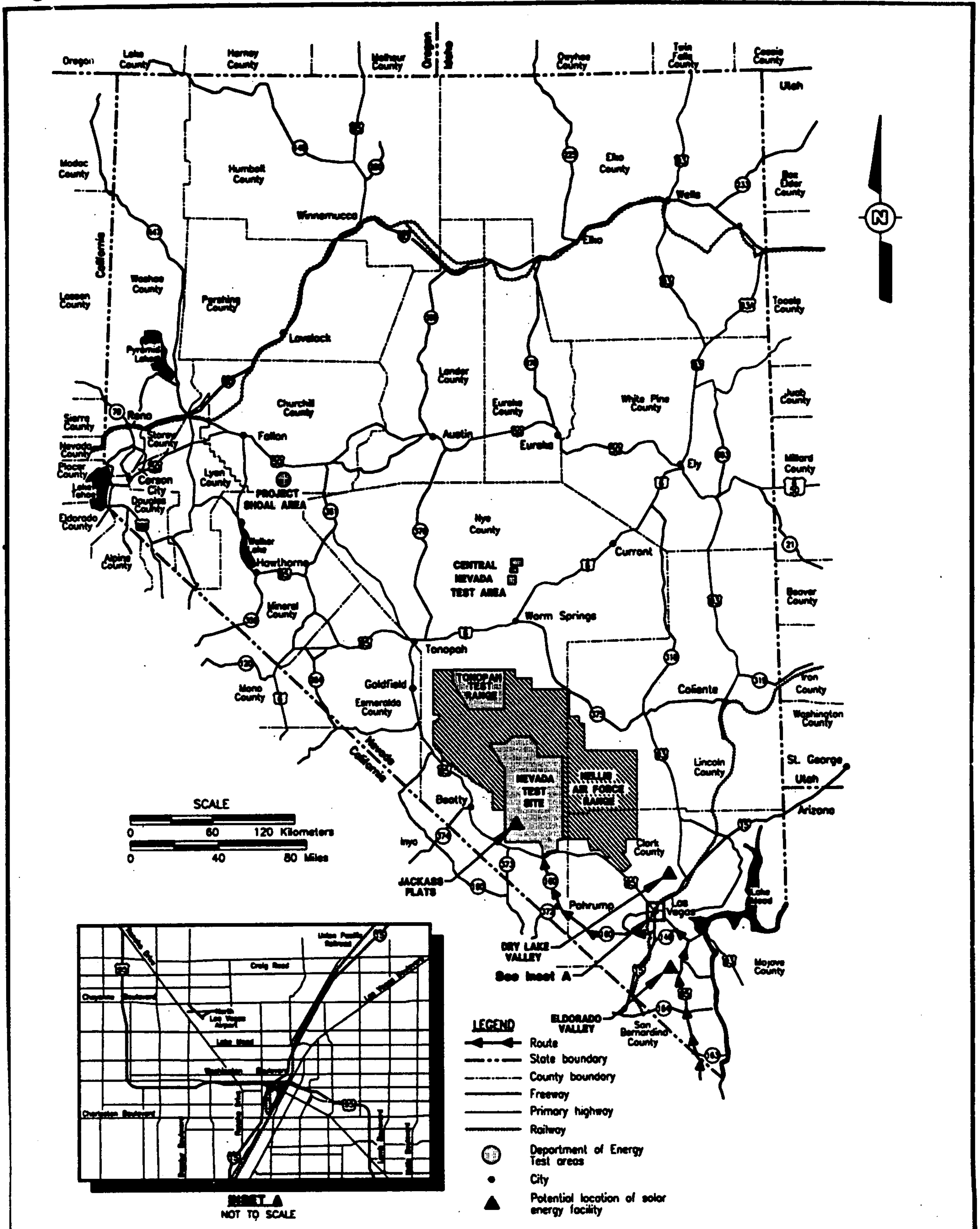


Figure 3-8. NV-7, Southern Route 8



NV-8, Southern Route 1 (Figure 3-9). North on Interstate 15 (from California), to Las Vegas through the Interstate 15/U.S. Highway 95 Interchange, north on U.S. Highway 95. The length of this route is 175 km (109 mi).

NV-9, Southern Route 2 (Figure 3-10). North on Interstate 15 (from California), west on State Road-160 to U.S. Highway 95. The length of this route is 208 km (129 mi).

NV-10, Southern Route 5 (Figure 3-11). North on State Road-373 (from California), east on U.S. Highway 95. The length of this route is 74 km (46 mi).

3.3.3 Data Values

The types of data used, their sources, assumptions, and related uncertainties for the waste management activities evaluation are discussed below. Specific values of all data are provided in DOE/NV (1996). Low-level and mixed waste characterization data was derived from the DOE Integrated Data Base, the Draft Waste Management Programmatic EIS (DOE, 1995c), and NTS waste management estimates. Representative physical and radiological characteristics were assumed for each waste type because detailed consideration of every possible shipment would be impractical. Contact-handled low-level waste, mixed waste, and transuranic waste were each assigned a dose rate of 0.05 mrem/hr at 1 m from the shipping container.

Accident severity categories for radioactive waste transportation accidents are taken from *Final on the Transportation of Radioactive Material by Air and Other Modes*, NUREG-0170 (NRC, 1977). Accident severity is assigned on the basis of impact force and the potential for fire. Each accident severity category is assigned a probability of occurrence. Potential radioactive releases from transportation accidents were estimated using release fractions (IT Corp., 1996) for each accident severity category.

Radioactive material released to the atmosphere is dispersed by the wind. Two Pasquill stability categories were selected; one to represent the average dispersion, and another to represent a worst-case dispersion.

Population dose estimates are based on the unit risk factor approach. The unit risk factor proves an estimate of the dose to either crew members or specified members of the public from transporting a single shipment, on a single route, with a specified population density. Unit risk factors, in units of person-rem per kilometer, are multiplied by shipping distances in various population zones (as determined by the HIGHWAY 3.2 code) to calculate the total population dose for one shipment.

The population dose estimates are then converted to excess latent cancer fatalities using the dose conversion factors of 5×10^{-4} (0.0005) excess fatal cancers per person-rem for members of the public and 4×10^{-4} (0.0004) fatal cancers per person-rem for the crew (ICRP, 1991).

Radiation detriment the dose conversion factors are 1.6×10^{-4} for the worker and 2.3×10^{-4} for the general public. The dose conversion factor for the public is slightly higher because of the inclusion of more sensitive individuals (e.g., children).

The chemical-induced noncancer risk is reported as a hazard index. The hazard index is the ratio between daily intake of a noncarcinogenic toxic chemical and acceptable reference level. If the hazard index is less than one, then no consequences would be expected.

Uncertainty is introduced with each step of the analysis. Conservative assumptions and values (those which lead to overestimating the risk) are used whenever assumptions are made, and when the data values are not well known. The most uncertain parameter was the contents of each shipment, e.g., the radiological characteristics, the chemical characteristics, and the physical form. It was conservatively assumed that the waste forms were resuspendable and combustible under accident conditions. The high end of allowable concentration values used for the chemicals were taken from (DOE, 1995c). Other uncertainties include the health effect models used for

Figure 3-9. NV-8, Southern Route 1

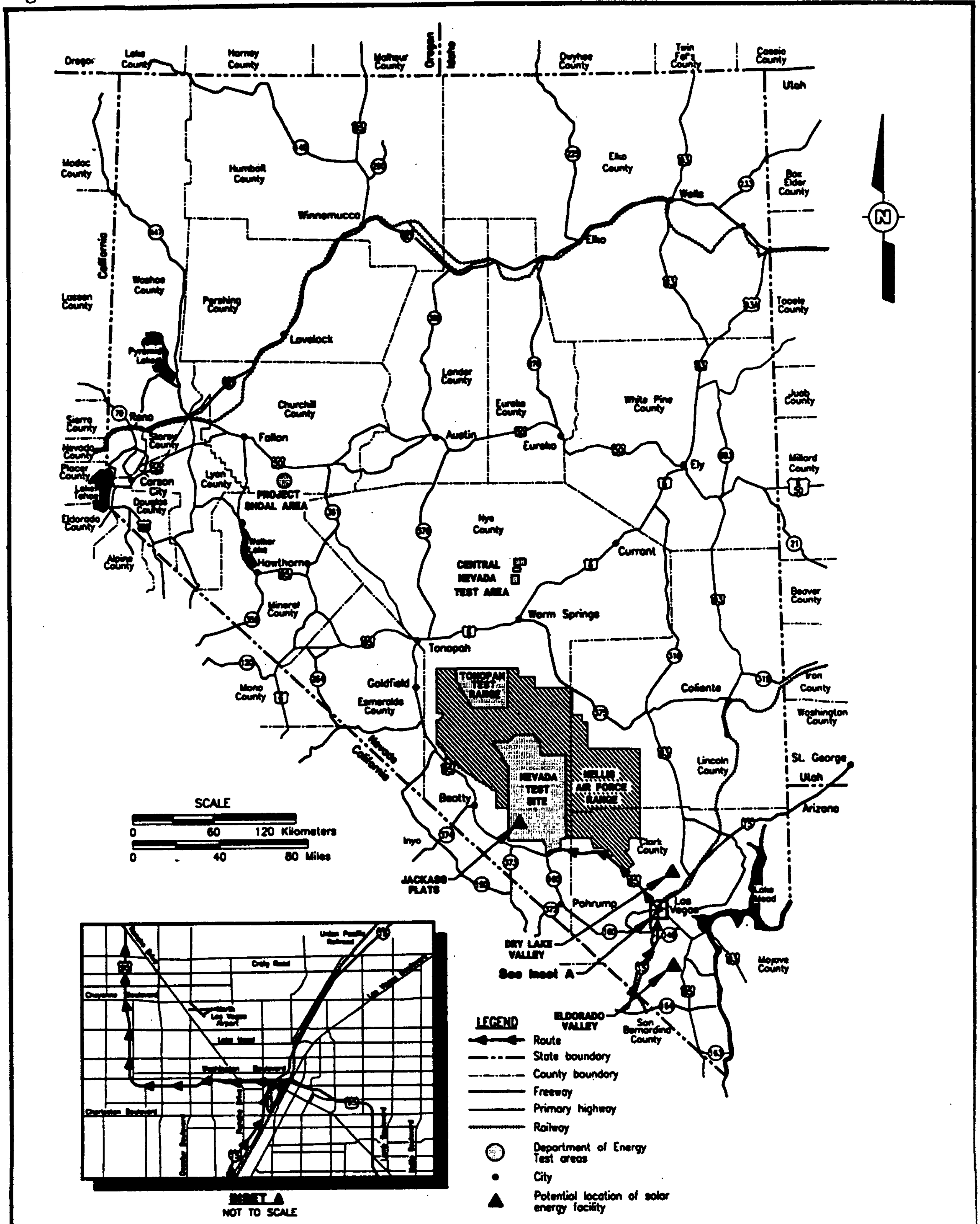


Figure 3-10. NV-9, Southern Route 2

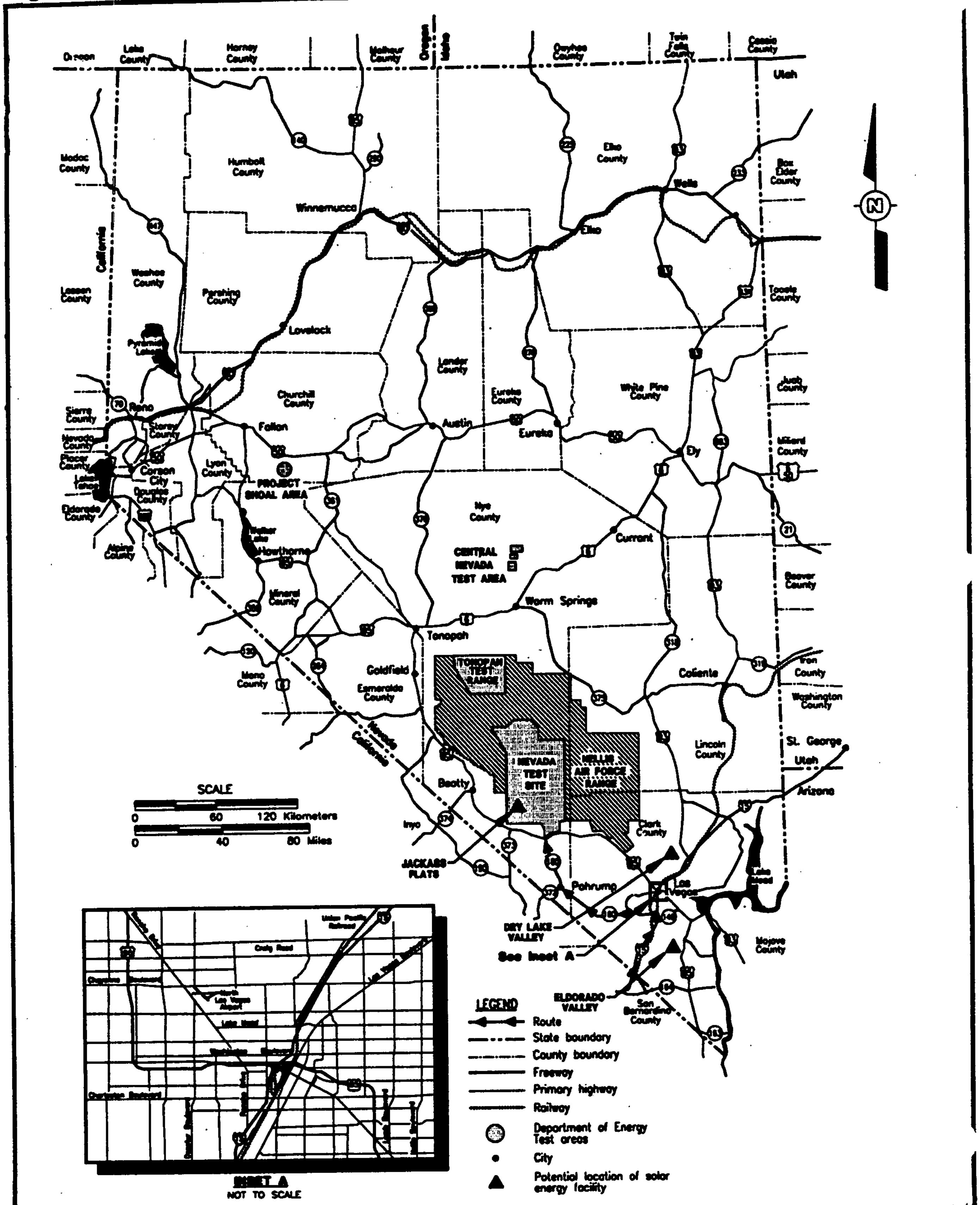
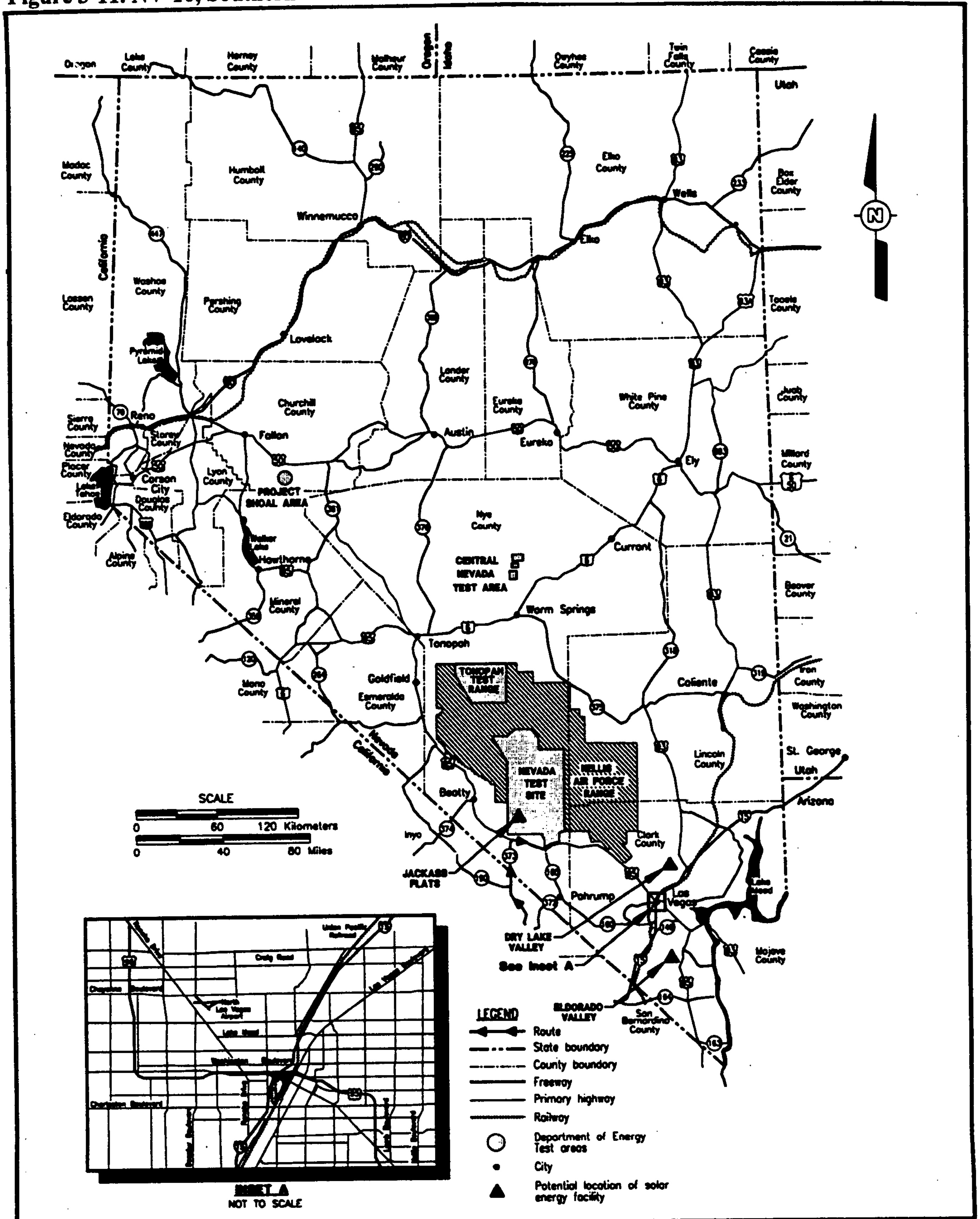


Figure 3-11. NV-10, Southern Route 5



chemicals, radionuclides, and dose assessment assumptions. The data required to apply the methodology are subject to sampling errors, variability, measurement errors, and assumptions. The cargo-related risks are low but they also have the largest uncertainties because the input parameters for their calculations are the least known. The uncertainties for the higher vehicle-related risks are the smallest, allowing differentiation for each route on the basis of distance, which is subject only to a small measurement error.

3.3.4 Waste Management Transportation Risk Results and Conclusions

The following sections discuss national, in-state, and on-site risks from the transportation low-level and mixed waste to the NTS.

National Routes Risk

The estimated number of vehicle fatalities along the national routes during the 10-year period for Alternative 1 is 2, 27 vehicle injuries are estimated. The risk of a single radiation-induced cancer fatality in the general population is 0.0025 (about 1 in 400). The risks calculated for the other consequence types is significantly smaller than these. Results are shown in Table 3-7.

Along the national routes within Nevada, less than one (0.02) vehicle death is estimated, and only one vehicle-related injury. The risk of a single radiation-induced cancer fatality is 0.00075 about 1 in 1,300 (Table 3-8).

Under Alternative 3, the number of vehicle fatalities is estimated as eight. One hundred and three vehicle-related injuries are estimated to occur. The risk of a single radiation-induced LCF is 0.077 (about 1 in 3). These results are shown in Table 3-7. Within Nevada, only four vehicle-related injuries are expected, and less than one (0.08) fatality. Cargo-related fatalities are 0.016 (Table 3-8).

Maximum Exposed Individual Risk

The maximum individual dose and health effects risk were calculated for members of the public: a person caught in traffic, a resident living along the highway, and a service station worker. These results are reported for a single event in *Maximum Individual Doses for Incident-Free Transportation*, (SAIC, 1996b). The maximum exposed individual was a person caught in traffic with an expected dose of 4.1 mrem/event, resulting in a risk of latent cancer fatality of 2×10^{-6} (about 1 in 500,000).

Incident-free nonradiological risk

Incident-free nonradiological risks for transportation of low-level waste and mixed waste were calculated in SAIC (1996a). These health effects resulted from exposure to vehicle exhaust emissions.

Under Alternative 1, these incident-free nonradiological risks are 3.02×10^{-3} (about 1 in 300), and they are 1.20×10^{-2} (about 1 in 75) under Alternative 3.

Maximum reasonably foreseeable accident

The maximum reasonably foreseeable accident is defined as the accident of highest consequences with a probability of occurrence that is greater than or equal to 1.0×10^{-7} per year. These accidents for low-level and mixed waste transportation under Alternatives 1 and 3 were analyzed in an assessment of NTS shipments (SAIC 1996c). The maximum reasonably foreseeable accidents were evaluated for urban, suburban, and rural populations under both neutral and stable atmospheric conditions. The maximum consequences under Alternative 1 occur in an urban zone under stable atmospheric conditions; they are radiation-induced fatal cancers (2.25×10^{-3}), and detriment (1.04×10^{-3}). The highest annual maximum severity accident frequency was 2.25×10^{-3} for travel through rural population zones.

Under Alternative 3, the most severe expected consequences from low-level waste transportation is also radiation-induced cancer (2.25×10^{-3}). The maximum severity accident frequency with these consequences is 8.08×10^{-3} for travel through rural population zones. The radiation-induced health effects consequences and probabilities for mixed waste transportation are the same as those for low-level waste transportation. The chemical-induced consequences are cancer (1.1×10^{-6}) and the chemical noncancer hazard index is 0.38. The hazard index represents the ratios of the daily exposure to a referenced acceptable limit; if the ratio is less than one, no adverse effects would be expected. The maximum probability of an accident with these consequences is 3.23×10^{-3}, also for travel through rural population zones.

The maximum reasonably foreseeable accident was not analyzed for Alternative 2 and 4 due to no off-site transportation.

In-State Route Risk Results

The expected number of consequences per shipment along the Nevada routes NV-1 through NV-10 are shown in Figures 3-12 through 3-19. The largest number of vehicle fatalities 1.8×10^{-5},is along NV-3 while NV-4 (Hoover Dam and through the Interstate 15/U.S. Highway 95 Interchange) poses the lowest risk (around 1×10^{-6}). The other routes have approximately the same traffic-related fatality rate (2×10^{-6}).

These risk estimates have very low uncertainties associated with them.

Vehicle-related injury estimates per shipment were the highest for NV-1, NV-2, NV-3, and NV-6 (around 2×10^{-4}). Injury rates (per shipment) for all other routes were approximately the same (around 1×10^{-4}) with the exception of NV-10 which is low due to the short distance traveled.

Risks due to incident-free shipment are the largest for routes with the longest distance, highest population, and low rates of speed through urban zones. Routes NV-1, NV-4, and NV-6 had the highest risk (approximately 7.5×10^{-7}); while all other routes had lower, but similar, risks (around 1.25×10^{-7}).

Radiation-induced cancer death estimates due to accidents are primarily sensitive to distance traveled and population density along the route. NV-3, the longest route, has the highest risk (8.75×10^{-12}). The difference between the highest risk and the lowest is exceedingly small.

Chemical cancer deaths and hazards due to accidents would be the result of acute exposure to members of the crew or the public during a release of volatile organic compounds when an accident caused the breach of a container. These risks are dependent on distance and population density; therefore, the risks for NV-1, NV-4, and NV-6 are the greatest. The risks for all remaining routes are by risks due to incident-free transportation. Incident-free transportation risks are conservative because the estimate of the population at risk is high, and because no credit is taken for the shielding properties of surrounding structures. Uncertainties were not calculated for these risks, as they are small compared to the off-site risks, and no alternate routing is considered.

Risks associated with the noncarcinogenic effect of volatile organic compounds are represented by a hazard index. If the hazard index is less than one; approximately the same because of large uncertainties in the calculation.

These results indicate that the greatest risk is from vehicle-related injuries, followed by vehicle-related fatalities, and finally, incident-free radiation exposures (fatalities and injuries).

On-Site Transportation Risk Results

Detailed results of the on-site transportation risk analysis are provided in DOE/NV (1996). The on-site transportation risk analysis includes; NTS-generated low-level waste from 17 points of origin on the NTS to the disposal site, plus contaminated soil from environmental restoration activities at Tonopah. A summary of results is shown on Table 3-9. No on-site transportation is associated with Alternative 2. As with off-site transportation, the risks from traffic fatalities are the largest, followed as it is for the national routes in-state routes, and on-site transportation, no adverse effects are expected.

Figure 3-12. Nevada In-State Traffic Fatality Risk

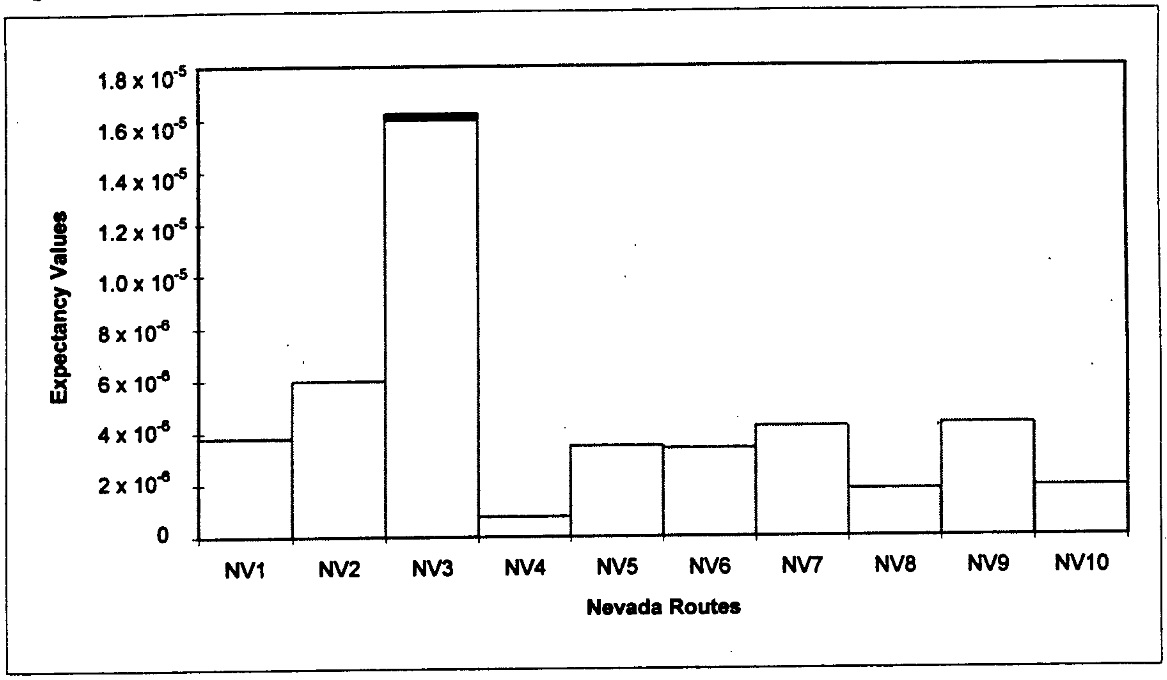


Figure 3-13. Nevada In-State Traffic Injury Risk

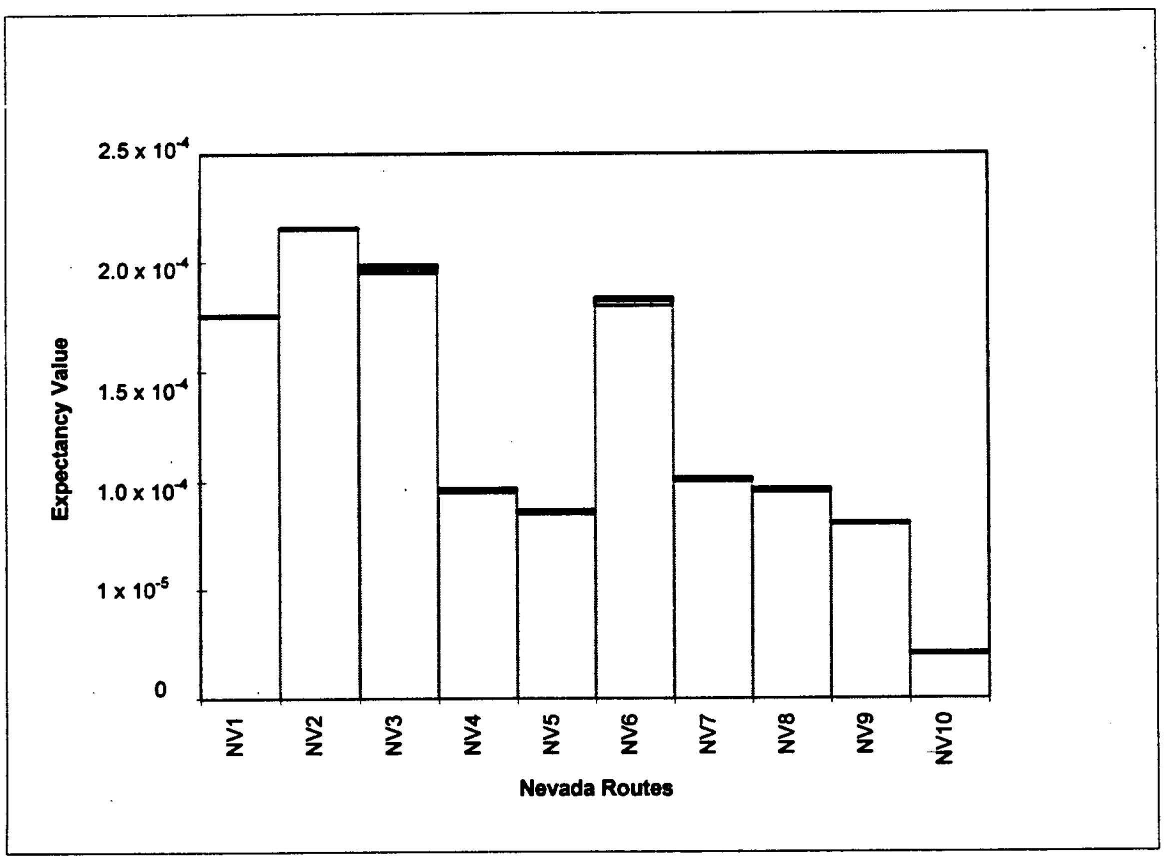


Figure 3-14. Nevada In-State Incident-Free Radiation-Induced Cancer Fatality Risk

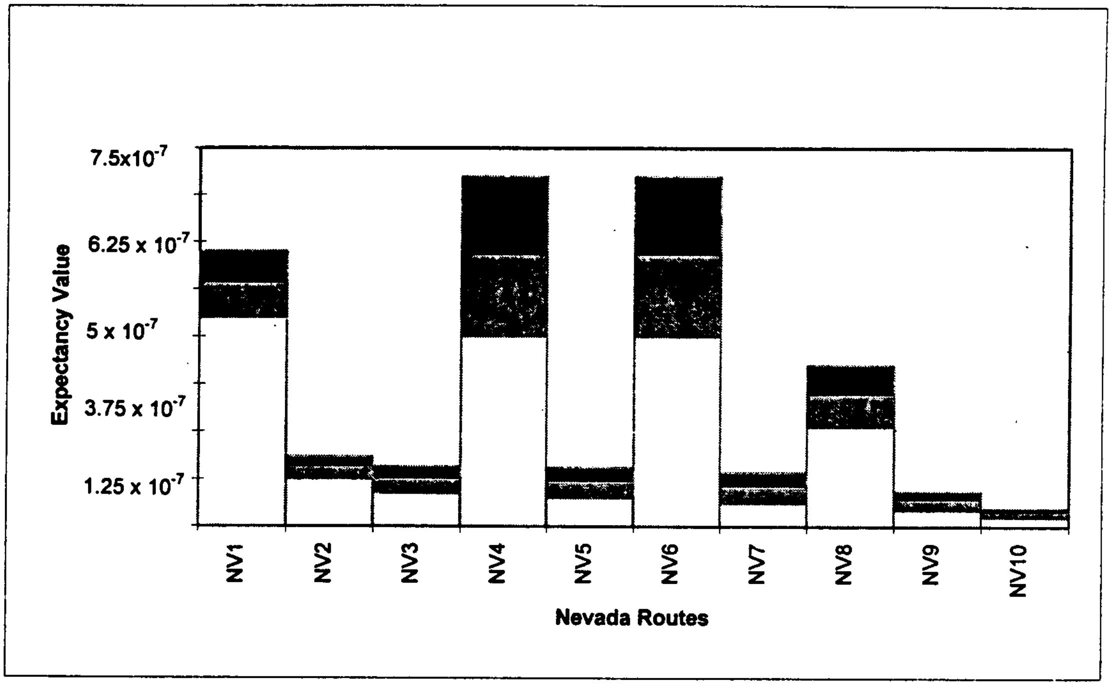


Figure 3-15. Nevada In-State Radiation-Induced Cancer Fatality Risk Due to Accidents

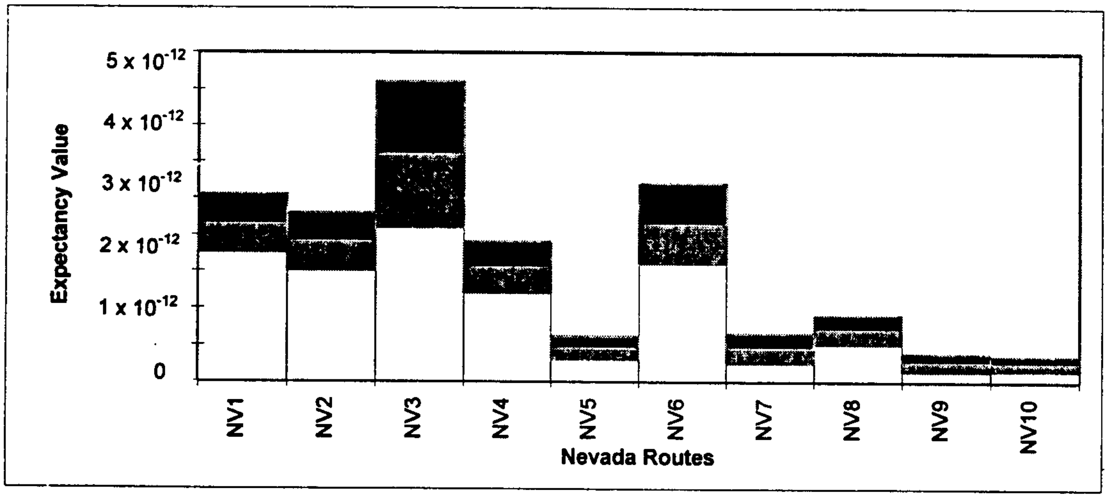


Figure 3-16. Nevada In-State Incident-Free Radiation Induced Detriment Risk

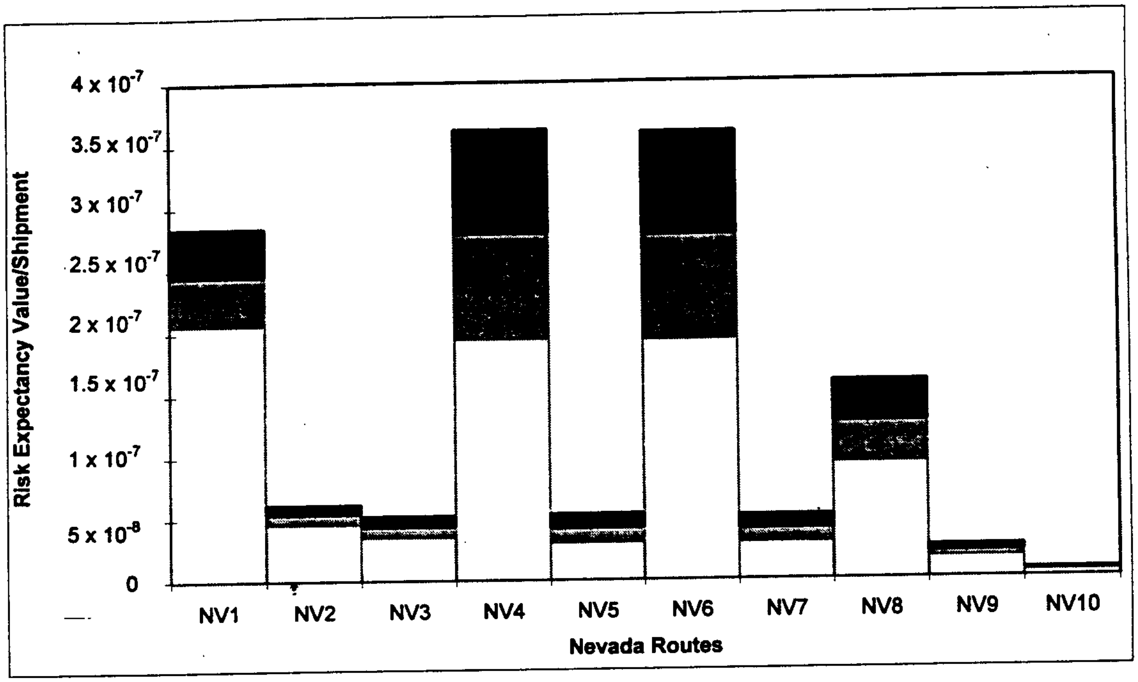


Figure 3-17. Nevada In-State Radiation-Induced Detriment Risk Due to Accidents

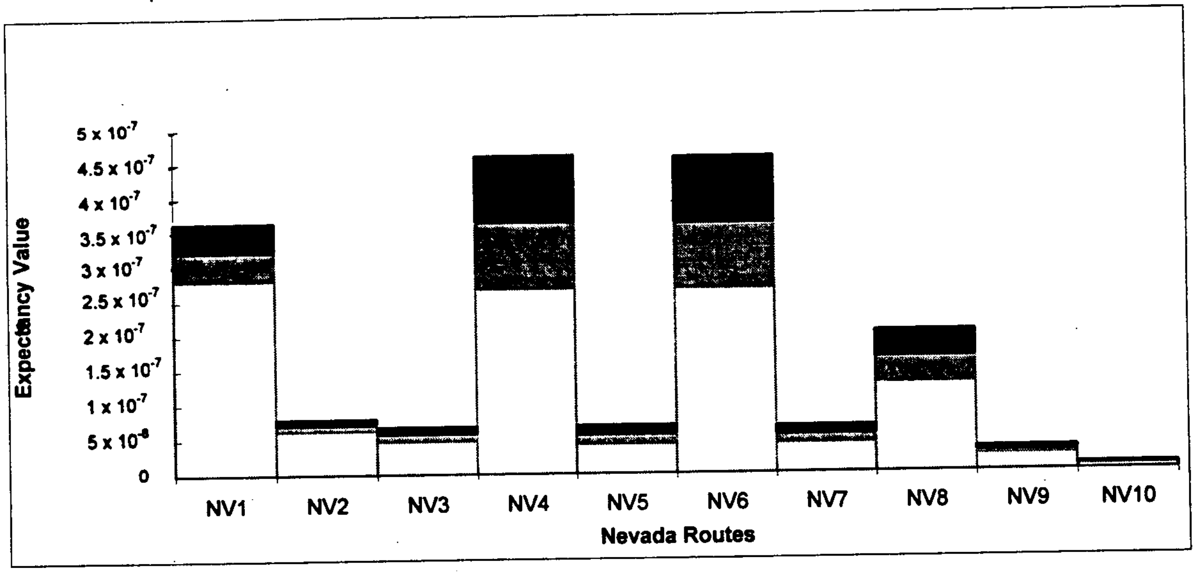


Figure 3-18. Nevada In-State Chemical-Induced Cancer Risk

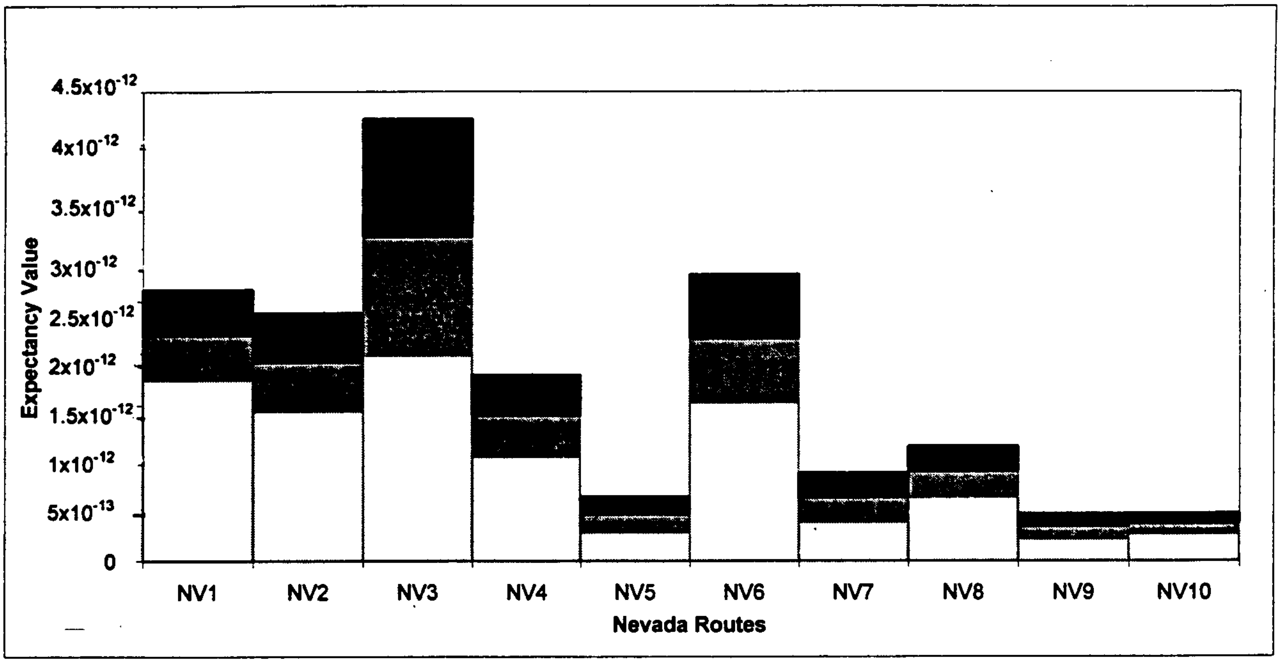


Figure 3-19. Nevada In-State Chemical-Induced Noncancer Hazard Index

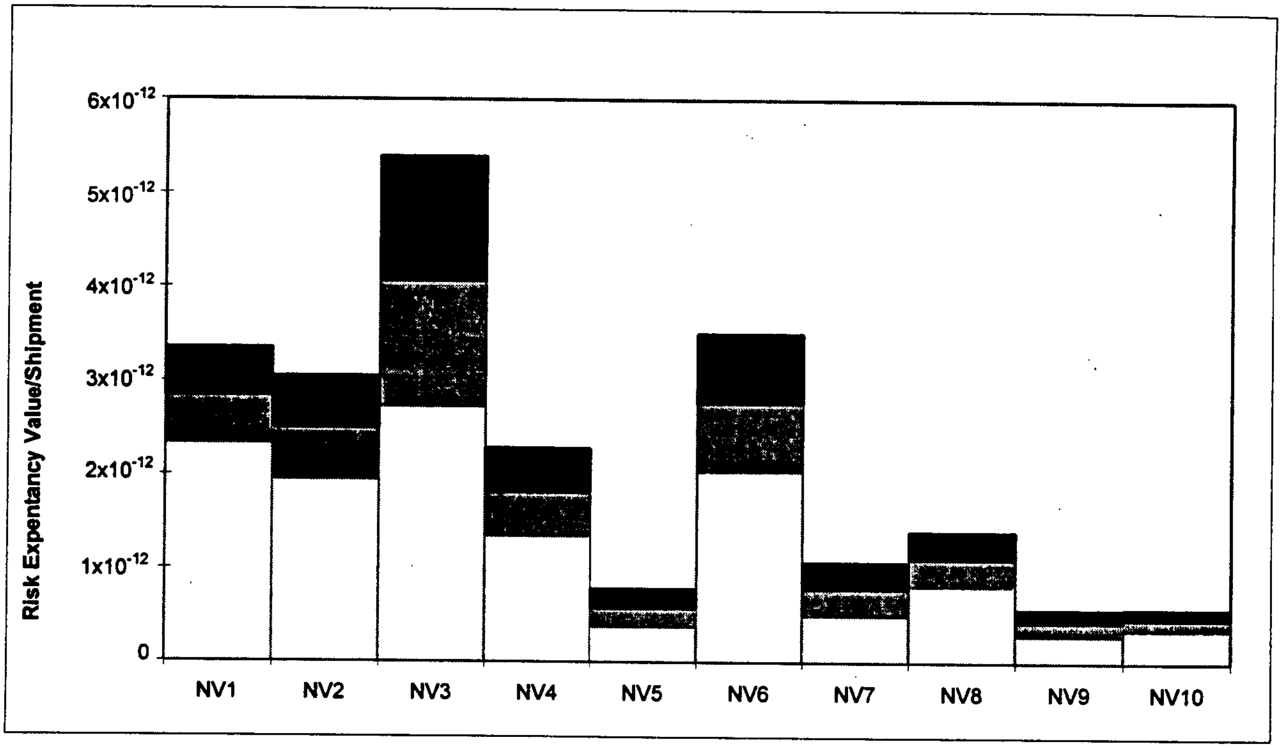


Table 3-7. Expected Number of Occurrences in 10 years (National Route)

	Risk	
Consequence	**Alternative 1**	**Alternative 3**
Vehicle-related fatalities	2	8
Vehicle-related injuries	27	1.3
Incident-free nonradiological health effects	3.02×10^{-3}	1.20×10^{-2}
Radiation-induced cancer fatalities	2.5×10^{-3}	7.7×10^{-2}
Radiation-induced detriment	1.4×10^{-3}	3.9×10^{-2}
Chemical-induced cancer	9×10^{-6}	7.5×10^{-5}

Table 3-8. Expected number of Occurrences in 10 years (within Nevada)

	Risk	
Consequence	**Alternative 1**	**Alternative 3**
Vehicle-related fatalities	2.3×10^{-2}	7×10^{-2}
Vehicle-related injuries	1	4
Incident-free nonradiological health effects	7.84×10^{-4}	1.61×10^{-3}
Radiation-induced cancer fatalities (LCFs)	7.5×10^{-4}	1.6×10^{-2}
Radiation-induced detriment	3.54×10^{-4}	7.9×10^{-3}
Chemical-induced cancer	2.4×10^{-4}	9.8×10^{-6}

3.3.5 Waste Management Transportation Risk Conclusions

The primary goal of the waste management analysis study was to estimate the health effects of the transportation of low-level and mixed waste along various routes from generators to the NTS. The results indicate that routing decisions need not rely solely upon the health risks, as they are all similar, and all are low. However, certain routes do exhibit small risk reductions over others, and their use could be a risk management tool. Reduction of total risk can be achieved mainly by selecting the route from a given generator site with the lowest traffic-related risks.

On the basis of the evaluation of in-state routes alone, routes NV-4, or NV-5 would have the lowest number of traffic related injuries or NV-10 if entering from the west. To reduce incident-free radiation cancer risks, NV-5 is preferable to NV-4; however, it should be noted that these risks are highly uncertain, and the estimates are very conservative. To reduce the risk due to accidents involving hazardous materials, NV-5 the most desirable route because it is the shortest distance, and has the lowest population density. However, when selecting national routes, risks outside the state would also have to be considered.

On-site transportation risks are common to all alternatives that involve transportation, and do not contribute significantly to the total risk of any alternative.

3.4 Hazardous Materials Shipments Transportation Risk

A separate analysis was performed for this EIS to assess impacts from transportation accidents involving nonradioactive hazardous materials SAIC (1996e). Hazardous chemicals are routinely shipped to the NTS from chemical manufacturers in various parts of the United States. In addition, the NTS routinely ships hazardous wastes to off-site hazardous waste treatment, storage, and disposal facilities. All shipments of hazardous chemicals and hazardous waste are made by truck.

To assess human health risks from transportation accidents involving hazardous chemicals, the shipment of chemicals in bulk quantities represents the bounding case because of the large quantities per shipment. A review of NTS hazardous material shipment records identified the top six chemicals that are routinely shipped to the NTS in bulk quantities. These chemicals were screened for relative toxicity to humans based on the Reference Concentration assigned to each chemical by the U.S. Environmental Protection Agency. (The reference concentration is the concentration in air below which it is unlikely for sensitive populations to experience adverse health effects.) Of the six chemicals reviewed, ammonia was found to have the highest relative toxicity. Approximately two shipments of ammonia per year are made from Las Vegas, NV to the NTS. Each shipment contains about 1,000 pounds of ammonia.

The bounding case for shipments of hazardous waste was determined by review of NTS hazardous waste shipment records. Each NTS hazardous waste stream was evaluated and ranked based on the following properties: potential for accidental dispersion, quantity, chemical concentration, material form (liquid, gas, or solid), and the frequency of shipment. Based on this screening methodology, Lab Pack waste was identified as the most important waste stream on the basis of types and quantities of hazardous wastes. Lab Pack wastes consist of a wide assortment of individual chemicals which were subsequently screened for relative toxicity based on their reference concentrations. The results of this screening process identified mercury, barium, chromium, arsenic, and cadmium as the Lab Pack chemicals that present the greatest health risks to humans. The average Lab Pack weight per shipment is about 460 kilograms. Under Alternatives 1 and 4, it was assumed that annual hazardous waste shipments would be similar to recent experience, about 20 shipments per year. The number of shipments is assumed to double to 40 shipments per year under Alternative 3. Alternative 2 was assumed to have a single shipment to remove any wastes stored in the Area 5 Hazardous Waste Storage Unit at the time that the NTS program operations were discontinued.

The postulated accident scenario is a truck accident leading to a breach of shipping containers (drums or tank) and a release of hazardous materials to the environment. The spilled chemicals either evaporate (liquid spill) or are aerosolized by the accident impact and wind (solid release). Accident probabilities were calculated for urban, suburban, and rural population zones based on: truck, accident rates per highway kilometer, the conditional probability that an accident will result in a release of hazardous material, the length (kilometers) of the shipment route, and the number of shipments per year.

Airborne concentrations of released chemicals were calculated using the EPI number code computer program for both neutral and stable atmospheric dispersion conditions. Consequences to people located downwind of the release are expressed in terms of Emergency Response Planning Guidelines (ERPGs). ERPG values are estimates of airborne concentration thresholds above which one can reasonably anticipate observing adverse effects based on an exposure time of one hour.

- ERPG-1: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing other than mild transient adverse health effects, or perceiving a clearly defined objectionable odor.

- ERPG-2: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or

Table 3-9. On-site Transportation Risk for NTS-Generated Waste

Consequence	Alternative 1	Alternative 3	Alternative 4
Traffic fatalities	0.11	0.11	0.11
Traffic injuries	1.1	1.1	1.1
Radiation-induced cancer fatalities	1×10^{-7}	3×10^{-7}	9×10^{-8}
Radiation-induced detriment	1×10^{-7}	2×10^{-7}	8×10^{-8}
Chemical-induced cancers	NA[a]	NA	NA

[a] Not applicable

developing irreversible or other serious health effects, or symptoms than could impair their abilities to take protective action.

- ERPG-3: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.

For a severe transportation accident involving a tanker shipment of ammonia, the probability of the accident occurring in an urban population zone is estimated to be about 2.3×10^{-7} per year and could result in 5 to 39 people being exposed to ammonia in excess of ERPG-3 concentrations. The probability of the accident in a suburban population zone increases to 1.4×10^{-6} per year and 1 to 7 people could be exposed to ammonia in excess of ERPG-3 concentrations. The accident probability increases to 4.3×10^{-6} for rural population zones where no people would be exposed to ERPG-3 concentrations, but 0 to 3 people could be exposed to ammonia in excess of ERPG-1 concentrations. These probabilities and consequences are assumed to be the same for Alternatives 1, 3, and 4. No bulk chemical shipments are expected under Alternative 2.

For a severe transportation accident involving a shipment of lab packed hazardous wastes, the probability of the accident occurring in an urban population zone is estimated to be about 2.5×10^{-5} per year. No people would be exposed to chemicals in excess of ERPG-3 concentrations, but 1 to 6 people could be exposed to chemicals in excess of ERPG-2 concentrations. The probability of the accident in a suburban population zone increased to 7.6×10^{-5} per year; one person could be exposed to chemicals in excess of ERPG-2 concentrations, and 92 to 183 people could be exposed in excess of ERPG-1 concentrations. The accident probability increases to 1.7×10^{-4} for rural population zones where no people would be exposed to ERPG-3 or ERPG-2 concentrations, but 1 to 2 people could be exposed to chemicals in excess of ERPG-1 concentrations. The probabilities given for these accidents are based on the estimated annual hazardous waste shipments for Alternatives 1 and 4. For Alternative 3, the accident probabilities double, but he consequences remain the same. For Alternative 2, the accident probabilities are lower by a factor of 20.

The consequences presented for hazardous material transportation accidents establish the upper bound of reasonably foreseeable consequences. In other words, if the postulated accidents actually occurred, the consequences would be expected to be less than those presented in this EIS. The accident analyses performed for the EIS did not consider mitigative actions, such as individuals taking cover, escaping to an area of lower or safe concentrations, or wearing protective equipment, which would lower the consequences of the postulated accidents.

3.5 Summary

A transportation risk analysis was performed in response to stakeholder concerns about the alternatives in the NTS EIS. The transportation of low-level waste, mixed waste, nuclear materials, and hazardous chemicals was analyzed. Both vehicle-related and cargo-related consequences were assessed for incident-free radiological and nonradiological health effects, vehicle fatalities and injuries, accident-initiated radiological fatalities and detriment, and chemical-induced cancers. A hazard index was calculated as a measure of the chemical-induced noncancer health effect. In addition, the maximum individual exposure (dose and health risk) for low-level waste transportation was calculated.

The maximum reasonably foreseeable accidents associated with low-level waste and mixed waste transportation were identified.

The results of the transportation risk analyses for Defense Program nuclear material and waste management of low-level and mixed waste show that the human health risks from transportation are low under any alternative, and are not significant contributors to the total risk from all operations under any alternative. Since transportation decisions do not need to be made on the basis of risk (because all the risks are low, and, are similar within the uncertainty bounds), other factors can be given greater consideration.

This Page Intentionally Left Blank

4.0 REFERENCES

REGULATION, ORDER, LAW

10 CFR 71 — Nuclear Regulatory Commission (NRC), *Energy: Packaging and Transportation of Radioactive Material, Code of Federal Regulations,* Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1988.

40 CFR 261, — U.S. Environmental Protection Agency (EPA), "Protection of Environment: Identification and Listing of Hazardous Waste", *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1988.

40 CFR 268 — U.S. Environmental Protection Agency (EPA), "Protection of Environment: *Land Disposal Restrictions", Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1988.

49 CFR 172.403 — U.S. Department of Transportation (DOT), Transportation: "Radioactive Material", *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1988.

49 CFR 397.101 — U.S. Department of Transportation (DOT), *"Federal Highway Administration: Requirements for Motor Carriers and Drivers," Code of Federal Regulations,* Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.

GENERAL

AAR, 1993 — *Association of American Railroads* (AAR), Competitive Policy Reporter, Volume IV, Number 8, 1995.

Blower, 1991 — Blower, D., *Trucks Involved in Fatal Accidents, Codebook 1980-88, By Power Unit Type, UMTRI-93-1*, University of Michigan Transportation Research Institute, 1993.

CH2M Hill, 1993 — CH2M Hill, *Hazardous Material Truck Safety Study, U.S. Highway 93 at Hoover Dam, Final Report,* CH2M Hill, Sacramento, CA 1993.

Clauss, 1996 — Clauss, D.B., Attachment to letter dated May 7, 1996, from D.B. Clauss to D. Howard, *U.S. DOE, Transportation Risk Assessment for Sandia National Laboratories to D. Howard, U.S. DOE, Nevada Test Site EIS.*

DOE, 1992 — Department of Energy, (DOE), Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements NVO-325, prepared by DOE/NV and Reynolds Electrical and Engineering Co., Inc., Waste Management Department, 1992.

DOE, 1993a	Department of Energy (DOE), *Transporting Radioactive Materials Q&A Answers to Your Questions*, DOE/EM-0097, Washington, DC, 1993.
DOE , 1993b	Department of Energy/Nevada Operations Office (DOE/NV) Hazardous Material On-Site Transportation Manual, Nevada Test Site, Rev 3, October 1994.
DOE, 1995a	Department of Energy (DOE), *Estimating the Cold War Mortgage: 1995 Baseline Environmental Management Report*, DOE/EM-0232, Vols. I, II, and Executive Summary, Office of Environmental Management, Washington, DC, 1995.
DOE, 1995b	Department of Energy (DOE), *Nevada Potential Repository Preliminary Transportation Strategy Study I*, B00000000-01717-4600-0023 Rev. 01, April 1995, prepared by TRW, Environmental Safety Systems, Las Vegas, NV, 1995.
DOE, 1995c	Department of Energy (DOE), Draft *Waste Management Programmatic EIS for Managing Treatment, Storage and Disposal of Radioactive and Hazardous Waste, U.S. Department of Energy, Office of Environmental Management, 1995.*
DOE/NV, 1996	Department of Energy (DOE), *Summary of the Transportation Risk Assessment Results for the Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada*, DOE Nevada Operations Office, Las Vegas, Nevada, 1996.
ICRP, 1991	International Commission on Radiological Protection (ICRP), 1990 *Recommendations of the International Commission on Radiological Protection,* Pergamon Press, Elmsford, New York, 1991
IT Corp, 1995a	Attachment to letter dated November 27, 1995, from Tom Wilczek, IT Corp., to Mary Ellen Giampaoli, U.S. DOE, *Benchmarking the Nevada Test Site Environmental Impact Statement Transportation Risk Asessment Model*
IT Corp, 1995b	Attachment to letter dated *December 1995,* from Tom Wilczek, IT Corporation, to Mary Ellen Giampaoli, U.S. DOE, *Tonopah Soils Transportation Risk Study*
IT Corp, 1996	Attachment to letter dated May 9, 1996 from Tom Wilczek, IT Corporation, to Mary Ellen Giampaoli, *U.S. DOE, NTS EIS Draft Transportation Risk Assessment*
Johnson et al., 1993	Johnson, P.E., D.S. Joy, D.B. Clarke, and J.M. Jacobi, *Highway 3.2-An Enhanced Highway Routing Model: Program Description, Methodology, and Revised User's Manual*, ORNL/TM-12124, Oak Ridge National Laboratory, Oak Ridge, TN, 1993
National Cancer Institute, 1990	Memorandum dated May 6, 1996, from Steve Adams, IT Corporation, to Denise Crenshaw-Smith, Science Applications International Corporation, *Cancer Statistics*

Nauhauser and Kanipe, 1993	Neuhauser, K.S., and F.L. Kanipe, *RADTRAN 4 Volume II: Technical Manual,* Kanipe, SAND89-2370, Sandia National Laboratories, Albuquerque, NM, 1993.
NRC, 1977	U.S. Nuclear Regulatory Commission (NRC), *Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes,* NUREG-0170, Office of Standards Development, Washington, DC, 1977.
Phillips et al., 1994	Phillips, J.S., D.B. Clauss, and D.F. Blower. *Determination of Influence Factors and Accident Rates for the Armored Tractor/Safe-Secure Trailer,* SAND93-0111, Sandia National Laboratories, Albuquerque, NM, 1994.
Rhyne, W.R.,	Rhyne, W.R., *Critical Issues in Performing Transportation Risk Studies,* H&R Technical Associates, Inc., Oak Ridge, TN, May 16, 1988.
SAIC, 1996a	Anderson, M., *Incident-Free Non-Radiological Health Effects for* Transportation of Waste Management and Defense Program Shipments to NTS, Engineering Design File NTS-01, Rev. 1, Science Applications International Corporation, Idaho Falls, Idaho, 1996.
SAIC, 1996b	Maheras, S., *Maximum Individual Doses for Incident-Free Transportation,* Engineering Design File NTS-02, Science Applications International Corporation, Idaho Falls, Idaho, 1996.
SAIC, 1996c	Pippen, H., *Assessment of the Maximum Reasonably Foreseeable Accident for Shipment of Low-Level Waste and Mixed Waste to NTS*, Engineering Design File NTS-03, Rev. 1, Science Applications International Corporation, 1996.
SAIC, 1996d	Morris, R., *Risk Assessment for the NTS EIS Alternatives 1 & 3 and the TTR*, Engineering Design File NTS-04, Science Applications International Corporation, Oak Ridge, Tennessee 1996.
SAIC, 1996e	Wieiman, T.E. and M. Hall, *Nevada Test Site Transportation of Hazardous Materials Accident Analysis*, Engineering Design File NTS-05, Science Applications International Corporation, Idaho Falls, Idaho, 1996.
SNL/NM, 1994	SNL/NM, *Defense Programs Transportation Risk Assessment: Probabilities and Consequences of Accidental Disposal of Radioactive Material Arising from Off-Site Transportation of Defense Program Material,* SAND93-1671, Albuquerque, NM, 1994.
Sullivan and Massie, 1993	Sullivan, K.P., and D.L. Massie, *Trucks Involved in Fatal Accidents, 1990 Factbook*, IMTRI-93-1, University of Michigan Transportation Research Institute, 1993. 3

This Page Intentionally Left Blank

Attachment A to Appendix I

APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS

This Page Intentionally Left Blank

Attachment A. Applicable Federal, State, and Local Laws and Regulations

All shipments of hazardous materials, including radioactive, whether from industry or government, must be packaged and transported according to strict federal, state, and local regulations. Handling, storage, and disposal of these wastes must also be performed in accordance with specific regulations. These regulations are intended to protect the public, transportation and other workers, and the environment from potential exposure to hazardous materials or radiation.

This appendix lists those federal, state, and local laws and regulations, including U.S. Department of Energy (DOE) orders, that the DOE believes are applicable to the safe transportation of materials to and from the Nevada Test Site (NTS). The NTS transportation activities must comply with federal, state, and local environmental protection regulations, waste management regulations, occupational health and safety standards, and transportation regulations.

In Tables A-1 through A-6, regulatory citations and requirements, including the implementing authority, are summarized. The summary column in each table lists a brief description of the regulation's possible relation to the NTS transportation activities. The tables are organized by implementation authority.

Table A-1. Applicable State and local laws and regulations. (Page 1 of 2)

Title	Authority	Citation	Summary
Committee on Transportation	Department of Motor Vehicles and Public Safety	AB748 (1993)	This legislation makes an appropriation to the Nevada Highway Patrol of the Department of Motor Vehicles and Public Safety for the pilot program of the Alliance of Uniform Hazardous Material (HAZMAT) Transportation Procedures and provides for other related matters. The pilot program will test uniform registration and permitting of hazardous materials motor carriers.
Rocky Mountain Low-Level Radioactive Waste Compact Statute	Compact Members, Rocky Mountain Low-Level Radioactive Waste Board	Nev. Rev. Stat. Ann. §§459.007 through 459.0083	Ratifies the Rocky Mountain Low-Level Radioactive Waste Compact, and approves Nevada's entry into same, for the cooperative management of low-level radioactive waste. The compact board is required to make suggestions to appropriate officials in the party states to ensure that adequate emergency response programs are available to deal with any exigency that might arise with respect to low-level waste transportation or management. Additionally, requires party states to adopt and enforce procedures for shipments to conform to packaging and transportation requirements. Authorizes the Department of Health to administer compact responsibilities.
License to Use Area for Disposal Required	Health Division	Nev. Rev. Stat. Ann. §§459.221	A shipper, producer or broker of radioactive waste must obtain a license from the Health Division in order to dispose of the waste. Unlicensed shippers will have the waste returned to them. The license is issued when the shipper or broker demonstrates that waste will be labeled and packaged in accordance with the regulations of the State Board of Health. Penalties are prescribed for violations.
Requirements for Transporting Radioactive Waste	Motor Vehicle Division, Public Service Commission	Nev. Rev. Stat. Ann. §§459.707 through 708	The approval of the Public Service Commission (PSC) is required for the Division to issue a permit to carriers that seek to transport radioactive waste. The PSC also must determine that carriers will comply with all applicable laws and regulations of the state and the federal government. Grounds for revocation of a permit are specified. Section 459.708 states that motor carriers shall reject packages for transport if they are leaking, do not bear the required shipping label, or are not accompanied by the prescribed shipping documents. Carriers are liable for packages in their custody that are deficient as noted above.

Table A-1. Applicable State and local laws and regulations. (Page 2 of 2)

Title	Authority	Citation	Summary
Nevada Hazardous Materials Laws	State Board of Health, State Department of Transportation, Department of Motor Vehicles and Public Safety, Highway Patrol Division, State Environmental Commission, Department of Conservation and Natural Resources	Nev. Rev. Stat. Ann. §§459.001 et seq.	A Nevada hazardous materials statute establishes requirements for hazardous and nuclear materials waste management, transportation, and emergency response.
Western Interstate Nuclear Compact	Western Interstate Nuclear Board	Nev. Rev. Stat. Ann. §§459.001 through 459.005	Nevada is a party to the Western Interstate Nuclear Compact which, in relevant part, obligates party states to provide mutual aid in coping with nuclear incidents. This may or may not extend to nuclear transportation incidents.
Hazardous Materials Regulations (February 1992 edition)	Board of Health	Nev. Admin. Code §§459.010 through 459.950	The Nevada Board of Health has promulgated radiation control regulations which concern hazardous materials licensing, transportation, and radiation protection.
Transportation of Hazardous Materials	Fire Chief	Ordinance No. 960	Clark County, Nevada, has an ordinance regarding transportation of hazardous materials. The ordinance includes requirements for reporting, certification, fees, routing, and liability issues as they relate to the transportation of hazardous materials through Clark County, Nevada.
Transportation of Hazardous Materials	Department of Fire Services	Ordinance No. 3190	The City of Las Vegas, Nevada, has an ordinance that regulates the transportation of hazardous (including radioactive) materials in the city. The ordinance includes requirements for reporting, permitting, fees, routing, and liability issues as they relate to the transportation of hazardous materials through Las Vegas, Nevada.
Transportation of Hazardous Materials	Fire Department	Ordinance No. 821	The City of North Las Vegas, Nevada, has an ordinance concerning hazardous materials transportation by various modes in and through the city. The ordinance includes requirements for adoption of federal regulations, liability, notification, and reporting issues as they relate to the transportation of hazardous materials through North Las Vegas, Nevada.

Table A-2. Applicable U.S. Department of Transportation regulations

Title	Authority	Citation	Summary
Transportation Title 49 CFR	U.S. Department of Transportation	Subtitle A (parts 1 - 99)	Office of the Secretary of Transportation
		Subtitle B	Other Regulations Relating to Transportation
		I (parts 100 - 199)	Research and Special Programs Administration, Department of Transportation
		II (parts 200 - 299)	Federal Railroad Administration, Department of Transportation
		III (parts 300 - 399)	Federal Highway Administration, Department of Transportation
		IV (parts 400 - 499)	Coast Guard, Department of Transportation
		V (parts 500 - 599)	National Highway Traffic Safety Administration, Department of Transportation
		VI (parts 600 - 699)	Federal Transit Administration, Department of Transportation
		VII (parts 700 - 799)	National Railroad Passenger Corporation
		VIII (parts 800 - 899)	National Transportation Safety Board
		X (parts 1,000 - 1,399)	Interstate Commerce Commission

Table A-3. Applicable Nuclear Regulatory Commission regulations

Title	Authority	Citation	Summary
Notices, Instructions and Reports to Workers; Inspections	U.S. Nuclear Regulatory Commission (NRC)	10 CFR 19	Each licensee shall post Form NRC-3 "Notice to Employees," the regulations in Title 10 CFR 20, and the applicable operating procedures. Each worker shall be advised annually of their exposure to radiation or radioactive material.
Standards for Protection Against Radiation	NRC	10 CFR 20	Establishes standards for protection against ionizing radiation resulting from activities conducted under licenses from the U.S. Nuclear Regulatory Commission.
Disposal of High-Level Radioactive Wastes in Geologic Repositories	NRC	10 CFR 60	Prescribes rules governing the licensing of the DOE to receive and possess radioactive material at a geologic repository.
Disposal of Low-Level Radioactive Waste	NRC	10 CFR 61	Provides standards for near-surface land disposal of radioactive waste.
Packaging and Transportation of Radioactive Material	NRC	10 CFR 71	Provides requirements for packaging, preparation for shipment, and transportation of licensed material; and states procedures and standards for U.S. Nuclear Regulatory Commission approval of packaging and shipping procedures for radioactive material.
Fees for facilities and materials licenses and other regulatory services under the Atomic Energy Act of 1954, as amended	NRC	10 CFR 170	Sets out fees charged for licensing services rendered by the U.S. Nuclear Regulatory Commission.

Table A-4. Applicable EPA regulations

Title	Authority	Citation	Summary
Resource Conservation and Recovery Act Standards Applicable to Generators of Hazardous Wastes	EPA Environmental Protection Agency	40 CFR 262	Part 262 describes the regulatory requirements imposed on generators of hazardous wastes. An EPA identification number is required prior to offering any hazardous waste for transport. Part 262 also deals with the preparation of hazardous wastes for shipment and preparing a uniform hazardous waste manifest.
Resource Conservation and Recovery Act —Standards Applicable to Transporters of Hazardous Waste	EPA	40 CFR 263	Part 263 deals with standards for hazardous waste transporters. A transporter of hazardous wastes must obtain an EPA identification number, comply with the hazardous waste manifest system, and notify the proper authorities if any discharges (spills) occur during transportation. In addition, Part 263 contains some provisions for permitting.
Designation, Reportable Quantities, and Notification	EPA	40 CFR 302	Identifies reportable quantities of listed hazardous substances and sets forth notification requirements for any releases of these substances that exceed reportable quantities.
Hazardous Chemical Reporting: Community Right-to-Know	EPA	40 CFR 370	Reporting requirements to provide the public with information on hazardous chemicals in their communities, and to facilitate emergency response plans are established.
National Environmental Policy Act of 1969	EPA	40 CFR 1500–1508	Establishes procedures to ensure that environmental information is available to the public before environmental decisions are made and taken.

Table A-5. Applicable Occupational Safety and Health Administration regulations

Title	Authority	Citation	Summary
Occupational Safety and Health Standards	U.S. Department of Labor	29 CFR Part 1910	Establishes provisions for workplace health and safety procedures.

Table A-6. Applicable DOE requirements

Title	Authority	Citation	Summary
National Environmental Policy Act Compliance Program	U. S. Department of Energy (DOE)	DOE Order 491 (Draft)	Implements the Environment, Safety, and Health Strategic Plan; and substantively revises DOE 5440.1E to incorporate provisions of the Secretary of Energy's National Environmental Policy Act Policy of June 1994. It reflects the secretary's charge to control the cost and time for document preparation and review while maintaining quality, implements effective National Environmental Policy Act planning and teamwork, enhances public involvement, and strives for continuous improvement of the National Environmental Policy Act process.
Materials Transportation and Traffic Management	DOE	DOE Order 460.2	Transportation management.
General Environmental Protection Program	DOE	DOE Order 5400.1	Establishes environmental protection program requirements, authorities, and responsibilities for DOE operations to ensure compliance with applicable federal, state, and local environmental protection laws and regulations, executive orders, and internal DOE policies.
Radiation Protection of the Public and the Environment	DOE	DOE Order 5400.5	Establishes standards and requirements for the operations of DoD and DOE contractors with respect to protection of members of the public and the environment against undue risk from radiation.
Radioactive Waste Management	DOE	DOE Order 5820.2A	Contains packaging requirements for various materials.
Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Waste	DOE	DOE Order 460.1	Each package offered for transport to a carrier must comply with this order, U.S. Department of Transportation regulations, and the applicable standards of Title 10 CFR Part 71.
Radiological Assistance Program	DOE	DOE Order 5530.3	DOE to provide support and emergency response.
Quality Assurance	DOE	DOE Order 5700.6C	Establishes quality assurance requirements for the DOE.
Nevada Test Site DOE Approved Waste Acceptance Criteria, Certification, and Transfer Requirements	DOE	NV-325 (Rev. 1)	Establishes procedures, requirements, and criteria for the safe transfer and disposal of low-level and mixed waste, and storage of transuranic and transuranic mixed waste at the NTS.

This Page Intentionally Left Blank

Attachment B to Appendix I

PROCEDURES AND REGULATIONS RELATING TO TRANSPORTATION OF HAZARDOUS MATERIALS

This Page Intentionally Left Blank

Attachment B. Procedures and Regulations Relating to Transportation of Hazardous Materials

B.1 General Transportation Procedures and Regulations

B.1.1 Containerization, Packaging, and Labeling Regulations

The containerization and packaging of hazardous materials must comply with detailed U.S. Department of Transportation (DOT) and the U.S. Nuclear Regulatory Commission regulations. The form, quantity, and concentration of the radioactive materials determine the type of packaging used. All radioactive materials must be packaged to ensure that the radiation level at the package surface does not exceed the DOT regulations 49 CFR 173. The requirements of Title 49 CFR 173, Subpart I, ensure that package handlers, transporters, and the public are advised of package contents; and do not receive dose rates in excess of recognized safe limits established by the U.S. Nuclear Regulatory Commission. After radioactive materials are put in the proper packaging, they are sealed, they are surveyed with special instruments to ensure radiation is within regulatory limits, and checked for external contamination. The package is then marked and labeled to provide information about its contents.

The radioactive waste type that would be shipped to the Nevada Test Site (NTS) under Alternatives 1 and 3 would likely be low-level waste or mixed waste. The type of packaging for a great majority of low-level and mixed waste will be industrial (strong, tight packages). However, to provide additional information and comparisons of the three basic types of packaging used to transport radioactive wastes and/or materials, information on all three basic types of packages are provided in the following paragraphs (49 CFR 173, Subpart I). It should be noted that packaging regulations apply to both rail and truck transport.

- **Industrial Packages.** This type of package is used for materials that present little hazard from radiation exposure, due to their low-level of radioactivity. They are shipped in "strong, tight" packages (49 CFR 173.421). Slightly contaminated clothing, laboratory samples, and smoke detectors are examples of materials that may be shipped in strong, tight packages. These packages are generally constructed of cardboard, wood, or metal. The DOT has proposed that strong, tight packages be replaced by "industrial packaging," which is a standard international package for low-level radioactive materials. Industrial packaging conforms to international design and construction requirements. This type of container will retain and protect the contents during normal transportation activities.

- **Type A Packages.** This type of container is used for radioactive materials with higher specific activity levels (radioactivity) These packages must demonstrate their ability to withstand a series of tests without release of their contents. Test requirements are established by the U.S. Nuclear Regulatory Commission. Regulations require that the package protect its contents and maintain sufficient shielding under conditions normally encountered during transportation. These packages are generally 55-gallon steel drums, steel boxes, or specially designed shielded boxes. Typically, Type A packages are used to transport radiopharmaceuticals (radioactive materials for medical use) and certain regulatory-qualified industrial products.

- **Type B Packages.** This type of container is used for radioactive materials that exceed the limits of Type A package requirements must be shipped in Type B packages. Shippers use this type of package to transport materials that would present a radiation hazard to the public or the environment if there was a major release. For that reason, a Type B package design must not only demonstrate its ability to withstand tests simulating normal shipping conditions, but it must also withstand credible accident conditions without releasing its contents. Type B packages are used to transport materials with high levels of radioactivity, such as spent fuel from nuclear power plants. The size of Type B packages can range from small containers to those weighing over 100 tons.

The packaging of waste is completed by the shipper. (In all cases, radioactive waste received at the NTS under Alternatives 1 and 3 would be from a DOE-approved waste generator.) The shipper marks and labels the container, and ensures that vehicle placarding is in place. The three types of waste packages are shown in Figure B-1.

Federal regulations *Radioactive Material* 49 CFR 172 requires that shippers follow specific required guidelines in marking and labeling all packages containing radioactive materials. At a minimum, markings must provide the proper shipping name, identification number, the shipper's name and address, as well as other information. Labels must identify the contents and radioactivity level (indicated in curies [Ci]), a unit of measurement that specifies the number of atoms undergoing radioactive decay per second), and provide a hazard index to ensure proper handling. Shippers of radioactive materials use one of three different shipping labels in accordance with Title 49 CFR Part 172.403 (c): Radioactive White I (lowest category), Yellow II, or Yellow III (highest category. The appropriate label corresponds to the type of material shipped, and the measured radiation level of the package's contents. Radioactive White I is designated for materials with a package surface radiation level of less than 0.5 mrem/hr. Radiation Yellow II is used for materials with a radiation level greater than 0.5 mrem/hr. But less than 50 mrem/hr. Yellow III is designated for waste with a radiation level greater than 50 mrem/hr. (See Table B-1). Any waste package containing a highway-route controlled quantity of radioactive material must be labeled Radioactive Yellow-III. This requirement does not generally relate to low-level or mixed waste. Each package requiring radioactive labels must have two labels, one affixed to opposite sides of the package. The package contents (name of radionuclides) and the activity of the contents (e.g., Ci and microcurie [μCi]) must be written on the radioactive label in the spaces provided.

The shipment of certain types of radioactive materials requires that the vehicle be clearly marked with placards on all four sides. Most shipments received at the NTS have the Radioactive White-1 placard. Materials that meet highway route-controlled parameters, such as commercial radioactive spent nuclear fuel, require a white square to be displayed behind each radioactive placard. The correct use of markings, labels, and placards is the responsibility of the shipper. Markings, labels, and placards identify the hazardous contents to emergency responders and guide them in the selection of appropriate safety procedures in the event of an accident.

Radioactive material shipments must be accompanied by accurate shipping papers (49 CFR 172.200). These papers contain detailed information on the materials being transported, and they reference the appropriate emergency response procedures to follow should the need arise. In addition, these documents include certification that the materials are properly described, classified, packaged, marked, and labeled and are in proper condition, according to Department of Transportation regulations. Drivers must keep shipping papers in the vehicle and make them available at all times for inspection by responsible officials.

Figure B-1. Examples of container types

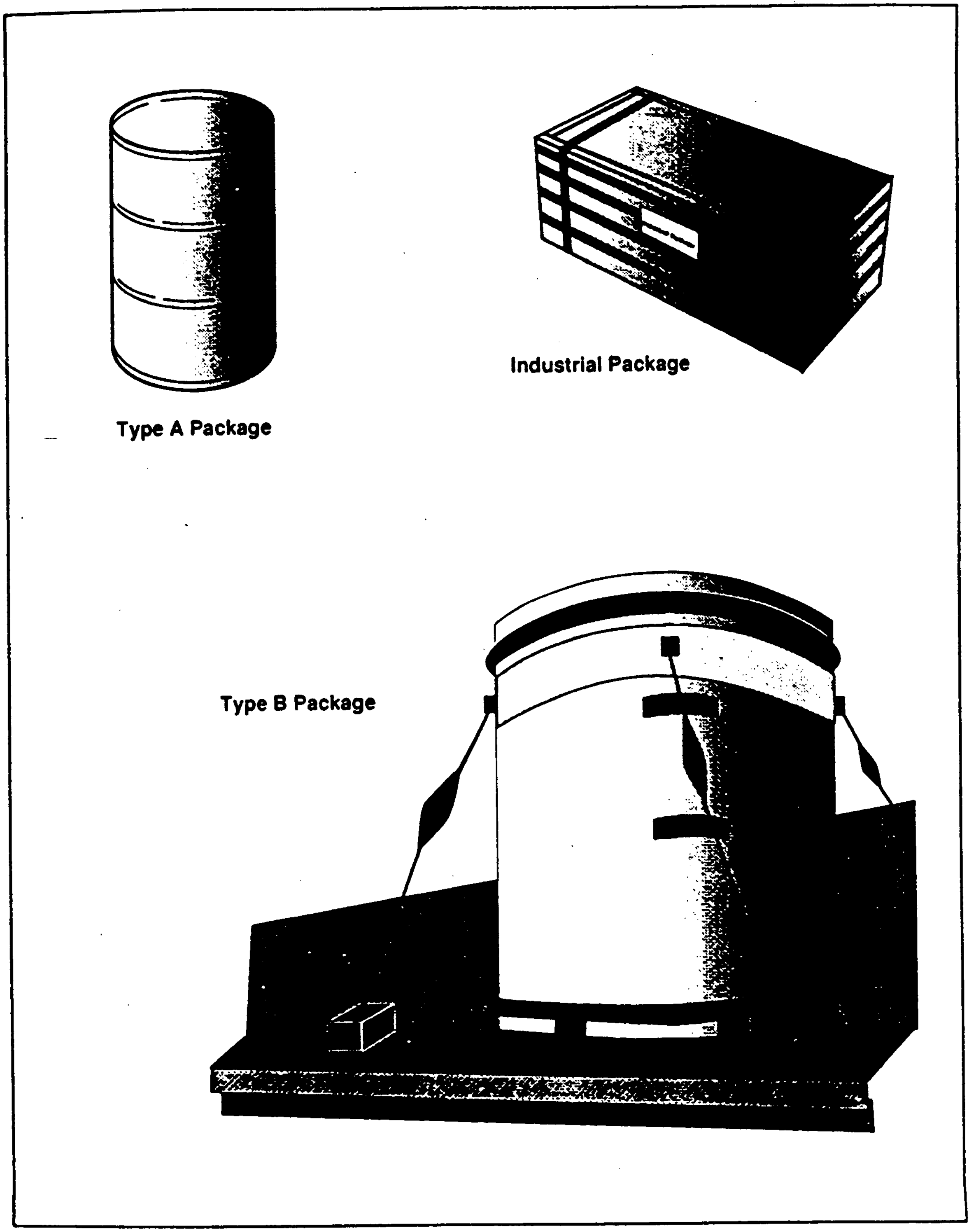


Table B-1. Category of label to be applied to radioactive materials packages

Transport Index (T.I.)	Radiation Level (RL) at Package Surface	Fissile Criteria	Label Category[a]
NA[b]	≤0.5 mrem/hr (mrem/hr)	Fissile class I only, no fissile class II or III	White-I
T.I. ≤ 1.0	0.5 mrem/h <RL ≤50 mrem/hr	Fissile class I, fissile class II, with T.I. ≤ 1.0, no fissile class III	Yellow-II
T.I. > 1.0	50 mrem/hr <RL	Fissile class II with 11.0 < T.I., fissile class III	Yellow-III

[a] Any package containing a "highway route controlled quantity" (49 CFR 173.403) must be labeled as Radioactive Yellow-III

[b] Not Applicable

B.1.2 DOE Procedure for the Selection of Carriers

The DOE, through its Transportation Management Division at DOE Headquarters in Washington, DC, make every effort to ensure the quality of the carriers, drivers, and equipment used to transport DOE material. The DOE has a Motor Carrier Evaluation Program to assist DOE field offices and contractor transportation personnel in selecting carriers to transport radioactive and hazardous materials.

Carriers are also subject to Federal Highway Administration inspections that provide information on driver qualifications, maintenance, and operating policies. The Department of Transportation issues a safety fitness rating for the carrier. DOE evaluates for its use only those carriers with a satisfactory rating from the Department of Transportation.

The DOT funds the Motor Carrier Safety Assistance Program, which provides information on accident statistics, roadside inspection results, and compliance reviews at the carrier's principal place of business. The DOE contractor's transportation specialists receive copies of this data, and use the information contained therein to select carriers for further consideration.

The DOE and its contractor transportation specialists visit carriers' corporate offices and maintenance facilities to determine whether they are eligible to transport radioactive and hazardous materials for the DOE.

The specialists review the following information on the carriers:

- Experience with hazardous and radioactive cargo
- Safety and regulatory compliance record
- Driver employment policies
- Equipment maintenance programs and procedures
- Emergency response capabilities
- Driver training program, including documentation
- Financial stability and insurance records.

The DOE scores each motor carrier on how well they comply with DOT standards, meet essential DOT-prescribed requirements, and possess desirable attributes. Any carrier not meeting DOT standards is declared ineligible. Carriers are typically re-evaluated on a scheduled basis related to their level of DOE activity.

Two contracting mechanisms exist for shipping materials: the special contract negotiated for individual shipments, or for a series of shipments; and the bill of lading which acts as the contract between carriers and shippers. Carriers performing under special contract are called contract carriers, while carriers performing under a bill of lading are called common carriers.

The Act to Regulate Commerce was signed into law on February 4, 1887, and created the Interstate Commerce Commission. Several additional acts were passed during the first half of the twentieth century that imposed restrictions on all modes of transportation. During this time, there was a major distinction between the two types of carriers, and shippers with "specialized" commodities normally chose contract carriers rather than common carriers because there was greater regulation of the contract carrier. During the late 1970s, deregulation was started and, the authority of the Interstate Commerce Commission has diminished significantly, in fact it may soon cease to exist. Much of what has become law has been tested in the courts and will be in the court system for years to come, but it is clear that industry and government are moving away from regulation. Deregulation has made the choice between contract and common carriers almost moot; however, shippers may elect to do comparison studies before selecting a carrier. In selecting a carrier, the DOE generator/shipper gives careful consideration to cost, performance history, and condition and availability of equipment. Inspections and evaluations of the carrier, and the ability to work closely with available carriers are also carefully deliberated.

The following paragraphs and tables show some of the differences between contract and common carriers. Primarily due to deregulation, industry and government preference is to use common carriers unless there are very specific, tangible benefits to be gained by using contract carriers.

Contract carriers are obligated to supply only what is negotiated and contained in the provisions of the specific contract. Additional needs identified by the shipper require further negotiation and incur additional cost. Delays are also a common result of this process. The responsibilities of both the carrier and the shipper must be carefully defined and documented; for example, responsibility for damage, delay, and terms of custody. (These responsibilities are inherent in the bill of lading and bind the common carrier without additional documentation.) Contractual timeframes and total tonnage to be moved are identified. The shipper must pay for the total identified tonnage even if the tonnage is less than the contractual amount. Each shipment is treated individually and is paid for through standard billing procedures. Payment is not made unless full service is rendered. The shipper has no control over who bids on the contract, which could result in an award to an owner-operated carrier that uses owner-operator drivers and equipment. In this situation, little or no control can be exercised over the operators or the equipment.

Some common carriers do have authority to bid on and operate as contract carriers, but there is no guarantee that a company in this status would be awarded the contract. Common carriers have control over their operators (employed by the company) and operate under established rules of operation such as those governing dispatcher-operator interactions, global positioning systems on equipment, and maintenance support agreements throughout the country. A comparison of carrier contractual issues is provided in Table B-2. In summary, public perception (based on comments received) is that DOE will have more control over their shipments, that the shipment will somehow be safer, and the government will be able to make all routing decisions if a contract carrier is selected (see Table B-3). This is not necessarily true. There are pros and cons to the type of carrier selected for any given shipment or series of shipments. In order to make a decision that provides the best, safest transportation for any commodity, a variety of subjects must be reviewed. All criteria such as type of shipment (truck load versus less than a truck load); single shipment or on-going campaign; single or multiple origins or destinations; specific routing requirements; general cargo versus hazardous materials; transit times, special handling, equipment, and packaging; services available in the geographic location of the shipper; willingness of carriers to work closely with DOE transportation managers and their contractors; and

Table B-2. Comparison of carrier contractual issues

CARRIER TYPE	PROS	CONS
Contract	Carrier must comply with Title 49 CFR Federal Motor Carrier Safety Regulations	Shipper will incur extra costs if item(s) not originally negotiated are requested
	Carrier will provide dedicated equipment and drivers	Obligated to adhere to contract requirements, procurement rules and regulations in addition to transportation regulations
		Potential for contractor financial instability
		Case law is not binding, only what is contained in the contract is binding
Common	No contract negotiation needed	
	Carrier must comply with Title 49 CFR Federal Motor Carrier Safety Regulations	
	Agree on routes to be used under certain conditions	
	Shipper pays for services received, with no stipulation to pay for more	
	Normally have more and better equipment, which is more readily available	
	Legally bound by case law	

Table B-3. Public perception of carrier issues

CARRIER TYPE	PROS	CONS
Contract	DOE in control of shipments DOE has control of routes used Contract carriers use best equipment, drivers, and communication devices available	
Common		DOE not in control of carrier operations No oversight of carrier's selection of routes

the effect of deregulation as discussed above will be examined before any decision to use common or contract carriers is made.

B.1.3 Route Selection Process

Carriers or private trucking companies are responsible for selecting routes for low-level waste shipments in accordance with *Federal Highway Administration: Requirements For Motor Carriers and Drivers Code of Federal Regulations* (49 CFR Part 397.101 (a). However, the DOE works closely with carriers in this area. The carriers are required to ensure that the motor vehicle is operated on routes that minimize radiological risk. They must consider available information on accident rates, transit time, population density and activities, and the time of day and day of week during which transport will occur.

For shipments containing a highway route-controlled quantity of radioactive material, the carrier must adhere to the requirements in Title 49 CFR Part 397.101(b) through (g)(3). These shipments occur on state-designated routes, (49 CFR 397.103), or preferred routes, as defined in Title 49 CFR Part 397.101(b).

B.1.4 Liability

Carriers of hazardous materials must carry liability insurance to cover damages in case of an accident. The carrier retains liability for accidents in which it is at fault. The carrier is also responsible for the costs to clean up the site of an accident. The DOE is responsible, however, for legitimate health and safety claims after an accident has occurred. Decreased land values or loss of business are not DOE's responsibility, because carriers are responsible for selecting routes of travel and must carry insurance in accordance with Department of Transportation requirements.

The required amount of coverage for carriers of radioactive materials varies according to the mode of transport (water, air, road, or rail). Minimum coverage requirements are contained in (49 CFR Part 387). If damages caused by an accident exceed the liability coverage held by the carrier, umbrella coverage is provided by the Price-Anderson Act. The Price-Anderson Act was added in 1957 as an amendment to the Atomic Energy Act of 1954 to help establish financial protection for persons injured and persons liable for those injured by a nuclear incident or a precautionary evacuation. The Act provides coverage for public liability arising from: (1) the slow release of radioactive material, if the release resulted from an action that occurred during contract activity, even if the damage occurred after the termination of the contract; and (2) the release of the nuclear material component of mixed waste. The Act also covers damages resulting from terrorism, sabotage, and other illegal acts which might occur during transport. Funding for this coverage comes from both private insurance and government indemnity.

B.1.5 Driver Training and Education

Drivers of vehicles that transport hazardous materials (which includes radioactive materials) must first receive special training and certification in accordance with Department of Transportation Regulations, which include the Federal Motor Carrier Safety regulations (49 CFR 350-399).

Drivers must have in their immediate possession a document certifying that training has been completed, and a copy placed in their qualification file (required by *Driver Qualification Files* 49 CFR 291.51) showing the following:

- The driver's name and operator's license number
- The dates that training was provided
- The name and address of the person providing the training
- That the driver has been trained in the hazards and characteristics of highway route-controlled quantity of Class 7 (radioactive) materials
- A statement by the person providing the training that information on the certificate is accurate.

Lastly, drivers must have in their immediate possession the route plan required by Title 49 CFR Part 391.57, and be operating the vehicle in accordance with the plan.

Transportation of hazardous waste also requires the specialized training of drivers. Title 49 CFR Parts 172.700-172.704 discusses the importance and responsibility for training and testing of employees who handle hazardous materials. As defined in *Definitions and Aggravations* (49 CFR Part 171.8), this would be a person who is employed by a hazardous materials employer, and who in the course of employment, directly affects hazardous materials transportation safety. Hazardous materials employers must ensure that every employee who handles hazardous materials is trained and tested in accordance with Title 49

CFR Parts 172.700-172.704 prior to performing any function subject to Department of Transportation's hazardous materials regulations. The training may be provided by the employers or other public or private sources and must include the following:

- **General Awareness Familiarization Training**

  Training designed to provide familiarity with the requirements of the hazardous materials regulations in Title 49 CFR, and to enable the employee to recognize and identify hazardous materials consistent with the hazard communication standards of the hazardous materials regulations in Title 49 CFR.

- **Function-Specific Training**

  Training concerning the requirements in Title 49 CFR as they apply to the employee's specific job function.

- **Safety Training**

  Training concerning emergency response, employee protection measures against work-place hazards, and methods and procedures for avoiding accidents.Training conducted by employers must comply with hazard communication programs required by the Occupational Safety and Health Administration of the Department of Labor or the Environmental Protection Agency (EPA). This training may be used to satisfy the training requirements of the preceding paragraph to avoid unnecessary duplication of training, to the extent that such training addresses the requirements.

The training for hazardous materials employees employed on or before July 2, 1993, shall be completed by October 1, 1993. Training for hazardous materials employees employed after July 2, 1993, or who change hazardous materials job functions, shall be completed within 90 days after employment or job change. The required training shall be received by the employee every 2 years.

Records of current training for the preceding 2 years must be created and maintained by the employer for as long as the employee is employed, and for 90 days after that. The records must include the following information:

- Employee's name
- Most recent training completion dates
- Description, copy, or location of the training materials
- Name and address of the person providing the training, and
- Certification that the hazardous material employee has been trained and tested.

B.1.6 Inspection and Enforcement System

State, tribal, and local law enforcement personnel may conduct vehicle inspections in terminals and along road sides, and are responsible for enforcement of all applicable state and local laws and regulations. For all radioactive material shipments, the Nevada Department of Human Resources, Health Division, is notified of the shipment prior to its entering Nevada. State officials make all other notifications within Nevada. In accordance with U.S. Nuclear Regulatory Commission directives, the general public is not specifically informed of a given shipment.

B.1.6.1 NTS Procedures. The DOE is committed to ensuring that waste accepted for disposal at the NTS is properly characterized, certified, packaged, and transported according to all safety, environmental, and transportation requirements. Transportation on the NTS is accomplished in accordance with the *Hazardous Material Onsite Transportation Safety Manual, Nevada Test Site* (DOE, 1994). The DOE/NV requirements are revised as necessary to reflect any changes in regulatory requirements. Waste that does not meet these requirements is not accepted for disposal on the NTS. In order to help in implementing the Radioactive Waste Acceptance Program, NTS personnel provide assistance through education and site visits for waste generators.

At the NTS, DOE/NV accepts and disposes of low-level waste. The waste is from approved DOE and DoD facilities across the United States. Approval to ship waste to the NTS is granted only after the waste generator certifies that all waste meets the DOE/NV's strict acceptance criteria. Personnel with expertise in waste management, quality assurance, and applicable state and federal regulations assure compliance with the program's inspection criteria. The requirements, terms, and conditions for accepting waste for disposal are briefly described in the following section.

All waste streams are characterized according to strict waste acceptance criteria prior to their being approved for shipment to the NTS or other DOE sites. A computerized database for DOE waste was established in 1987. This database includes information regarding the generator, number of shipments, weight, volume, radionuclides, and their concentrations. At the disposal site, the location of each waste package in the disposal facility is mapped according to a grid system.

DOE Order 5820.2A requires the disposal facility to develop and implement waste acceptance criteria. The NTS specific program for waste acceptance, at its radioactive waste disposal facilities, is accomplished by the rigorous approval process detailed in the *Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements* (NV-325, Revision 1) (DOE, 1992). The NV-325 details the acceptance criteria that on- and off-site generators must meet to dispose or store radioactive waste at the NTS. The NV-325 requirements specify criteria for acceptable waste content and form, characterization, packaging, labeling, certification, and transport. All waste must meet these strict criteria to ensure that all safety, health, environmental, and transportation requirements are met.

In order to evaluate the acceptability of the site's overall waste certification program and each individual waste stream, the DOE/NV conducts comprehensive reviews of programmatic and waste-related documentation and performs a thorough facility audit. Each site sending waste to the NTS will continue to be reevaluated on a regularly scheduled basis. Although NV-325 provides waste acceptance criteria for four radioactive waste types, the NTS has only received low-level waste from off-site generators since May, 1990. Criteria for the three waste types not currently being received at the NTS will remain in NV-325. This establishes a documented acceptance program for such waste types if and/or when the NTS is capable of receiving these waste types.

The most accurate waste volume projections available are based on 3-year forecasts that are provided to the NTS by the waste generators. Generators are required to submit 3-year forecasts every 6 months. Information from the 3-year forecasts is broken down by fiscal year quarters (fiscal years run from October 1 through September 30), and is provided to the Nevada Division of Environmental Protection on a quarterly basis.

Typically, the 3-year forecasts include both approved generators and those generators who are not approved, but are actively in the NV-325 approval process cycle. Generators who are not approved and not actively involved in the approval process sometimes submit 3-year forecasts but it is not a requirement.

There are strict requirements for waste acceptance at the NTS. The acceptance process begins with an application. Each site designated by the DOE Headquarters to ship low-level waste to the NTS must submit an application to the DOE/NV. Applications are reviewed to ensure that the waste and the generator's waste management program are fully described. Applications for low-level waste must also state that the waste does not contain any nonradioactive hazardous materials as defined by the Resource Conservation and Recovery Act. These requirements include the identification, transportation, treatment, storage, and disposal of waste.

Once the application review is completed and accepted, personnel from the DOE/NV travel to the waste generator's facility to inspect all stages of waste production. This review is necessary to ensure that the information in the generator's application is complete and accurate; methods of waste generation, characterization, handling, and shipping are evaluated and certified.

After the inspection is complete, an audit report is issued. If problems are identified, the generator must complete corrective actions, and DOE personnel must return to the site to verify that the problems have been corrected. When all requirements are met, the manager of the DOE/NV permits the generator to send waste to the NTS for disposal. Sites that are approved to dispose of low-level waste are inspected periodically to assure that all waste acceptance criteria continue to be met.

Each generator shipping waste to the NTS must designate a waste certification official who is independent from budget concerns to schedule waste handing and shipping. The waste certification official is a key person responsible for certifying that the waste shipped to the NTS meets DOE/NV requirements. In addition, the generator must have an independent quality assurance organization that reviews all phases of the waste management program, including inspections and waste certification.

To determine the ability of the generator to meet waste acceptance criteria, generator quality assurance personnel inspect the following key points, at a minimum, during the independent examination:

- Empty shipping containers are inspected to assure that they are free from dents, rust, corrosion, or other conditions that could compromise strength and integrity.
- Waste is certified as meeting DOE/NV requirements. For example, low-level waste cannot contain nonradioactive hazardous waste, free liquids, gas containers under pressure, disease-causing or infectious agents, corrosive material, or explosives. If necessary, the waste must be stabilized so it does not give off harmful vapors, gases, or liquids. The generator must demonstrate that its personnel are qualified to properly document and certify that these conditions are met.
- Waste packaging must meet strength, size, and weight requirements. This is necessary to ensure that the integrity of all packages is maintained after they are stacked in landfills at the NTS waste management site. In addition, marking and labeling each waste package must meet Department of Transportation, federal, and environmental safety requirements.

Radioactive cargo is the most closely inspected of all hazardous material shipments, and must be accompanied by shipping papers. These papers contain accurate, detailed information on the materials being transported, and they reference the appropriate emergency response procedures to follow, should the need arise. In addition, these documents include certification that the materials are properly described, classified, packaged, marked, labeled, and are in proper condition according to Department of Transportation regulations. Drivers must keep shipping papers in the vehicle and make them available at all times for inspection by responsible officials.

B.1.7 Monitoring and Tracking System

The waste disposal sites are presently open Monday through Thursday (during daylight hours only). Waste shipments are scheduled so that they arrive in time to be off-loaded during business hours. In the event that a nonclassified shipment arrives and cannot be off-loaded during business hours, the driver reports to the Mercury guard gate to check in. The driver is directed to a secure staging area where the trailer may be detached from the tractor. The trailer remains at the staging area until normal business hours when it is reattached to the tractor and sent through the normal receiving process. There are established procedures regulating radioactive waste entering the NTS waste disposal areas (Areas 3 and 5) (NV-

325). The procedures for receiving hazardous materials (including radioactive materials) for other programs and activities on the site follow the basic steps described in the following paragraphs:

A more detailed description of the NTS transportation requirements is available in DOE/NV Hazardous Material On-Site Transportation Manual, Nevada Test Site, the DOE-356, Rev. 3, October 1994.

The load-bearing truck checks in at the receiving office for the NTS at Mercury, Nevada, to present the shipping orders and manifest to the security officer. The trucks are monitored to make sure external radiation levels are below established limits before they are permitted on the NTS. Each truck trailer is also inspected to ensure the security seal is intact. The attending officer reviews the shipping papers and contacts the disposal area to verify the truck's entry and load. Upon showing proper identification to the NTS security officer, the driver is given a badge with a dosimeter (a device for measuring doses of radiation), which must be worn while at the NTS. Information about the truck's forthcoming entrance, its contents, and its destination is entered into the on-site tracking system for hazardous materials.

The truck is then permitted to enter through the Mercury gate and proceed to the disposal site. At the waste site office, the shipping papers are again reviewed and verified. The shipment is monitored again for external radiation levels, and the security seal is rechecked. The truck then enters a gate to the disposal area, and the trailer is carefully opened (the seal removed) and monitored for radioactive contamination. Each package is inspected as it is unloaded to make sure that it is undamaged and properly labeled. The packages are customarily unloaded into the disposal pit by forklift or crane. Later, the entire container is placed in a specific location within the disposal pit for permanent disposal and covering. When these materials are taken to specific locations on the NTS, the on-site tracking system is again used to show the route taken by vehicles carrying the hazardous materials within the NTS. Finally, the empty trailer is monitored for radioactive contamination before it is released from the waste management site. The truck is again inspected for radioactive contamination within the Mercury camp area and before exiting the Mercury gate. The driver returns to the receiving office to check out and return the badge and dosimeter. The truck's departure is noted on the tracking system.

In Nevada, a monitoring/tracking system based at the NTS is used. This tracking system, called the NTS Traffic System, is a database. Waste generator sites provide information on the shipment location, volume, and time that the shipment would be expected at the NTS. The routing from the generator sites is known by the agencies using the database. The information can be revised if the driver is delayed, for example, due to mechanical failure. County and local governments may request access to this tracking system.

B.2 Transportation of Defense Materials

The DOE maintains and operates the Transportation Safeguards System. This system is comprised of a fleet of specialized equipment used to transport, in a safe and secure manner, Category II or higher nuclear material between DoD and DOE production sites, laboratories, and test sites. The materials transported support DOE and DoD activities for production, testing, surveillance, limited-life component replacements, and dismantlement and disposal of nuclear weapons. Materials are transported throughout the United States either by air or over-the-road operations. For the purpose of this study, only over-the road operations are germane.

The DOE, Albuquerque Operations Office, Transportation Safeguards Division is responsible for the operation and maintenance of the Transportation Safeguards System. In terms of over-the-road operations, the specialized equipment includes a fleet of highly modified highway tractors, safe-secure trailers, and support escort vehicles. Since the DOE exclusively operates and maintains the Transportation Safeguards System, it is responsible for evaluating and approving these transportation operations throughout the continental United States.

The safe-secure trailer is a modified, standard closed van. The dry-freight-type semi-trailer includes necessary cargo tie-down equipment and temperature monitoring, fire alarm, and access denial systems. It is essentially a mobile vault that is highly resistant to unauthorized entry and provides a high degree of cargo protection under accident conditions. The safe-secure trailers are pulled by an armored, penetration-resistant highway tractor. Many special features are also added to these tractors to make them safe for the drivers and passengers, *Highway Transportation Technical analysis Report* (Crowder et al, 1993). The safe-secure trailers are accompanied by armed couriers in escort vehicles equipped with communications and electronics systems, radiological monitoring equipment, and other equipment to enhance safety and security.

The DOE operates the Transportation Safeguards System under full compliance with DOT requirements, except for regulations that would tend to conflict with security imperatives, the DOE complies with, and often exceeds, the requirements of the DOT regulations during over-the-road operations, even though the DOE is exempted from compliance with *U.S. Government Material* (49 CFR Part 173.7[b]).

Since its establishment in 1975, the Transportation Safeguards Division has accumulated more than 120 million km (75 million mi) of over-the-road experience in transporting DOE Defense Program-owned cargo without any accidents that resulted in a release of radioactive material.

B.3 References

REGULATION, ORDER, LAW

49 CFR 171-397 — U.S. Department of Transportation, "Transportation," *Code of Federal Regulations,* Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1994.

GENERAL

Crowder et al., 1993 — Crowder, G.W., B.D. Boughten, J.K. Deuel, and L.J. Branstetter, *Highway Transportation Technical Analysis Report (CHITTAR)*, Draft SAND93-2501, Secret National Security Information, Sandia National Laboratories, Albuquerque, NM, 1993.

DOE, 1992 — U.S. Department of Energy (DOE), Nevada Operations Office, *Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements*, NV-325, Rev. 1, Las Vegas, NV, 1992.

DOE/NV, 1994 — DOE, *Hazardous Material Onsite Transportation Safety Manual, Nevada Test Site*, DOE/NV 356, Rev. 3, 1994.

This Page Intentionally Left Blank

Attachment C to Appendix I

PUBLIC PARTICIPATION IN THE TRANSPORTATION STUDY

This Page Intentionally Left Blank

Attachment C. Public Participation in the Transportation Study

C.1 Summary of Public Involvement

The Transportation Study is one of the technical reports being prepared in support of the Nevada Test Site (NTS) Environmental Impact Statement (EIS). It identifies and addresses the potential environmental impacts related to the transportation of hazardous materials to and from the NTS under the alternatives being considered in the NTS EIS. The following discussion generally describes the public participation in the Transportation Study.

Following the formal NTS EIS scoping period, a general transportation meeting was held in Las Vegas on November 15, 1994. Those in attendance included representatives of surrounding counties and cities near the NTS. Presentations by the U.S. Department of Energy, Nevada Operations Office (DOE/NV) representatives included a description of existing transportation conditions, DOE procedures, emergency response capabilities, and the proposed draft outline of the Transportation Study. Comments, issues, and questions regarding transportation were raised by those in attendance (Section C.2). In addition, one-on-one meetings between the DOE/NV transportation group and county and city officials were requested. These one-on-one meetings, which were held at each requested location (e.g., cities of North Las Vegas and Henderson), were conducted to offer an opportunity for governmental and American Indian representatives to voice their concerns. Additionally, the DOE/NV transportation group was able to present and respond to requests for additional information on a timely basis. Two committees, the Protocol Working Group and Risk Assessment Working Group, were also established during the one-on-one meetings.

The Protocol and Risk Assessment Working Groups were formed to provide forums for communication on specific transportation concerns. The Protocol Working Group was established to discuss the protocol for handling routing decisions that may have the potential to affect local communities. The Risk Assessment Working Group was established to provide local data and ad hoc studies to help ensure that the most current information available is used in the Transportation Study.

A second meeting with representatives of various surrounding counties, cities, and other interested organizations was held on April 20, 1995. During this meeting, preliminary results were issued through the Draft Preliminary Transportation Study. Information on concerns and issues raised during the first meeting, during the one-on-ones, through the mail, and by telephone calls was provided at this meeting. In addition, comments on the preliminary results of the transportation impacts were discussed.

The meetings of the Protocol and Risk Assessment Working Groups will continue on an as-needed basis. One-on-one meetings with the representatives from American Indian tribes and organizations will continue. A list of the scoping meetings, as of the fall of 1995 is shown in Table C-1.

C.2 General Responses to the April 20, 1995, Transportation Meeting Comments

These responses were prepared following the April 20, 1995, transportation meeting and sent to everyone on the "Big Group" mailing list. Subsequent to this mailing, additional discussions were held internally that altered the response to comment number 2. A short discussion follows the original response that provides DOE/NV's most current thinking.

General Response

The comments provided during the transportation closed session meeting on April 20, 1995, are valued for several reasons. The public comments demonstrate sincere interest in the study, provide indicate recognition that the DOE is taking the public's concerns seriously.

Table C-1. EIS Meetings as of October 13, 1995 (Page 1 of 2)

Location	Date
Scoping Meetings	
State of Nevada	August 20, 1994
Fallon, Nevada	September 7, 1994
Carson City, Nevada	September 8, 1994
St. George, Utah	September 13, 1994
Tonopah, Nevada	September 15, 1995
Las Vegas (Cashman Field), Nevada	September 20, 1994
Pahrump, Nevada	September 21, 1994
Caliente, Nevada	September 22, 1994
Henderson, Nevada	October 4, 1994
State of Nevada Clearinghouse (Carson City), Nevada	August 30, 1994
EM Community Advisory Board, Nevada	October 5, 1994
Affected Units of Governments (White Pine County, state, tribal, local governments)	October 21, 1994
South-Central Nevada Federal Complex Advisory Board	October 28, 1994
Transportation Study Meetings	
Local/County Governments (Las Vegas, Nevada)	August 22,1994
Local/County Governments (Harry Reid Center, Las Vegas, Nevada)	November 15, 1994
Local/County Governments (Harry Reid Center, Las Vegas, Nevada)	April 20, 1995
Transportation Study One-on-One Meetings	
Clark County, Las Vegas, Nevada	December 6, 1994
City of Henderson, Nevada	December 7, 1994
City of Las Vegas, Nevada	December 12, 1994
City of North Las Vegas, Nevada	December 13, 1994
Boulder City, Nevada	January 5, 1995
Lincoln County, Nevada	January 18, 1995
Nye County, Nevada	January 16, 1995
Goldfield, Nevada	March 13, 1995
Laughlin, Nevada	March 14, 1995

Table C-1. EIS Meetings as of October 13, 1995 (Page 2 of 2)

American Indian	March 22, 1995
Ely, Nevada	February 10, 1995
EM Community Advisory Board	March 1, 1995
Implementation Plan Meetings	
EM Community Advisory Board	February 1, 1995
Las Vegas, Nevada	February 7, 1995
Reno, Nevada	February 9, 1995
Las Vegas, Nevada	March 7, 1995
Reno, Nevada	March 9, 1995
Other Meetings	
Air & Waste Management	December 14, 1994
State, Tribal, Local Government Coordinating in Tonopah	February 14, 1995
Southern Nevada Federal Facilities Community Advisory Board	February 28, 1995
American Indian Consultation	March 17-19, 1995
State Clearinghouse Meeting - Carson City, Nevada	April 19, 1995
Paiute Tribe of Southern Utah	September 9, 1995
Moapa Band of Paiutes	September 14, 1995
Las Vegas Paiute Tribe, Nevada	September 19, 1995

Before providing item-by-item responses to comments, we note that the comments were provided in response to ongoing dialogue, as well as in the April 10, 1995, Preliminary Draft Transportation Study. This draft was not complete, it was a work-in-progress document.

Item by Item Response to Comments

1. No analysis of data, generators, commodities, and radiation waste type.

Response: The analysis was not included in the April 10, 1995, Preliminary Draft Transportation Study because the model had not yet been run. This information will be included in the next draft.

2. Not integrated yet with Yucca Mountain.

Response: Although the DOE has stated that only the Yucca Mountain site characterization activities will be included in the NTS EIS, the DOE/NV staff is currently working with their Yucca Mountain counterparts to determine an approach to effect integration of transportation issues. This will be possible because Yucca Mountain is beginning preparation of their own EIS. The planned EIS for a potential repository at Yucca Mountain will evaluate the environmental impacts of construction, operation, and closure of a repository at Yucca Mountain. The Yucca Mountain EIS will consider the cumulative impact of transporting nuclear waste with the radioactive materials/waste shipments expected by the NTS.

Following the preparation of this response, a meeting was held with representatives of Yucca Mountain Site Characterization Projects Office and a decision was made not to commit Yucca Mountain to consider cumulative impacts associated with NTS waste shipments. The DOE will consider cumulative impacts; however, Yucca Mountain may not be the organization that does this work.

3. Heavy haul route refers to Craig Road and the "Spaghetti Bowl," contrary to previous agreements.

Response: As agreed in a meeting with North Las Vegas officials in July 1994, the DOE/NV is committed to not using Craig Road for shipments of low-level waste. We are currently telling the carriers they are not to use the Craig Road route. To the best of our knowledge, no agreement has been reached regarding the "Spaghetti Bowl"; however, we are committed to exploring all options for avoiding this interchange.

As responsible decision makers, we want to make sure we have the data required to support our decisions. Therefore, both Craig Road and the "Spaghetti Bowl" will be included in the study. Inclusion of a route in the study does not imply that route will be used.

4. Inadequate risk assessment factors.

Response: Risk assessment factors were not identified in the Preliminary Draft Transportation Study, but will be part of the final document. In addition, a risk working group has been formed to address this issue in detail.

5. Page 1.3 (Preliminary Draft Transportation Study): Today's meeting is already written.

Response: A place was set aside in the study for "today's meeting." Since the meeting was set, we felt it appropriate to include an up-to-date summary of public involvement activities. The outcome of the April 20, 1995, meeting was not included, only its date and purpose.

6. Mistake on 1.2.2 (Preliminary Transportation Study): Conflict with National Environmental Policy Act *Code of Federal Regulations*, Cost/Benefit Analysis 40 CFR 1502.23.

Response: It is our understanding that this comment refers to the fact that the National Environmental Policy Act 40 CFR 1502.23 states that alternatives cannot be eliminated based solely on cost. We recognize this constraint and are now including a description of both the northern and southern rail routes for comparison to highway routes. Please see Item 19 for further discussion of how rail routes will be addressed in the completed Transportation Study.

7. Sources of information are weak, inaccurate, and untimely.

Response: We are making every effort to ensure accurate and timely information is used in the study. One step toward this is our request to local, state, and tribal governments to provide their most current demographic and traffic data for incorporating into the risk models. We will be working with the Risk Assessment Working Group to obtain the most current official data.

8. Unfair in training, rural versus urban.

Response: First responder training is available to all jurisdictions within the state of Nevada, and has been given in several Nevada counties.

First-On-Scene Training has been made available by the DOE to fire, law enforcement, and emergency medical responders throughout Nevada since 1983 (at no cost other than travel to the presentation site). Because of the nature of this training, the basic courses have been presented at specialized training facilities at the NTS. Refresher training sessions have been presented for many people at locations in both southern (Las Vegas and Henderson) and northern (Reno-Sparks and Elko) Nevada. The Emergency Medical Personnel Radiological Seminar will be presented this August in both Tonopah and Ely. Understanding that the volunteer nature of the rural response force may make it difficult for them to attend, the DOE will work with them to schedule training.

9. Future and current choke points are ignored "Spaghetti Bowl".

Response: Analysis of choke points, such as Hoover Dam and the "Spaghetti Bowl," will be provided in the final study. This issue will also be addressed by the Transportation Protocol Working Group. In addition, the "Spaghetti Bowl" is scheduled for reconstruction over the next few years to alleviate congestion problems.

10. Guiding assumptions for risk analyses were not presented.

Response: The assumptions had not yet been incorporated into the study. They will be provided in the next version of the Transportation Study. These will also be discussed by the Risk Assessment Working Group. In addition, the technical appendices addressing the risk analyses will be available to interested parties in early June, prior to release of the next version of the study.

11. Rail spur implications for waste volume are not addressed.

Response: Over the next several weeks, the DOE/NV must decide on what assumptions to make regarding the volume of low-level radioactive waste to be transported to the NTS. Once these assumptions are made, the DOE/NV can complete its evaluations and draft report.

The scope of the rail evaluations includes a cost and risk comparison of moving the same volume of materials by both truck and rail. The potential competitive advantages to the NTS of having rail access, to support the development of new missions, could lead to the movement of additional materials not considered in this evaluation. For the development of major new facilities, a separate impact assessment could be required.

12. No impact analysis.

Response: The April 10, 1995, version of the Preliminary Draft Transportation Study does not include impact analyses, because the model for the risk assessment had not yet been completed.

13. Section 2.5.1 (Preliminary Draft Transportation Study): has no provision for funding personnel training in rural counties.

Response: First responder training is free to the counties. As stated in Item 8, the DOE will work with the counties and the Transportation Protocol Working Group to identify needs and develop a strategy to meet those needs.

14. What about compensation for rural (county training) volunteers, i.e., lost wages, vacation (time), and equipment?

Response: Please see Items 8 and 13.

15. Section 1.4 (Preliminary Draft Transportation Study): Please include your definition of high-activity low-level waste.

Response: The next version of the Transportation Study will include a definition of high-activity low-level waste, as well as other waste types. It is important to remember that the definitions of high-level and low-level waste are rooted in the way the waste was generated, rather than the level of radioactivity in the waste. Keeping that in mind, the following definitions are presented:

High-level waste: Radioactive material which results from chemical reprocessing of spent fuel, contains fission products, traces of uranium and plutonium, and other transuranic elements.

Low-level waste: Radioactive waste not classified as high-level waste, transuranic waste, spent fuel, or by-product material. In genera,l most low-level waste has low specific activity. However, low-level waste can have high specific activity and still be considered low-level waste because it is not high-level waste, transuranic waste, or spent nuclear fuel.

Transuranic waste: Waste material contaminated with U-233 (and its daughter products), certain isotopes of plutonium, and nuclides with atomic numbers greater than 92 (uranium). It is produced primarily from reprocessing spent fuel and from the use of plutonium in the fabrication of nuclear weapons.

16. Tribes should not have to go to the DOE; DOE should go to the tribes.

Response: For many years, the DOE has transported radioactive and non-radioactive materials and waste on state and federal highways across American Indian lands. Although the DOE has complied with all national and state transportation laws and regulations, we have not made a concentrated effort, to date, to coordinate our transportation needs with the various tribal governments. Now, recognizing and understanding our responsibility, we are working to establish relationships and coordinating our transportation needs with tribal governments prior to shipping materials and waste. A letter was sent to each Tribal Council Chair inviting him or her to meet with the DOE on a government-to-government basis to discuss the topic of transportation.

In addition, the DOE has had several meetings with American Indian representatives specifically to discuss the NTS EIS. To fully incorporate the comments from the American Indian tribes, the DOE has provided funding for a Resource Document to be prepared by a team of American Indian writers representing various local tribes. This Resource Document is expected to reflect a unified position and/or comments on the NTS EIS. This is an innovative outreach approach that is consistent with the DOE's resolve to incorporate and encourage the full participation of the American Indian People.

17. The document does not consider reality of local conditions, policy, or sentiment.

Response: The DOE has met one-on-one, and in larger groups, to gain a better understanding of local concerns. The study was modified to address and clarify questions raised about the regulatory arena the DOE operates in with regards to transportation, carrier selection, oversight of carriers, and emergency management and training. As the study is finalized, our goal is to reflect local conditions, policy, and sentiment in the draft study report as long as they do not conflict with U.S. Department of Transportation laws and regulations.

18. There is no discussion of liability (insurance).

Response: The information on liability had not been fully compiled; therefore, was not included in the April 10, 1995, version of the preliminary draft study. It will be provided in the completed draft version of the Transportation Study.

Liability is the responsibility of the commercial carrier. Most commercial carriers are insured by private insurance companies. Carriers are aware of liability and insurance requirements. The DOE traffic managers inform their traffic officer that copies of carrier insurance coverage must be available prior to using a carrier.

19. Figure 1.1 (Preliminary Draft Transportation Rail Study) needed work, particularly to clarify "main" versus "alternate."

Response: The April 10, 1995, preliminary study identified two rail routes; the Modified Valley route, and the Stateline route as feasible alternatives for rail access to the NTS. Since that time, in response to comments received, we have decided that the final study will include descriptions of the four routes as identified and recommended for detailed evaluation in the Yucca Mountain document, "Nevada Potential Repository Preliminary Transportation Strategy Study 1." These routes will be discussed for comparison purposes only (with highway routing). No rail decision will be made as a result of this study or the NTS EIS.

The only scenario where rail access to the NTS might be required, because of the large volumes of projected low-level waste, is where the NTS would be the sole low-level waste disposal site for the

DOE complex. This is one of the alternatives included in the Draft Waste Management Programmatic EIS and is included in Alternative 3 of the NTS EIS. Although the NTS EIS and this transportation study are addressing this option, the final decision will be made in association with the Draft Waste Management Programmatic EIS and its transportation study. Therefore, detailed risk analysis, as would be performed for decisional purposes, will not be done for the NTS EIS.

20. Page 1.2.1 (Preliminary Draft Transportation Rail Study): regarding the No-Build Alternative: trucks go through Las Vegas, contrary to promises made at one-on-one county meetings.

Response: Please see Item 3.

21. Clarify issues about responsibility, accountability, liability.

Response: The April 10, 1995, draft report did not offer a clear discussion of responsibilities, accountability, and liability. Our goal is to provide this discussion as it pertains to the DOE, carriers, and local jurisdictions in the completed draft study report.

22. Other routes are omitted, e.g., Tonopah Test Range, Tonopah Test Site, Nellis Air Force Base.

Response: The Transportation Study focuses on activities at the NTS and Tonopah Test Range, as well as off-site locations within Nevada. While there are no waste disposal areas within the other DOE Nevada-operated sites, Environmental Restoration Program Projects are expected at these sites under Alternatives 1, 3, and 4 of the NTS EIS. Transportation of materials associated with these activities will be along the same Nevada public highways as identified in the existing and or potential highway routes. This point will be clarified in the Transportation Study.

23. Previous statements and agreements are missing, time and time again.

Response: The final Transportation Study will summarize comments and concerns raised by the local jurisdictions. However, although all input will be considered, it is possible that not all will be adapted or used. In addition, many of the suggestions received during the one-on-one meetings have been formulated into issues that will be further addressed by the Transportation Protocol Working Group. (Also, see response to Item 17).

24. Environmental risk is not considered under scenarios.

Response: The Transportation Study will include possible human impacts associated with various scenarios corresponding to the four alternatives identified in the NTS EIS. As stated, the Preliminary Draft Transportation Study was not completed and subsequently, the risk information was not included in the April 10, 1995, version.

25. No new alignment for heavy haul.

Response: Please see Item 3.

26. Heavy haul analysis and discussion is not realistic.

Response: Please see Item 3.

27. Legislation is in process to create a rail spur - fait accompli - not a recommendation.

Response: Our goal is to include a short summary of the events associated with the legislation in the completed draft study report. However, this legislation affects Yucca Mountain, and not the NTS EIS. Proposed language, as introduced, would require a separate National Environmental Policy Act process to evaluate the impacts of using this route for the movement of spent nuclear fuel and high-level waste. The Modified Valley Route, as well as other potential rail corridors, will be evaluated in the planned EIS for a Potential Repository at Yucca Mountain. Movement of these materials is not part of the scope of the transportation study, or a mission under consideration in the four EIS alternatives.

28. Page 1.2.2 (Preliminary Draft Transportation Study): No presentation of northern routes and no reason.

Response: Please see Item 19.

29. Page 2.1.1 (Preliminary Transportation Rail Study): The authority to designate routes, truck (economy) company, DOE, Nevada Department of Transportation.

Response: Low-level and mixed waste are not considered highway route controlled quantities; however, the following discussion is provided should there by some materials of this nature sent to the NTS.

Movement of highway route controlled quantities takes place on preferred highway routes identified by individual states with the intent to minimize time in transit. Interstate highway routes and alternatives designated by a state routing agency are preferred routes. Because Nevada has no designated routes, the preferred routes to the NTS presently include Interstate 15 and U.S. Highway 95. Nevada is considering the designation of alternative preferred routes. The DOE would be obliged to use these routes for highway route controlled quantities shipments. However, few projected shipments in this study would contain highway route controlled quantities of radioactive material. The Transportation Study, when completed, will provide the Nevada Department of Transportation information relating to all possible state-designated shipping routes.

Subsection 2.2.3 presently provides information on state routing agencies having the authority to designate routes for highway route controlled quantities shipments. Carriers planning highway route controlled quantity shipments are responsible for obtaining information about existing state-designated routes. States report these routes to the DOE, as required. The Department of Transportation maintains this information in a database for carriers to access and use.

30. Trucks' minimum requirements not stated.

Response: Please see Item 3.

31. No relationship between this study and the other 26 DOE EISs, especially the study of transportation issues.

Response: Consistent with Alternative 3 of the NTS EIS, the Transportation Study will address all materials that are identified in the other DOE EISs for possible shipment to the NTS. However, our study is focused primarily on intra-Nevada issues, and therefore, is relying on the EISs to provide the National Environmental Policy Act coverage for the activities they address.

In addition, while the Preliminary Transportation Study does not address this issue explicitly, the NTS EIS will contain a section entitled "Cumulative Effects." The Council on Environmental Quality (CEQ) defines *Protection of Environment: Cumulative Impact* 40 CFR Part 1508.7 cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." Subsequently, the NTS EIS is the appropriate report to identify and analyze impacts of other EISs regarding cumulative impacts.

32. It is not apparent that a review has been made of comprehensive laws and regulations (local, state, tribal, special districts, etc.).

Response: It is our goal to provide available information on various laws and regulations in the completed draft Transportation Study.

33. Rail options don't consider inter-modal transfer.

Response: Please see Item 3. Intermodal transfers will be included in the completed draft Transportation Study.

34. The DOE is abdicating routing authority to carriers.

Response: The DOE does not have routing authority for any shipments. It strictly adheres to Department of Transportation regulations for all hazardous materials (both radioactive and non-radioactive) shipments. However, the DOE will explore all avenues to ensure selected carriers of hazardous materials adhere to all transportation direction. These avenues include alternate contracting mechanisms, which would provide the DOE with some control over route selection.

35. Take each issue presented here and give written comment and response to concerns and rationale.

Response: The DOE/NV will adopt this practice for the remainder of the Transportation Study.

36. Be more clear of ongoing process and how we will be meaningfully involved in it.

Response: Since the summer of 1994, the DOE/NV has been involved in an ongoing dialogue with state, tribal, and local governments in an effort to understand our stakeholders concerns and response to these concerns. We are using a multi-tiered approach that offers several methods for participation in the Transportation Study:

(a) Traditional public participation associated with development and finalization of an EIS

(b) Periodic "Big Group" meetings with state, county, city, and tribal leaders, as well as interested members of the public

(c) One-on-one meetings with interested communities

(d) Transportation Protocol Working Group

(e) Transportation Risk Assessment Working Group.

Comments and suggestions received during any of these activities will be considered and incorporated into the Transportation Study, as appropriate. In all cases, the DOE/NV will respond to the comments explaining how they were incorporated, or why they were not incorporated.

The Transportation Protocol Working Group, composed of representatives from city, county, tribal, state and federal governments, as well as from the NTS Community Advisory Board, will develop recommendations on transportation issues, which it will present to the "Big Group." The goal is for participants in the "Big Group" to take these recommendations back to their respective organizations for review, and provide individual official comments and recommendations to the DOE/NV.

To maintain the dialogue established through these various venues, the Transportation Protocol Working Group will continue to meet after completion of the Transportation Study. It is anticipated that the Transportation Risk Assessment Working Group will disband upon completion of the Transportation Study, since their work will be completed.

In addition, the DOE/NV is committed to establishing a working relationship with American Indian councils to identify if and how the American Indians want to participate in this process.

Furthermore, in those areas directly related to local concerns, we invite state, local, and tribal governments, to provide explicit wording for sections they are concerned about. This will assist us in reflecting local conditions, policies, and sentiments accurately.

37. Include a list or map that shows all generators.

Response: This information will be provided (as indicated above) in the completed Transportation Study.

38. Give all assumptions and data sources used for risk analysis.

Response: This information will be provided (as indicated above) in the completed Transportation Study.

39. Discuss rail transportation from any direction, not just Las Vegas and areas from the south.

Response: Please see Item 19.

40. Rail routes are not as available to generators as are road routes.

Response: Please see Item 19.

41. It is unclear how to incorporate comments that have been made before - no-show on nontribal participation.

Response: Please see Item 16.

42. Address alternate routes to Hoover Dam.

Response: The completed Transportation Study will include risk analyses for alternate routes to Hoover Dam.

43. Include a broad discussion of the U.S. Air Force Acts and DOE/U.S. Nuclear Regulatory Commission implementation.

Response: At this time, we do not believe that a discussion of U.S. Air Force Acts and DOE/U.S. Nuclear Regulatory Commission is relevant to the Transportation Study.

44. Clarify parameters on route selection.

Response: The principal objective of the Transportation Study is to determine the probable impacts of the NTS EIS proposed alternatives on the existing and potential highway routes, and consider a rail spur alternative as appropriate. The "Big Group" may, on considering the results of the probable impact analysis, decide to make recommendations for the DOE/NV to consider in the routes selected for transporting hazardous materials to the NTS EIS. Also, see Item 34.

C.3 References

REGULATION, ORDER, LAW

40 CFR 1502.23 — Environmental Protection Agency (EPA), *Code of Federal Regulations, Protection of Environment: Cost-Benefit Analysis*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.

40 CFR 1508.7 — EPA, *Code of Federal Regulations, Protection of Environment: Cumulative Impact*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.

This Page Intentionally Left Blank

Attachment D to Appendix I

EMERGENCY RESPONSE PROCEDURES AND TRAINING

This Page Intentionally Left Blank

Attachment D. Emergency Response Procedures and Training

Radioactive materials are among the many kinds of hazardous materials that emergency responders might have to deal with in a transportation accident. The more potentially harmful the levels of radioactive materials, the stricter the packaging, safeguards, and other requirements designed to prevent their release must be. Although rare, accidents involving radioactive materials do happen, and an emergency preparedness system is in place to respond.

Ultimately, state, tribal, and local government officials in the region where an accident occurs have the prime responsibility for initial emergency response to any accident, including those involving radioactive materials. A highway patrol officer, or fireman, is usually the first person on the scene. The first responder will typically relay the information about the accident to a State Command Center that will contact the hazardous materials response team, the carrier, and the U.S. Department of Energy (DOE). These first responders also typically administer first aid, isolate the area, extinguish fires, and identify the hazard by the vehicle placards and shipping papers. They may also contact CHEMTREC, a company that provides help on how to respond to hazardous material emergencies, if hazardous materials or mixed waste are involved. The first responder can refer to the U.S. Department of Energy (DOT) Emergency Response Guidebook to determine immediate steps to be taken. Upon request, state and federal agencies will supply trained personnel to conduct radiological tests at the site to determine whether any radioactive material releases have occurred. Most local and state governments have emergency response plans and training programs in place to prepare first responders for transportation accidents involving radioactive materials. States also conduct radiological response training on behalf of the Federal Emergency Management Agency, which also supplies radiological monitoring instruments to the states. The Federal Emergency Management Agency also provides the Radiological Emergency Response Training for the state, tribal, and non-DOE response team members.

D.1 Federal Response

Federal agencies do not become involved in responding to an emergency unless specifically requested to do so by state, tribal, or local government officials (Figure D-1). However, if a federal agency's support is needed, it is available as described in the Federal Radiological Emergency Response Plan, which outlines each agency's responsibility. The DOE will provide support in accordance with the Atomic Energy Act of 1954 and DOE Order 5530.3, *Radiological Assistance Program*. The DOE is the primary agency for providing radiological monitoring and assessment assistance. The Nuclear Regulatory Commission, The Environmental Protection Agency, the Federal Emergency Management Agency, and other agencies also provide assistance as part of this plan. The DOE's support ranges from giving technical advice over the telephone, to sending highly trained personnel and state-of-the-art equipment to the accident site (on request by authorized state officials) to help identify and minimize any radiological hazards, and perform radiological monitoring.

Any state, tribal, local, or private sector organization needing radiological assistance can call the nearest DOE Regional Coordinating Offices to obtain information, advice, or assistance through the Federal Radiological Monitoring and Assessment Plan (Figure D-2). The DOE maintains Regional Coordinating Offices in eight regions across the country. The Regional Coordinating Offices receive calls for assistance 24-hours a day, and are prepared to send trained personnel and equipment to an accident site. The DOE Regional Coordinator decides what action is needed based on the request. The DOE Regional Coordinating Office also ensures that appropriate state or tribal personnel are contacted in order to ensure appropriate involvement of them and their resources. If necessary, the coordinator sends a

Figure D-1. Typical notifications made following a radiological transportation emergency

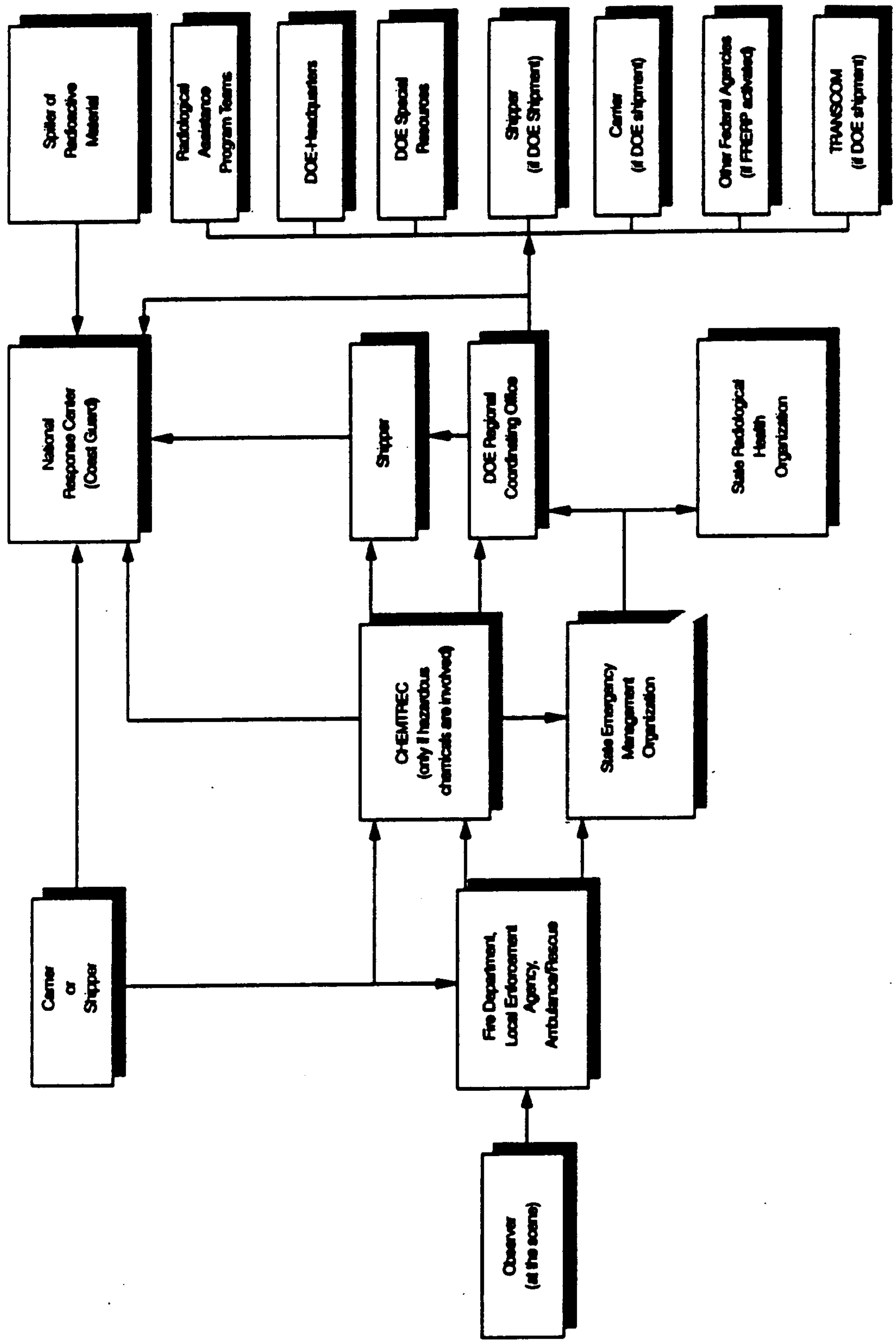
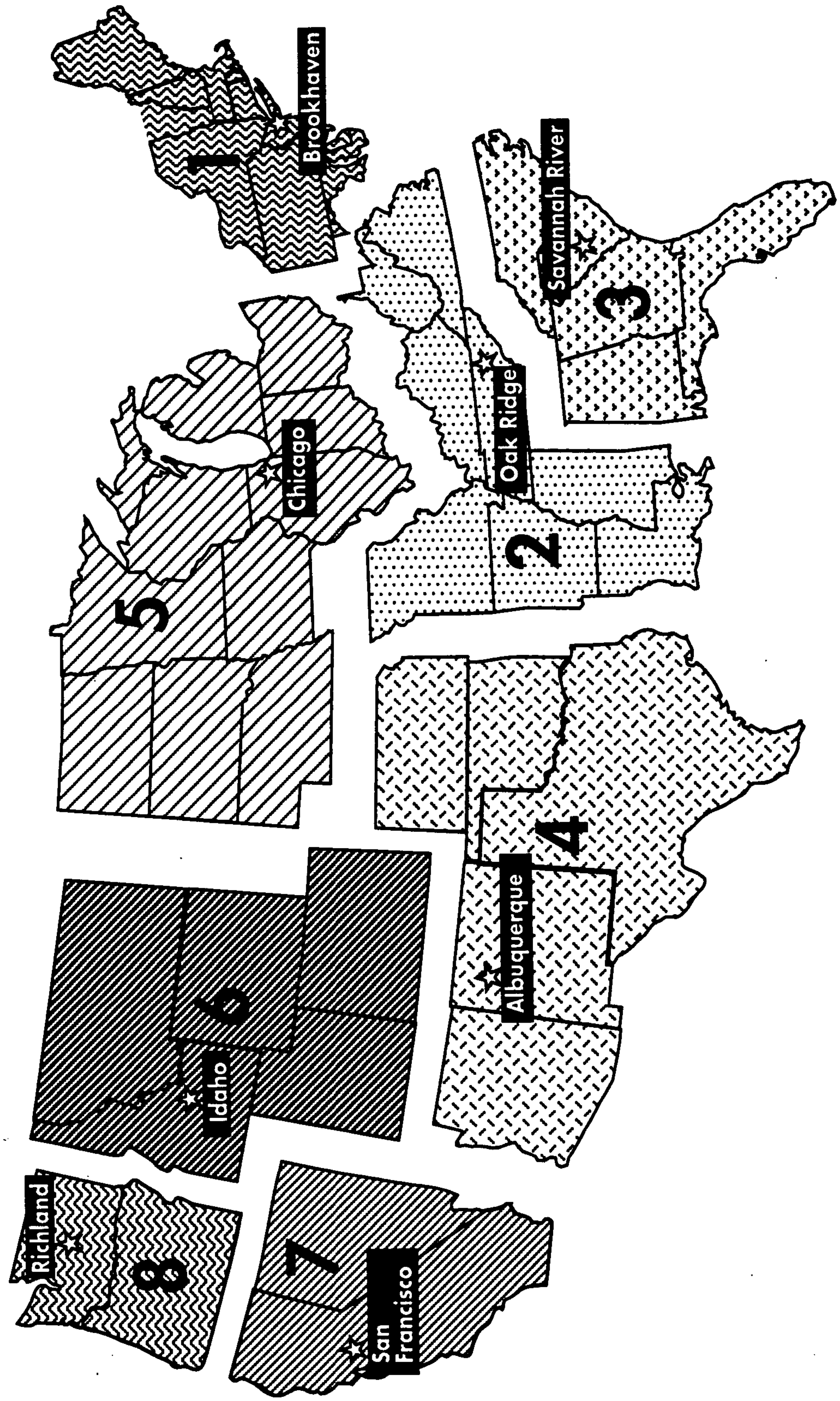


Figure D-2. U.S. Department of Energy regional coordinating offices



federal team to the accident site to assist the authorities in charge. If personnel, equipment, or both are needed at the accident scene, the Regional Coordinating Office coordinates the activation of a DOE Radiological Assistance Program Team. The Radiological Assistance Program team's capabilities include field monitoring, spectrometry, sampling, decontamination, dedicated response vehicles, mobile laboratories, generators, communications equipment, and aerial surveys. Personnel include health physicists, industrial hygienists, and public information staff. Should the emergency require monitoring and assessment resources exceeding those of the Radiological Assistance Program team, a federal monitoring and assessment center will be established, where all federal agencies provide support.

After the immediate threat from the accident has passed, the lead federal radiological monitoring and assessment role is transferred from the DOE to the Environmental Protection Agency. It is the responsibility of the carrier to repackage and dispose of any primary radioactive material spilled, plus any contaminated material.

Although the DOE only ships about 11,000 radioactive material shipments per year (compared to a national total of 2 million such shipments), the DOE actively ensures the safety of its shipments, including assisting state and local emergency responders, as requested, should an accident occur.

The DOE follows all DOT (49 CFR 170-178, 383, 387, and 390 through 399), Nuclear Regulatory Commission; *Energy: Packaging and Transportation of Radioactive Material* (10 CFR 71), and other regulations and operating procedures to help ensure safe transport, and to assist emergency response personnel. This compliance includes proper packaging, marking and labeling the packages, providing the correct emergency response information on shipping papers, placarding the vehicle, stowing and securing the packages, complying with driver training and routing requirements, and following vehicle safety requirements. Local, state, tribal, and federal emergency response systems are in place to respond in the event of a transportation accident. This response network, along with other preventive safety measures, such as package design and testing, and adherence to stringent regulations, support the continued safe shipping of DOE-owned radioactive materials.

D.2 Training Programs

The DOE, other government agencies, and private industry all offer emergency response training for personnel responding to accidents involving hazardous and radioactive materials. The DOE also provides training to state and local emergency personnel that covers basic procedures for dealing with transportation accidents. The first-on-scene training program has been made available by the DOE, to fire, law enforcement, and emergency medical responders in Nevada since 1983 (at no cost other than travel expenses to the presentation site). These courses are available to all jurisdictions within the State of Nevada and have been given in several Nevada counties. Emergency Medical Personnel Radiological seminars will be presented in the near future in Tonopah and Ely, Nevada. The DOE is committed to working with rural emergency and volunteer response forces to make it easier to attend training by arranging training schedules and locations that are easily accessible.

The Transportation Emergency Preparedness Program establishes consistent response policies and procedures among the DOE's various programs. A controlled, coordinated emergency preparedness program ensures a constant capability to respond to accidents involving radioactive materials. The Transportation Emergency Preparedness Program also supports the Transportation Emergency Training for Response Assistance Program, which provides radiological response training for both DOE and civil responders. Civil-oriented Transportation Emergency Training for Response Assistance Program training sessions include the Radiological Emergency Training for Local Responders course, intended primarily for local emergency personnel; and Radiological Emergency Operations, for state, tribal, and regional radiological response team members. Radiological Emergency Operations is a revision of the Radiological Emergency Response Operations course formerly taught by the DOE. It is now more oriented toward response to transportation incidents involving radiological materials. Civil personnel, in limited numbers, have also attended the Rail Radiological Response and Transportation Public Information courses, which are part of the Transportation Emergency Training for the Response Assistance program.

The Transportation Emergency Training for Response Assistance Program is managed by DOE/NV for the DOE Headquarters Offices of Environmental Management, Nonproliferation, and National Security.

The Transportation Emergency Preparedness Program initiatives focus on planning and training, exercises, and technical assistance to DOE elements, as well as state, tribal, and local governments. An important Transportation Emergency Preparedness Program initiative is a series of training exercises known as TRANSAX which is emergency preparedness simulation. The DOE, in conjunction with states and tribes, conducts these training exercises to evaluate response systems and support services.

TRANSAX '90, the first such exercise, was a joint effort between the DOE, state, and local agencies in Colorado.

TRANSAX '92, involved agencies of the state of Idaho, Shoshone-Bannock Tribes, and local organizations for response and accident command.

TRANSAX '94, involved agencies of the states of Idaho and Oregon, local governments, and the Umatilla Tribe.

The TRANSAX exercises helped participants improve their emergency response planning and procedures. The series is ongoing and will involve other states, tribes, and local organizations in the future.

The DOE-sponsored training programs are available to all local and state agencies that may have the need to respond to emergency situations involving transportation of radioactive materials.

D.3 References

REGULATION, ORDER, LAW

10 CFR 71	U.S. Nuclear Regulatory Commission (NRC), *Energy: Packaging and Transportation of Radioactive Material, Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1988.
49 CFR 171-399	U.S. Department of Transportation (DOT), *"Transportation," Office of the Federal Register,* Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC.
DOE Order 5530.3	Department of Energy (DOE), *Radiological Assistance Program*, Washington, DC, 1992.

Attachment E to Appendix I

NTS RAIL ACCESS STUDY

This Page Intentionally Left Blank

Attachment E. Nevada Test Site Rail Access Study

Transportation of low-level waste to the Nevada Test Site NTS by truck could also be accomplished by developing rail access from one of the existing mainline railroads or by intermodal transfer to a legal weight truck. This section provides a summary of considerations related to rail spur development, use of truck/rail intermodal systems, and comparisons to the continued use of truck transportation systems.

This discussion serves as an introduction to alternative radioactive material transportation opportunities that could benefit both the community and the federal government. This section does not support any specific decision in this Environmental Impact Statement (EIS), since rail transportation is not part of any specified operating alternative. Rather, this section is a basis for starting a future discussion of this issue.

The primary outcome of developing the capability of transporting low level waste to the NTS by rail or by using truck/rail intermodal systems, would be the reduction of the number of legal-weight truck shipments of material in particular, radioactive material. The radiological and nonradiological risk to the public and the environment during transport of these materials by truck is roughly proportional to the number of shipments. According to the Association of American Railroads, *Competitive Policy Reporter* (AAR, 1993), rail transport is five times safer than truck transport in terms of accidents per ton-mi when carrying hazardous materials. Railroads also ensure that shipments are better separated from other traffic and the public.

E.1 Railroad Access

Three major railroad lines pass through Nevada, which could be used as a starting point in developing a rail spur to the NTS. One of these routes is the Union Pacific line that runs from Salt Lake City, Utah south into Nevada at Caliente, then south through Las Vegas and into California near Stateline, Nevada. The second carrier is the Southern Pacific Railroad that operates a route from Ogden, Utah, to Reno, Nevada. This line has two branch lines, one running south from the vicinity of Cobre, Nevada, to Ely, Nevada, and the other running south from the vicinity of Hazen, Nevada, to Thorne, Nevada. The Union Pacific operates a second northern route that runs from Salt Lake City, Utah, to Winnemucca, Nevada, and then west into California. The Southern Pacific line and the Union Pacific line run parallel between Wells and Winnemucca, Nevada. All rail shipments going west use the Southern Pacific line, and those going east use the Union Pacific line between those two points.

E.1.1 Site Rail Access History

Several studies have been done over the last several years to evaluate rail access options from an existing mainline railroad to the NTS. The following sections present a general description of these studies.

E.1.1.1 Feasibility Study for Transportation Facilities to NTS. In March 1962, Holmes & Narver prepared a report for the Atomic Energy Commission entitled *"Feasibility Study for Transportation Facilities to the Nevada Test Site,"* (AEC, 1962). The study was a preliminary determination of the technical and economic feasibility of constructing and operating a railroad short-line from the vicinity of Las Vegas (Wann) to Mercury and then on to Jackass Flats in Area 25. The result of that study indicated that the short-line railroad concept was technically and economically feasible. The cost of the rail line was estimated to be $12,323,000, and could be amortized in about 6⅓ years. The end result of this activity was that the U. S. Department of Energy (DOE) supported Clark County in upgrading U.S. Highway 95 into a four-lane highway from Las Vegas to the entrance to Mercury to provide a safer highway for the NTS workers.

E.1.1.2 Lincoln County Study. In 1989, ETS Pacific prepared a report for the City of Caliente evaluating three alternative rail corridor routes through Lincoln County, Nevada to Yucca Mountain, Nevada. These routes could also service the NTS.

The first route started in Caliente and then went north to Pioche on the abandoned Union Pacific railroad right-of-way. The alignment continued up Lake Valley to Bristol Wells and then westerly down through Dry Lake Valley, south of Burnt Peak, to cross State Route 318. The line continued to Timber Gap, into Garden Valley, and then into Sand Spring Valley. The line then ran southwest to Chalk Mountain, crossing State Route 375, and then into the Nellis Air Force Range Complex (NAFR). The line continued down Emigrant Valley around Rhyolite Hills to Groom Pass. From Groom Pass, the line descended to Yucca Flat onto the NTS and then to Yucca Mountain. As reported in the study; *Evaluate Alternative Rail Corridor Routes through Lincoln County* (ETS Pacific, 1989a), This alignment was 331 km (206 mi) long, and was estimated to cost $215 million to construct.

The second route was essentially the same, except that it started at Crestline (about 32 km [20 mi] northeast of Caliente on the Union Pacific mainline), went to Sheep Springs Draw, then descended just east of Panaca Hills, and connected to the first route just north of Condor Canyon. As reported in the study, this alignment was 327 km (203 mi) long, and in 1988 ETS Pacific estimated its cost would have been about $210 million.

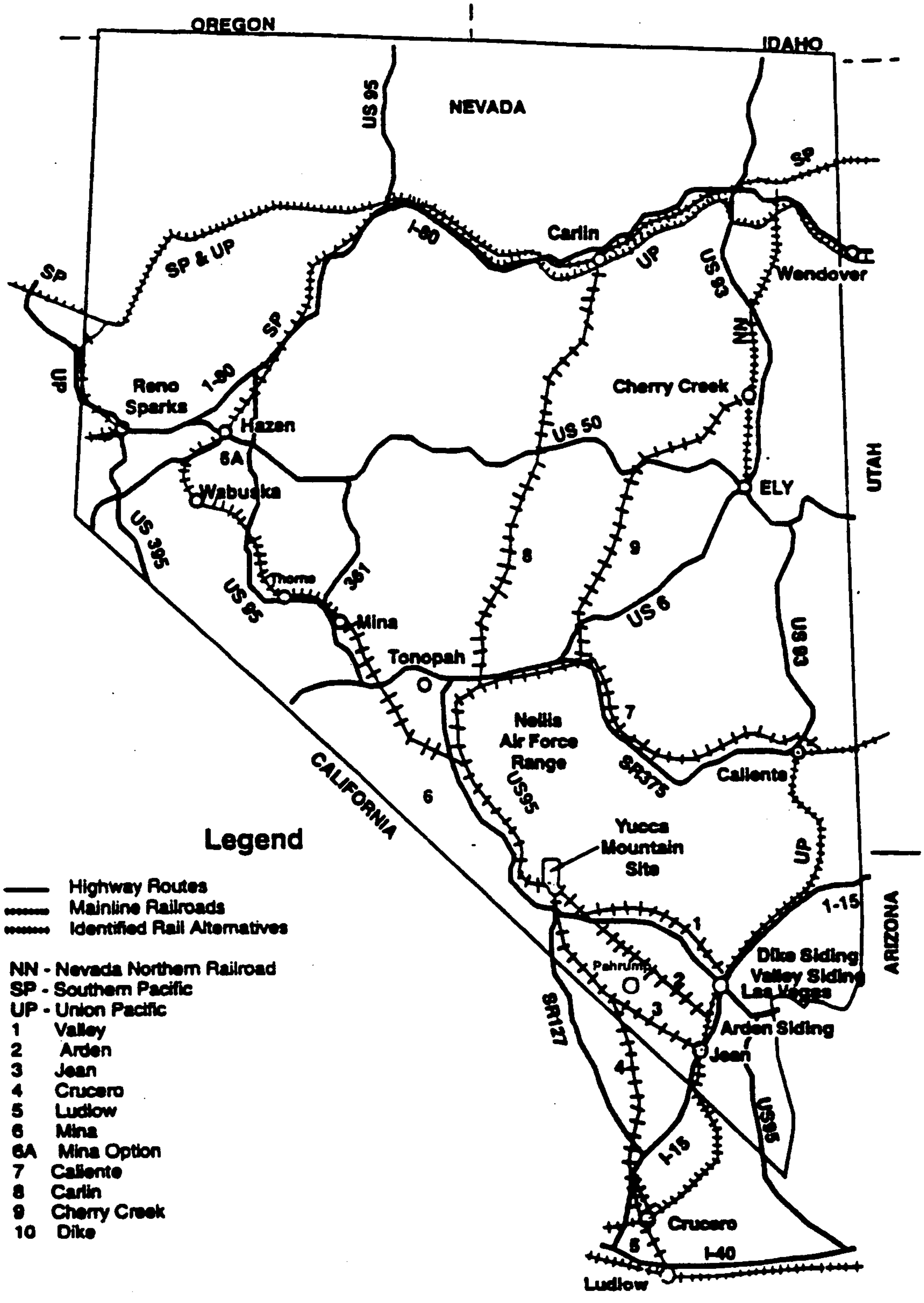
The third route started south of Caliente in Elgin, Nevada, followed Kane Springs Valley to U.S. Highway 93, then went parallel to U.S. Highway 93 north to Lower Pahranagat Lake. The line then went southwest into the Desert National Wildlife Range passing Desert Lake, into Clark County, and ended near U.S. Highway 95. This route would require an intermodal transfer station along U.S. Highway 95 to transfer the waste from railcar to truck for the remaining 161 km (100 mi) of the route. As reported in the study, this alignment was 187 km (116 mi) long, and 1988 cost estimates were about $171 million. Subsequent to the study that developed the route from Elgin to U.S. Highway 95, ETS Pacific issued a study (ETS Pacific, 1989b) that added a rail alignment from the location at the end of the previous alignment at U.S. Highway 95 that went north along U.S. Highway 95 to the vicinity of Yucca Mountain. The additional rail alignment of 121 km (75 mi) in length would have added about $86 million to the total cost of building the rail line from Elgin to Yucca Mountain.

Based on the data developed in the study, ETS Pacific ranked the three routes from most desirable to least desirable in the order of the second route, the first route, and the third route. ETS Pacific determined the third route is the least desirable because it passes through the Desert National Wildlife Range and does not end up at Yucca Mountain. This report did not consider going through the NAFR Complex and the NTS in the area of the underground nuclear testing to be problematic.

E.1.1.3 Preliminary Rail Access Study. In 1990, the DOE issued a *Preliminary Rail Access Study* (DOE, 1990) that identified 10 rail options (Figure E-1) from the currently existing mainline railroads in Nevada to Yucca Mountain. Lincoln County and Caliente identified three additional alignments that were addressed in the study. Each of the options was reviewed to identify land-use compatibility issues. They were categorized as either having existing conflicts that are not likely to change prior to DOE needing access, potential conflicts, or no identified conflicts. Of the 13 alignments (including 3 from the Lincoln County study), the Caliente and Jean alignments were found to have no significant land-use conflicts, and the Carlin alignment was judged to have the least potential for serious conflicts of all the routes connecting to the Southern Pacific line, based on a detailed review of current ownership patterns and development criteria.

The three routes identified with the least land-use conflicts were recommended for further engineering evaluation with the objective of not excluding access to any of the three regional rail

Figure E-1 U.S. Department of Energy identified railroad options and Nevada state rail network, 1989



carriers. The remaining 10 alignments were recommended for continued monitoring, should any of the identified land access conflicts be removed. As identified in the rail access study, the final routes selected for consideration as potential rail access alignments to the Yucca Mountain site will be identified and discussed as part of the Yucca Mountain Project EIS scoping process.

A major result of this study is a table of the lengths of each alignment and the costs, both capital and operating, and maintenance costs. Line lengths and costs ranged from a low of 159 km (99 mi), \$142 million (1988 dollars) capital cost, and \$740,000 annual operations and maintenance costs for the Valley option; to a maximum of 721 km (448 mi), \$735 million capital cost, and \$3.3 million annual operations and maintenance costs for the longest of the Caliente alignments. The capital costs included the cost of \$500,000 per mile for track work, \$500,000 per mile for grading, fencing, and establishing right of way access. In mountainous terrain, an additional \$1 million to \$1.2 million per mile was allotted for increased grading and drainage. The operating cost calculations estimated a cost of \$16.70 per 1,000 gross ton miles. The maintenance costs were estimated to be from \$5,140 per track mile equivalent to an additional operating cost of \$50.15 per 1,000 gross ton miles. This estimate was based on a projected tonnage of 102,000 gross tons per year.

E.1.1.4 Caliente Route Conceptual Design. In June 1992, the final Caliente Route report was issued *Yucca Mountain Rail Access Study:* Caliente Route Design Report (DOE, 1992). That followed a year after the draft report was issued for external review in June 1991. The scope of the study was to develop the conceptual design, provide preliminary environmental analysis, and prepare a cost estimate for the Caliente alignment. This study included an environmental screening to aid in route establishment. The conceptual design also included the design of an access highway from U.S. Highway 95, in Amargosa Valley, to the potential site at Yucca Mountain, about 26 km (16 mi) away. Two possible routes from the vicinity of Caliente to the potential site at Yucca Mountain were developed, which constituted an envelope of possible routes between Caliente and Yucca Mountain. Approximately 11,675 km (7,256 mi) of rail alignment were included in the detail study.

Information was developed on engineering factors including distance, grade rise and fall, the amount of cut and fill required, curvature, drainage, and rail operations. Alignment maps on a horizontal scale of 2.54 cm equals 152 m (1 in equals 500 ft), and a vertical scale of 2.54 cm equals 15.2 m (1 in equals 50 ft), were developed for the alignment studied. A hydrology study was conducted to evaluate worst case runoff flows for a 100-year flood condition. Environmental constraints were evaluated to complement the engineering tradeoffs in route locations, to ensure that the base route and options did not traverse environmentally sensitive areas. In addition, archaeological studies were conducted to assure that the potential route and options did not traverse restricted, historical, archaeological, or cultural sites.

Five potential operational options were evaluated in this study. These included DOE owned, DOE operated; DOE owned, short line operated; DOE owned, contractor operated; DOE owned, Class I railroad operated; and privately owned, privately operated. Finally, engineering, construction, and operating costs were developed for each of the operational options.

The results of the rail study indicate there is a potential feasible rail route, with several options, from the existing Union Pacific railroad in the Caliente area to the potential repository site at Yucca Mountain. Conceptual plan and profile evaluations indicate that this route can be constructed within the limitations of present railroad engineering practices and normal operating standards. The base cost of doing the detail design and constructing the railroad was \$108 million in 1990 dollars.

E.1.1.5 High Speed Surface Transportation between Las Vegas and the NTS. In April 1994, Raytheon Services Nevada issued a draft report High Speed Surface Transportation between Las Vegas and the Nevada Test Site (RSN, 1994). That report explored the rationale for a potential high-speed rail corridor between Las Vegas and the NTS to accommodate increased workers for new programs at the NTS in the 21st Century. The study looked at a personnel carrier from the vicinity of U.S. Highway 95 and Ann Road, in northwest Las Vegas, to Mercury and Control Point 6 in the NTS, with another branch line to Yucca Mountain. The line was not connected to any existing railroad line. It would include 185 km (115 mi) of mainline track plus sidings and passing turn-outs. There would be two train sets, each consisting of one engine and six passenger cars, with four terminals on the line. The total cost of constructing the rail line and the associated equipment was $964 million. No follow-up to this study has been initiated.

E.1.1.6 Yucca Mountain System Study. The *Nevada Potential Repository Preliminary Transportation Strategy, Study 1* (DOE, 1995) reevaluated 13 previously identified rail routes and advanced a new route called the Valley Modified Route. This route was added as the result of recent discussions with U.S. Bureau of Land Management Las Vegas District personnel regarding the status of two potential Wilderness Areas. The routes were categorized as follows:

E.1.1.6.1 Recommended for Detailed Evaluation—These rail routes were deemed the most reasonable route alternatives based on the conclusions of the (DOE, 1990) (see Section E.1.1.3) and Study 1. They were considered reasonable, based on minimal land-use conflicts, maximal use of favorable topography and federal land, avoidance of land federally withdrawn from public use, direct access to a major regional carrier, and conditions allowing design in accordance with accepted rail engineering practices. Routes in this category are Caliente, Carlin, Jean (see Figure E-1), and Valley Modified (see Figure E-2).

E.1.1.6.2 Eliminated from Detailed Evaluation Monitor—These rail routes failed to meet one or more of the evaluation criteria listed in the previous paragraph. They were considered technically feasible, but known or potential land use conflicts, indirect access to a major regional carrier, or conflict with land federally withdrawn from public use, significantly reduced the potential for these routes to be successfully developed. The routes are to be maintained by the Yucca Mountain Project at the present level of development, and the conditions that caused these route to be placed in this category will be monitored. Routes in this category, shown in Figure E-1, are Mina, Cherry Creek, and Dike.

E.1.1.6.3 Eliminated from Further Study—These rail routes failed to meet one or more of the evaluation criteria listed in the recommended status category, and the study has determined that the unfavorable conditions eliminate any potential for the route to be successfully developed. The routes are to be maintained at the present level of development by the Yucca Mountain Project and will be presented in the National Environmental Policy Act scoping process, with the route alternatives assigned to the other two status categories.

During the National Environmental Policy Act scoping process, these rail routes will be discussed briefly to identify the reasons for their elimination. Routes in this category (Section E.1.1.2 and Figure E-1) are Lincoln County A, B, & C, Crucero, Ludlow, Valley, and Arden.

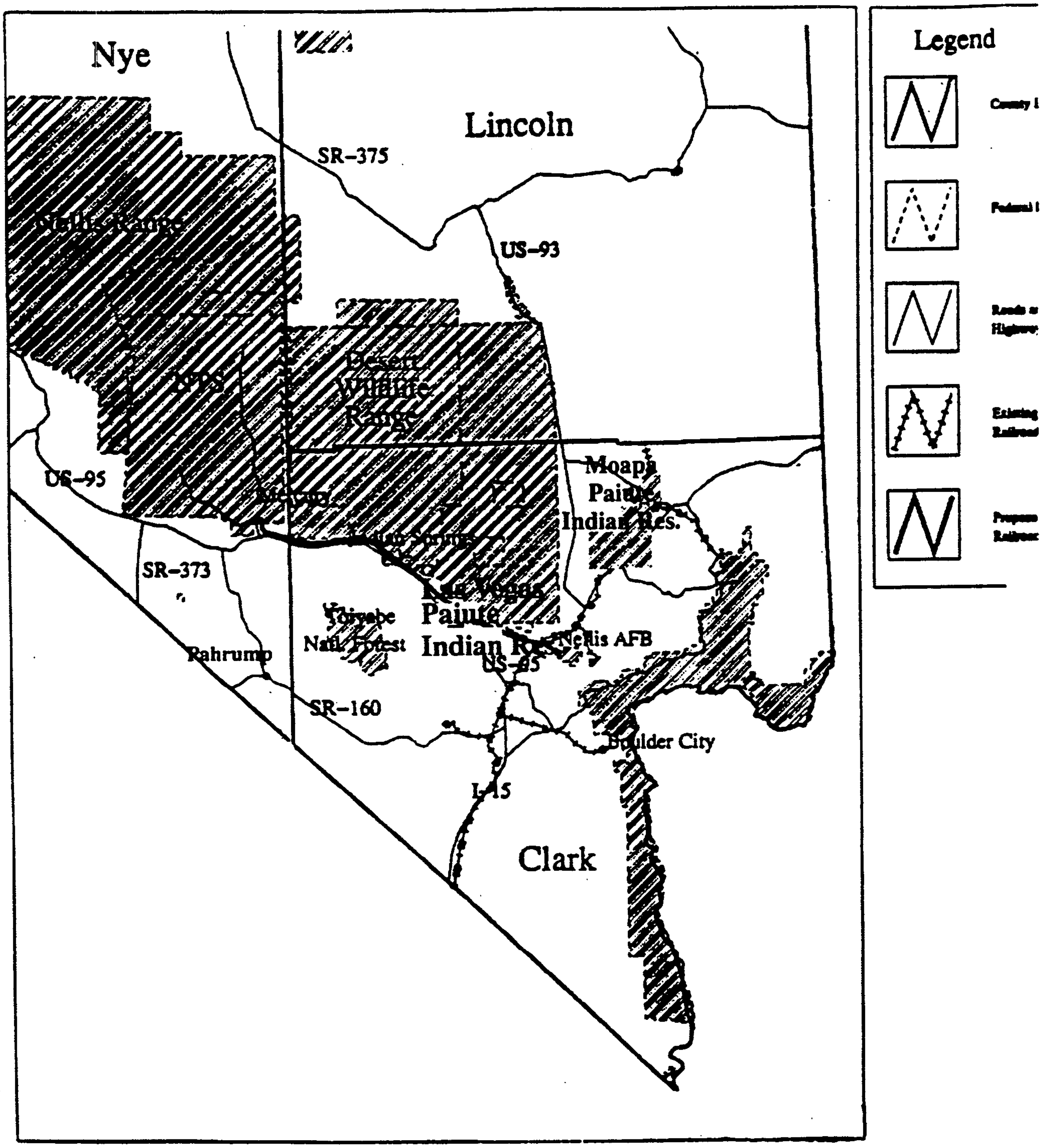
The rail routes recommended for detailed evaluation by Study 1 were comparatively evaluated against the Preliminary Rail Access Study (DOE, 1990) selection criteria. The selected routes were also evaluated using the following preliminary criteria developed by the Study 1 team

- Ease of construction
- Initial cost
- Safety
- Flexibility for personnel and freight
- Operating and maintenance costs
- Safeguards and security
- Public perception.

E.1.2 Description of Alternatives

Two options were considered in this study: (1) a no-build alternative in which the NTS would continue to be supported by truck or rail/truck intermodal shipments; and (2) construction and operation of a rail spur to the NTS as a supplement to truck transportation.

Figure E-2. Modified Valley Route Profile



E.1.2.1 No-Build Alternative. Under the no-build alternative, a rail spur would not be constructed and the existing rail and highway network would remain the same. Normal highway improvements planned by Clark County, the State of Nevada, and improvements made to the railroad by the Union Pacific Railroad would continue. This would mean that radioactive waste shipments would continue to be brought in by truck or using rail/truck intermodal systems. Any waste brought in by rail, destined for the NTS, would have to be transported from the rail line to the NTS by truck. Issues associated with truck-only shipments are described in the other attachments.

E.1.2.2 Rail Alignments. Four routes were selected for evaluation in this study based on the need to compare truck and rail systems. Shorter, less expensive routes were developed to identify potential environmental impacts. Longer routes were included for completeness. The routes considered in this report do not include all feasible routes, but do address stakeholder concerns about the continued shipment of waste through the Las Vegas Valley. If the DOE decides to propose construction of a spur, this proposal would be subjected to a separate National Environmental Policy Act action. Exclusion of routes from the detailed study in this report, likewise, does not terminate the government's potential interest in other alternatives as part of future actions.

Routes originating in northern Nevada, identified in previous DOE studies, were not given detailed consideration in this report because they offered no advantages to improve transportation to the NTS compared to the two routes selected and would require more resources to build and operate. Routes across the NAFR were also reviewed and not considered in the report. These routes offered no advantages to improve transportation to the NTS compared to the routes selected, and could significantly impact the mission of that facility.

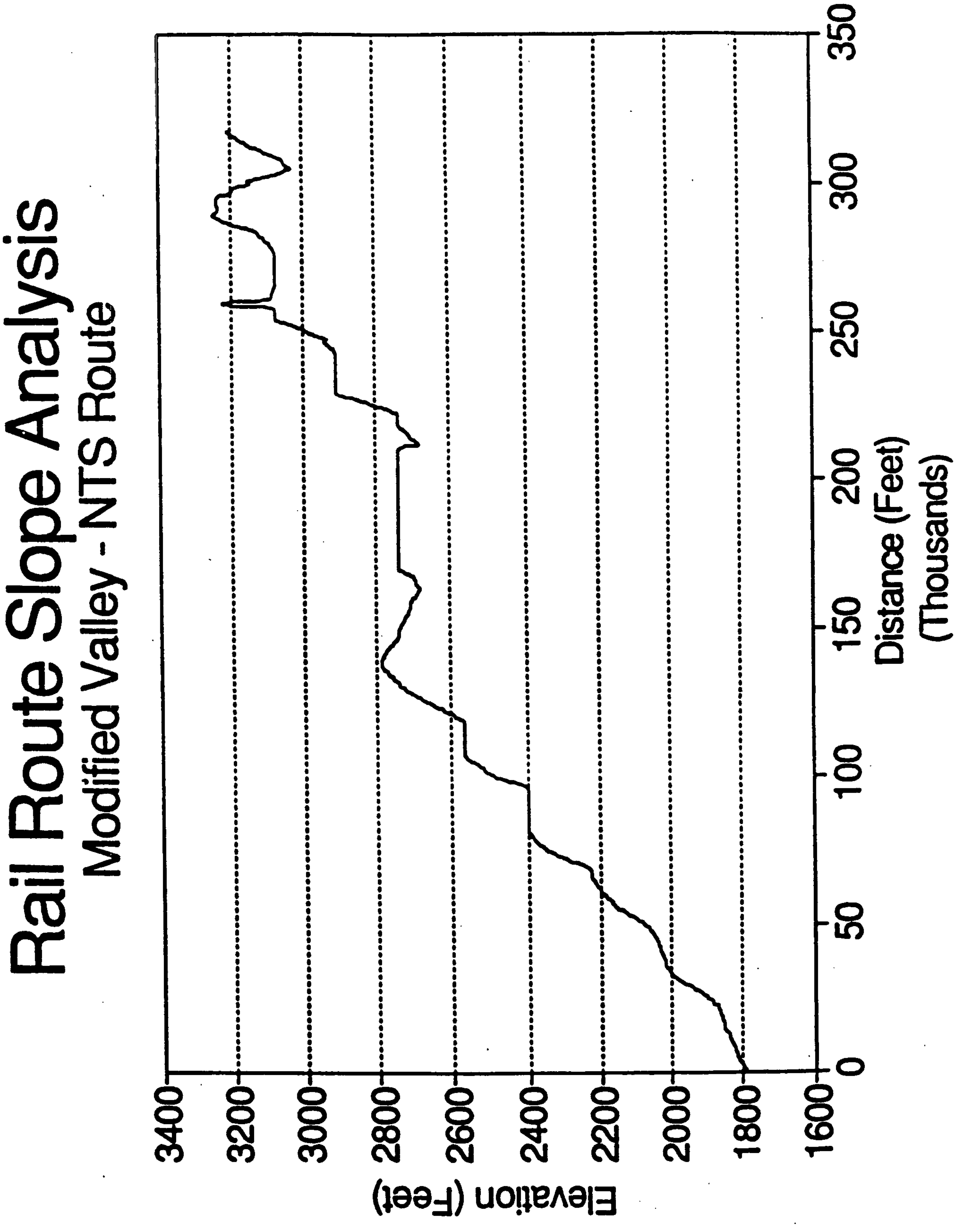
E.1.2.2.1 Valley Modified Route—The route being proposed is a combination of the Valley route and the Dike Siding route identified in (DOE, 1990) (Figure E-2) and the repository system study (DOE, 1995). This route leaves the Union Pacific mainline north of the Valley Siding, northwest adjacent to the NAFR Complex land to near the southern boundary of the Desert National Wildlife Range. It would continue west along the boundary of the range and then northwest again between the Southern Paiute Indian Reservation and the Desert National Wildlife Range. The route would continue northwest between U.S. Highway 95 and the NAFR land, then pass in the vicinity of the Indian Springs Air Force Auxiliary Field. Past the Indian Springs Auxiliary Field, the route would be between the highway and the mountain range, entering the NTS between the main gate at Mercury and the airplane landing strip.

The advantage of the Valley Modified route is that it is the shortest of all the alignments that have been evaluated in previous reports, and does not pass through any rugged terrain. Figure E-3 shows an approximate route profile.

The major obstacle to this alignment is that it passes through Wilderness Study Areas. However, the U.S. Bureau of Land Management has recommended the removal of these Wilderness Study Area classifications, *Final Environmental Impact Statement, Preliminary Wilderness Recommendations* (DOI, 1990). If legislation removes the Wilderness Study Area designation, this entire alignment would be on federal lands managed by the U.S. Bureau of Land Management and on land withdrawn for the U.S. Air Force at Indian Springs. If right-of-way access across the Indian Springs Auxiliary Air Base is not available, it is possible to cross U.S. Highway 95 prior to reaching Indian Springs, going south of the community of Indian Springs, and then crossing U.S. Highway 95 again into the NTS. This alignment would be longer, two grade separations would be required, and there is rougher terrain to go through, which would make this option more costly. The additional cost for the grade separations and land excavation is estimated to be $25 million. An alternative alignment for this route would be to originate near Dike Siding northeast of Valley siding. This alignment would cross the Sheep Mountain Bombing Range but would allow the route to pass to the north of areas under consideration for residential development as part of the City of North Las Vegas.

E. 1.2.2.2 Stateline Route—A separate alternative route would originate from the Union Pacific mainline near Stateline, Nevada (Figure E-4). This route is similar to the Jean route identified in the DOE Preliminary Rail Access Study and is designated as the Modified Jean Route in Study 1.

Figure E-3. Modified valley route profile



The route would cross Interstate 15 through a grade separation, proceed along the south end of the Spring Mountains, and cross the border into California and into the Mesquite Valley area. The route would proceed north along the Spring Mountains into Nevada east of the Sandy Valley area, avoiding private lands. The alignment would then cross State Route 160 through a grade separation, and skirt the community of Pahrump and the Ash Meadows Wildlife Refuge. The route would then cross U.S. Highway 95 via a grade separation between State Route 160 and State Route 373, and proceed along U.S. Highway 95, passing through Area 25 past Little Skull Mountain toward Mercury to the desired areas in the NTS.

The advantage of this route over any of the other options is that it is shorter than any other route except the route that leaves Jean and remains in Nevada. The advantage of this route is that it crosses the Spring Mountains at an elevation of nearly 304 m (1,000 ft) lower than any of the routes from Jean that remain in Nevada. Although the route is about 24 km (15 mi) longer, lower construction costs are expected to more than offset the cost for the increased distance. A route profile is shown in Figure E-5.

The disadvantage of this route is that it crosses the California Desert Conservation Area. The U.S. Bureau of Land Management can only grant a right-of-way through these lands if there is no other feasible route. Shipments would also use the Santa Fe Railroad through Barstow, California, if shipments through Las Vegas are to be minimized.

E.1.2.2.3 Caliente—This route is described in Section E.1.1 and shown in Figure E-1 of this report. It is included here for completeness but was not developed in detail in the remainder of this report.

E.1.2.2.4 Carlin—This route is described in Study 1, referenced in Section E., and is shown in Figure E-1. This route would depart from the Union Pacific/Southern Pacific paired track near Carlin, Nevada. The route parallels Nevada Highway 278 and then passes south through either the Monitor or Smokey Valley along the west side of the NTS entering the site near Amargosa Valley. This route is included here for completeness but is not developed in detail.

E.1.2.3 Truck Haul Routes. This section introduces truck routes evaluated for use in possible truck/rail intermodal shipments to the NTS. Truck transport of legal weight (less than 36,240 kg [80,000 lb]), overweight (36,240 kg greater than [80,000 lb]), and heavy loads (greater than 58,437 kg [129,000 lb]) in Nevada over existing U.S. and state highways and secondary roads is feasible, and can be performed without restriction for legal weight shipments or within the existing permit system for overweight and overlength loads with a number of state restrictions.

The State of Nevada's permit system for overweight and overlength truck transport allows loads in excess of 58,437 kg (129,000 lb). However, the transport of loads of this type on a regular basis would need to be evaluated with state permitting agencies. In addition to obtaining a state permit, the state permitting agency also must approve the route. The annual cost for the state overweight and overlength permit is $120 per ton in excess of 36,240 kg (80,000 lb) for each transport vehicle. An added annual cost of $1,000 is required for a hazardous materials permit for carriers with 6 to 25 vehicles. Prior to transporting loads from an existing mainline railroad in Nevada to the NTS, an intermodal transfer facility adjacent to an existing railroad will have to be developed.

For an infrequent transfer, portable cranes could be used at an existing rail siding to make that transfer. If there were frequent transfers, a permanent facility might need to be developed. Trucks would be required to meet the state requirements for maximum axle loads (9,060 kg [20,000 lb] for a single axle, 15,402 kg [34,000 lb] for a tandem axle, and 21,744 kg [48,000 lb] for a tridem axle) and minimum axle spacing.

Road grade should be limited to a maximum of 4 to 5 percent. Grades of 6 to 7 percent could be negotiated, but would require either additional tractors or larger tractors. This is very important for overweight and heavy haul trucks. Either asphalt or concrete road surfaces are acceptable. Unpaved roads are not recommended; however, if properly constructed, they could be used. Unpaved roads and some secondary roads require time-of-year restrictions as roads thawing in the spring tend to be quite soft and rutted.

Figure E-4. Stateline alternative rail alignment

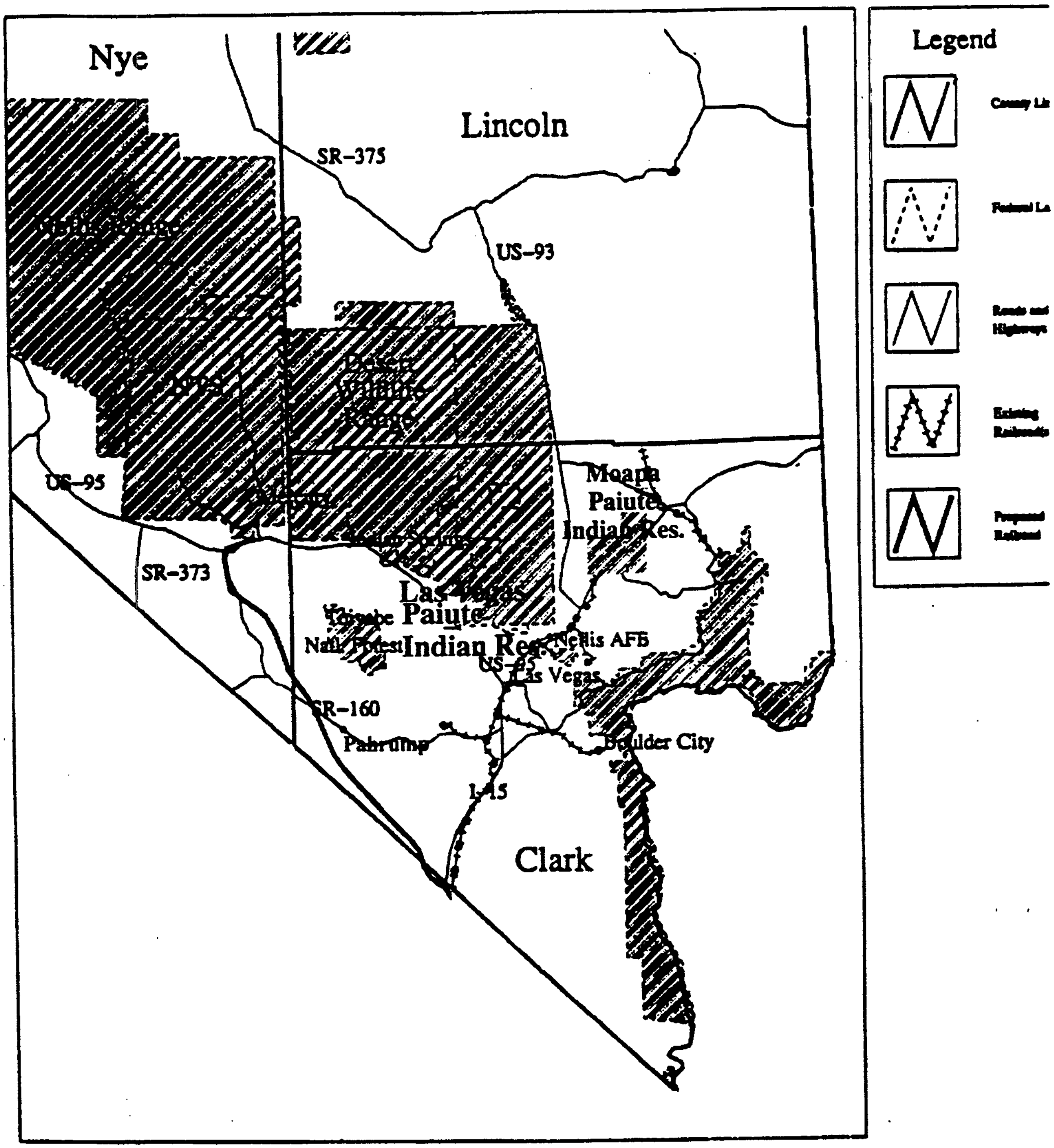
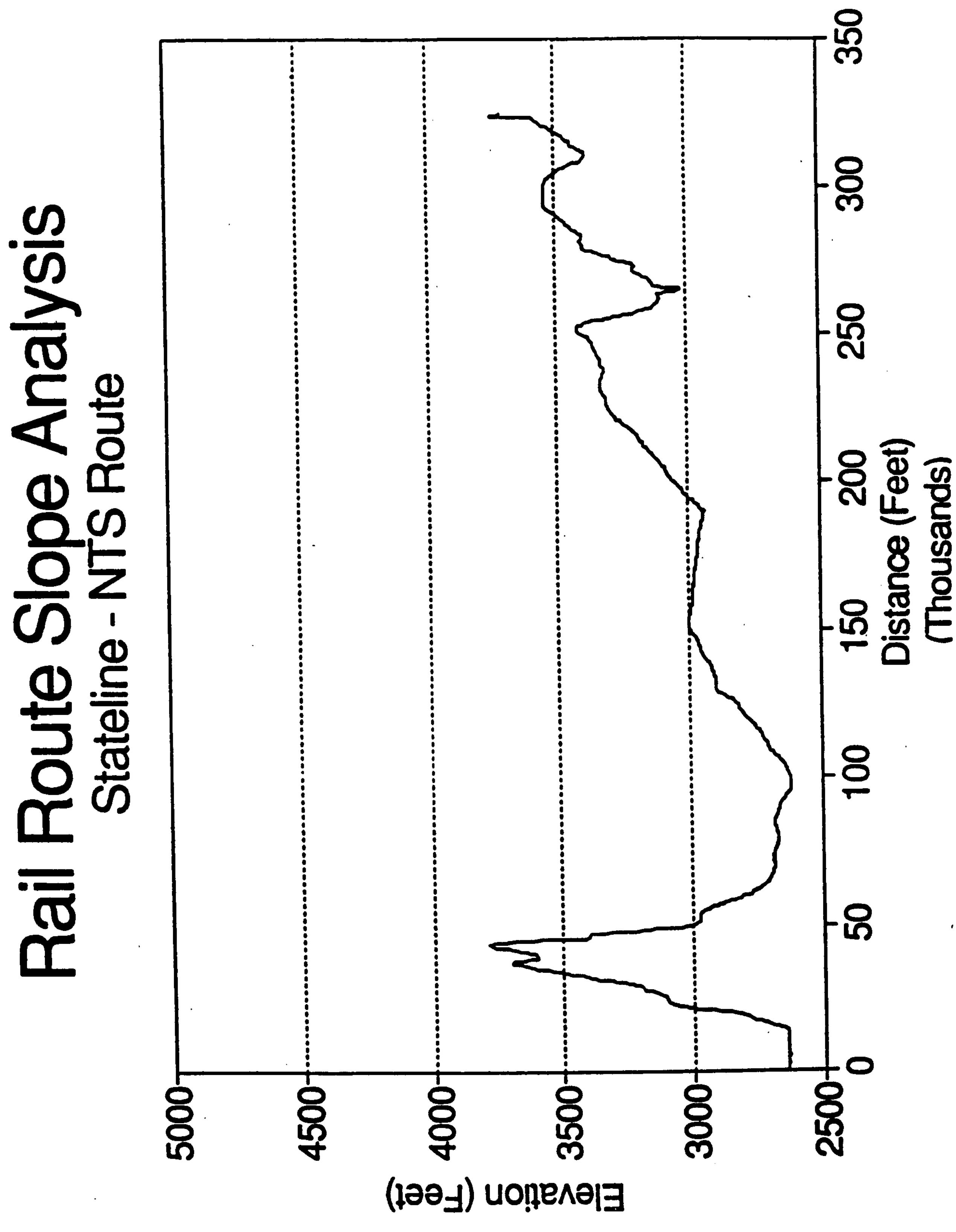


Figure E-5. Rail route slope analysis



E.1.2.3.1 Apex/Valley Truck Haul Route—This truck route would start at one of the sidings between Apex and Valley on the Union Pacific mainline. The route would use existing highways either across Craig Road or to the intersection of Interstate 15 and U.S. Highway 95. The route would then take U.S. Highway 95 north to Mercury and into the NTS.

The advantage of this route is that it uses multiple lane divided highways without significant local road access, with the exception of Craig Road, if that road is used. The major disadvantage of this route is that it has to pass through Las Vegas and, in particular, through the high-traffic intersection at Interstate 15 and U.S. Highway 95.

E.1.2.3.2 Arden Truck Haul Route—The Arden truck route would originate at the Union Pacific siding in Arden, just south of Las Vegas and near State Route 160. This route would take Route 160 through Pahrump to U.S. Highway 95 and then south on U.S. Highway 95 to Mercury. The advantage to this route is that it does not go through the populated sections of Las Vegas. The disadvantage of this route is that it goes through the populated and business sections of Pahrump. State Route 160 is also not a desirable heavy haul highway, according to the Nevada Department of Transportation.

E.1.2.3.3 Other Truck Haul Routes—Other alternatives to the movement of trucks through Las Vegas would result in an extremely long route, going through other communities or both. An example would be to make the intermodal transfer in the vicinity of Caliente, using U.S. Highway 93 to State Route 375, then using State Route 375 to U.S. Highway 6, then to U.S. Highway 95 in Tonopah, and finally U.S. Highway 95 south to Mercury. This would be a distance of about 579 km (360 mi), passing through the communities of Tonopah, Goldfield, and Beatty. Use of California State Route 127 to State Route 373 and then to Mercury via U.S. Highway 95 is an example of a longer route originating south of Las Vegas.

E.2 Cost Analysis

E.2.1 Rail Construction Costs

Cost drivers in the development of rail access include the design activity and the survey work needed to support the design, administration, and contract management.

The major material cost drivers for construction include: (1) earthwork and rock excavation, (2) ballast and sub-ballast processing and transport, (3) track and ties, (4) grade separations, and (5) drainage structures.

The cost for the Modified Valley route is estimated to be \$320 million for the approximately 161-km (100-mi) spur. The cost for the Stateline alternative is estimated to be \$400 million for the approximately 201-km (125-mi) spur. These estimates are based on the cost estimate from the Caliente conceptual design report (DOE, 1992), considering the difference in distances. These estimates include the design costs, all construction costs, and a 35 percent contingency factor on construction.

E.2.2 Intermodal Truck/Rail Construction Costs

If intermodal systems are used, there would be a construction cost of developing and operating an intermodal transfer station. It is estimated that the design and construction of a covered transfer station with a sufficient overhead crane would cost about \$2.5 million. There would also be the operational cost of the intermodal transfer station, which would depend on the frequency of its use.

E.2.3 A Comparison of Truck, Rail, and Intermodal Shipping Costs

Estimated shipping costs for radioactive waste shipments by rail and by intermodal truck/rail modes were developed using a combination of the truck costs, and a verbal rail transportation cost estimate obtained from the Union Pacific Transportation Company. The costs developed for trucks were based on twelve 1.2 x 1.2 x 2.1 m (4 x 4 x 7 ft) waste boxes on a trailer. The cost per mile based on the trip length. The rail cost developed in this appendix is based on a single railcar carrying two cargo containers, each holding nine 1.2 x 1.2 x 2.1 m (4 x 4 x 7 ft) waste boxes. The Union Pacific estimated costs are based on the movement of a railcar with 2 cargo containers having 18 waste boxes from Chicago to Las Vegas and returning the two empty cargo containers. No adjustment was made in the cost per rail car mile for multiple railcars per train or for increased trip lengths. Additional cost savings may be possible if these parameters are included.

Estimates were made for representative shipments to the NTS from sites in two general areas. Costs for intermodal shipments are not significantly different between shipping by rail using the Union Pacific to Clive, Utah, and then by truck to the NTS; shipping by rail using the Union Pacific to North Las Vegas and then by truck to the NTS; or shipping by rail using the Santa Fe Railroad Company to Barstow, California by rail and then by truck to NTS. On the basis of distance from a site to the NTS, Argonne National Laboratory-East (ANL-E), Bettis Atomic Power Laboratory (BAPL), Fernald (FEMP), Mound, Oak Ridge National Laboratory (ORNL), Portsmouth Gaseous Diffusion Plant (PORTS), the RMI Extrusion Plant, and the Savannah River Site (SRS) are nearly the same 3,339 ± 362 km (2,075 ± 225 mi); and so the radioactive waste transportation costs from each site to the NTS would be about the same. The Knolls Atomic Power Laboratory (KAPL) is somewhat farther 4,183 km (2,600 mi) and the cost would be somewhat higher. Also, Lawrence Livermore National Laboratory (LLNL), Rocky Flats (RFETS), Hanford, Los Alamos National Laboratory (LANL), the Stanford Linear Accelerator (SLAC), and the Idaho National Engineering Laboratory (INEL) are about the same distance from the NTS (1,512 ± 257 km [940 ± 160 mi]), and so the cost of shipping the waste from those sites to the NTS would be about the same.

The resulting cost estimate for an intermodal truck/rail shipment from any of the distant sites to the NTS is about $416 per box, whereas a truck shipment from the originator site to the NTS is about $678 per box. The cost estimate for an intermodal truck/rail shipment from one of the closer sites to the NTS is about $247 per box, whereas a truck shipment all the way is about $342 per box. The main reason for the smaller difference is that the truck rate for short hauls (approximately 161 km [100 mi]) is more than twice the rate for truck shipments of more than 1,126 km (700 mi), so the effect of the short (approximately 161 km [100 mi]) intermodal truck shipment is more pronounced. As a comparison, if a rail spur were constructed to the NTS, the shipping cost is estimated to be about $307 per box for the distant sites and about $139 per box for the closer sites.

Based on the "No Action Alternative Volumes," shipments from the distant sites (FEMP, Mound, ORNL, and RMI), a total of about $14.6 million could be saved using intermodal truck/rail transportation, and about $20.7 million would be saved if the NTS rail spur is constructed. Savings of about $2.5 million could be realized on shipments from the closer sites using intermodal transportation. Additional savings of $5.4 million could be made if shipments could go all the way by rail. Total savings could be $17.1 million for intermodal shipments, and $26.1 million for an NTS rail spur.

Based on the Expanded Use Alternative Volumes from the distant sites, a total of about $43.3 million could be saved for intermodal truck/rail transportation, and a savings of $61.3 million, using a rail spur to the NTS. From the closer sites, an additional savings of $12.2 million could be realized using intermodal transportation or $26 million for an NTS rail spur. Potential savings total $55.5 million for intermodal transportation and $87.3 million for an NTS rail spur in this alternative.

One caution with regard to these cost estimates is that they are based on a truck load of only 12 boxes and an intermodal truck load of 9 boxes. This means that to meet the maximum legal-weight truck requirement of 36,240 kg (80,000 lb) maximum, the boxes had to average less than 2,039 kg (4,500 lb). In recent discussions with FEMP transportation personnel, future boxes of waste from FEMP for NTS would contain contaminated equipment weighing between 2,265 kg (5,000 lb) and 2,718 kg (6,000 lb) per box, and there wouldbe boxes of transite (concrete) weighing 3,624 kg (8,000 lb) to 4,077 kg (9,000 lb) per box. Therefore, future truck shipments from FEMP to the NTS may not contain the 12 boxes without exceeding the maximum gross vehicle weight of 80,000 lb. This means that some future shipments from FEMP would cost the same per shipment but would have fewer boxes per truckload, thereby increasing the cost per box. Rail shipments having higher weight limits would not be subject to this reduction in efficiency.

In conclusion, there is an opportunity for significant cost savings in transporting low-level waste using intermodal rail/truck shipments versus shipping all the way from the originator site to the NTS site by truck. In addition, if a rail spur is constructed out to the NTS, substantial additional savings could be realized that could partially offset the capital costs of this alternative.

E.5 References

REGULATION, ORDER, LAW

43 CFR 2300 — U.S. Department of the Interior (DOI), Bureau of Land Management (BLM), *Public Lands: Land Withdrawals 4.34-General, Code of Federal Regulations,* Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.

43 CFR 2800 — U.S. Department of the Interior (DOI), Bureau of Land Management (BLM), *Public Lands: Land Withdrawals, Rights-of-Way 4.34- General, Code of Federal Regulations,* Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.

GENERAL

AAR, 1993 — AAR (Association of American Railroads), *Competitive Policy Reporter,* Volume IV, Number 8, 1993.

AEC,1962 — AEC (U.S. Atomic Energy Commission, Nevada Operations Office), *Feasibility Study for Transportation Facilities to Nevada Test Site.* Holmes & Narver, Inc., On-Continent Test Division, Las Vegas, NV, 1962.

DOE, 1990 — DOE, (U.S. Department of Energy), *Preliminary Rail Access Study,* DOE/YMP-89-16, Yucca Mountain Site Characterization Project Office, Las Vegas, NV, 1990.

DOE, 1992 — DOE (U.S. Department of Energy), *Yucca Mountain Rail Access Study: Caliente Route Conceptual Design Report*, Science Applications International Corp., Las Vegas, NV, 1992.

DOE, 1995 — DOE, *Nevada Potential Repository Preliminary Transportation Strategy Study1,* B00000000-01717-4600-00023 Rev. 01, TRW Environmental Safety Systems, Las Vegas, NV, 1995.

DOI, 1990 — DOI (U.S. Department of the Interior), *Final Environmental Impact Statement, Preliminary Wilderness Recommendations*, U.S. Bureau of Land Management, Las Vegas, NV, 1990.

ETS Pacific, 1989a — ETS Pacific, *Evaluate Alternative Rail Corridor Routes through Lincoln County,* NV, to Yucca Mountain, NV, August 1989.

ETS Pacific, 1989b — Rail Route C Extension vs. Intermodal Facility at Yucca Mountain, December 1989

RSN, 1994 — Raytheon Services Nevada, *High Speed Surface Transportation Between Las Vegas and the Nevada Test Site.* Draft, Las Vegas, NV, 1994.

DOT, 1977 — U.S. Department of Transportation, *Final Standards, Classification, and Designation of Lines of Class 1 Railroads in the United States,* Washington, DC, 1977

This Page Intentionally Left Blank

Attachment F to Appendix I

GENERATOR ROUTES

This Page Intentionally Left Blank

Attachment F. National Generator Routes

Generator: Aberdeen Proving Ground (APG-1), Aberdeen, Maryland

The primary transportation route from the Aberdeen Proving Ground to the Nevada border departs the Aberdeen Proving Ground heading northwest on State Route 22 to U.S. Highway 40 for approximately 2 mi^2. At this point, Interstate 95 is taken southwest 21 mi into Baltimore, Maryland. At Baltimore, Interstate 695 is then taken past Interstate 83 for 10 mi to Interstate 70. Interstate 70 is then traveled for 116 mi northwest and into Breezewood, Pennsylvania. Interstate 70 turns in a westerly direction and is traveled 2 mi until Interstate 70 and Interstate 76 merge. Interstate 70/76 is then traveled 87 mi to New Stanton, Pennsylvania at which point Interstate 70 branches off from Interstate 76. Interstate 70 is then driven northwest 5 mi into Washington, Pennsylvania where Interstate 70 intersects with Interstate 79. Travel continues on Interstate 70 from Washington, Pennsylvania 149 mi into Columbus, Ohio. At the city limits of Columbus, Interstate 270 (a by-pass) is taken north 21 mi until it reconnects with Interstate 70. Interstate 70 is then taken west 160 mi to Indianapolis, Indiana. At Indianapolis, Interstate 465 is driven south around Indianapolis for about 19 mi until it reconnects with Interstate 70. Interstate 70 is then traveled west 131 mi into Teutopolis, Illinois. At Teutopolis, Interstate 70 becomes Interstate 57 and is driven approximately 6 mi back to Interstate 70 in Effingham, Illinois. Interstate 70 is then traveled 77 mi west into Edwardsville, Illinois. At Edwardsville, Interstate 270 is taken and traveled 30 mi into St. Louis, Missouri. At St. Louis, Interstate 70 is taken west, 224 mi to Kansas City, Missouri. At Kansas City, Missouri, Interstate 435 is taken and is driven 31 mi west into Kansas City, Kansas. At Kansas City, Kansas, Interstate 70 is taken 46 mi west to Topeka, Kansas. Interstate 470 is traveled for 12 mi around the Topeka city limits. At this point, Interstate 470 reconnects with Interstate 70, which is driven for 1,037 mi west through Colorado and into Cove Fort, Utah. At Cove Fort, Interstate 15 is driven southwest 161 mi through northwest Arizona and to the Nevada border. This national route would likely use NV-1 or NV-2.

Generator: Ames Laboratory (Ames-1), Ames, Iowa

The primary transportation route from the Ames Laboratory to the Nevada border consists of traveling 3 mi^2 on local roads to Ames, Iowa. At Ames, U.S. Highway 30 is traveled to Interstate 35. Interstate 35 is then driven south 25 mi to Des Moines, Iowa. In Des Moines, Interstate 35 merges with Interstate 80 and is traveled west for 14 mi around the Des Moines city limits until Interstate 80 branches off from Interstate 35. Interstate 80 is then taken west for 96 mi to Minden, Iowa. At Minden, Interstate 680 is driven 16 mi to Loveland, Iowa where Interstate 680 combines with Interstate 29. At Loveland, Interstate 680/29 is traveled for 10 mi to Crescent, Iowa. At Crescent, Interstate 680 branches off from Interstate 29 and is traveled west 17 mi into Omaha, Nebraska. At Omaha, Interstate 80 is driven 343 mi to Big Springs, Nebraska. At Big Springs, Interstate 76 is traveled west 186 mi to Arvada, Colorado. At Arvada, Interstate 70 is taken southwest 502 mi to Cove Fort, Utah. At Cove Fort, Interstate 15 is driven 161 mi through northwest Arizona to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Argonne National Laboratory-East (ANLE-1), Chicago, Illinois

The primary transportation route from the Argonne National Laboratory-east to the Nevada border consists of traveling 1 mi over local roads to Interstate 55 in Darien, Illinois. Interstate 55 is then taken southwest for 23 mi into Joliet, Illinois. At Joliet, Interstate 80 is traveled west for 117 mi to Green Rock, Illinois where Interstate 74 intersects Interstate 80. At Green Rock, Interstate 74 is then traveled west for 9 mi to Quad City Airport, Moline, Illinois and Interstate 280 is taken at that point. Interstate 280 is driven 18 mi around the southwest perimeter of Rock Island, Illinois and Davenport, Illinois. At this point, Interstate 80 is driven west 153 mi into Des Moines, Iowa. At Des Moines, Interstate 80 combines with Interstate 35 and is taken 14 mi until Interstate 80 splits off from Interstate 80/35. Interstate 80 is driven 96 mi from Des Moines to Minden, Iowa. At Minden, Interstate 680 is driven 16 mi to Loveland, Iowa where Interstate 680 merges with Interstate 29. At Loveland, Interstate 680/29 is traveled for 10 mi to Crescent, Iowa. At Crescent, Interstate 29 branches off from Interstate 680 is travel west on Interstate 29 for 17 mi into Omaha, Nebraska. At Omaha, Interstate 80 is driven 343 mi to Big Springs, Nebraska. At Big Springs, Interstate 76 is traveled west 186 mi to Arvada, Colorado. At Arvada, Interstate 70 is then taken southwest 502 mi to Cove Fort, Utah. At Cove Fort, Interstate 15 is driven 161 mi through northwest Arizona to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Argonne National Laboratory - West (ANLW-1), Idaho Falls, Idaho

The primary transportation route from the Argonne National Laboratory-West to the Nevada border begins by traveling 4 mi on local roads to U.S. Highway 20. U.S. Highway 20 is then driven 12 mi to Atomic City, Idaho. At Atomic City, U.S. Highway 26 is driven 36 mi to Blackfoot, Idaho. At Blackfoot, Interstate 15 is taken 112 mi to Tremonton, Utah. At Tremonton, Interstate 15 combines with Interstate 84 and is traveled 30 mi to Ogden, Utah. At Ogden, Interstate 15 is traveled 27 mi to North Salt Lake. At North Salt Lake, Interstate 215 is driven 17 mi to Midvale, Utah back to Interstate 15. At Midvale, Interstate 15 is driven 331 mi through northwest Arizona to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Bettis Atomic Power Laboratory (BAPL), West Mifflin, Pennsylvania

The primary transportation route from the Bettis Atomic Power Laboratory to the Nevada border consists of traveling on local roads for 1 mi to State Route 837 at Dravosburg, Pennsylvania. State Route 837 is driven for 5 mi to Clairton, Pennsylvania to State Route 51. State Route 51 is driven south 12 mi to Interstate 70 located in Wickhaven, Pennsylvania. Interstate 70 is then traveled west 32 mi to Washington, Pennsylvania. From Washington, Interstate 70 is traveled 27 mi southwest into Wheeling, West Virginia. At Wheeling, Interstate 470 is taken 11 mi west to St. Clairsville. At St. Clairsville, Interstate 70 is taken to Columbus, Ohio. At the city limits of Columbus, Interstate 270 is taken north 21 mi until it intersects with Interstate 70. Interstate 70 is then taken west 160 mi to Indianapolis, Indiana. At Indianapolis, Interstate 465 is driven south around Indianapolis for about 19 mi where it re-connects with Interstate 70. Interstate 70 is then traveled west 131 mi into Teutopolis, Illinois. At Teutopolis, Interstate 70 becomes Interstate 57 and is driven approximately 6 mi back to Interstate 70, located in Effingham, Illinois. Interstate 70 is then traveled 77 mi west into Edwardsville, Illinois. At Edwardsville, Interstate 270 is traveled 30 mi into St. Louis, Missouri. At St. Louis, Interstate 70 is once again taken west 224 mi to Kansas City, Missouri. At Kansas City, Missouri, Interstate 435 is driven 31 mi west into Kansas City, Kansas. At Kansas City, Kansas, Interstate 70 is taken approximately 46 mi west past Bonner Springs, Kansas to Topeka, Kansas. At this point, Interstate 470 is traveled for 12 mi around the Topeka city limits until Interstate 470 reconnects with Interstate 70. Interstate 70 is then driven for 1,037 mi west through Colorado and into Cove Fort, Utah. At Cove Fort, Interstate 15 is driven southwest 161 mi through northwest Arizona and to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Brookhaven National Laboratory (BNL-1), Brookhaven, New York

The primary transportation route from the Brookhaven National Laboratory to the Nevada border consists of traveling 1 mi northeast on local roads to Yaphank, New York. Local CR-46 is obtained at Yaphank and traveled 2 mi south to Upton, New York, where Interstate 495 can be taken 51 mi west to New York, New York. At

New York, Interstate 295 is taken from Bayside, New York, northwest for about 3 mi to Locust Point, New York, and then 1 mi to Bronx, New York. Interstate 95/278 is driven through the Bronx until Interstate 95 splits off from Interstate 278. Interstate 95 is taken for 7 mi from the Bronx to the George Washington Bridge, past the bridge for 1 mi to Fort Lee, New Jersey. Interstate 95 is driven through Fort Lee for 4 mi to Bogota, New Jersey, at which point Interstate 95 turns into Interstate 80. Interstate 80 is then traveled 64 mi west to Pahaquarry, New Jersey, and then 2 mi to East Stroudsburg, Pennsylvania. At East Stroudsburg, Interstate 80 is driven west 330 mi to North Jackson, Ohio. At North Jackson, Interstate 80 is taken northwest 74 mi to Elyria, Ohio, where Interstate 80 combines with Interstate 90. Interstate 80/90 is then taken 281 mi to Portage, Indiana, where Interstate 80 branches off from Interstate 90. At Portage, Interstate 80 is taken for approximately 1 mi to Lake Station, Indiana, at which point Interstate 80 combines with Interstate 94. Interstate 80/94 is then traveled 19 mi to Lansing, Illinois, where Interstate 94 branches off, and Interstate 80 combines with Interstate 294. Interstate 80/294 is driven west for 5 mi to Homewood, Illinois. At Homewood, Interstate 80 branches off and is taken 146 mi to Green Rock, Illinois. At Green Rock, Interstate 74 is then traveled west for 9 mi to Quad City Airport, Moline, Illinois. At that point Interstate 280 is driven 18 mi around the southwest perimeter of Rock Island, Illinois, and Davenport, Illinois, until Interstate 80 is once again picked up. At this point, Interstate 80 is driven west 153 mi into Des Moines, Iowa. At Des Moines, Interstate 80 combines with Interstate 35 and is taken 14 mi until Interstate 80 splits off from Interstate 80/35. Interstate 80 is driven 96 mi from Des Moines to Minden, Iowa. At Minden, Interstate 680 is driven 16 mi to Loveland, Iowa, where Interstate 680 merges with Interstate 29. At Loveland, Interstate 680/29 is traveled for 10 mi to Crescent, Iowa. At Crescent, Interstate 680 branches off from Interstate 29 and is traveled west 17 mi into Omaha, Nebraska. At Omaha, Interstate 80 is driven 343 mi to Big Springs, Nebraska. At Big Springs, Interstate 76 is traveled west 186 mi to Arvada, Colorado. At Arvada, Interstate 70 is then taken southwest 502 mi to Cove Fort, Utah. At Cove Fort, Interstate 15 is driven 161 mi through northwest Arizona and to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Fernald Environmental Management Project (FEMP-1), Fernald, Ohio

The primary transportation route from the Fernald Environmental Management Project to the Nevada border consists of traveling 7 mi from the Fernald Plant to Miamitown, Ohio. At Miamitown, Interstate 275/274 is traveled west for 2 mi to Harrison, Ohio, at which point Interstate 274 branches off from Interstate 74. At Harrison, Interstate 74 is driven 81 mi northwest to Indianapolis, Indiana, where Interstate 74 combines with Interstate 465. Interstate 465 is taken for about 20 mi until it intersects with Interstate 70. Interstate 70 is then traveled west 131 mi into Teutopolis, Illinois. At Teutopolis, Interstate 70 becomes Interstate 57 and is driven approximately 6 mi to Interstate 70, located in Effingham, Illinois. Interstate 70 is then traveled 77 mi west into Edwardsville, Illinois. At Edwardsville, Interstate 270 is traveled 30 mi into St. Louis, Missouri. At St. Louis, Interstate 70 is once again taken west 224 mi to Kansas City, Missouri. At Kansas City, Missouri Interstate 435 is driven 31 mi west into Kansas City, Kansas. At Kansas City, Kansas Interstate 70 is taken approximately 46 mi west past Bonner Springs, Kansas to Topeka, Kansas. At this point, Interstate 470 is traveled for 12 mi around the Topeka city limits until Interstate 470 intersects with Interstate 70. Interstate 70 is then driven for 1,037 mi west through Colorado and into Cove Fort, Utah. At Cove Fort, Interstate 15 is driven southwest 161 mi through northwest Arizona and to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Fernald Environmental Management Project (FEMP-2), Fernald, Ohio

One alternate transportation route from the Fernald Environmental Management Project to the Nevada border consists of traveling south for 7 mi on State Route 128 to Miamitown, Ohio. Interstate 275/74 is taken west 2 mi to Harrison, Ohio, where Interstate 275 branches off from Interstate 74. Interstate 275 is taken west 25 mi to Erlanger, Kentucky to Interstate 71/75. Interstate 71/75 is driven south for 12 mi to Walton, Kentucky, at which point Interstate 71 and Interstate 75 branch off. Interstate 71 is then traveled from Walton southwest 76 mi to Louisville, Kentucky. At Louisville, Interstate 64 is traveled 181 mi to Mt. Vernon, Illinois. At Mt. Vernon, Interstate 64 combines with Interstate 57 for 5 mi. At this point, Interstate 64 branches off from Interstate 57 and is traveled 67 mi to Washington Park, Illinois. At Washington Park, Interstate 255 is driven 21 mi west to St. Louis, Missouri. At St. Louis, Interstate 270 is taken around the city limits 6 mi to Interstate 44. Interstate 44 is then traveled 276 mi west past Joplin, Missouri, and another 17 mi past Miami, Oklahoma, continuing 72 mi past Catoosa, Oklahoma, and another 20 mi past Oakhurst, Oklahoma proceeding 86 mi to Oklahoma City, Oklahoma, where Interstate 35 and Interstate 44 combine. Interstate 35/44 is driven 5 mi through Oklahoma City to the point where Interstate 44 branches off from Interstate 35. Interstate 44 is then driven from Oklahoma City 10 mi to Interstate 40. Interstate 40 is driven 1,004 mi through the Texas Panhandle and New Mexico to Kingman, Arizona. At Kingman, U.S. Highway 93 is driven northwest 72 mi to the Nevada border. This route would likely continue on NV-4 or NV-5.

Generator: Fernald Environmental Management Project (FEMP-3), Fernald, Ohio

One alternate transportation route from the Fernald Environmental Management Project to the Nevada border consists of traveling south for 7 mi on State Route 128 to Miamitown, Ohio. Interstate 275/ 74 is taken west 2 mi to Harrison, Ohio, where Interstate 275 branches off from Interstate 74. Interstate 275 is taken west 25 mi to Erlanger, Kentucky, to Interstate 71/75. Interstate 71/75 is driven south for 12 mi to Walton, Kentucky, at which point Interstate 71 and Interstate 75 branch off. Interstate 71 is then traveled from Walton southwest 76 mi to Louisville, Kentucky. At Louisville, Interstate 64 is traveled 181 mi to Mt. Vernon, Illinois. At Mt. Vernon, Interstate 64 combines with Interstate 57 for 5 mi. At this point, Interstate 64 branches off from Interstate 57 and is traveled 67 mi to Washington Park, Illinois. At Washington Park, Interstate 255 is driven 21 mi west to St. Louis, Missouri. At St. Louis, Interstate 270 is taken around the city limits 6 mi to Interstate 44. Interstate 44 is then traveled 276 mi west past Joplin, Missouri, and another 17 mi past Miami, Oklahoma. Interstate 44 is continued past Miami 72 mi to Catoosa, Oklahoma, and another 20 mi to Oakhurst, Oklahoma proceeding 86 mi to Oklahoma City, Oklahoma, where Interstate 35 and Interstate 44 combine. Interstate 35/44 is driven 5 mi through Oklahoma City to the point where Interstate 44 branches off from Interstate 35. Interstate 44 is then driven from Oklahoma City 10 mi to Interstate 40. Interstate 40 is driven 1,085 mi through the Texas Panhandle, New Mexico and Arizona to Needles, California. At Needles, U.S. Highway 95 is driven 23 mi north to the Nevada border. This route would likely continue on NV-6 or NV-7.

Generator: Fernald Environmental Management Project (FEMP-4), Fernald, Ohio

One alternate transportation route from the Fernald Environmental Management Project to the Nevada border consists of traveling south for 7 mi on State Route 128 to Miamitown, Ohio. Interstate 275/74 is taken west 2 mi to Harrison, Ohio, where Interstate 275 branches off from Interstate 74. Interstate 275 is taken west 25 mi to Erlanger, Kentucky, to Interstate 71/75. Interstate 71/75 is driven south for 12 mi to Walton, Kentucky, at which point Interstate 71 and Interstate 75 branch off. Interstate 71 is then traveled from Walton southwest 76 mi to Louisville, Kentucky. At Louisville, Interstate 64 is traveled 181 mi to Mt. Vernon, Illinois. At Mt. Vernon, Interstate 64 combines with Interstate 57 for 5 mi. At this point, Interstate 64 branches off from Interstate 57 and is traveled 67 mi to Washington Park, Illinois. At Washington Park, Interstate 255 is driven 21 mi west to St. Louis, Missouri. At St. Louis, Interstate 270 is taken around the city limits 6 mi to Interstate 44. Interstate 44 is then traveled 471 mi west to Oklahoma City, Oklahoma, where Interstate 35 and Interstate 44 combine.

Interstate 35/44 is driven 5 mi through Oklahoma City to the point where Interstate 44 branches off from Interstate 35. Interstate 44 is then driven from Oklahoma City 10 mi to Interstate 40. Interstate 40 is driven 1,217 mi through the Texas Panhandle, New Mexico, and Arizona to Barstow, California. At Barstow, Interstate 15 is driven 112 mi north to the Nevada border. This route would likely continue on NV-8 or NV-9.

Generator: Fermi National Accelerator Laboratory (FNAL-1), Batavia, Illinois

The primary transportation route from the Fermi National Accelerator Laboratory to the Nevada border consists of traveling on local roads west 3 mi to Batavia, Illinois. At Batavia, State Route 31 is taken south for 4 mi to North Aurora, Illinois, where Interstate 88 is located. Interstate 88 is then traveled west 117 mi to Rapids City, Illinois. At Rapids City, Interstate 80 is driven 7 mi to Green Rock, Illinois. At Green Rock, Interstate 74 is then taken west for 9 mi to Quad City Airport, Moline, Illinois, where Interstate 280 is driven 18 mi around the southwest perimeter of Rock Island, Illinois, and Davenport, Illinois, until Interstate 80 is once again intercepted. At this point, Interstate 80 is driven west 153 mi into Des Moines, Iowa. At Des Moines, Interstate 80 combines with Interstate 35 and is taken 14 mi until Interstate 80 splits off from Interstate 80/35. Interstate 80 is driven 96 mi from Des Moines to Minden, Iowa. At Minden, Interstate 680 is driven 16 mi to Loveland, Iowa, where Interstate 680 combines with Interstate 29. At Loveland, Interstate 680/29 is traveled for 10 mi to Crescent, Iowa. At Crescent, Interstate 680 branches off from Interstate 29 and is traveled west 17 mi into Omaha, Nebraska. At Omaha, Interstate 80 is driven 343 mi to Big Springs, Nebraska. At Big Springs, Interstate 76 is traveled west 186 mi to Arvada, Colorado. At Arvada, Interstate 70 is then taken southwest 502 mi to Cove Fort, Utah. At Cove Fort, Interstate 15 is driven 161 mi through northwest Arizona and to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Hanford Site (HS-1), Richland, Washington

The primary transportation route from the Hanford Site to the Nevada border consists of traveling 4 mi on LR-4S to Richland, Washington. At Richland, State Route 240 is driven west for 7 mi through Richland to Interstate 182. Interstate 182 is then traveled for 5 mi to West Richland, Washington, to Interstate 82. Interstate 82 is then driven from West Richland south for 41 mi to Hermiston, Oregon, to Interstate 84. Interstate 84 is driven 512 mi southeast through Idaho and into Tremonton, Utah, where Interstate 82 combines with Interstate 15. Interstate 15/82 is then traveled 39 mi south to Ogden, Utah, at which point Interstate 15 branches off from Interstate 84. At Ogden, Interstate 15 is taken south 27 mi to North Salt Lake, Utah. At North Salt Lake, Interstate 215 is driven 17 mi around Salt Lake City, Utah, to Midvale, Utah. At Midvale, Interstate 15 is traveled south for 331 mi into northwest Arizona and up to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Hanford Site (HS-2), Richland, Washington

One alternate transportation route from the Hanford Site to the Nevada border consists of traveling 4 mi on LR-4S to Richland, Washington. At Richland, State Route 240 is driven west for 7 mi through Richland to Interstate 182. Interstate 182 is driven 5 mi to West Richland, Washington, to Interstate 82. At West Richland, Interstate 82 is driven 41 mi to Hermiston, Oregon to Interstate 84. Interstate 84 is then driven 371 mi southeast to Twin Falls, Idaho. U.S. Highway 93 is traveled south 7 mi through Twin Falls to U.S. Highway 30/95. U.S. Highway 30/95 is driven for 5 mi west to Filer, Utah, to U.S. Highway 93. U.S. Highway 93 is then traveled 42 mi from Filer to the Nevada border. This route would likely continue on NV-3.

Generator: Idaho National Engineering Laboratory (INEL-1), Idaho Falls, Idaho

The primary transportation route from the Idaho National Engineering Laboratory to the Nevada border consists of traveling 1 mi on local roads through the Idaho National Engineering Laboratory to U.S. Highway 20/26. U.S. Highway 20/26 is then driven 4 mi to Atomic City, Idaho. U.S. Highway 26 is then driven southeast 36 mi to Blackfoot, Idaho, to Interstate 15. Interstate 15 is then traveled south 112 mi to Tremonton, Utah. At Tremonton, Interstate 15/84 is then taken 39 mi south to Ogden, Utah, at which point Interstate 15 branches off from Interstate 84. At Ogden, Interstate 15 is taken south 27 mi to North Salt Lake, Utah. At North Salt Lake, Interstate 215 is driven 17 mi around Salt Lake City, Utah, to Midvale, Utah. At Midvale, Interstate 15 is traveled south for 331 mi into northwest Arizona and up to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Idaho National Engineering Laboratory (INEL-2), Idaho Falls, Idaho

One alternate transportation route from the Idaho National Engineering Laboratory to the Nevada border consists of traveling 1 mi on local roads through the Idaho National Laboratory to U.S. Highway 20/26. U.S. Highway 20/26 is then driven 4 mi to Atomic City, Idaho. U.S. Highway 26 is then driven southeast 36 mi to Blackfoot, Idaho, to Interstate 15. At Blackfoot, Interstate 15 is driven 20 mi to Chubbuck, Idaho. At Chubbuck, Interstate 86 is driven 63 mi southwest to Raft River, Idaho. At Raft River, Interstate 84 is taken 49 mi to Twin Falls, Idaho, to U.S. Highway 93. U.S. Highway 93 is traveled south 7 mi through Twin Falls to U.S. Highway 30/95. U.S. Highway 30/95 is driven for 5 mi west to Filer, Utah, to U.S. Highway 93. U.S. Highway 93 is then traveled 42 mi from Filer to the Nevada border. This route would likely continue on NV-3.

Generator: Inhalation Toxicological Research Institute (ITRI-1), Albuquerque, New Mexico

The primary transportation route from the Inhalation Toxicological Research Institute to the Nevada border consists of traveling through Albuquerque, New Mexico for 11 mi on local roads to Interstate 40. Interstate 40 is then driven 474 mi west to Kingman, Arizona. At Kingman, U.S. Highway 93 is traveled 72 mi northwest to the Nevada border. This route would likely continue on NV-4 or NV-5.

Generator: Inhalation Toxicological Research Institute (ITRI-2), Albuquerque, New Mexico

One alternate transportation route from the Inhalation Toxicological Research Institute to the Nevada border consists of traveling through Albuquerque, New Mexico for 11 mi on local roads to Interstate 40. Interstate 40 is then driven 555 mi west through Arizona to Needles, California. At Needles, U.S. Highway 95 is traveled 23 mi northwest to the Nevada border. This route would likely continue on NV-6 or NV-7.

Generator: Inhalation Toxicological Research Institute Albuquerque (ITRI-3), New Mexico

One alternate transportation route from the Inhalation Toxicological Research Institute to the Nevada border consists of traveling through Albuquerque, New Mexico for 11 mi on local roads to Interstate 40. Interstate 40 is then driven 687 mi west through Arizona to Barstow, California. At Barstow, Interstate 15 is traveled 112 mi northwest to the Nevada border. This route would likely continue on NV-8 or NV-9.

Generator: Knolls Atomic Power Laboratory (KAPL-1), Schenectady, New York

The primary transportation route from the Knolls Atomic Power Laboratory to the Nevada border consists of traveling 4 mi on local roads to Schenectady, New York. State Route 7 is then taken about 2 mi to Interstate 890 in Schenectady. Interstate 890 is driven south from Schenectady for about 1 mi to Interstate 90, which is then driven west 266 mi to Buffalo, New York. Interstate 90 is then traveled for 9 mi south to Lackawanna, New York. At Lackawanna, Interstate 90 is continued 66 mi along the coast of Lake Erie southwest to Ripley, New York. At Ripley, Interstate 90 is again continued 106 mi to Willoughby Hills, Ohio. At Willoughby Hills, Interstate 271 is driven 14 mi to Bedford, Ohio. At Bedford, Interstate 480 is driven west through Cleveland 30 mi to North Ridgeville, Ohio. Interstate 80 is acquired in North Ridgeville and is traveled 8 mi to Elyria, Ohio. At Elyria, Interstate 80 combines with Interstate 90. Interstate 80/Interstate 90 is then taken 281 mi to Portage, Indiana, where Interstate 80 branches off from Interstate 90. At Portage, Interstate 80 is taken for approximately 1 mi to Lake Station, Indiana, at which point Interstate 80 combines with Interstate 94. Interstate 80/94 is then traveled 19 mi to Lansing, Illinois, where Interstate 94 branches off and Interstate 80 combines with Interstate 294. Interstate 80/294 is driven west for 5 mi to Homewood, Illinois. At Homewood, Interstate 80 branches off and is taken 146 mi to Green Rock, Illinois. At Green Rock, Interstate 74 is then traveled west for 9 mi to Quad City Airport, Moline, Illinois, where Interstate 280 is driven 18 mi around the southwest perimeter of Rock Island, Illinois, and Davenport, Illinois, until Interstate 80 is once again intercepted. At this point, Interstate 80 is driven west 153 mi into Des Moines, Iowa. At Des Moines, Interstate 80 combines with Interstate 35 and is taken 14 mi until Interstate 80 splits off from Interstate 80/35. Interstate 80 is driven 96 mi from Des Moines to Minden, Iowa. At Minden, Interstate 680 is driven 16 mi to Loveland, Iowa, where Interstate 680 combines with Interstate 29. At Loveland, Interstate 680/29 is traveled for 10 mi to Crescent, Iowa. At Crescent, Interstate 680 branches off from Interstate 29 and is traveled west 17 mi into Omaha, Nebraska. At Omaha, Interstate 80 is acquired and driven 343 mi to Big Springs, Nebraska. At Big Springs, Interstate 76 is traveled west 186 mi to Arvada, Colorado. At Arvada, Interstate 70 is then taken southwest 502 mi to Cove Fort, Utah. At Cove Fort, Interstate 15 is driven 161 mi through northwest Arizona and to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Los Alamos National Laboratory (LANL-1), Los Alamos, New Mexico

The primary transportation route from the Los Alamos National Laboratory to the Nevada border consists of traveling local roads to State Route 4 in Bandelier, New Mexico. At Bandelier, State Route 4 is driven 1 mi to State Route 502. State Route 502 is then traveled for 12 mi to Pojoaque, New Mexico, where U.S. Highway 285/84 is traveled 18 mi south into Santa Fe, New Mexico, to U.S. Highway 4. U.S. Highway 4 is driven 2 mi south to Interstate 25, which is then driven 56 mi south to Albuquerque, New Mexico. At Albuquerque, Interstate 40 is driven 468 mi to Kingman, Arizona. At Kingman, U.S. Highway 93 is traveled 72 mi northwest to the Nevada border. This route would likely continue on NV-4 or NV-5.

Generator: Los Alamos National Laboratory (LANL-2), Los Alamos, New Mexico

One alternate transportation route from the Los Alamos National Laboratory to the Nevada border consists of traveling local roads to State Route 4 in Bandelier, New Mexico. At Bandelier, State Route 4 is driven 1 mi to State Route 502. State Route 502 is then traveled for 12 mi to Pojoaque, New Mexico, where U.S. Highway 285/84 can be acquired. U.S. Highway 285/84 is then traveled 18 mi south into Santa Fe, New Mexico, where U.S. Highway 84 is driven 2 mi south to Interstate 25. Interstate 25 is then taken 56 mi south to Albuquerque, New Mexico. At Albuquerque, Interstate 40 is driven 549 mi across Arizona to Needles, California. At Needles, U.S. Highway 95 can be accessed and driven north for 23 mi to the Nevada border. This route would likely continue on NV-6 or NV-7.

Generator: Los Alamos National Laboratory (LANL-3), Los Alamos, New Mexico

One alternate transportation route from the Los Alamos National Laboratory to the Nevada border consists of traveling local roads to State Route 4 in Bandelier, New Mexico. At Bandelier, State Route 4 is driven 1 mi to State Route 502. State

Route 502 is then traveled for 12 mi to Pojoaque, New Mexico, where U.S. Highway 285/84 is traveled 18 mi south into Santa Fe, New Mexico. U.S. Highway 84 is driven 2 mi south to Interstate 25. Interstate 25 is then taken 56 mi south to Albuquerque, New Mexico. At Albuquerque, Interstate 40 is driven 681 mi across Arizona to Barstow, California. At Barstow, Interstate 15 can be accessed and driven north for 112 mi to the Nevada border. This route would likely continue on NV-8 or NV-9.

Generator: Lawrence Berkeley Laboratory (LBL-1), Berkeley, California

The primary transportation route from the Lawrence Berkeley Laboratory to the Nevada border consists of traveling 3 mi on local roads to Berkeley, California. At Berkeley, Interstate 580/80 is traveled 2 mi to Oakland, California where Interstate 580 splits off by itself. Interstate 580 is then driven 1 mi south to Interstate 980 in Piedmont, California. Interstate 980 is driven 2 mi to Oakland, California, to Interstate 880. Interstate 880 is then driven 11 mi southeast to San Leandro, California. At San Leandro, Interstate 238 is traveled for 2 mi to Castro Valley, California, where Interstate 580 is found. Interstate 580 is then taken 47 mi to Vernalis, California. At Vernalis, Interstate 5 is driven 291 mi south to San Fernando, California, where Interstate 210 is then driven 48 mi to Interstate 10 in Pomona, California. Interstate 10 is traveled 17 mi to Ontario, California, where Interstate 15 is accessed and driven 186 mi northeast to the Nevada border. This route would likely continue on NV-8 or NV-9.

Generator: Lawrence Berkeley Laboratory (LBL-2), Berkeley, California

One alternate transportation route from the Lawrence Berkeley Laboratory to the Nevada border consists of traveling 3 mi on local roads to Berkeley, California. At Berkeley, Interstate 580/80 is traveled 2 mi to Oakland, California, where Interstate 580 splits off. Interstate 580 is then driven 1 mi south to Interstate 980 in Piedmont, California. Interstate 980 is driven 2 mi to Oakland, California, to Interstate 880. Interstate 880 is then driven 11 mi southeast to San Leandro, California. At San Leandro, Interstate 238 is traveled for 2 mi to Castro Valley, California, where Interstate 580 is found. Interstate 580 is then taken 47 mi to Vernalis, California. At Vernalis, Interstate 5 is driven 291 mi south to San Fernando, California, where Interstate 210 can be acquired. Interstate 210 is taken 48 mi east to Pomona, California to the Interstate 10. Interstate 10 is then traveled 17 mi to Ontario, California, where Interstate 15 can then be driven 137 mi northeast to Baker, California. At Baker, State Route 127 can be taken 56 mi to Shoshone, California, where State Route 127 combines with State Route 373. State Route 127/373 is driven 34 mi north to the Nevada border. This route would likely continue on NV-10.

Generator: Lawrence Livermore National Laboratory (LLNL-1), Livermore, California

The primary transportation route from the Lawrence Livermore National Laboratory to the Nevada border consists of traveling approximately 3 mi on local roads to Altamont, California. At Altamont, Interstate 580 is accessed and driven south 24 mi to Vernalis, California, to Interstate 5. Interstate 5 is then traveled south 291 mi to San Fernando, California, to Interstate 210. Interstate 210 is then taken 48 mi east to Pomona, California. At Pomona, Interstate 10 is driven 17 mi east to Ontario, California, to Interstate 15. Interstate 15 is then traveled 186 mi northeast from Ontario to the Nevada border. This route would likely continue on NV-8 or NV-9.

Generator: Lawrence Livermore National Laboratory (LLNL-2), Livermore, California

One alternate transportation route from the Lawrence Livermore National Laboratory to the Nevada border consists of traveling approximately 3 mi on local roads to Altamont, California. At Altamont, Interstate 580 is accessed and driven south 24 mi to Vernalis, California, to Interstate 5. Interstate 5 is then traveled south 291 mi to San Fernando, California, to Interstate 210.

Interstate 210 is then taken 48 mi east to Pomona, California. At Pomona, Interstate 10 is driven 17 mi east to Ontario, California, to Interstate 15. Interstate 15 is then taken 137 mi northeast to Baker, California. At Baker, State Route 127 is driven north for 56 mi to Shoshone, California. At Shoshone, State Route 127 combines with State Route 373 and is traveled 34 mi north to the Nevada border. This route would likely continue on NV-10.

Generator: Mound Plant (Mound-1), Miamisburg, Ohio

The primary transportation route from the Mound Facility to the Nevada border consists of traveling 1 mi on local roads to Miamisburg, Ohio, to State Route 725. State Route 275 is then traveled for 3 mi through Miamisburg, to Interstate 75. Interstate 75 is then accessed and driven 18 mi through Dayton, Ohio, to Vandalia, Ohio. At Vandalia, Interstate 70 is driven west 101 mi to Indianapolis, Indiana. At Indianapolis, Interstate 465 is taken past Interstate 74 for about 20 mi until it intersects with Interstate 70. Interstate 70 is then traveled west 131 mi into Teutopolis, Illinois. At Teutopolis, Interstate 70 becomes Interstate 57 and is driven approximately 6 mi to Interstate 70, located in Effingham, Illinois. Interstate 70 is then traveled 77 mi west into Edwardsville, Illinois. At Edwardsville, Interstate 270 is traveled 30 mi into St. Louis, Missouri. At St. Louis, Interstate 70 is again taken west 224 mi to Kansas City, Missouri. At Kansas City, Missouri, Interstate 435 is driven 31 mi west into Kansas City, Kansas. At Kansas City, Kansas, Interstate 70 is taken approximately 4 mi west to Bonner Springs, Kansas. At Bonner Springs, Interstate 70 is continued 42 mi west to Topeka, Kansas. At this point, Interstate 470 is traveled for 12 mi around the Topeka city limits until Interstate 470 intersects with Interstate 70. Interstate 70 is then driven for 1,037 mi west through Colorado and into Cove Fort, Utah. At Cove Fort, Interstate 15 is driven southwest 161 mi through northwest Arizona and to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Oak Ridge Reservation (ORISE-1), Oak Ridge, Tennessee

The primary transportation route from the Oak Ridge Reservation to the Nevada border consists of traveling from Oak Ridge, Tennessee, 7 mi on State Route 62 to Solway, Tennessee. At Solway, State Route 162 is traveled 6 mi east to Knoxville, Tennessee. At Knoxville, Interstate 40/75 is accessed and driven 10 mi west to Farragut, Tennessee, where Interstate 40 splits off from Interstate 75. Interstate 40 is then traveled 156 mi west to Nashville, Tennessee. At Nashville, Interstate 24 is taken south for 1 mi to Interstate 440 where it is driven west 7 mi to Interstate 40. Interstate 40 is then driven from Nashville west for another 215 mi to West Memphis, Tennessee. At West Memphis, Interstate 40 combines with Interstate 55 for 3 mi when Interstate 40 once again splits off. Interstate 40 is then taken west for 443 mi through Arkansas and into Oklahoma City, Oklahoma. At Oklahoma City, Interstate 240 is driven for 17 mi west around Oklahoma City to Interstate 44. Interstate 44 is then traveled north for 5 mi to Interstate 40. Interstate 40 is again accessed and traveled west 1,004 mi through the Texas Panhandle, through New Mexico, and into Kingman, Arizona. At Kingman, U.S. Highway 93 can then be taken northwest 72 mi to the Nevada border. This route would likely continue on NV-4 or NV-5.

Generator: Oak Ridge Reservation (ORISE-2), Oak Ridge, Tennessee

One alternate transportation route from the Oak Ridge Reservation to the Nevada border consists of traveling from Oak Ridge, Tennessee, 7 mi on State Route 62 to Solway, Tennessee. At Solway, State Route 162 is traveled 6 mi east to Knoxville, Tennessee.At Knoxville, Interstate 40/75 is accessed and driven 10 mi west to Farragut, Tennessee, where Interstate 40 splits off from Interstate 75. Interstate 40 is then traveled 156 mi west to Nashville, Tennessee. At Nashville, Interstate 24 is taken south for 1 mi to Interstate 440 where it is driven west 7 mi to Interstate 40. Interstate 40 is then driven from

Nashville west for another 215 mi to West Memphis, Tennessee. At West Memphis, Interstate 40 combines with Interstate 55 for 3 mi when Interstate 40 once again splits off. Interstate 40 is then traveled west for 443 mi through Arkansas and into Oklahoma City, Oklahoma. At Oklahoma City, Interstate 240 is obtained and driven for 17 mi west around Oklahoma City to Interstate 44. Interstate 44 is then traveled north for 5 mi to Interstate 40. Interstate 40 is again accessed and traveled west 1,085 mi through the Texas Panhandle, New Mexico, Arizona, and into Needles, California. At Needles, U.S. Highway 95 can then be taken north 72 mi to the Nevada border. This route would likely continue on NV-6 or NV-7.

Generator: Oak Ridge Reservation (ORISE-3), Oak Ridge, Tennessee

One alternate transportation route from the Oak Ridge Reservation to the Nevada border consists of traveling from Oak Ridge, Tennessee, 7 mi on State Route 62 to Solway, Tennessee. At Solway, State Route 162 is traveled 6 mi east to Knoxville, Tennessee. At Knoxville, Interstate 40/75 is accessed and driven 10 mi west to Farragut, Tennessee, where Interstate 40 splits off from Interstate 75. Interstate 40 is then traveled 156 mi west to Nashville, Tennessee. At Nashville, Interstate 24 is taken south for 1 mi to Interstate 440 where it is driven west 7 mi to Interstate 40. Interstate 40 is then driven from Nashville west for another 215 mi to West Memphis, Tennessee. At West Memphis, Interstate 40 combines with Interstate 55 for 3 mi when Interstate 40 once again splits off. Interstate 40 is then traveled west for 443 mi through Arkansas and into Oklahoma City, Oklahoma. At Oklahoma City, Interstate 240 is driven for 17 mi west around Oklahoma City to Interstate 44. Interstate 44 is then traveled north for 5 mi to Interstate 40. Interstate 40 is again acquired and traveled west 1,217 mi through the Texas Panhandle, New Mexico, Arizona, and into Barstow, California. At Barstow, Interstate 15 is taken north 112 mi to the Nevada border. This route would likely continue on NV-8 or NV-9.

Generator: Paducah Gaseous Diffusion Plant (PGDP-1), Paducah, Kentucky

The primary transportation route from the Paducah Gaseous Diffusion Plant to the Nevada border consists of traveling 3 mi on local roads to Kevil, Kentucky. At Kevil, U.S. Highway 60 is traveled east 8 mi to Paducah, Kentucky. At Paducah, Interstate 24 is driven 44 mi north to Pulleys Mill, Illinois, where Interstate 57 can be found. Interstate 57 is then traveled for 48 mi north to Mt. Vernon, Illinois, at which point Interstate 57 and Interstate 64 combine. Interstate 57/64 are driven 5 mi north to Mt. Vernon where Interstate 64 branches off from Interstate 57. Interstate 64 is then driven 67 mi west to Washington Park, Illinois. Interstate 255 is obtained in Washington Park and is driven 11 mi to Edwardsville, Illinois. At Edwardsville, Interstate 270 is taken 22 mi west to St. Louis, Missouri. At St. Louis, Interstate 70 is taken west 224 mi to Kansas City, Missouri. At Kansas City, Missouri, Interstate 435 is driven 31 mi west into Kansas City, Kansas. At Kansas City, Kansas, Interstate 70 is taken approximately 46 mi west to Topeka, Kansas. At this point, Interstate 470 is traveled for 12 mi around the Topeka city limits until Interstate 470 intersects with Interstate 70. Interstate 70 is then driven for 1,037 mi west through Colorado and into Cove Fort, Utah. At Cove Fort, Interstate 15 is driven southwest 161 mi through northwest Arizona and to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Pantex Plant (Pantex-1), Amarillo, Texas

The primary transportation route from the Pantex Plant to the Nevada border consists of traveling south 4 mi on FR-683 to Pantex, Texas. At Pantex, U.S. Highway 60 is then taken west 7 mi to Amarillo, Texas. At Amarillo, LR-335 is driven west 22 mi around Amarillo to Interstate 40. Interstate 40 is then driven 745 mi west through New Mexico to Kingman, Arizona. At Kingman, U.S. Highway 93 is driven northwest 72 mi to the Nevada border. This route would likely continue on NV-4 or NV-5.

Generator: Pantex Plant (Pantex-2), Amarillo, Texas

One alternate transportation route from the Pantex Plant to the Nevada border consists of traveling south 4 mi on FR-683 to Pantex, Texas. At Pantex, U.S. Highway 60 is then taken west 7 mi to Amarillo, Texas. At Amarillo, LR-335 is driven west 22 mi around Amarillo to Interstate 40. Interstate 40 is then picked up in Amarillo and driven 826 mi west through New Mexico and Arizona to Needles, California. At Needles, U.S. Highway 95 is driven north 23 mi to the Nevada border. This route would likely continue on NV-6 or NV-7.

Generator: Pantex Plant (Pantex-3), Amarillo, Texas

One alternate transportation route from the Pantex Plant to the Nevada border consists of traveling south 4 mi on FR-683 to Pantex, Texas. At Pantex, U.S. Highway 60 is then taken west 7 mi to Amarillo, Texas. At Amarillo, LR-335 is driven west 22 mi around Amarillo to Interstate 40. Interstate 40 is then taken from Amarillo and driven 958 mi west through New Mexico and Arizona to Barstow, California. At Barstow, Interstate 15 is driven north 112 mi to the Nevada border. This route would likely continue on NV-8 or NV-9.

Generator: Portsmouth Gaseous Diffusion Plant (PORTS-1), Portsmouth, Ohio

The primary transportation route from the Portsmouth Gaseous Diffusion Plant to the Nevada border consists of traveling 25 mi north on U.S. Highway 23 to Chillicothe, Ohio. At Chillicothe, U.S. Highway 23 and U.S. Highway 35 combine, and U.S. Highway 23/35 is driven 2 mi until U.S. Highway 23 splits off. U.S. Highway 23 is then taken 37 mi north to Shadeville, Ohio. At Shadeville, Interstate 270 is traveled 11 mi to Columbus, Ohio. At Columbus, Interstate 70 is then taken west for 160 mi to Indianapolis, Indiana. At Indianapolis, Interstate 465 is driven south around Indianapolis for about 20 mi until it intersects with Interstate 70. Interstate 70 is then traveled west 131 mi into Teutopolis, Illinois. At Teutopolis, Interstate 70 becomes Interstate 57 and is driven approximately 6 mi to Interstate 70, located in Effingham, Illinois. Interstate 70 is then traveled 77 mi west into Edwardsville, Illinois. At Edwardsville, Interstate 270 is traveled 30 mi into St. Louis, Missouri. At St. Louis, Interstate 70 is taken west 224 mi to Kansas City, Missouri. At Kansas City, Missouri, Interstate 435 is driven 31 mi west into Kansas City, Kansas. At Kansas City, Kansas, Interstate 70 is taken approximately 46 mi west to Topeka, Kansas. Interstate 470 is traveled for 12 mi around the Topeka city limits. At this point, Interstate 470 intersects with Interstate 70 and is driven for 1,037 mi west through Colorado and into Cove Fort, Utah. At Cove Fort, Interstate 15 is driven southwest 161 mi through northwest Arizona and to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Princeton Plasma Physics Laboratory (PPPL-1), Princeton, New Jersey

The primary transportation route from the Princeton Plasma Physics Laboratory to the Nevada border consists of traveling from the Princeton Laboratory on U.S. Highway 1 for 7 mi to Bakersville, New Jersey. At Bakersville, Interstate 295 is traveled 9 mi to White Horse, New Jersey. At White Horse, Interstate 195 is driven 1 mi to Bordentown, New Jersey. At Bordentown, U.S. Highway 206 is taken south for 2 mi to the point U.S. Highway 130 and U.S. Highway 206 come together. U.S. Highway 130/ U.S. Highway 206 is then traveled 1 mi through Bordentown to where U.S. Highway 206 splits off from U.S. Highway 130. U.S. Highway 206 is then taken 1 mi to Mansfield Square, New Jersey. At Mansfield Square, U.S. Highway 206 is driven 2 mi to Hedding, New Jersey, where Interstate 276 can be found. Interstate 276 is then driven 4 mi to Florence, New Jersey at the New Jersey-Pennsylvania border, and on for 3 mi west to Bristol, Pennsylvania. At Bristol, Interstate 276 is then driven for 31 mi to Valley Forge, Pennsylvania, where Interstate 276 turns into Interstate 76. Interstate 76 is then traveled 166 mi to Breezewood, Pennsylvania. At Breezewood, Interstate 70 and Interstate 76 combine, and Interstate 70/76 is traveled 87 mi to New Stanton, Pennsylvania. At New Stanton, Interstate 70 splits from Interstate 76 and is driven for 38 mi to Laboratory, Pennsylvania. At Laboratory, Interstate 70 and Interstate 79 combine and the road is traveled for 5 mi into Washington, Pennsylvania. At Washington, Interstate 70 splits off from Interstate 79 and is taken west 27 mi to Interstate 470 in Wheeling, West Virginia. Interstate 470 is then traveled to the south of Wheeling for 11 mi. Interstate 70 is once again picked up in St. Clairsville, Ohio. Interstate 70 is then taken from St. Clairsville to Columbus, Ohio, which is 111 mi away. At the city limits of Columbus, Interstate 270 is taken north 21 mi until it intersects with Interstate 70. Interstate 70 is then taken west 160 mi to Indianapolis, Indiana. At Indianapolis, Interstate 465 is driven south for about 19 mi until it intersects with Interstate 70. Interstate 70 is then taken west 131 mi into Teutopolis, Illinois. At Teutopolis, Interstate 70 becomes Interstate 57 and is driven approximately 6 mi to Interstate 70, located in Effingham, Illinois. Interstate 70 is then traveled 77 mi west into Edwardsville, Illinois. At Edwardsville, Interstate 270 is obtained and traveled 30 mi into St. Louis, Missouri. At St. Louis, Interstate 70 is taken west 224 mi to Kansas City, Missouri. At Kansas City, Missouri, Interstate 435 is driven 31 mi west into Kansas City, Kansas. At Kansas City, Kansas, Interstate 70 is taken approximately 46 mi west to Topeka, Kansas. Interstate 470 is taken for 12 mi around the Topeka city limits. At this point, Interstate 470 intersects with Interstate 70 and Interstate 70 is driven for 1,037 mi west through Colorado and into Cove Fort, Utah. At Cove Fort, Interstate 15 is driven southwest 161 mi through northwest Arizona and to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Rocketdyne Division (RD-1), Canoga Park, California (also identified as Energy Technology Engineering Center)

The primary transportation route from the Rocketdyne Division to the Nevada border consists of traveling north 3 mi on State Route 27 to Woodland Hills, California. At Woodland Hills, U.S. Highway 101 is driven 13 mi east to North Hollywood, California. At North Hollywood, State Route 134 is driven 13 mi to Pasadena, California. At Pasadena, Interstate 210 is driven 23 mi to Pomona, California, to Interstate 10. Interstate 10 is then traveled 17 mi east into Ontario, California. At Ontario, Interstate 15 is taken 186 mi northeast to the Nevada border. This route would likely continue on NV-8 or NV-9.

Generator: Rocketdyne Division (RD-2), Canoga Park, California (also identified as Energy Technology Engineering Center)

One alternate transportation route from the Rocketdyne Division to the Nevada border consists of traveling north 3 mi on State Route 27 to Woodland Hills, California. At Woodland Hills, U.S. Highway 101 is taken 13 mi east to North Hollywood, California. At North Hollywood, State Route 134 is driven 13 mi to Pasadena, California, at which point Interstate 210 is driven 23 mi to Pomona, California, to Interstate 10. Interstate 10 is then traveled 17 mi east into Ontario, California. At Ontario, Interstate 15 is driven northeast 137 mi to Baker, California. At Baker, State Route 127 is taken north 56 mi to Shoshone. State Route 127/373 is then traveled 34 mi north to the Nevada border. This route would likely continue on NV-10.

Generator: Rocky Flats Plant (RFP-1), Golden, Colorado

The primary transportation route from the Rocky Flats Plant to the Nevada border consists of traveling 2 mi on local roads to Rocky Flats. At Rocky Flats, State Route 93 is traveled 3 mi to Marshall, Colorado. At Marshall, State Route 128 is then traveled 8 mi to Broomfield, Colorado. At Broomfield, U.S. Highway 36 is driven 9 mi to Thornton, Colorado. Interstate 25 is then traveled 1 mi to Interstate 76 in Commerce City. Interstate 76 is taken 5 mi through Denver, Colorado, to Interstate 70. Interstate 70 is then traveled 502 mi to Cove Fort, Utah. At Cove Fort, Interstate 15 is then taken 161 mi across northwest Arizona and to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Reactive Metals, Inc., (RMI-1), Ashtabula, Ohio

The primary transportation route from the Reactive Metals, Inc., to the Nevada border consists of traveling 3 mi on State Route 11 to Ashtabula, Ohio. In Ashtabula, Interstate 90 is traveled southwest 42 mi to Willoughby Hills, Ohio. At Willoughby, Interstate 271 is driven 14 mi to Bedford, Ohio. At Bedford, Interstate 271 and Interstate 480 combine and are driven 4 mi south to Northfield, Ohio. At Northfield, Interstate 271 splits off from Interstate 480 and is traveled 21 mi to Weymouth, Ohio. At Weymouth, Interstate 71 is driven 12 mi north to Strongsville, Ohio. Interstate 80 is then driven west for 17 mi to Elyria, Ohio. At Elyria, Interstate 80 combines with Interstate 90 and Interstate 80/90 is traveled 281 mi to Portage, Indiana, where Interstate 80 branches off from Interstate 90. At Portage, Interstate 80 is taken for approximately 1 mi to Lake Station, Indiana, at which point Interstate 80 combines with Interstate 94. Interstate 80/94 is then traveled 19 mi to Lansing, Illinois, where Interstate 94 branches off and Interstate 80 combines with Interstate 294. Interstate 80/294 is driven west for 5 mi to Homewood, Illinois. At Homewood, Interstate 80 branches off and is taken 146 mi to Green Rock, Illinois. At Green Rock, Interstate 74 is then traveled west for 9 mi to Quad City Airport, Moline, Illinois, and Interstate 280. Interstate 280 is driven 18 mi around the southwest perimeter of Rock Island, Illinois, and Davenport, Illinois. At this point, Interstate 80 is driven west 153 mi into Des Moines, Iowa. At Des Moines, Interstate 80 combines with Interstate 35 and is taken 14 mi until Interstate 80 splits off from Interstate 80/35. Interstate 80 is taken 96 mi from Des Moines to Minden, Iowa. At Minden, Interstate 680 is driven 16 mi to Loveland, Iowa, where Interstate 680 combines with Interstate 29. At Loveland, Interstate 680/29 is traveled for 10 mi to Crescent, Iowa. At Crescent, Interstate 680 branches off from Interstate 29 and Interstate 680 is traveled west 17 mi into Omaha, Nebraska. At Omaha, Interstate 80 is driven 343 mi to Big Springs, Nebraska. At Big Springs, Interstate 76 is traveled west 186 mi to Arvada, Colorado. At Arvada, Interstate 70 is then taken southwest 502 mi to Cove Fort, Utah. At Cove Fort, Interstate 15 is driven 161 mi through northwest Arizona to the Nevada border. This route would likely continue on NV-1 or NV-2.

Generator: Stanford Linear Accelerator Center (SLAC-1), Palo Alto, California

The primary transportation route from the Stanford Linear Accelerator Center to the Nevada border consists of traveling on Interstate 280 for 22 mi to San Jose, California. At San Jose, Interstate 680 is taken north to Dublin, California. At Dublin, Interstate 580 is driven east 37 mi to Vernalis, California, to Interstate 5. Interstate 5 is then traveled south 291 mi to San Fernando, California, to Interstate 210. Interstate 210 is then taken 48 mi east to Pomona, California. At Pomona, Interstate 10 is driven 17 mi east to Ontario, California, to Interstate 15. Interstate 15 is then traveled 186 mi northeast from Ontario to the Nevada border. This route would likely continue on NV-8 or NV-9.

Generator: Stanford Linear Accelerator Center (SLAC-2), Palo Alto, California

One alternate transportation route from the Stanford Linear Accelerator Center to the Nevada border consists of traveling on Interstate 280 for 22 mi to San Jose, California. At San Jose, Interstate 680 is taken north to Dublin, California. At Dublin, Interstate 580 is driven east 37 mi to Vernalis, California. Interstate 5 is then traveled south 291 mi to San Fernando, California. Interstate 210 is then taken 48 mi east to Pomona, California. At Pomona, Interstate 10 is driven 17 mi east to Ontario, California, to Interstate 15. Interstate 15 is then taken 137 mi northeast to Baker, California. At Baker, State Route 127 is driven north for 56 mi to Shoshone, California. At Shoshone, State Route 127 combines with State Route 373 and is traveled 34 mi north to the Nevada border. This route would likely continue on NV-10.

Generator: Sandia National Laboratories (SNLA-1), Albuquerque, New Mexico

The primary transportation route from Sandia National Laboratories, Albuquerque to the Nevada border consists of traveling 3 mi on local roads to Albuquerque, New Mexico. At Albuquerque, Interstate 40 is taken west for 474 mi to Kingman, Arizona. At Kingman, U.S. Highway 93 is taken north for 72 mi to the Nevada border. This route would likely continue on NV-4 or NV-5.

Generator: Sandia National Laboratories (SNLA-2), Albuquerque, New Mexico

One alternate transportation route from Sandia National Laboratories, Albuquerque, to the Nevada border consists of traveling 3 mi on local roads to Albuquerque, New Mexico. At Albuquerque, Interstate 40 is traveled west 555 mi to Needles, California. At Needles, U.S. Highway 95 is taken north for 23 mi to the Nevada border. This route would likely continue on NV-6 or NV-7.

Generator: Sandia National Laboratories (SNLA-3), Albuquerque, New Mexico

One alternate transportation route from Sandia National Laboratories, Albuquerque, to the Nevada border consists of traveling 3 mi on local roads to Albuquerque, New Mexico where Interstate 40 is accessed and traveled west 687 mi to Barstow, California. At Barstow, Interstate 15 is taken north for 112 mi up to the Nevada border. This route would likely continue on NV-8 or NV-9.

Generator: Sandia National Laboratories, Livermore (SNLL-1), Livermore, California

The primary transportation route from Sandia National Laboratories, Livermore to the Nevada border consists of traveling 2 mi on local roads to Livermore Valley, California. At Livermore Valley, Interstate 580 is driven 25 mi to Vernalis, California. Interstate 5 is then traveled south 291 mi to San Fernando, California. Interstate 210 is then taken 48 mi east to Pomona, California. At Pomona, Interstate 10 is driven 17 mi east to Ontario, California, to Interstate 15. Interstate 15 is then traveled 186 mi northeast from Ontario to the Nevada border. This route would likely continue on NV-8 or NV-9.

Generator: Sandia National Laboratories, Livermore (SNLL-2), Livermore, California

One alternate transportation route from Sandia National Laboratories, Livermore, to the Nevada border consists of traveling 2 mi on local roads to Livermore Valley, California. At Livermore Valley, Interstate 580 is driven 25 mi to Vernalis, California. Interstate 5 is then traveled south 291 mi to San Fernando, California. Interstate 210 is then taken 48 mi east to Pomona, California. At Pomona, Interstate 10 is driven 17 mi east to Ontario, California, to Interstate 15. Interstate 15 is then taken 137 mi northeast to Baker, California. At Baker, State Route 127 is driven north for 56 mi to Shoshone, California. At Shoshone, State Route 127 combines with State Route 373 and is traveled 34 mi north to the Nevada border. This route would likely continue on NV-10.

Generator: Savannah River Site (SRS-1), Aiken, South Carolina

The primary transportation route from the Savannah River Site to the Nevada border consists of traveling 4 mi on local roads to New Ellenton, South Carolina. At New Ellenton, State Route 19 is then taken 12 mi north to Aiken, South Carolina. At Aiken, State Route 19 is driven 6 mi north to Interstate 20. Interstate 20 is traveled west 155 mi to Atlanta, Georgia. At Atlanta, Interstate 285 is traveled 26 mi around the southern part of Atlanta to Interstate 75. Interstate 75 is then traveled 93 mi northwest to East Ridge, Tennessee. At East Ridge, Interstate 24 is taken 133 mi northwest to Nashville, Tennessee. At Nashville, Interstate 24 is taken south for 1 mi to Interstate 440 where it is driven west 7 mi to Interstate 40. Interstate 40 is then driven from Nashville west for 658 mi into Oklahoma City, Oklahoma. At Oklahoma City, Interstate 240 is taken for 17 mi west around Oklahoma City to Interstate 44. Interstate 44 is then traveled north for 5 mi to Interstate 40. Interstate 40 is traveled west 1,004 mi through the Texas Panhandle, through New Mexico, and into Kingman, Arizona. At Kingman, U.S. Highway 93 is taken northwest 72 mi to the Nevada border. This route would likely continue on NV-4 or NV-5.

Generator: Savannah River Site (SRS-2), Aiken, South Carolina

One alternate transportation route from the

Savannah River Site to the Nevada border consists of traveling 4 mi on local roads to New Ellenton, South Carolina. At New Ellenton, State Route 19 is then taken 12 mi north to Aiken, South Carolina. At Aiken, State Route 19 is driven 6 mi north to Interstate 20. Interstate 20 is traveled west 155 mi to Atlanta, Georgia. At Atlanta, Interstate 285 is traveled 26 mi around the southern part of Atlanta to Interstate 75. Interstate 75 is then traveled 93 mi northwest to East Ridge, Tennessee. At East Ridge, Interstate 24 is taken 133 mi northwest to Nashville, Tennessee. At Nashville, Interstate 24 is taken south for 1 mi to Interstate 440 is then driven west 7 mi to Interstate 40. Interstate 40 is taken from Nashville west for 658 mi into Oklahoma City, Oklahoma. At Oklahoma City, Interstate 240 is driven for 17 mi west around Oklahoma City to Interstate 44. Interstate 44 is then traveled north for 5 mi to Interstate 40. Interstate 40 is traveled west 1,085 mi through the Texas Panhandle, New Mexico, and Arizona into Needles, California. At Needles, U.S. Highway 95 can then be taken north 23 mi to the Nevada border. This route would likely continue on NV-6 or NV-7.

Generator: Savannah River Site (SRS-3), Aiken, South Carolina

One alternate transportation route from the Savannah River Site to the Nevada border consists of traveling 3 mi on local roads to Jackson, South Carolina. At Jackson, State Route 125 is then taken 10 mi north to Beech Island, South Carolina. At Beech Island, State Route 28 is driven 11 mi north to Interstate 20. Interstate 20 is traveled west 135 mi to Atlanta, Georgia. At Atlanta, Interstate 285 is traveled 26 mi around the southern part of Atlanta to Interstate 75. Interstate 75 is then traveled 93 mi northwest to East Ridge, Tennessee. At East Ridge, Interstate 24 is taken 133 mi northwest to Nashville, Tennessee. At Nashville, Interstate 24 is taken south for 1 mi to Interstate 440 where it is driven west 7 mi to Interstate 40. Interstate 40 is then driven from Nashville west for 658 mi into Oklahoma City, Oklahoma. At Oklahoma City, Interstate 240 is driven for 17 mi west around Oklahoma City to Interstate 44. Interstate 44 is then traveled north for 5 mi to Interstate 40. Interstate 40 is taken west 1,217 mi through the Texas Panhandle, New Mexico, and Arizona into Barstow, California. At Barstow, Interstate 15 can then be taken north 112 mi up to the Nevada border. This route would likely continue on NV-8 or NV-9.

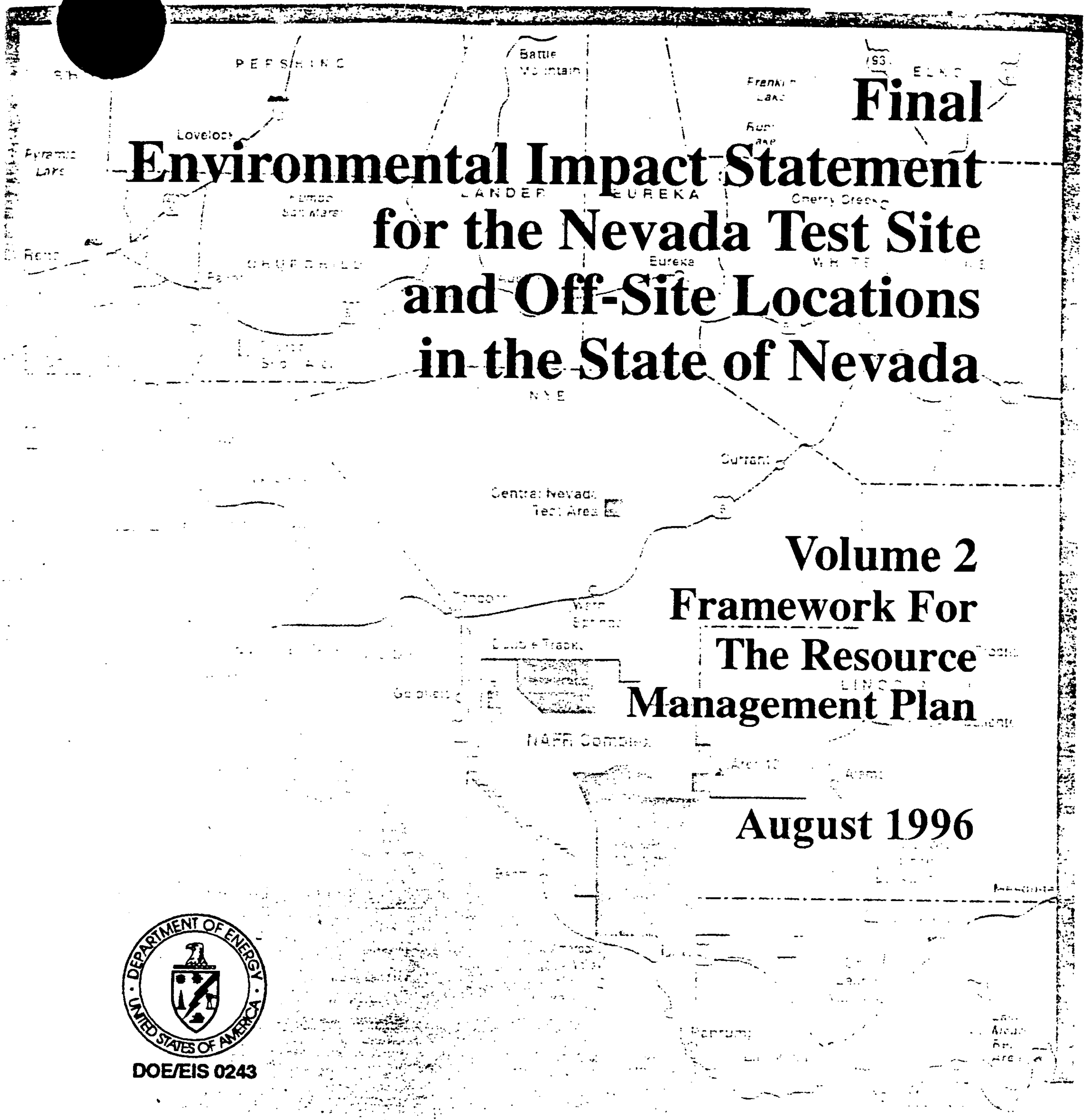
Generator: West Valley Demonstration Project (WVDP-1), West Valley, New York

The primary transportation route from the West Valley Demonstration Project to the Nevada border consists of traveling 2 mi on CR-85 to Springville, New York. At Springville, U.S. Highway 219 is traveled north 17 mi to North Boston, New York, to State Route 391. State Route 391 is driven 4 mi to Hamburg, New York. At Hamburg, State Route 75 is driven 2 mi to Interstate 90. Interstate 90 is taken 165 mi to Willoughby Hills, Ohio. At Willoughby Hills, Interstate 271 is driven 14 mi to Bedford, Ohio. At Bedford, Interstate 271 and Interstate 480 combine and is driven 4 mi south to Northfield, Ohio. At Northfield, Interstate 271 splits off from Interstate 480 and is traveled 21 mi to Weymouth, Ohio. At Weymouth, Interstate 71 is driven 12 mi north to Strongsville, Ohio. Interstate 80 is then driven west for 17 mi to Elyria, Ohio. At Elyria, Interstate 80 combines with Interstate 90 and Interstate 80/90 is traveled 281 mi to Portage, Indiana, where Interstate 80 branches off from Interstate 90. At Portage, Interstate 80 is taken for approximately 1 mi to Lake Station, Indiana, at which point Interstate 80 combines with Interstate 94. Interstate 80/Interstate 94 is then traveled 19 mi to Lansing, Illinois, where Interstate 94 branches off and Interstate 80 combines with Interstate 294. Interstate 80/294 is driven west for 5 mi to Homewood, Illinois. At Homewood, Interstate 80 branches off and is taken 146 mi to Green Rock, Illinois. At Green Rock, Interstate 74 is then traveled west for 9.0 mi to Quad City Airport, Moline, Illinois. Interstate 280 is driven 18 mi around the southwest perimeter of Rock Island, Illinois and Davenport, Illinois. At this point, Interstate 80 is driven west 153 mi into Des Moines, Iowa. At Des Moines, Interstate 80 combines with Interstate 35 and is taken 14 mi until Interstate 80 splits off from Interstate 80/35. Interstate 80 is driven 96 mi from Des Moines to Minden, Iowa. At Minden, Interstate 680 is driven 160 mi to Loveland, Iowa, where Interstate 680 combines with Interstate 29. At Loveland, Interstate 680/29 is traveled for 10 mi to Crescent, Iowa. At Crescent, Interstate 680 branches off from Interstate 29 and is traveled west 17 mi into Omaha, Nebraska. At Omaha, Interstate 80 is driven 343 mi to Big Springs, Nebraska. At Big Springs, Interstate 76 is traveled west 186 mi to Arvada, Colorado. At Arvada, Interstate 70 is then taken southwest 502 mi to Cove Fort, Utah. At Cove Fort, Interstate 15 is driven 161 mi through northwest Arizona and to the Nevada border. This route would likely continue on NV-1 or NV-2.

*U.S. GOVERNMENT PRINTING OFFICE: 1996-785-718

MOL.20010727.0191

Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada



Volume 2

Framework For The Resource Management Plan

August 1996

DOE/EIS 0243

United States Department of Energy
Nevada Operations Office
Las Vegas, Nevada

Final
Environmental Impact Statement

for
the Nevada Test Site and Off-Site Locations
in the State of Nevada

Volume 2

U.S. Department of Energy
Nevada Operations Office
Las Vegas, Nevada

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

List of Figures

List of Tables

List of Plates
(See Chapter 6)

List of Acronyms and Abbreviations

DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy, Nevada Operations Office
EIS	Environmental Impact Statement
km^2	square kilometer
mi^2	square mile
NTS	Nevada Test Site
RMP	Resource Management Plan

This Page Intentionally Left Blank

CHAPTER 1
INTRODUCTION

1.1 Purpose

The purpose of this document is to publicize how the U.S. Department of Energy Nevada Operations Office (DOE/NV) proposes to develop and use a *Resource Management Plan* for the Nevada Test Site (NTS) so the public could comment on and assist in the following activities:

- Developing the methods for creating and using the plan
- Identifying the values people place on manmade and natural resources found on the NTS
- Developing the goals the DOE/NV will use to guide the conservation and use of those resources
- Identifying the management actions needed to meet constraints and resource management goals
- Incorporating the principles of ecosystem management into land and resource management on the NTS.

This framework for the *Resource Management Plan* was developed in conjunction with the Environmental Impact Statement for the Nevada Test Site and off-site locations in the state of Nevada (NTS EIS) to take advantage of the extensive data collection and public participation activities associated with the National Environmental Policy Act. After public input was received during the comment period for the Draft NTS EIS, DOE/NV revised this description of the *Resource Management Plan* and published it with the NTS Final EIS. This revision includes the goals DOE/NV has developed for managing resources and land-use constraints. It also includes the final plans for developing the *Resource Management Plan*. These plans will guide DOE/NV as it develops a *Resource Management Plan* in the coming years.

1.2 Background

For over 40 years, the NTS has been used primarily to test nuclear weapons. Because of recent commitments by the United States government to impose a moratorium on future tests of nuclear weapons, there are now opportunities to use the NTS for other purposes. This site has numerous resources, including 3,496 square kilometers (km^2) (1,350 square miles [mi^2]) of land, a well-developed infrastructure, a skilled workforce, and a well-studied cultural, physical, and biotic environment. These resources make the NTS attractive for many new projects designed to support the missions of the U.S. Department of Energy (DOE) and other agencies, and to stimulate the economy of the region.

Yet, even at a remote facility the size of the NTS, there are constraints on the number and type of new projects that can be developed. For example, most NTS areas are safe, but some land on the NTS is unsafe for most future uses because of land subsidence or radiation contamination caused by past nuclear weapons tests or waste disposal activities. Some areas are reserved for ongoing missions, while other areas are too steep or remote for most uses. There also are limits to the number of long-term projects that can be supported by the existing infrastructure or that can occur without affecting the long-term health of the ecosystem on the NTS. These constraints can be minimized and public benefit can be enhanced by carefully designing and managing projects so that they have the minimum possible adverse impact on existing natural and manmade resources on the NTS.

1.3 Policy and Procedures

DOE has established policies and assigned responsibilities for planning and developing DOE sites (DOE Order 430.1). This order requires all sites to establish a planning process and document the results of that process. The DOE/NV has developed and refined its technical site information (RSN, 1994) to the point where it accurately depicts existing and planned facilities and infrastructure. DOE Order 430.1 falls short of defining a system for managing both the natural and manmade resources of a site and for ensuring that the selection, location, and design of future projects are compatible with ongoing uses, existing resources, and public concerns. The DOE realizes that such comprehensive plans are necessary and has developed a land- and facility-use management policy (O'Leary, 1994). The results of the past two years of planning, and the resulting recommendations are presented in "Charting the Course: The Future Use Report," (DOE, 1996).

Planning for all future uses of the NTS will incorporate this policy. To improve land-use and resource management planning on the NTS and to take the first step in complying with this policy, the DOE/NV is developing a *Resource Management Plan* for the NTS. The *Resource Management Plan* will use the technical site information as a starting point and will ultimately gather other ongoing management and planning activities under one comprehensive plan. The *Resource Management Plan* will not be used to identify or select future

U.S. DEPARTMENT OF ENERGY
LAND- AND FACILITY-USE MANAGEMENT POLICY

It is the Department of Energy's policy to manage all of its land and facilities as valuable national resources. Our stewardship will be based on the principles of ecosystem management and sustainable development. We will integrate mission, economic, ecologic, social, and cultural factors in a comprehensive plan for each site that will guide land and facility decisions. Each comprehensive plan will consider the site's larger regional context and be developed with stakeholder participation. This policy will result in land and facility uses that support the Department's critical missions, stimulate the economy, and protect the environment.

NTS RESOURCE MANAGEMENT PLAN GOAL

The goal of the Resource Management Plan is to establish a process for managing resources to ensure long-term diversity and productivity of affected ecosystems and sustainable use of land and facilities on the NTS. The process will be based on the principles of ecosystem management and be developed with the participation of surrounding land managers and other interested parties. The DOE/NV will use this process to assess the impact of existing facilities and activities, and evaluate the selection, design, location, and impact of proposed facilities and activities. The plan will identify the criteria for evaluating the compatibility of these activities with human health and safety, ongoing missions, existing infrastructure, cultural and natural resources, public values, and other resource issues and constraints.

missions for the NTS; those tasks are the subject of other strategic planning efforts. For example, the Community Reuse Organization has been formed to plan and execute economic development initiatives and act as the community's single voice to the DOE/NV for economic development. As new missions are proposed for the NTS, the DOE/NV will use the *Resource Management Plan* to identify the available resources and the constraints on the use of those resources. The purpose and use of the *Resource Management Plan* is described in the following goal.

The principles of ecosystem management, which is an approach to sustain the production of natural resources and the ecosystems on which those resources depend, will be used as guidance to ensure the long-term productivity of resources on and around the NTS. Some important principles of this approach considered in the plan are the maintenance of biodiversity, goal-oriented planning and management, consideration of ecological units and timeframes, improved communication and coordination with other parties, use of an integrated and interdisciplinary team, and adaptive management. Chapter 3 contains more details of how DOE/NV proposes to implement ecosystem management as part of the *Resource Management Plan.*

Stakeholder comments and the principles of ecosystem management and sustainable development will assist in the development of goals for the management of resources on the NTS. The DOE/NV will then identify management actions that should be taken to achieve those goals. These management actions will be incorporated into land and resource management procedures and comprehensive planning analyses. The DOE/NV will use these procedures and planning systems to aid in the selection and design of new proposed projects and the evaluation of the impacts of existing and proposed activities on the ecosystems and resources on the NTS.

Land-use planning and resource management are the responsibility of the landlord program office at each DOE site. At the NTS, the Defense Program performs these functions through the Office of the Assistant Manager for Technical Services at the Engineering Division. The Defense Program will also take the lead in resolving conflicts among program offices at the NTS. Responsibility for monitoring the environment on the NTS also lies with the Assistant Manager for Technical Services at the Environmental Protection Division. Coordination of the DOE/NV National Environmental Policy Act process is the responsibility of the National Environmental Policy Act Compliance Officer, who works within the Environmental Protection Division. Figure 1-1 shows the organizational relationship of these DOE/NV offices. The DOE/NV has granted permission for the exclusive use of a portion of the NTS to the Yucca Mountain Site Characterization Office. Land-use planning and resource management in this area will be coordinated in accordance with the memorandum of agreement between the DOE/NV and Yucca Mountain Site Characterization Office (DOE/NV, 1994a).

1.4 Relation to the Nevada Test Site Environmental Impact Statement

Although this description of the *Resource Management Plan* was initiated and published in conjunction with the Draft NTS EIS, the *Resource Management Plan* will take longer to complete than the NTS EIS. Therefore, the *Resource Management Plan* will not be available as a planning or analysis tool for this EIS. In the future, however, it will be an integral part of the National Environmental Policy Act process on the NTS. Figure 1-2 shows the steps DOE/NV will take beyond the Record of Decision to integrate the *Resource Management Plan* with future environmental review processes. The DOE is committed to completing the *Resource Management Plan*, which is estimated to take approximately 2 years. After completion, the *Resource Management Plan* will be used to identify conflicts among the selected alternative and the resource management goals, preferred land uses, and resource constraints developed and identified in the *Resource Management Plan*. It is a regulatory requirement of the DOE (10 CFR 1021) to review a NTS EIS of multifacility sites at least every 5 years and to make these evaluations by means of a National Environmental Policy Act review. This review will evaluate any potential conflicts between the *Resource Management Plan* and the existing NTS EIS and will be the basis for determining whether (1) the existing NTS EIS should be supplemented, (2) a new NTS EIS should be prepared, or (3) no further National Environmental Policy Act documentation is required. In addition to supporting reviews of the NTS EIS, the *Resource Management Plan* will also be used as a tool in future programmatic and site-specific National Environmental Policy Act reviews to identify the

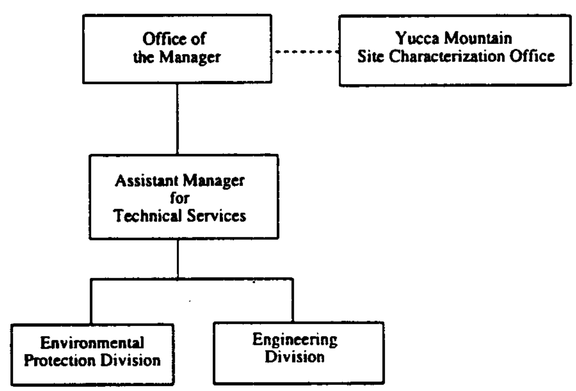


Figure 1.1 Partial organization chart for the DOE/NV

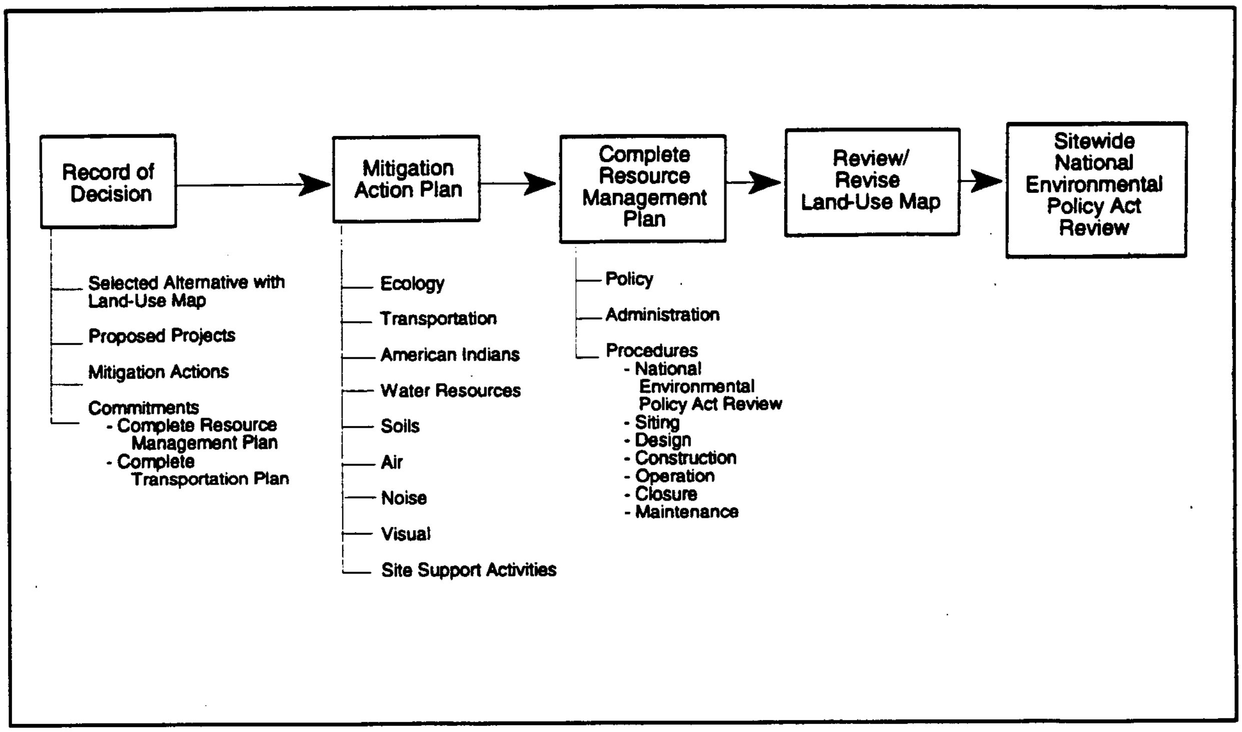


Figure 1-2. National Environmental Policy Act/*Resource Management Plan* 5-year interface

best location and design of new projects and to aid in resource and cumulative impact analysis for the NTS.[1]

1.5 Relation to Other Agency Resource Management Plans

This *Resource Management Plan* will differ in some ways from management plans commonly produced by federal land and resource managing agencies such as the U.S. Bureau of Land Management, U.S. Forest Service, or U.S. Fish and Wildlife Service. These agencies' plans tend to address natural resource consumption and unreconciled conflict issues. In contrast, natural resources are not the primary management focus of the DOE's NTS missions. The primary resources required by the DOE NTS missions are the site support activities and large, remote areas found on the NTS. Existing site support activities and their relation to land use on the NTS are an important consideration; therefore, these manmade resources will constitute a significant aspect of the *Resource Management Plan.* The *Resource Management Plan* also will consider natural resources and will be used during land-use planning to balance the development and use of manmade resources with the wise stewardship of natural resources. The DOE also intends that the development of the *Resource Management Plan* will result in a set of land-use planning tools to be used in new project planning and siting. Because of the significantly differing missions and consequent planning needs, the DOE/NV's Resource Management Plan process will vary from those typically produced by other federal agencies.

1.6 Public Participation

The public and other interested parties (for example, business and environmental organizations; state and local governments; and federal agencies) will have a key role in the development and use of the *Resource Management Plan.* DOE/NV also recognizes that tribal governments have a key role,

[1]See Chapter 1, Introduction, of Volume 1 of the NTS EIS for further discussion of National Environmental Policy Act reviews relevant to the NTS.

and will continue consultations with the Consolidated Group of Tribes and Organizations during development of the *Resource Management Plan*. The DOE/NV has been and will continue seeking and using input from interested parties. As part of the public participation process for the NTS EIS, the DOE sought comments on how to involve interested parties in the development of the *Resource Management Plan*. Involvement could take the form of public meetings, focus groups, cooperation with the Community Advisory Board for NTS programs, and so on. The DOE/NV solicited suggestions about the goals to be used to guide resource use on the NTS and, in the future, will engage interested parties in identifying the management actions needed to achieve those goals. The public and interested parties will also be asked to participate in the National Environmental Policy Act process (which is where conflicts between alternate uses of resources will be identified and evaluated) and in periodic reviews of the *Resource Management Plan*. In addition, the DOE/NV will communicate, cooperate, and develop partnerships with surrounding land owners and managers as part of its effort to use an ecosystem approach to managing resources.

1.7 American Indian Participation

The following concepts of American Indian participation in the development of the *Resource Management Plan* have been proposed by the EIS American Indian Writers Subgroup. Although they have not been approved by the Consolidated Group of Tribes and Organizations or tribal governments, they provide a framework from which to begin. In this respect, DOE/NV will continue to consult with the Consolidated Group of Tribes and Organizations regarding American Indian participation.

American Indian ethnic groups whose aboriginal territories included the NTS lands have accumulated centuries of knowledge on the resources present at this site. Through continued use, Indian people developed a profound understanding of the cycles of resource renewal and natural transformation of the landscape, the relationships between plants, animals, minerals, water, air, and landforms that form the ecosystem, and the spiritual and healing power of this land. Elders describe their relationship with the NTS lands:

> *When you come to this land you feel at home, it gives you a peaceful feeling, the land, the mountains, the birds. Like when I cross over the mountains and see Owens Valley. In the old times the people used to come together and have social gatherings and pow-wows. When we came together here [at Gold Meadow] in 1993 it was the first time after at least 50 years that the three ethnic groups had the opportunity to get together. It felt very peaceful to be back home among Indian people. This opportunity for tribal elders to return to this holy place was an important pilgrimage after being kept forcefully away from this land for all those years. It was a special gift for tribal elders who still remembered Gold Meadow, and for the younger people who experienced this pilgrimage with us.*

American Indians can contribute this knowledge to the development of a comprehensive and culturally sensitive Resource Management Plan for the NTS by:

- *Assisting DOE/NV in the development of methods of identification, inventory, and preservation of American Indian resources*
- *Sharing values and perceptions that Indian people place on the resources at NTS*
- *Broadening and refining the goals that DOE/NV will use to guide the conservation and culturally appropriate use of those resources*
- *Identifying American Indian priorities and constraints on resource management goals*
- *Bringing American Indian views on traditional ecosystems so that the principles of ecosystem management can be incorporated into the Resource Management Plan in a culturally sensitive manner. Ultimately, the goal of American Indian participation in the Resource*

Management Plan is to develop a long term co-management plan for the cultural resources present at the NTS.

1.8 Contents of This Document

Chapter 2 in this document contains a description of how the DOE/NV proposes to develop and implement the *Resource Management Plan.* Chapter 3 contains a description of how ecosystem management will be used to guide the development and implementation of this plan. Chapter 4 provides a list and explanations of the draft goals the DOE proposes to use as guidance for land-use planning and the management of resources on the NTS and presents preliminary map products that document NTS resources and constraints. Chapter 5 contains references. Chapter 6 provides examples of the mapping tools DOE/NV can use to display data associated with the *Resource Management Plan.*

This Page Intentionally Left Blank

CHAPTER 2
DEVELOPMENT OF THE RESOURCE MANAGEMENT PLAN

The first section of this chapter describes the eight steps the DOE/NV proposes to take to develop and implement the *Resource Management Plan*. The first two steps, information review and development of resource management goals, have been initiated. The results obtained to date for Steps 1 and 2 may be modified. Steps 3 through 8, which deal with management actions and land-use development, are being initiated based on public comment. To assist the public in understanding how the *Resource Management Plan* will be developed, this chapter contains examples of how the *Resource Management Plan* may be developed for the issues of biological resources and existing missions.

2.1 Proposed Steps

Step 1. Review Information and Identify Resources. Descriptions of the NTS and its resources were reviewed to identify which resources should be considered in this *Resource Management Plan* and understand how they should be managed. The Draft NTS EIS and documents cited in that NTS EIS were the primary sources of information reviewed for this step. Because comprehensive and current information was available in the Draft NTS EIS, it was not necessary to write additional documents summarizing or describing the resources on the NTS to complete Step 1.

A major component contributing to the success of this *Resource Management Plan* will be the identification of all the important resource issues and constraints on the NTS that should be considered during land- and facility-use planning and ecosystem management. For the *Resource Management Plan* to adequately consider public concerns, all resources on the NTS that are of value to the public must be identified. For the *Resource Management Plan* to be useful for selecting, designing, and locating activities, the attendant resource requirements, and design and location constraints, must be identified. Therefore, part of the first step in developing the *Resource Management Plan* will be to identify the resource issues to be considered. Table 2-1 is the list of resource issues developed as a result of input received during the public comment period for the Draft NTS EIS.

Step 2. Develop Management Goals for Resource Issues and Constraints. The DOE/NV proposes to use a goal-oriented approach in this *Resource Management Plan*. To do this, management goals will be developed for each resource issue. These goals will be used to identify actions needed for wise resource use and sound ecosystem management, while maintaining the critical mission of the NTS in national security. The goals then will be used to evaluate the effects of the DOE/NV activities on NTS resources. Thus, the next step in creating this *Resource Management Plan* is to develop management goals for each of the resource issues listed in Table 2-1. These goals will reflect the following:

- The DOE/NV's commitments to complete its primary missions on the NTS
- The DOE/NV's commitments for managing and conserving resources
- The values that the public places on those resources
- The strategies the DOE/NV will use to minimize impacts of constraints on land use
- The principles of ecosystem management (see Chapter 3).

Chapter 4 contains the goals that the DOE/NV has developed for the resource issues listed in Table 2-1. These goals are based on laws, regulations, the DOE/NV policies, and the comments received during review of the Draft EIS. Although the DOE/NV will be committed to these goals, the goals may be amended or augmented should constraints or conditions change. The DOE/NV will use the *Resource Management Plan* to point out conflicts between the goals and

Table 2-1. Proposed list of resource issues to be considered in the *Resource Management Plan*

Resource Issue	Definition
Existing Missions	Ongoing projects and the land, water, site support activities, facilities, and other resources they require.
Site Support Activities and Facilities	Existing use of buildings, roads, utility distribution systems, and other manmade facilities.
Health and Safety	Radiation, chemical contamination, ground subsidence, and other factors that could endanger the public or personnel using a facility or site.
Land	Constraints dictated by land-withdrawal orders and other legal land-use agreements; soil characteristics, topography, floodplains, faults, and other natural features.
Water	Quality and quantity of surface and subsurface water.
Cultural and American Indian Resources	Use and preservation of historic properties, traditional cultural properties, rock art; archaeologic sites, other artifacts, and traditional use of plants and animals.
Biological Resources	Long-term viability of plants, animals, and the abiotic factors they depend on (such as soil).
Air	Maintenance of air quality.
Geological and Mineral Resources	Extraction and use of geological resources of economic or scientific value.
Airspace	Use of restricted airspace.
Socioeconomics	Relationship among resource uses and local and regional socioeconomic conditions and economic development.

proposed activities. Programmatic and site-specific National Environmental Policy Act review processes will address any conflicts between a proposed action and the *Resource Management Plan* goals and will analyze resource and cumulative impacts of the action and its alternatives for the public and the decisionmaker.

Step 3. Develop Management Actions to Reach the Goals. The third step in developing this *Resource Management Plan* will be to identify and list the management actions that the DOE/NV will take during land-use planning and resource management to meet the goals for each resource issue and constraint. These actions will be developed through consultation with the Consolidated Group of Tribes and Organizations; coordination and cooperation with the Yucca Mountain Site Characterization Office; nearby federal land managers such as the U.S. Air Force, U.S. Bureau of Land Management, National Park Service, and U.S. Fish and Wildlife Service; state resource management agencies such as the Division of Wildlife, the Division of Water Resources, the Division of Minerals, and the Division of Forestry; and other interested parties such as the NTS Community Advisory Board. On issues related to economic development and its effect on the NTS and surrounding communities, the DOE/NV will consult with the Community Reuse Organization. To effectively complete Step 3 of this process, the DOE/NV will endeavor to expand existing working relationships and to enter into other agreements with public agencies, business and environmental organizations, and other interested parties. Section 1.6 discusses the DOE/NV's intent to involve others in the development of the *Resource Management Plan*. Section 2.2 contains examples of possible management actions for two resource issues.

Step 4. Identify, Collect, Analyze, and Summarize Data Needed to Implement the Management Actions. Each management action will then be reviewed to determine if additional information is needed to implement the action. For example, some management actions may require a further understanding of ecological processes, interrelationships, and long-term impacts. Actions needing additional information will be prioritized by the DOE/NV based on the impact of delaying implementation of that action, the time required to obtain the information, and the cost of acquiring the information. If necessary, cost/benefit analyses or risk assessments will be conducted to identify the management actions and corresponding information needs that have the greatest impact on achieving a goal and, therefore, should receive the highest priority. The DOE/NV will then collect and analyze the data, beginning with the management actions evaluated as having the highest priority.

Step 5. Develop the Land-Use Planning Tools. Suitable management actions developed in Step 3, and associated data acquired in Step 4, that can be evaluated and displayed spatially (mapped), will be incorporated into a computerized geographic information system or other mapping tool. Much of this information already is available and is contained in the Nevada Test Site Technical Site Information (RSN, 1994). Examples of the types of actions and data to be mapped are plant and animal habitats to be protected, land and other resources reserved for ongoing missions, and facilities available for future uses (refer to Chapter 6, Plates 1 through 20). If the geographical information system format must be used for other data, the DOE/NV will coordinate through the National Geospatial Data Clearinghouse, as required (White, 1994), to ensure cooperative efforts with federal, state, and local governments, and the private sector.

The mapping tools will then be used to develop a land- and facility-use classification system for the NTS. This system will characterize the compatibility of the current use and condition of lands and facilities with future uses. For example, areas that are essential for the viability of a species, have irreplaceable cultural resources, or that have high risks to humans may be classified as incompatible with all other future uses. Land and facilities that are used occasionally for ongoing missions or have some other partial restrictions required to meet a goal defined in Step 2 will be classified as compatible with some other uses. The types of acceptable uses will be identified and added to the classification system. Land and facilities that are not being used and have no restrictions will be classified as compatible with all future land uses. This classification system then will be incorporated into land-use classification maps and decision-support or planning programs. These tools will be used during land-use planning to identify suitable locations for proposed activities.

Management actions that cannot be mapped will be incorporated into the DOE/NV policies, requirements, or procedures. Examples of this type of action are the amount of water to be withdrawn from wells and the requirement to search areas for threatened or endangered species and systematically inventory cultural resources prior to disturbing land. These requirements will be followed during development and operation of activities and will be used as guidelines during land-use planning.

Step 6. Implement the *Resource Management Plan* During Land-Use Planning. When implemented, the *Resource Management Plan* will be used to aid in the selection and design of proposed new projects and the evaluation of the impacts of existing and proposed activities on the ecosystem and resources on the NTS. Resource and cumulative impact analysis will be formally evaluated as part of the National Environmental Policy Act review process. The first step will occur when new projects are proposed for the NTS. The planning tools and classification system identified in Step 5 will be used to determine whether there are sufficient land, facilities, and other resources on the NTS required for the activity. If suitable land and sufficient resources are available, the planning tools will be used to aid in selecting suitable locations and designs. This information then will be used during the National Environmental Policy Act review process to evaluate the consequences to resources on the NTS. Alternatives that create conflicts between resource uses and the management goals for those resources will be identified so the public can comment on those conflicts and decisionmakers will be informed about the consequences of proposed actions and alternatives on resources. Decisions on the selection and siting of projects will be documented in the NTS Technical Site Information as is currently done for planned improvements.

Step 7. Monitor Resources and Adaptively Manage. Some of the decisions the DOE/NV will make during development of management actions will be based on a limited understanding of the interactions between natural and manmade systems on the NTS. Therefore, the DOE/NV will monitor impacts on resources that may be negatively affected by an activity. That monitoring will be designed to determine whether the goals for each resource are being met. The DOE/NV already conducts extensive environmental monitoring on the NTS and will continue to use these efforts to monitor the effects of decisions made through the *Resource Management Plan.* If unacceptable impacts, as defined by the goals, are detected during monitoring, activities will be re-evaluated for resolution by decisionmakers per Step 6. If unacceptable impacts are not detected, the DOE/NV may consider increasing the use or impact on a resource so long as that increase does not violate one of the goals. To ensure that limited funding for monitoring is spent wisely, risk or impact assessments may be conducted to identify the resources at the greatest risk and the activities that are placing them at risk.

Step 8. Periodically Review and Update the Plan. The decisions made during the development of the *Resource Management Plan* will be summarized in a document or series of documents that list the goal(s) for each resource, the recommended management actions, the maps or the DOE/NV processes developed to implement those actions, and the monitoring needs and management decisions required by those actions. These documents will be updated in two phases. First, if unacceptable impacts are identified during monitoring (Step 7) and are a result of ineffective or incorrect management actions, those actions and associated maps and decision support tools will be modified immediately. Second, the entire plan will be reviewed by the DOE/NV about every 5 years. During that review process, the public will be asked to identify resource issues and constraints not already included in the plan, evaluate the goals developed for new and previously identified resource issues and constraints, and identify and evaluate management actions. If necessary, the documents and associated planning tools and processes will then be modified.

2.2 Examples

Example 2-1 shows how the *Resource Management Plan* may be developed for biological resources. The proposed goal developed in Step 2 reflects the principle of ecosystem management described in Section 3.3.1 concerning conservation of biodiversity. The management action listed under Step 3 involves protection of the habitat necessary to ensure that an endemic plant species remains viable. Because the distribution of the plant used in this example is well known, no additional information would be obtained during Step 4. Therefore, the habitat of this species to be protected could be entered into a mapping system and a land-use classification for that habitat would be developed in Step 5. If activities then occur that affect populations of this plant, the DOE/NV may need to monitor populations of the plant and adaptively manage as part of Steps 7 and 8.

Example 2-2 shows how the *Resource Management Plan* may be developed to manage impacts on existing missions. The proposed goal used in the example reflects a priority for and commitment to ongoing missions. The example of a management action identifies the need for identifying and reserving the space required for ongoing projects.

2.3 How American Indian Participation May Be Incorporated into the *Resource Management Plan*

The following steps for American Indian participation in the development of the *Resource Management Plan* have been proposed by the EIS American Indian Writers Subgroup. Although they have not been approved by the Consolidated Group of Tribal Organizations or tribal governments, they provide a framework from which to begin. In this respect, DOE/NV will continue to consult with the Consolidated Group of Tribes and Organizations regarding implementation of these proposed steps.

Example 2-1. How the *Resource Management Plan* might be developed for biological resources

Step 1. Review Information and Identify Biological Resources on the NTS.

The Draft NTS EIS and references cited in that document were reviewed to develop an understanding of biological resources on the NTS. Plants, animals, and the abiotic factors they require (e.g., soil) were identified as important resources.

Step 2. Proposed Goal for Biological Resources.

Manage habitat and ecosystem processes to support viable populations of native plants and animals, including state and federal endangered, threatened, and candidate species.

Step 3. Example of Management Actions That Reflect the Goal.

Regulate disturbances within the known locations of Beatley milkvetch (*Astragalus beatleyae*), a plant endemic to the northwest corner of the NTS and surrounding land on Nellis Air Force Range Complex. This species is a candidate for listing under the Endangered Species Act.

Step 4. Identify, Collect, Analyze, and Summarize Data Needed To Meet the Goals.

The distribution of Beatley milkvetch on the NTS is well known. Additional information is not needed to implement this recommendation.

Step 5. Develop the Land-Use Planning Tools.

The habitat to be protected will be mapped and incorporated into the planning tools.

Step 6. Implement the *Resource Management Plan* During Land-Use Planning.

The planning tools and procedures developed during Step 5 will be used to evaluate the suitability of proposed activities, select the location of suitable activities, and evaluate the effects of proposed and existing activities on biological resources.

Step 7. Monitor Resources and Adaptively Manage.

If activities occur that might impact populations of Beatley milkvetch, those populations would be monitored and the damaging activity modified based on the results of that monitoring, provided that the activity could be modified and is not an element critical to the primary mission of the NTS.

Step 8. Periodically Review and Update the Plan.

The goal, management actions, maps, procedures, and monitoring information will be reviewed about every 5 years to ensure they still are relevant, acceptable to stakeholders, complete, and accurate.

Example 2-2. How the *Resource Management Plan* might be developed for existing missions

Step 1. Review Information on Existing Missions on the NTS.

The Draft NTS EIS, references cited in that document, and the NTS Technical Site Information were reviewed to develop an understanding of the existing missions on the NTS. Existing missions were proposed (see Table 2-1) as important resources on the NTS and as possible constraints on land use by new missions.

Step 2. Proposed Goal for Existing Missions.

Ensure new uses for the NTS do not interfere with critical operations of existing missions or create additional costs for those missions.

Step 3. Examples of Management Actions that Reflect the Goal.

Action 1. Prohibit incompatible development in areas required by existing missions.

Action 2. Reserve the amount required for each existing mission from the total amount of subsurface water available on the NTS.

Step 4. Identify, Collect, Analyze, and Summarize Data Needed to Meet the Goals.

Action 1. Determine the area required for each existing mission and identify all uses of those areas that are incompatible with the missions.

Action 2. Determine the water required for each mission and the source of that water.

Step 5. Develop the Land-Use Planning Tools.

Action 1. Determine and map the land required for each mission and develop an associated database of compatible and incompatible uses for that land.

Action 2. Develop a process that will ensure that the required amount of water is reserved for each project and incorporate this process into the DOE/NV requirement documents.

Step 6. Implement the *Resource Management Plan* During Land-Use Planning.

The planning tools and procedures developed during Step 5 will be used to evaluate the suitability of proposed activities, select the location of suitable activities, and evaluate the effects of proposed and existing activities on current missions.

Step 7. Monitor Resources and Adaptively Manage.

Monitoring and adaptive management may not be required for these management actions.

Step 8. Periodically Review and Update the Plan.

The goal, management actions, maps, procedures, and monitoring information will be reviewed about every 5 years to ensure they are still relevant, acceptable to stakeholders, complete, and accurate.

We use the proposed steps of development of the Resource Management Plan to offer a framework for American Indian participation:

Step 1. Review Information and Identify Resources. *Since 1987 the DOE/NV has worked with the CGTO to identify American Indian resources first at Yucca Mountain and currently at the NTS. Systematic studies of American Indian resources include archaeological sites, traditional cultural properties, and plant resources in Pahute and Rainier Mesas. These studies demonstrate not only how important this land and its resources are for Indian people but also how valuable traditional knowledge can be for developing the Resource Management Plan. Other American Indian resources present at the NTS that need to be systematically investigated are:*

- *animals*
- *minerals*
- *rock art*
- *water*
- *air*
- *soils*
- *landforms.*

Currently, American Indian participation in the protection and management of resources at the NTS is not limited to compliance with Section 106 of the Historic Preservation Act, but includes 10 years of consultation with DOE/NV, including the American Indian Religious Freedom Act (AIRFA) compliance program, the Native American Graves Protection and Repatriation Act (NAGPRA) compliance program, and the direct participation of American Indians in the writing of sections for the NTS EIS. Consultation that may be implemented in the future, specifically that relate to the Resource Management Plan, will be successful if it is built on past and present relationships between DOE/NV and the Consolidated Group of Tribes and Organizations.

Step 2. Develop Management Goals for Resource Issues and Constraints. *Throughout the years of nuclear testing and other defense-related operations conducted at the NTS, American Indians were extremely concerned by the American government's lack of regard for the tragic effects that these activities had on cultural and environmental resources and the minimal response to public concerns on these activities. The CGTO is concerned that alternative NTS missions and activities--defense-related or not--may continue to negatively impact Indian resources at the NTS. The goal of the CGTO is to participate as a partner in the development of strategies that the DOE/NV could use to minimize or even completely eliminate impacts to their critical resources.*

Step 3. Develop Management Actions to Reach the Goals. *The CGTO is concerned that the current Draft Framework for the Resource Management Plan has excluded the sovereign nations from the drafting of the list of management actions that the DOE/NV may take during land-use planning and resource management. The CGTO expects that its member tribes and organizations be invited to coordinate and cooperate with the DOE/NV to reach this goal. A critical issue that must be addressed in the future is the socioeconomic impact that NTS activities have had on neighboring tribal lands. The CGTO considers that an expansion of the DOE/NV's existing working relationships and a negotiation of agreements with neighboring tribal governments is essential for developing a positive and effective co-management strategy.*

Step 4. Identify, Collect, and Summarize Data Needed to Implement the Management Actions. *A comprehensive and culturally sensitive Resource Management Plan should include systematic identification and data collection on American Indian resources and on contemporary issues of concern for tribal governments, such as health and safety, environmental justice, socioeconomic impacts, and risk assessment of nuclear waste transportation. The current working relationship between the DOE/NV and the CGTO includes the identification and partial data collection on American Indian cultural resources. However, issues of concern for the contemporary well-being of Indian people have yet to be addressed. American Indians would like to participate in the identification, collection, and summary of data needed to implement management actions.*

Step 5. Develop the Land-Use Planning Tools. *American Indian resources should be systematically incorporated into the evaluation of management* *actions and mapping of data collected through Step 4. At least one member organization of the CGTO, the Kaibab Southern Paiute Tribe, is currently developing a multi-media management plan for their own resources along the Colorado River Corridor, including resource identification, data collection, field monitoring, and long-term education programs on the conservation management of resources by tribal people. In the near future, American Indians will have the technical knowledge and tools to actively collaborate with the DOE/NV in the development of land-use planning tools. An agreement which includes the DOE/NV's sponsorship of technical training of Indian people on this step would greatly accelerate learning and improve collaborative efforts.*

American Indians would like to be invited to examine, discuss, and provide recommendations on suitable land uses and compatibility between future land-use alternatives and cultural concerns of Indian people. It is important for the DOE/NV to understand that, in the American Indian point of view, "land-disturbing activities" are not limited to construction or land restoration, but include well drilling, waste disposal, opening of the NTS to public use, and other alternative programs and actions being considered in this EIS.

Step 6. Implement the Resource Management Plan During Land-Use Planning. *American Indian governments would like the DOE/NV to engage in government-to-government consultation during the selection and design of new projects, so that Indian people can evaluate in detail and follow closely the development and progress of projects that can potentially affect their traditional resources. American Indians consider the selection of suitable locations for new projects a critical step in all NTS proposed programs and activities and thus would like to be directly involved during the evaluation, decisionmaking, and implementation stages.*

Step 7. Monitor Resources and Adaptively Manage. *An American Indian monitoring program is currently in place and has been sponsored by the DOE/NV since 1993. This monitoring program is currently limited to archaeological research at the site. Indian tribes would like to expand the monitoring program to other ground-disturbing activities that may affect wildlife, forestry, water, air, soils, and minerals of importance to Indian people. Ideally, a training program to provide American Indians with background knowledge and monitoring skills would complement traditional knowledge on ecosystems and would help implement a culturally sensitive monitoring strategy that is positive and feasible for both the DOE/NV and tribal governments. Expanding the American Indian monitoring program to include other resources and training Indian monitors would greatly enhance the DOE/NV's ability to identify, collect, and summarize the data needed to implement the Resource Management Plan (Step 4).*

A long term goal of the CGTO has been to achieve comanagement of the NTS. Comanagement is a term that seems to best describe the relationship between the DOE/NV and the CGTO who have come together over the past 10 years to jointly identify and suggest mitigation recommendations to protect American Indian cultural resources. This co-management relationship must be identified and addressed in detail during the implementation of the Resource Management Plan. Tribal governments would like to continue having the opportunity to voice their concerns whenever culturally and socially unacceptable proposals are being evaluated by the DOE/NV.

Step 8. Periodically Review and Update the Plan. *American Indians are not just one more resource within the NTS lands, nor are they independent stakeholders. Tribal governments are sovereign nations which, under President Clinton's mandate (American Indian Policy, DOE, 1994), must be addressed in a government-to-government consultation. Tribal governments would like the opportunity to follow-up the development and implementation of the Resource Management Plan, engage in formal consultation whenever new programs and activities are being evaluated, and participate in land-use management strategies, including mapping and inventory of resources, monitoring, and risk assessment evaluations. Maintaining communication between the DOE/NV and tribal governments will ensure that the Resource Management Plan is responsive to cultural concerns and the well-being of Indian people.*

CHAPTER 3
ECOSYSTEM MANAGEMENT

By signing the Land- and Facility-Use Management Policy, the Secretary of Energy has added the DOE to the list of federal agencies that have accepted ecosystem management as the appropriate approach for managing federal lands. This chapter describes how ecosystem management will be incorporated into the *Resource Management Plan* and used during land-use and resource management on the NTS. The first section defines ecosystem management and compares this management philosophy with past resource management practices on the NTS. The second section briefly describes some characteristics of the environment on the NTS that influence how ecosystem management will be applied. The third section describes the principles of ecosystem management to be implemented at the NTS and how those principles will be incorporated into the *Resource Management Plan*. Finally, an American Indian Ecosystem perspective is presented.

3.1 What is Ecosystem Management?

The concept of ecosystems (i.e., dynamic and interrelating communities of organisms and the physical environments with which they interact) and the ecosystem approach to managing natural resources (i.e., protecting or restoring important ecosystem components such as function, structure, and composition by considering all components, including humans, as part of an interrelated system) have been discussed for many years. Recently, however, an increase in conflicts between uses of resources and the concern for loss of biodiversity (i.e., the variety of plants, animals, and other living organisms found in an area; the genetic differences among those organisms; and the communities and ecosystems within which they occur) have prompted land managers to attempt to incorporate these ideas into policy. Ecosystem management means different things to different people. The following definitions give an indication of the range of ideas about ecosystem management and why it should be implemented.

Ecosystem management is the integration of ecological, economic, and social principles to manage biological and physical systems in a manner that safeguards the long-term ecological sustainability, natural diversity, and productivity of the landscape. The primary goal of ecosystem management is to conserve, restore, and maintain the ecological integrity, productivity, and biological diversity of public lands (U.S. Fish and Wildlife Service, 1994).

> ... the process of seeking to produce (i.e., restore, sustain, or enhance) desired conditions, uses, and values of complex communities of organisms that work together with their environments as integrated units (Salwasser and Pfister, 1994).

> ... a rational allocation of land use that maintains the physical integrity of our environment and the biotic diversity that we would normally find there (Shaffer, 1994).

These definitions include several points that are important for the management of natural resources on the NTS. First, the primary goal of ecosystem management is to improve or maintain the diversity and integrity of ecosystems so production of desired resources will be sustained for current and future generations. Some of the desired natural resources on and around the NTS being considered in this *Resource Management Plan* are water, wildlife, unpolluted air, and undisturbed land. Second, any actions planned for using, conserving, or impacting natural resources should be developed and evaluated in the context of the natural systems within which they occur. Otherwise, the ramifications may not be evaluated at the appropriate temporal or spatial scale, and detrimental side effects may not be identified. Therefore, when the DOE/NV plans to use a natural resource, such as water or land, that action will not be evaluated simply as a short-term use of one product from a simple system. Instead, an integrated approach will be implemented to evaluate how those uses will impact the diversity, long-term productivity, and resilience of a complex and interrelated system that includes biotic and abiotic components. Third, these evaluations must also consider the social and economic values placed on ecosystems and their resources by local, regional, and national stakeholders. Finally, ecosystem management is a philosophical approach to managing human activities and natural resources within the bounds of local and regional ecological, economic, and social systems. It is not a specific set of management practices that can be applied in the same manner to all situations. Therefore, the set of practices established to implement this management approach on the NTS will differ from those established at other locations.

The need to switch from traditional resource management practices to the ecosystem management approach has come primarily from situations where there are serious conflicts between multiple uses of land and resources. The traditional approach to resource management in these multiple-use situations has been for each agency or division within an agency to focus on the production or use of the resource for which it was responsible with little integrated effort to consider the sustainability of impacted ecosystems. Ecosystem management is being viewed as a more scientifically and socially valid method for maintaining sustainable natural resources and the ecosystems they require while resolving conflicts among conflicting resource uses (U.S. Fish and Wildlife Service, 1994; Kaufmann et al., 1994).

Why should a management approach that has been considered primarily for multiple-use situations be used on the NTS where multiple use of resources is not mandated or considered? One reason is that the DOE/NV requires, and will continue to require, the use of natural resources, such as water, air, and land, to complete its missions. Therefore, the long-term value of the NTS to the DOE/NV will depend on the wise use of land and the maintenance of the ecosystem. Also, many of the resources on the NTS, whether currently required by the DOE/NV (e.g., water and air) or not (e.g., wildlife and vegetation), have social, cultural, religious, and economic value to others. Also, the large-scale ecosystems on the NTS extend far beyond the site's boundaries, and some DOE/NV activities could impact valued resources located beyond those boundaries. The DOE/NV, therefore, cannot simply manage or consider only those resources required or located within the site's boundaries. To ensure that the DOE/NV's resource needs continue to be met and to ensure that the social and economic values held by others are considered, the DOE/NV must integrate ecological, economic, and social principles to maintain the ecosystems producing those resources. This approach will ensure that the NTS and the surrounding areas will remain valuable national resources no matter how they may be used in the future. For these reasons, the DOE's Land- and Facility-Use Management Policy requires integrating mission with ecologic factors and incorporating ecosystem management into its site management.

How does ecosystem management differ from past management of lands and natural resources on the NTS? In some ways it differs very little. For example, the DOE/NV already has policies for cataloging and protecting diverse species on the NTS. Also, the DOE/NV usually has evaluated and mitigated the impacts of its activities on natural resources within the context and scope of the ecosystem in the NTS. However, in at least two ways, ecosystem management differs a great deal from past management practices. First, the DOE/NV has never had an explicitly stated set of goals to guide the conservation and management of NTS resources. In part because of this, there has often been little consideration for biological diversity and ecosystem integrity by the DOE/NV when planning and implementing programs on the NTS. Second, there has been no program to identify and integrate social values for resources on the NTS other than those values reflected in the programs implemented on the site. Because these steps are an important part of the *Resource Management Plan*, this plan will be the primary tool for implementing NTS ecosystem management.

3.2 Characteristics of the Environment on the Nevada Test Site That Influence Ecosystem Management

The following are some characteristics of the environment on the NTS that will influence how ecosystem management will be developed and implemented. It is important to understand the characteristics of the site to understand why the DOE/NV has chosen to emphasize the principles of ecosystem management that follow.

3.2.1 Knowledge of Ecosystems on the Nevada Test Site

The natural environment on the NTS probably has been better studied than any other large site in Nevada. A thorough inventory of the plants and vertebrate animals was conducted in the 1960s and has continued to the present time (Beatley, 1976; O'Farrell and Emery, 1976; Castetter and Hill, 1979; Medica, 1990). Special attention has been given recently to understanding the distribution and abundance of those plant and animal species that are rare, have a limited range, or are protected by the Endangered Species Act (EG&G/EM, 1991; Blomquist et al.,1992; Rautenstrauch et al., 1994; Blomquist et al., 1995). Studies also have been conducted to better understand factors causing the distribution and abundance of some of the dominant plants and animals on the NTS (e.g., Beatley, 1969 and 1974). During the 1970s, part of the International Biome Program was conducted in the Mojave Desert portion of the NTS to study the ecological processes in this region. In the southwest corner of the NTS, detailed studies have been conducted to characterize the environment and monitor the impacts of the Yucca Mountain Site Characterization Project (Green et al., 1991, Angerer, et al., 1994). The DOE/NV also has sponsored many studies to better understand and monitor the impacts of radiation and other impacts on the ecosystem (Friesen, 1992).

Although the environment at the NTS has been well studied, there are some aspects of the environment that are not well understood. For example, comprehensive inventories of many invertebrate taxa on the NTS have not been conducted. An understanding of the population dynamics and key ecological processes and interrelationships is lacking for many species. The long-term impacts of some DOE/NV activities on the ecosystem are not well understood. Therefore, future ecosystem studies should focus on the ecosystem components and functions likely to be affected by the DOE/NV activities.

3.2.2 Impacts of Past Activities

Although large parts of the NTS have been affected by human activities, the majority of this site remains relatively undisturbed. Most of the disturbances are concentrated in the bottom of Yucca Flat, Frenchman Flat, and Jackass Flats and on parts of Pahute and Rainier Mesas. Much of the rest of the NTS, including large areas in the central western part of the site, has few permanent disturbances and little human activity.

No species are known to have been destroyed at the NTS since the DOE/NV and its predecessors began using this site in the 1940s. However, DOE/NV activities have reduced the available habitat for some species, especially those found in the valley bottoms mentioned above. Also, the encroachment of exotic plants onto the NTS has changed the structure and probably some of the ecological processes such as nutrient cycling throughout much of the site. Although exotic plants probably were not introduced directly as a result of the DOE/NV activities, the spread of some of these species may have been accelerated by the DOE/NV's land-disturbing activities.

3.2.3 Surrounding Land

The NTS is surrounded by very large tracts of relatively undisturbed land. Most of this land is managed by federal agencies such as the Department of Defense (DoD), U.S. Bureau of Land Management, and U.S. Fish and Wildlife Service, many of which have ecosystem management policies that must be considered during development and implementation of the *Resource Management Plan*. There are also some private lands and land that belongs to American Indian tribes near the NTS.

3.2.4 Geographic Range of Ecosystems on the Nevada Test Site

Biotic communities and landscape patterns similar to those found on the NTS can be found far beyond the boundaries of this site. The transition zone between the Mojave and Great Basin deserts, along which the NTS lies, extends west from the NTS into California and east into Utah. Although there are regional differences in the relative abundance of species within this band of transition, and no doubt some genetic differences also, the general pattern of species abundance is similar.

Because of this, there are few rare species or species with limited geographic ranges on the NTS. No plant species are endemic to the NTS, though a few, such as Beatley milkvetch and Beatley phacelia (*Phacelia beatleyae*), are found in a few places off the NTS. All vertebrate animal species on the NTS (including the desert tortoise, the only threatened or endangered species common on the NTS) have ranges that extend far beyond the site. Too little work has been done to determine if there are any invertebrates unique to the NTS or the immediately adjacent areas.

3.2.5 Use of Natural Resources on the Nevada Test Site

Few of the natural resources on the NTS are directly used for economic, recreational, or other social benefits. Water and land are the only natural resources consistently required by the DOE/NV activities. Grazing, timber harvesting, and mining are not permitted on the NTS. Wildlife currently can be viewed only by those permitted to work on or visit the site. Animals on the NTS can be hunted only if they travel off the site. Individuals of a few species, such as doves, waterfowl, and mule deer may move off the NTS and be available for hunting, but these individuals probably contribute very little to hunting opportunities in the region. Because natural resources on the NTS have few direct uses, less attention has been given to their management than in areas such as national forests where multiple use of natural resources is mandated. In addition, defining social values for natural resources on the NTS is more difficult than in areas where their use can be measured directly.

3.3 Principles of Ecosystem Management

This section describes principles or themes of ecosystem management that apply to resource management on the NTS. It includes descriptions of how those principles will be incorporated into the *Resource Management Plan* and other programs conducted by the DOE/NV to monitor and manage natural resources on the NTS.

3.3.1 Maintain Biological Diversity

Maintenance of biodiversity is one of the primary reasons for implementing ecosystem management on any site (CEQ, 1993). The DOE/NV will incorporate this principle by selecting and striving to achieve goals for biological resources in the *Resource Management Plan* that reflect this principle. The proposed goal in Section 4.7 for the management of biological resources—to maintain habitat and ecosystem processes needed to support viable populations of all native plants and animals, including state and federal endangered, threatened, and candidate species—reflects the DOE/NV's commitment to maintain biodiversity and ecosystem integrity. It is based on maintaining viable populations and the ecosystem processes, structure, and abiotic and biotic components required by those populations. Although this proposed goal may be modified based on input by stakeholders, the final version will include a similar commitment. As described in Chapter 2, this goal will be used to identify necessary management actions and compatible land uses for maintaining diversity.

3.3.2 Use a Goal-Oriented Approach To Identify Desired Outcomes

One of the keys to the success of ecosystem management is to base that management on long-term horizons and goals that describe desired ecosystem conditions, incorporate human values, and are developed with full participation of all interested parties (Grumbine, 1994; DOI, 1994b; GAO, 1994). The *Resource Management Plan* will be based on a goal-oriented approach. An early step in developing that plan will be to solicit and incorporate opinions from those interested in how the plan should be developed and how resources should be managed. These opinions will be used to develop goals for the management of resources that incorporate public values and describe the desired ecosystem conditions and resource production to be achieved.

3.3.3 Base Management on Ecological Units and Timeframes

For the DOE/NV to successfully implement an ecosystem approach to managing natural resources, the agency must evaluate impacts of its activities and develop mitigation and other management actions at appropriate spatial and temporal scales. The appropriate scale depends on the type of impact and the ecosystem components being affected or considered. In general, these scales are larger and longer than the boundaries and planning periods often considered by the DOE/NV in the past when evaluating impacts or managing resources. As described in Sections 3.2.3 and 3.2.4, the boundaries of the large-scale ecosystem pattern found on the NTS extend far beyond the NTS and include land owned and managed by many individuals and agencies. Similarly, the timeframes within which ecosystems respond and adapt to changes are seldom the same timeframes the DOE/NV has used for planning. The DOE/NV normally develops plans for 5- or 10-year periods. In contrast, some components of desert ecosystems, such as shrubs and other perennial vegetation, change (Shreve, 1942; Beatley, 1976; Webb et al., 1988) and recover from disturbances (Wells, 1961; Wallace et al., 1980; Webb and Wilshire, 1980; Carpenter et al., 1986; Angerer et al., 1994) over much longer periods.

This principle will be incorporated into the *Resource Management Plan* by selecting management goals and actions at appropriate scales, regardless of the planning schedules or boundaries of the NTS. For example, the first goal listed in Section 4.5 for the management of water resources—maintain an adequate water supply for existing uses on the NTS while ensuring a long-term sustainable supply of water for the NTS and the surrounding ecosystem—will require the DOE/NV to consider the impacts of groundwater pumping over an area much larger than the NTS. The DOE/NV will also have to consider the consequences of its actions on future water supplies, which will require predicting impacts on water availability over a very long period. Example 2.1 includes an example of management actions that will require consideration of impacts and activities beyond the NTS.

3.3.4 Improve Communication and Cooperation with Interested and Affected Parties

To develop a meaningful goal-oriented approach and to manage at spatial scales larger than the NTS, the DOE must improve communication and coordination with adjacent land managers and other interested and affected parties (U.S. Interagency Ecosystem Management Task Force, [IEMTF, 1995a, b]). For example, the DOE/NV will strive to better integrate management of shared resources; improve methods for collecting, sharing, and using scientific information; develop better lines of communication with the public; and develop partnerships with interested parties. Some of those partnerships already exist, such as a five-party agreement between the DOE/NV, U.S. Bureau of Land Management, DoD (Nellis Air Force Range Complex), U.S. Fish and Wildlife Service, and Nevada Division of Wildlife. Others will need to be developed with additional agencies, tribes, and private citizens. The DOE/NV realizes that this is a change in the way resources on and around the NTS have been managed and is committed to taking a leadership role in bringing together the necessary parties to ensure that DOE/NV's and other agencies' management goals are achieved.

3.3.5 Adopt an Integrated, Interdisciplinary Approach To Land Management

Ecosystems are complex natural systems with interrelated biotic and abiotic components. A change in one of those components may cause inadvertent impacts to other components. Understanding and managing such a system, therefore, requires the consideration of all components and their relationships. To do this, the DOE/NV will need to develop an integrated framework for planning, evaluating, and monitoring projects and their impact on the ecosystem.

The *Resource Management Plan* will provide part of the framework for developing this integrated, interdisciplinary approach to land management. The resources considered in the *Resource Management Plan* represent important components of the ecosystem, including natural, biotic components; abiotic components, such as water and air; and manmade components, such as the facilities, infrastructure, and activities. To ensure that the management goals for all of these resources are achieved simultaneously, the interactions between these ecosystem components will have to be considered during the planning phase for all activities. Because an understanding of these interactions is beyond the scope of any one discipline or area of study, the DOE/NV will use an interdisciplinary team to make these evaluations.

To judge the compatibility of proposed activities with the goals established for this *Resource Management Plan*, the DOE/NV also will have to predict the impacts of those activities on the environment. Unfortunately, there are few ecosystem-based models available to make such predictions. Therefore, the DOE/NV will have to develop them as part of this *Resource Management Plan*. Because collecting required data and developing the models can be expensive, models may be developed only for those resources of greatest importance or most likely to be affected. Risk assessments or cost benefit analyses may be used to identify those models of greatest importance.

3.3.6 Use Adaptive Management

Adaptive management is a common-sense approach to monitoring impacts and managing resources. It involves three steps: monitoring; using the information collected during monitoring to develop a better understanding of the ecological, economic, and social systems on and around the NTS; and adapting management practices in response to that information.

Monitoring is a crucial step in the *Resource Management Plan* because the predictions of impacts and selection of suitable land uses that will result from the plan will be based on an incomplete understanding of the ecosystem on the NTS. As described in Step 7 of Section 2.1, this monitoring will focus on ensuring that the goals of the plan are being met. The proposed goal for biological resources concerns the maintenance of biodiversity and viable plant and animal populations. To ensure this goal is met, changes in biodiversity will be monitored. The appropriate hierarchical levels chosen for monitoring diversity (e.g., genetic, species, community, or landscape) will depend on the type of impacts that occur, the scale at which those impacts occur, and the species or groups of species at greatest risk. In addition, the abundance or other characteristics of populations at greatest risk will also be monitored to ensure they remain viable.

The DOE/NV needs to develop a better understanding of how its activities affect the ecosystem so they can better predict and avoid adverse impacts. Much of this can be done by developing the monitoring program as a set of studies designed to test whether specific activities affect resources (Walters and Holling, 1990; Kessler et al., 1992). In addition, the DOE/NV should conduct research to develop a better understanding of ecosystem processes and components most affected by human activities and to develop better predictive models.

All information gathered while monitoring and studying the environment must then be applied via the *Resource Management Plan* to more effectively manage resources and land use. To do this effectively, the *Resource Management Plan* must be adaptable. As described in Steps 7 and 8 of Section 2.1, the *Resource Management Plan* will be a "living" plan that can be modified quickly. When warranted, management actions and the planning tools used to implement those actions will be rapidly updated. In addition, the DOE/NV will periodically conduct public review of the goals and management actions to ensure they consider current public opinion.

3.3.7 American Indian Ecosystem Perspectives

The following American Indian ecosystem perspectives have been proposed by the EIS American Indian Writers Subgroup. Although they have not been approved by the Consolidated Group of Tribes and Organizations or tribal governments, they provide a framework from which to begin. In this respect, DOE/NV will continue to consult with the Consolidated Group of Tribes and Organizations regarding implementation of the *Resource Management Plan*.

Ecosystem management is a term that is being used in the current Framework for the Resource Management Plan in response to recent federal guidelines. Indian people have a unique view of ecosystems and culturally established procedures for using them in a sustainable manner. These cultural ways, which could be called ecosystem management strategies, have been developed out of thousands of years of experience living on and learning from the NTS ecosystems. The Indian ecosystem approach reflects what is being called cultural landscapes elsewhere in cultural resource management (Stoffle et al., 1996).

The meaning of a natural ecosystem is a key issue within the Indian view of ecosystem management. According to traditional ecosystem management perspectives, natural ecosystems contain Indian people interacting with the physical environment, plants, and animals. After thousands of years of interacting with American Indians, the plants, animals, and physical resources of the NTS have adjusted to this relationship. Indian people believe that the land is to be used in a culturally appropriate manner or it will become infertile. "Talk to it" is what Indian people say. The plant to be picked, the animal to be hunted, the mineral to be mined, the water to be drunk, all need to be talked to so they understand why they are being used and so they can willingly give themselves over to the service of Indian people. In return, the picked plant comes back thicker, the animal herd is stronger, the mineral deposits are used in religious ceremonies, and the water satisfies one of its purposes. The view of a natural landscape containing Indian people interacting with the landscape is already expressed in previous NTS EIS comments as well as in previous NTS documents (Stoffle et al., 1990).

Defining a Native American Ecological Unit is a critical issue for implementing an ecosystem management strategy that includes cultural resources. Indian people often accept geographically unique units like hydrological basins as reflecting traditional adaptive units. However, these geographically unique units are bound together into larger culturally based units. Ultimately it is culture not natural geography that reflects the mind of Indian people's adaptation. Cultural-geographic units identified by past studies are the (1) local use area, (2) district, and (3) holy land or nation. Additional cultural-geographic units are the (1) regional landscape, (2) ecoscape, (3) story-scape, and (4) landmarks (Stoffle et al., 1996). The American Indian Writers Subgroup would like the Resource Management Plan to consider using Native American cultural-geographic units as part of the base management plan.

This Page Intentionally Left Blank

CHAPTER 4
RESOURCE MANAGEMENT GOALS

This chapter contains the goals for the management of resources and land-use constraints that the DOE is proposing to include in this *Resource Management Plan*. They are based on public comment, laws, regulations, and the DOE's policies for the management of these resources and constraints. These goals are general, qualitative statements summarizing the DOE's commitments for managing resources. In the future, they may be revised to include more specific, quantitative information that can be used to identify limits on resource uses and conflicts between alternate uses and goals. They will be used to evaluate the effects of the DOE/NV activities on resource issues and to identify management actions needed for wise resource use and sound ecosystem management. Also included are brief explanations of why the DOE chose these goals; constraints on the use or management of the resources imposed by laws, regulations, mission requirements, and prior DOE commitments; limitations on the DOE's ability to achieve the goals; and, when available, map products documenting the DOE's knowledge of NTS resources and constraints.

There will be times when mission requirements and/or goals for resources conflict and cannot be achieved simultaneously. These conflicts will be identified and proposed resolutions evaluated during the National Environmental Policy Act review process and discussed in the appropriate Environmental Assessment or EIS. Possible solutions that may be considered include canceling a proposed mission, modifying a proposed mission to reduce impacts on a resource, modifying existing missions, or not achieving a goal. Of course, goals based on federal, state, and county laws and regulations, and human health and safety, will always be adhered to. As part of the National Environmental Policy Act review process, interested parties will then be able to comment on the conflicts and proposed resolutions. Decisionmakers within the DOE or other appropriate agencies will then select a resolution based on costs, benefits, and public comments.

4.1 Existing Missions

The DOE/NV identified two goals to ensure the success of existing missions on the NTS:

- Ensure new uses of the NTS do not interfere with critical operations of existing missions or create additional costs for those missions

- Manage existing missions in a way that most effectively and efficiently uses the resources of the NTS.

The first goal was selected to ensure that the land and other resources required for ongoing missions are reserved for those missions, and that the siting and operation of new missions, does not jeopardize the success of those missions. If alternative uses such as industrial, commercial, or recreational are accepted for the NTS to promote economic development or other needs of interested parties, those uses will then be treated as existing missions. Resource requirements for those uses will be identified and reserved. Currently, conflicts with existing missions are minimized through the Site Development Planning and Operations Permit processes. The second goal was chosen to ensure that existing missions are operated in a safe and prudent manner that does not jeopardize new missions.

4.2 Site Support Activities and Facilities

The maintenance of the infrastructure and facilities on the NTS is critical to the success of ongoing missions on the NTS and for sustaining the value of this site as a premier outdoor laboratory. The following goals will ensure that ongoing missions are supported and the potential for future missions is maintained:

- Support existing NTS missions by maintaining existing infrastructure and facilities

- Accommodate expanded uses of the NTS through proactive planning and development of new or expanded infrastructure

- Site new facilities to take maximum advantage of existing site support activities and facilities.

The DOE/NV's ability to maintain and expand site support activities will be constrained by availability of funding. The third goal was chosen to minimize the environmental and economic impacts of having to develop a new, redundant infrastructure and facilities. Currently, the use of existing site support activities and facilities is managed through the Site Development Planning and Operations Permit processes and by NTS Standard Operating Procedure 4304 (DOE/NV, 1994b).

The DOE has developed several map products through the use of a geographic information system to assist the infrastructure planning effort. Plate 1 provides a representation of the NTS road network; other maps identifying facility and other infrastructure features are currently under development.

4.3 Health and Safety

Worker and public health and safety are top priorities for the DOE on the NTS. Consideration of safety requirements and risks during the siting of new facilities, as required by the following goal, will minimize those risks.

- Site new facilities in areas that comply with applicable safety regulations and have minimal radiation and other safety risks.

This goal will also eliminate the costs of adapting new facilities to minimize risks associated with inherently unsafe sites. Health and safety requirements are defined in the DOE directives and are considered in the design criteria for each construction effort.

Areas of the NTS which pose health or safety risks include those associated with past nuclear activities. Plate 2 shows the locations of past nuclear tests. Plate 3 shows manmade radiation exposure rates, and Plate 4 shows the total terrestrial exposure rate.

4.4 Land

Use of the NTS is controlled by public land withdrawals and other legal constraints. The DOE developed the following goals to comply with legal restrictions and to minimize construction costs:

- Site new facilities to ensure compliance with public land withdrawals, Memorandum of Understanding, and other legal constraints on use of real estate

- When possible, site new facilities in, or as close as possible, to previously disturbed lands in order to preserve and protect undisturbed land

- When possible, site new facilities in areas with suitable soil, slope, drainage, and other natural features.

The first goal was developed to ensure that those restrictions are considered. The legally acceptable uses for all lands on the NTS will be identified and incorporated into land-use planning. Land withdrawals pertaining to the NTS are discussed in Volume 1 of the NTS EIS.

The second goal will promote the long-term protection of natural resources on the NTS. Because vegetation in the desert ecosystem on the NTS takes a long time to return to its predisturbance state (Angerer et al., 1994), one of the best ways to protect natural environments is to minimize disturbances. The ability to achieve this goal may be constrained by the operational requirements of specific activities.

There are numerous locations on the NTS that have steep slopes, unstable soil, or other natural features that will require expensive modification of facilities constructed on those locations. The third goal was selected to require the consideration of those constraints during land-use planning and to minimize construction costs. The ability to achieve this goal will be constrained by the land-use requirements of each project or facility. For example, a monitoring station or other facility that must be located in a specific, remote section of the NTS will be designed and constructed to fit that site, even if there are additional construction costs for adapting the facility to the site. Engineering constraints such as these are considered in the design criteria for each construction effort.

Plates 5 and 6 show the topography and surface drainage, respectively, of the NTS. In addition to natural hazards, areas of the NTS have been permanently disturbed as a result of underground nuclear testing. Plate 7 shows the areas within Yucca Flat where land use is constrained by the presence of nuclear explosion craters.

4.5 Water

The following goals were selected to ensure the quality and quantity of surface and subsurface water:

- Maintain an adequate water supply for existing uses on the NTS while ensuring a long-term sustainable supply of water for the NTS and the surrounding ecosystem

- Maintain the quality of those waters that are presently clean enough to be in compliance with state and federal standards.

The first goal was selected to ensure that a balance is achieved between current use of water on the NTS and future sustainable use on the NTS and in the surrounding region. The DOE will strive to achieve the second goal to ensure that available water will be suitable for all future uses and to comply with the Clean Water Act, the Safe Drinking Water Act, and the Nevada Water Pollution Control Law. The DOE/NV currently manages a system of groundwater production and monitoring wells in compliance with applicable state and federal regulations. Withdrawal of water by the DOE/NV on the NTS is exempt from Nevada water laws when water is used to support primary mission activities.

4.6 Cultural and American Indian Resources

To ensure preservation of cultural resources on the NTS, the DOE selected the following goal:

- Identify and protect American Indian, historic, and other cultural resources on the NTS and preserve the historic, cultural, and scientific values they represent, in conformance with all laws and DOE policies, and with the results of consultation with the Consolidated Group of Tribes and Organizations.

This goal was selected to ensure that the DOE complies with all appropriate laws and regulations regarding cultural resources, and to incorporate the results of ongoing consultations with American Indians into the DOE/NV's land-use planning process. The ability to achieve this goal will be constrained by the requirements of ongoing missions and safety considerations on the NTS. Currently, the DOE/NV holds regular working meetings with the Consolidated Group of Tribes and Organizations and, when needed, special studies and visits to the NTS are conducted. These consultations have resulted in 58 mitigation recommendations for protection of cultural resource sites (DRI, 1994). Section 110 of the National Historic Preservation Act requires federal agencies to establish a preservation program to protect and preserve all historic properties, including National Historic Landmarks, and to provide a process for nominating properties to the National Register of Historic Places. The preservation program must ensure that agreements on how adverse effects on National Register properties will be considered are developed and implemented through consultation with local governments, Indian tribes, the State Historic Preservation Office (SHPO), and interested public. Section 106 of the National Historic Preservation Act also requires federal agencies to consult with SHPO as well as the Advisory Council on Historic Preservation when evaluating the effects of their actions on historic properties. American Indian participation in the protection and management of resources at the NTS is not limited to compliance with Section 106 of the Historic Preservation Act, but includes 10 years of consultation with DOE/NV, including the AIRFA compliance program, the NAGPRA compliance program, and the direct participation of American Indians in the writing of sections for the NTS EIS. Consultation that may be implemented in the future, specifically that related to the *Resource Management Plan*, will be successful if it is built on past and present relationships between the DOE/NV and the Consolidated Group of Tribes and Organizations. The DOE/NV expects to continue these consultations throughout the development and implementation of the *Resource Management Plan* to ensure American Indian participation in managing cultural resources on the NTS.

4.7 Biological Resources

Maintenance of biodiversity and ecosystem integrity is one of the important principles of ecosystem management. To achieve this principle, the DOE selected the following goal:

- Maintain habitat and ecosystem processes needed to support viable populations of all native plants and animals, including state and federal endangered, threatened, and candidate species.

This goal will be achieved by managing human activities that influence the habitat, community structure, and ecosystem processes that are important to each species. By achieving this goal, the DOE will ensure that its activities do not jeopardize the continued existence of any populations of plants or animals on or near the NTS or cause any species to be listed as threatened or endangered under the Endangered Species Act. The goal also ensures compliance with that section of the Endangered Species Act that requires federal agencies to carry out programs for conserving threatened and endangered species. Currently, the DOE/NV consults with the U.S. Fish and Wildlife Service, per Section 7 of the Endangered Species Act to ensure that its actions are not likely to jeopardize the continued existence of any listed species or will not adversely affect critical habitat. In order to comply with the Endangered Species Act at the NTS, the DOE/NV Order 54XC.1B (DOE Order NV54XC.1B, 1994) provides guidance for the protection of threatened, endangered, proposed, and candidate species, and . NTS Standard Operating Procedure 5418 (DOE/NV, 1994c) guides the conduct of preconstruction surveys. The DOE/NV monitors the natural environment as part of the Basic Environmental Compliance and Monitoring Program.

Plate 8 shows the distribution of plant species, which in 1995 were designated as candidates for listing under the Endangered Species Act on the NTS. Tortoise sightings and the extent of tortoise habitat are shown on Plate 9. Plates 10 through 16 show areas of land and habitat disturbances on the NTS resulting from historic operations.

4.8 Air

To ensure compliance with applicable air-quality regulations, maintenance of air quality on the NTS, and minimal impact on future missions and the ecosystem, the DOE identified the following goal:

- Ensure that the current air quality attainment designation found on the NTS is maintained so that humans, existing and new missions, and biological resources on and around the NTS are not negatively affected.

Currently, the DOE/NV coordinates with the State of Nevada Division of Environmental Protection, Air Quality Bureau, and implements a permitting program regarding air quality for its facilities at the NTS.

4.9 Geological and Mineral Resources

The DOE selected the following goals regarding the extraction and use of geological and mineral resources on the NTS:

- Minimize impacts to unique geological resources and economically important mineral resources and provide access to the scientific community for the study of those unique resources when possible

- Make economically important geological resources available with minimum adverse impact on the DOE's missions.

The first goal focuses on the conservation and study of unique resources, such as type sections, rare fossils, and the Timber Mountain Caldera National Natural Landmark, and on the prevention of damage to economically important mineral resources through inadvertent actions related to the DOE's missions on the NTS. The second will allow mining of important geological resources, such as gravel, and allow the possibility of mineral exploration on the NTS. Plates 17 through 20 show subsurface nuclear test locations as an example of how three-dimensional mapping could be used to display geological information. Use of geological resources is not currently permitted on the NTS and, if permitted in the future, will be constrained by the security and safety requirements of the DOE missions, health and safety concerns, land-use agreements, and other regulations.

4.10 Airspace

The following goal was chosen to maximize the effectiveness of restricted airspace over the NTS and surrounding lands:

- Coordinate airspace requirements with surrounding land-management agencies and make restricted airspace available for uses compatible with the DOE's missions.

Currently airspace over the NTS is classified as restricted by the Federal Aviation Administration and controlled by the U.S. Air Force. As missions on the NTS change, the use of airspace will be evaluated for other possible uses, such as increased military training flights.

4.11 Socioeconomics

The following goal was chosen to ensure that the impact on surrounding areas is considered when making land-use decisions:

- Manage resources and missions in a manner that considers the local and regional social and economic values and stimulates the local and regional economy.

Land-use decisions made for the NTS will affect surrounding communities in such areas as transportation, law enforcement, emergency management, procurement, and economic development. This goal was chosen to ensure that the impact on surrounding communities is considered when making land-use decisions. To the extent consistent with its mission, the DOE/NV will cooperate with land-use plans of local governments such as Nye County and other surrounding counties. On issues related to economic development and its effects on the NTS and its surrounding communities, the DOE/NV will also talk with the Community Reuse Organization.

This Page Intentionally Left Blank

CHAPTER 5
REFERENCES

REGULATION, ORDER, LAW

10 CFR 1021	U.S. Department of Energy (DOE), "National Environmental Policy Act; Implementing Procedures and Guidelines Revocation; Final Rule and Notice," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
DOE Order 430.1	DOE, "Life-Cycle Asset Management," Washington, DC, 1995.
DOE Order NV54XC.1B	U.S. Department of Energy, Nevada Operations Office (DOE/NV), "Threatened and Endangered Species Protection," DOE Order NV54XC.1B, Las Vegas, NV, 1994.

GENERAL

Angerer et al., 1994	Angerer, J. P., W. K. Ostler, W. D. Gabbert, and B. W. Schultz *Secondary Succession on Disturbed Sites at Yucca Mountain, Nevada*, EGG 11265-1118 UC-702, EG&G Energy Measurements, Las Vegas, NV, 1994.
BLM, 1994	U.S. Bureau of Land Management (BLM), *Ecosystem Management in the BLM: from Concept to Commitment*, U.S. Department of Interior, Washington, DC, 1994.
Beatley, 1969	Beatley, J. C., "Dependence of Desert Rodents on Winter Annuals and Precipitation," *Ecology*, Vol. 50, Pp. 721-724, 1969.
Beatley, 1974	Beatley, J. C., "Effects of Rainfall and Temperature on the Distribution and Behavior of *Larrea tridentata* (Creosote bush) in the Mojave Desert of Nevada," *Ecology*, Vol. 55, Pp. 245-261, 1974.
Beatley, 1976	Beatley, J. C., *Vascular Plants of the Nevada Test Site and Central-Southern Nevada: Ecologic and Geographic Distributions*, TID-26881, U.S. National Technical Information Service, Springfield, VA, 1976.
Blomquist et al., 1992	Blomquist, K. W., C. A. Wills, W. K. Ostler, K. R. Rautenstrauch, and T. P. O'Farrell, *Distribution, Life History, Management, and Current Status of Astragalus beatleyae on the U.S. Department of Energy's Nevada Test Site*, EGG 10617-2187, EG&G Energy Measurements, Santa Barbara Operations, Goleta, CA, 1992.
Blomquist et al., 1995	Blomquist et al. (EG&G Energy Measurements), *Status of Candidate Plant Species on and near the Nevada Test Site*, (Draft) EG&G Energy Measurements, Las Vegas Area Operations, Las Vegas, NV, 1995.
CEQ, 1993	Council on Environmental Quality (CEQ), *Incorporating Biodiversity Considerations into Environmental Impact Analysis Under the National Environmental Policy* Act, Washington, DC, 1993.

Carpenter et al., 1986	Carpenter, D. E., M. G. Barbour, and C. J. Bahre, "Old Field Succession in Mojave Desert Scrub," *Madrono*, Vol. 33, Pp. 111-122, 1986.
Castetter and Hill, 1979	Castetter, R. C., and H. O. Hill, "Additions to the Birds of the Nevada Test Site," *Western Birds*, Vol. 10, Pp. 221-223, 1979.
DOE, 1994	DOE, Memorandum for the Heads of Executive Departments and Agencies, Government-to-Government Relations with Native American Tribal Governments, Washington, DC, 1994.
DOE, 1996	DOE, *Charting the Course: The Future Use Report*, DOE/EM-0283, U.S. Department of Energy, Office of Environmental Management, Washington, DC, 1996.
DOE/NV, 1994a	DOE/NV, *Memorandum of Agreement (MOA) Between DOE Nevada Operations Office and the Yucca Mountain Site Characterization Office*, Las Vegas, NV, 1994.
DOE/NV, 1994b	DOE/NV, "Facilities Management and Utilization," Nevada Test Site Standard Operating Procedure (NTS SOP) 4304, Las Vegas, NV, 1994.
DOE/NV, 1994c	DOE/NV, "Protection of Endangered Species and Cultural Resources," NTS SOP 5418, Las Vegas, NV, 1994.
DRI, 1994	Desert Research Institute (DRI), *Native American Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site*, Technical Report No. 84, Desert Research Institute, Reno, NV, 1994.
EG&G/EM, 1991	EG&G Energy Measurements (EG&G/EM), *The Distribution and Abundance of Desert Tortoises on the Nevada Test Site*, EGG 10617-2081, EG&G Energy Measurements, Santa Barbara Operations, Goleta, CA, 1991.
Friesen, 1992	Friesen, H.N., *Summary of the Nevada Applied Ecology Group and Correlative Programs*, DOE/NV-357 (Version 2). Las Vegas, NV, 1992.
GAO, 1994	General Accounting Office (GAO), *Ecosystem Management: Additional Actions Needed to Adequately Test a Promising Approach*, (GAO/RCED-94-111), Washington, DC, 1994.
Green et al., 1991	Green, R. A., M. K. Cox, T. B. Doerr, T. P. O'Farrell, W. K. Ostler, K. R. Rautenstrauch, and C. A. Wills, "Assessing Impacts on Biological Resources From Site Characterization Activities of the Yucca Mountain Project." *Proceedings of the High Level Radioactive Waste Management Conference*, 2, Pp. 1456-1460, 1991.
Grumbine, 1994	Grumbine, R. E., "What Is Ecosystem Management?" *Conservation Biology*, Vol. 8, Pp. 27-38, 1994.

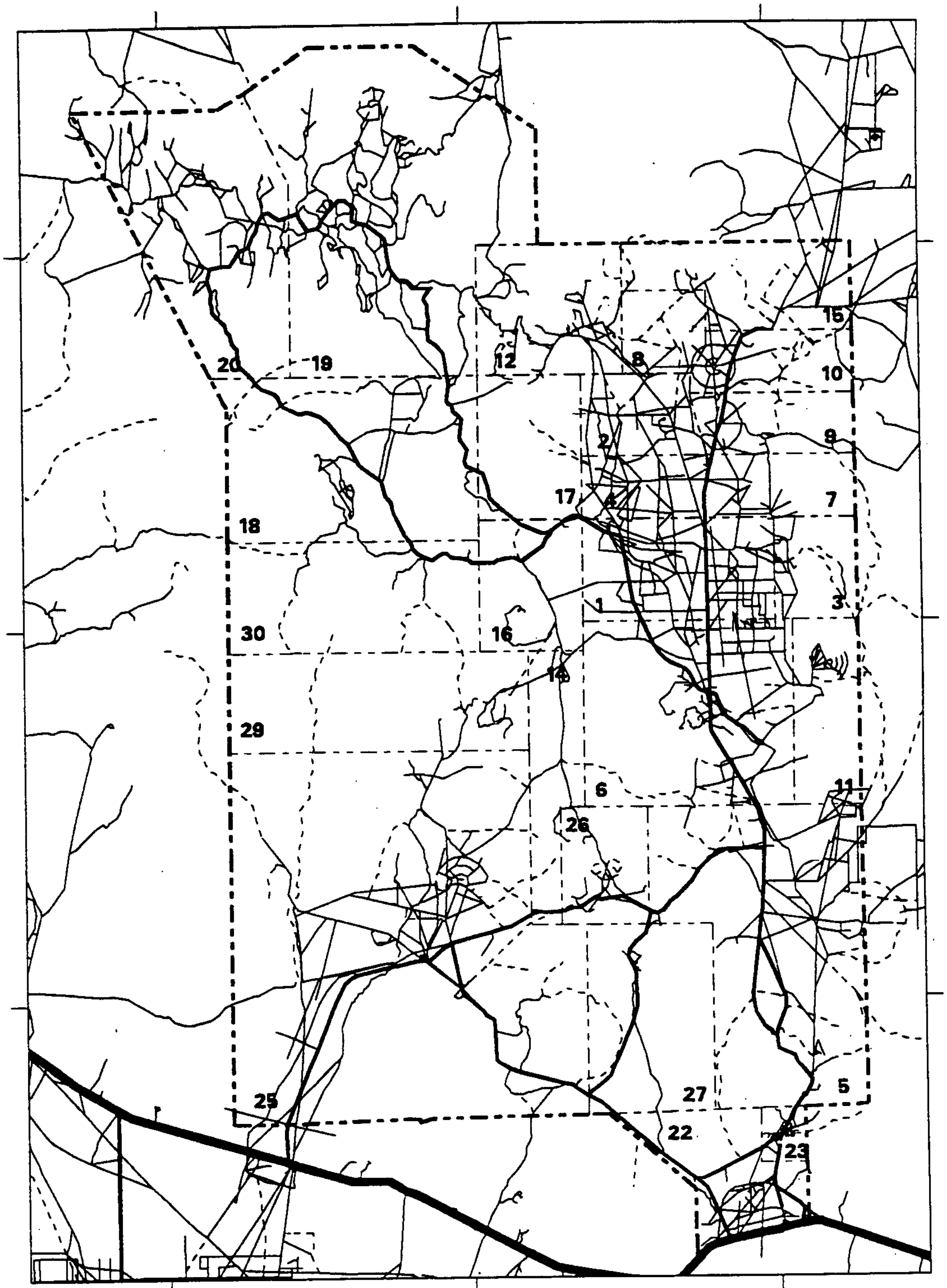
IEMTF, 1995a	Interagency Ecosystem Management Task Force (IEMTF), *The Ecosystem Approach: Healthy Ecosystem and Sustainable Economies, Volume I-Overview*, Washington, DC, 1995.
IEMTF, 1995b	IEMTF, *The Ecosystem Approach: Healthy Ecosystems and Sustainable Economics, Volume II-Implementation Issues*, Washington, DC, 1995.
Kaufmann et al., 1994	Kaufmann, M. R., R. T. Graham, D. A. Boyce, Jr., W. H. Moir, L. Perry, R. T. Reynolds, R. L. Bassett, P. Mehlhop, C. B. Edminster, W. M. Block, and P. S. Corn, *An Ecological Basis for Ecosystem Management*, General Technical Report RM-246, U.S. Department of Agriculture, Forest Service, Fort Collins, CO, 1994.
Kessler et al., 1992	Kessler, W. B., H. Salwasser, C. W. Cartwright, Jr., and J. A. Caplan, "New Perspectives For Sustainable Natural Resources Management," *Ecological Applications*, Vol. 2, Pp. 221-225, 1992.
Medica, 1990	Medica, P. A., "Noteworthy Mammal Distribution Records for the Nevada Test Site," *Great Basin Naturalist*, Vol. 50, Pp. 83-84, 1990.
O'Farrell and Emery, 1976.	O'Farrell, T. P., and L. A. Emery, *Ecology of the Nevada Test Site: a Narrative Summary and Annotated Bibliography*, DOE/NVO-167, Desert Research Institute, Boulder City, NV, 1976.
O'Leary, 1994	O'Leary, H. R., Memorandum for Secretarial Officers and Operations Office Managers, dated December 21, 1994, regarding Land and Facility Use Policy, 1994.
RSN, 1994	Raytheon Services Nevada (RSN), *Nevada Test Site Technical Site Information,* prepared for the DOE/NV, Las Vegas, NV, 1994.
Rautenstrauch et al., 1994	Rautenstrauch, K. R., G. A. Brown, and R. G. Goodwin, *The Northern Boundary of the Desert Tortoise Range on the Nevada Test Site*. EGG 11265-1103, EG&G Energy Measurements, Las Vegas, NV, 1994.
Salwasser and Pfister, 1994	Salwasser, H., and R. D. Pfister, "Ecosystem Management: From Theory To Practice" in *Sustainable Ecological Systems: Implementing an Ecological Approach to Land Management*, U.S. Department of Agriculture, Forest Service, Fort Collins, CO, Pp. 150-161, 1994.
Shaffer, 1994	Shaffer, M. L., "Ecosystem Management: Lessons From the Grizzly Bear in the Northern Rockies," *Ecosystem Management: Status and Potential*, Environmental and Natural Resources Policy Division, Congressional Research Service, Library of Congress, Washington, DC, 1994, Pp 128.
Shreve, 1942	Shreve, F., "The Desert Vegetation of North America," *Botanical Review*, Vol. 8, Pp. 195-246, 1942.
Stoffle et al., 1990	Stoffle, Richard W., D. B. Halmo, J. E. Olmstead, and M. J. Evans, *Native American Cultural Resource Studies at Yucca Mountain, Nevada*, Institute for Social Research, University of Michigan, Ann Arbor, MI, 1990.

Stoffle et al., 1996	Stoffle, Richard W., David Halmo, and Diane Austin, "Cultural Landscapes and Traditional Cultural Properties: A Southern Paiute View of the Grand Canyon and Colorado River," (Accepted for publication) *American Indian Quarterly.*
U.S. Fish and Wildlife Service	U.S. Fish and Wildlife Service, *An Ecosystem Approach to Fish and Wildlife Conservation*, U.S. Department of Interior, Washington, DC, 1994.
Wallace et al., 1980	Wallace A., E. M. Romney, and R. B. Hunter, *"The Challenge of a Desert: Revegetation of Disturbed Desert Lands,"* Great Basin Naturalist Memoirs, Vol. 4, Pp. 216-225, 1980.
Walters and Holling, 1990	Walters, C. J., and C. S. Holling, "Large-Scale Management Experiments and Learning by Doing." *Ecology*, Vol. 71, Pp. 2060-2068, 1990.
Webb et al., 1988	Webb, R. H., J. W. Steiger, and E. B. Newman, *The Response of Vegetation to Disturbance in Death Valley National Monument, California*, Bulletin 1793, U.S. Department of Interior, Geological Survey, Washington, DC, 1988.
Webb and Wilshire, 1980	Webb, R. H., and H. G. Wilshire, "Recovery of Soils and Vegetation in a Mojave Desert Ghost Town, Nevada, U.S.A." *Journal of Arid Environments*, Vol. 3, Pp. 291-303, 1980.
Wells, 1961	Wells, P. V., "Succession in Desert Vegetation on Streets of a Nevada Ghost Town." *Science*, Vol. 134, Pp. 670-671, 1961.
White, 1994	White, W. H., *Memorandum for Departmental Elements*, dated July 6, 1994, Regarding Geographic Information Systems, Their Data, and DOE, 1994.

CHAPTER 6
PLATES

This Page Intentionally Left Blank

*U.S. GOVERNMENT PRINTING OFFICE: 1996-785-718



Primary Road
Light Duty Road
Unimproved Road
Trail

N

5 0 5 10 MILES

5 0 5 10 15 KM

Plate 1: Roads.

DOE/REL NTS-95-042.1

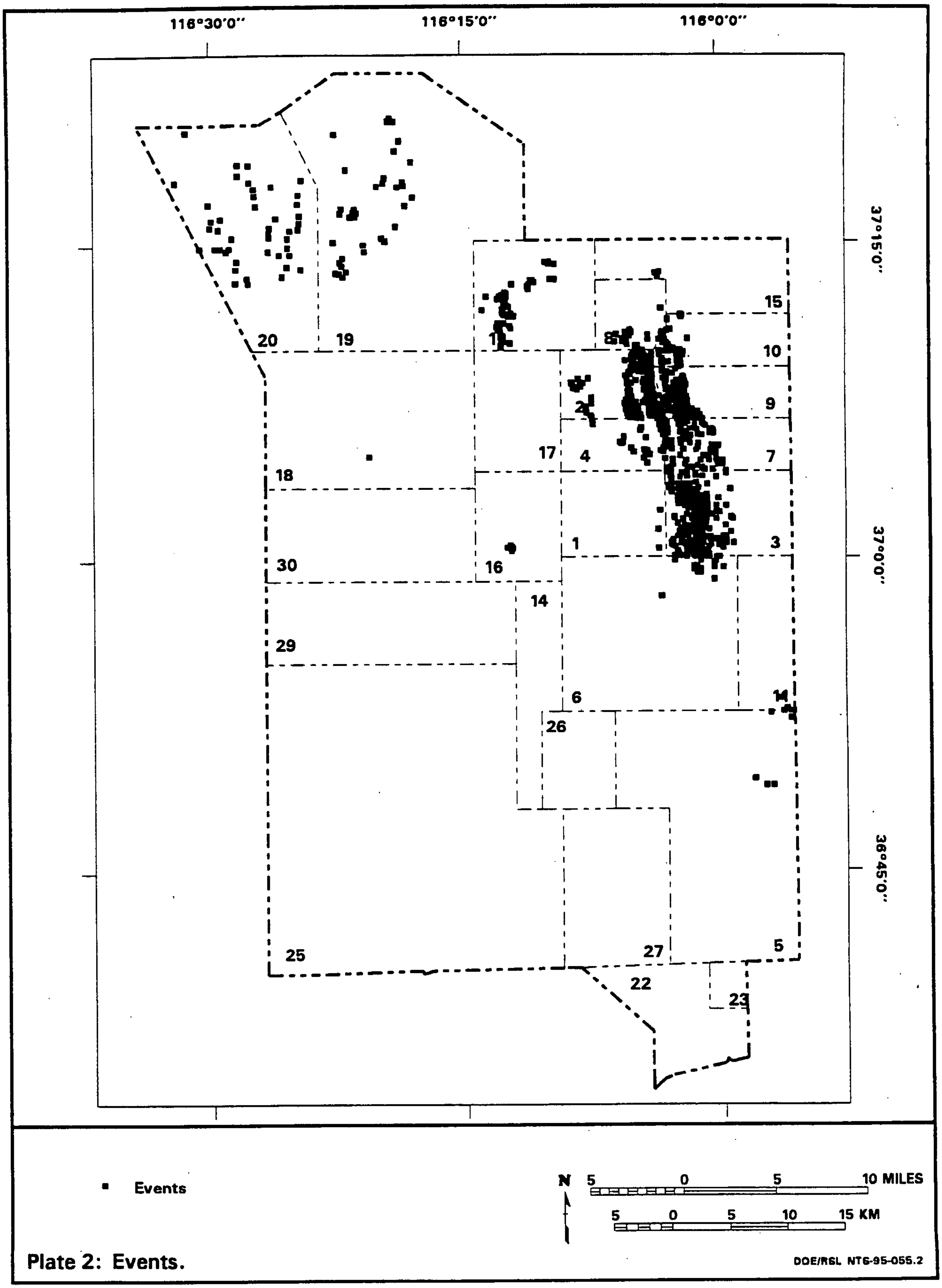


Plate 2: Events.

DOE/RSL NTS-95-055.2

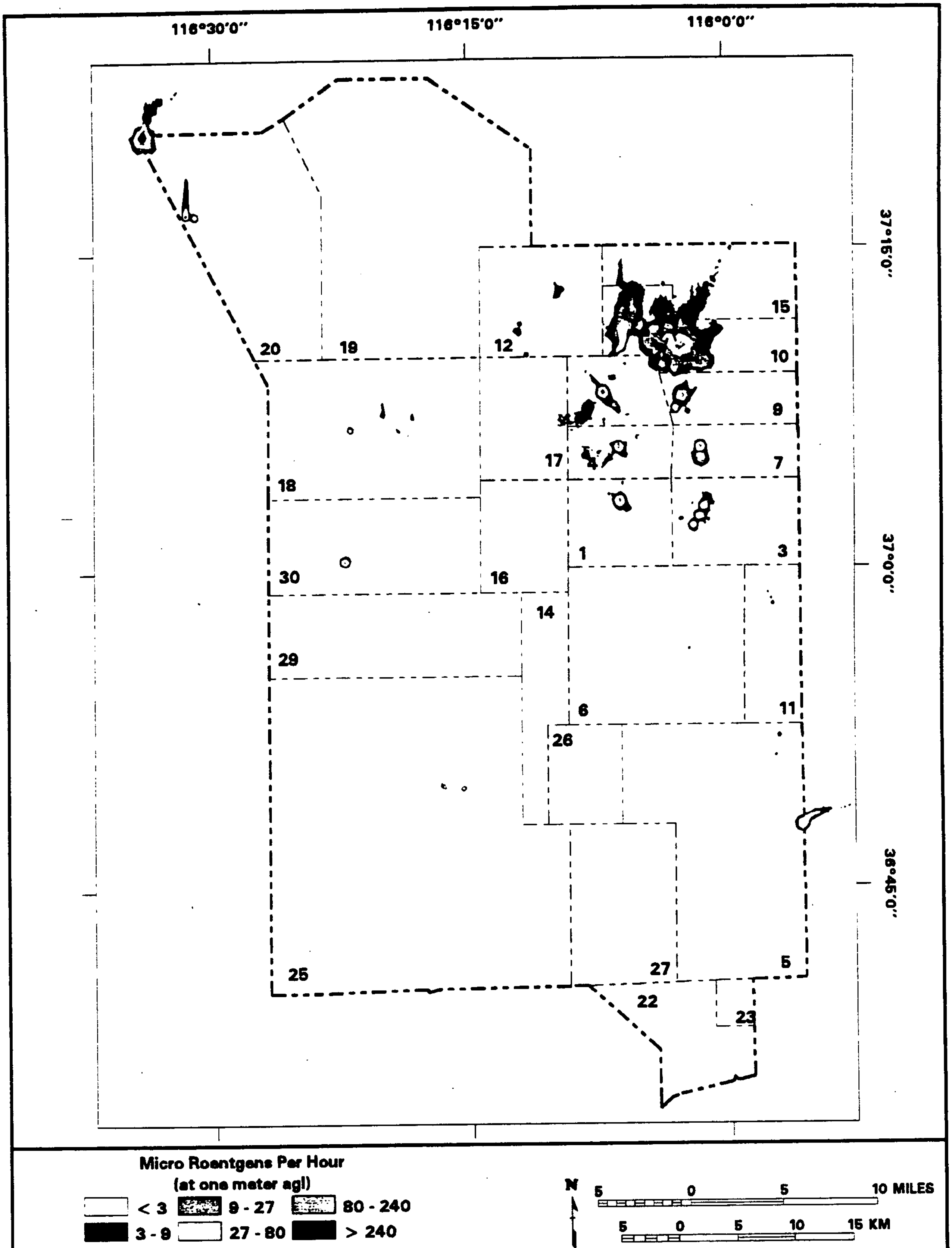
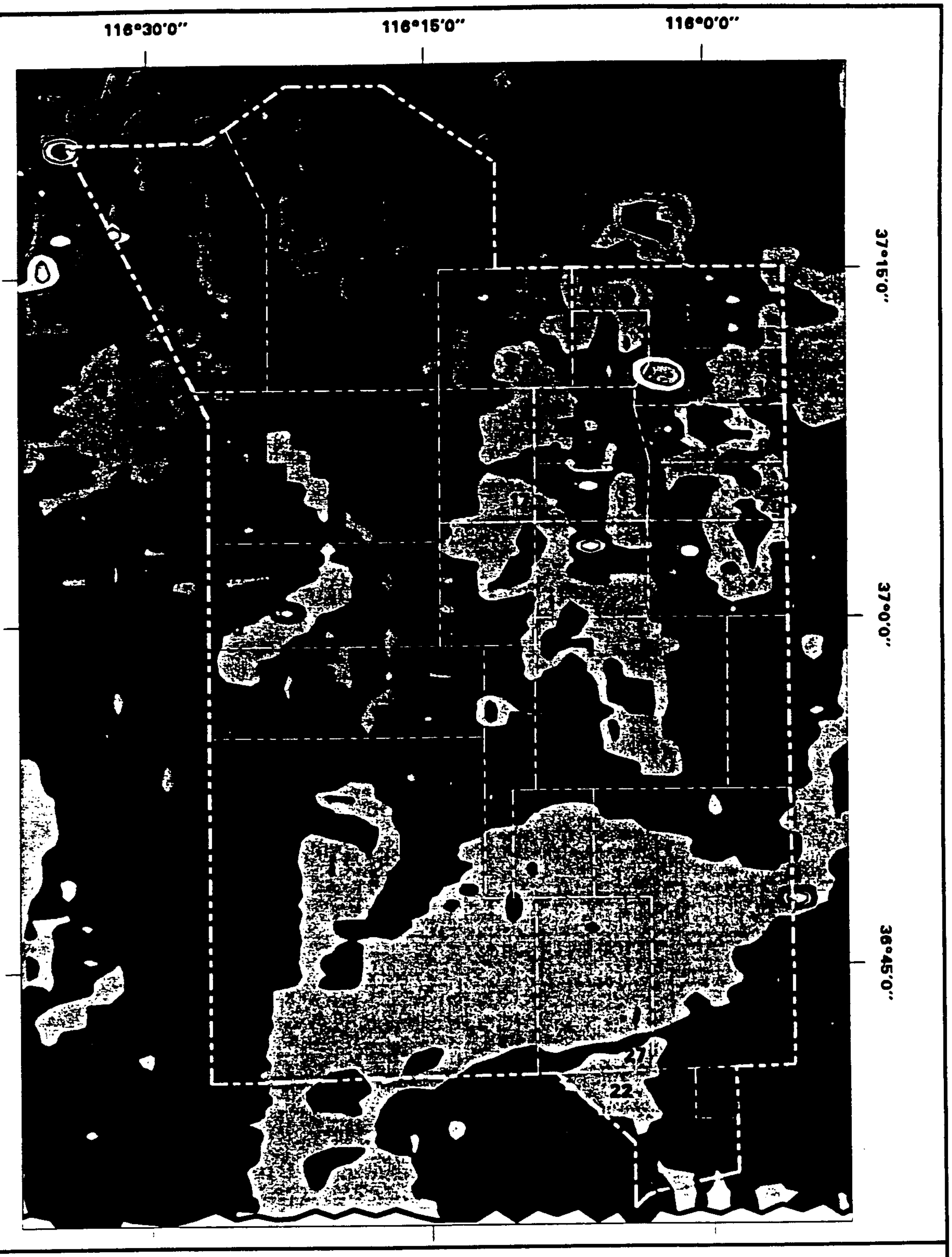


Plate 3: 1994 Radiation Survey - Man Made Exposure Rate.

DOE/RSL NTS-95-053.1



Micro Roentgens Per Hour
(at one meter agl)

< 6 | 12 - 18 | 24 - 36 | 72 - 360
6 - 12 | 18 - 24 | 36 - 72 | Survey Boundary

N

5 0 5 10 MILES

5 0 5 10 15 KM

Plate 4: 1992 Radiation Survey - Terrestrial Exposure Rate.

DOE/RSL NTS-95-054.1

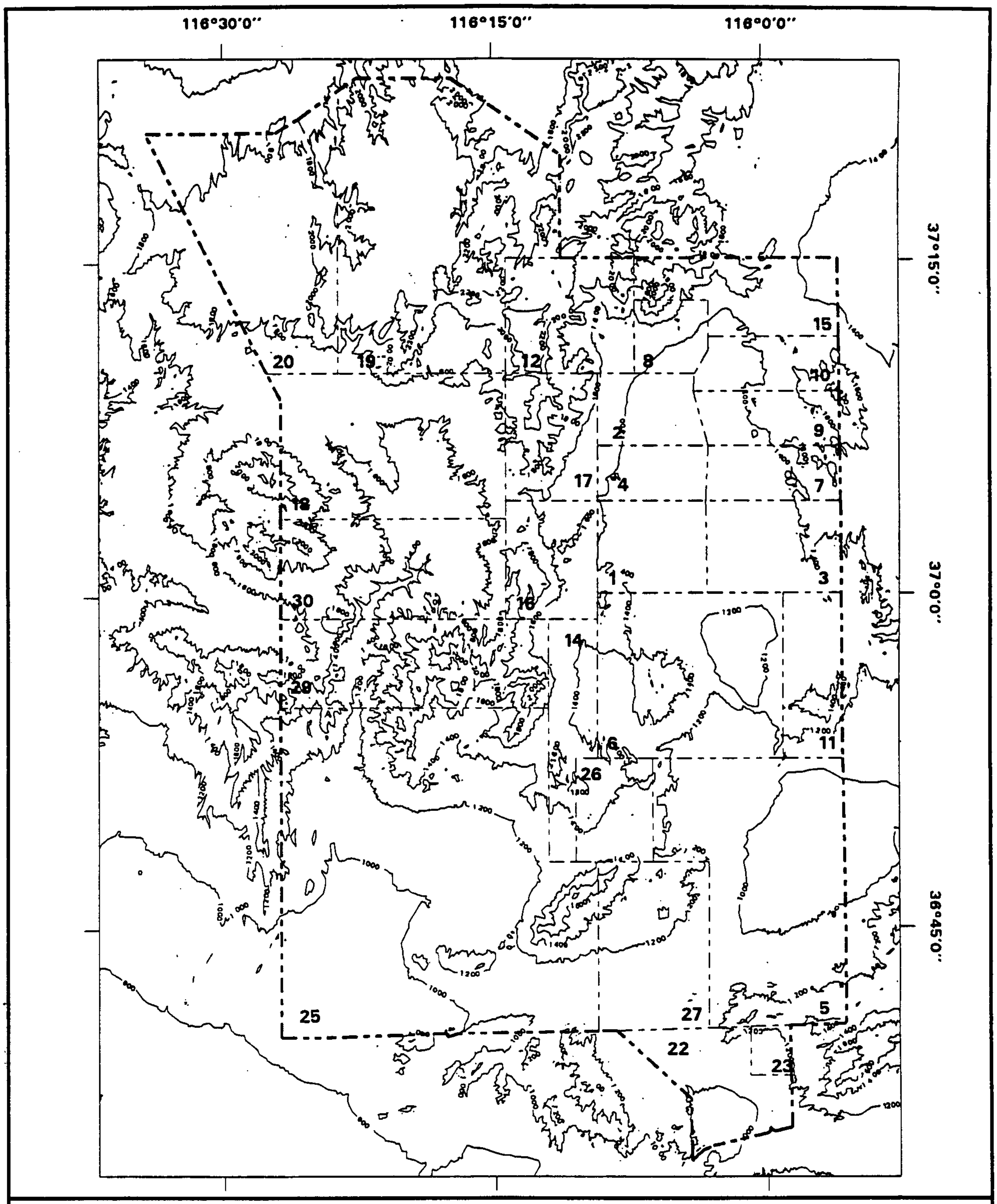


Plate 5: Topography.

DOE/RSL NT6-95-043.1

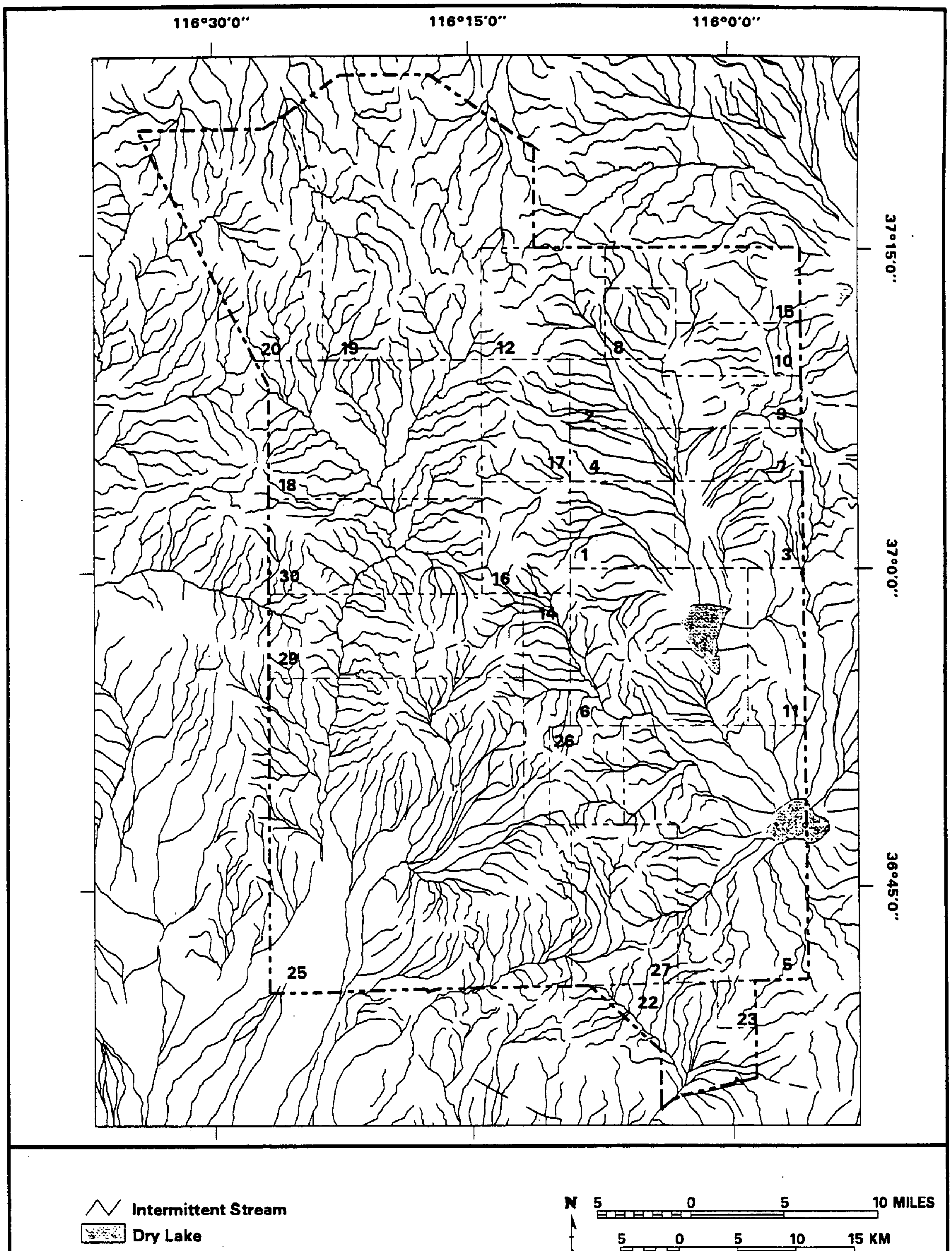
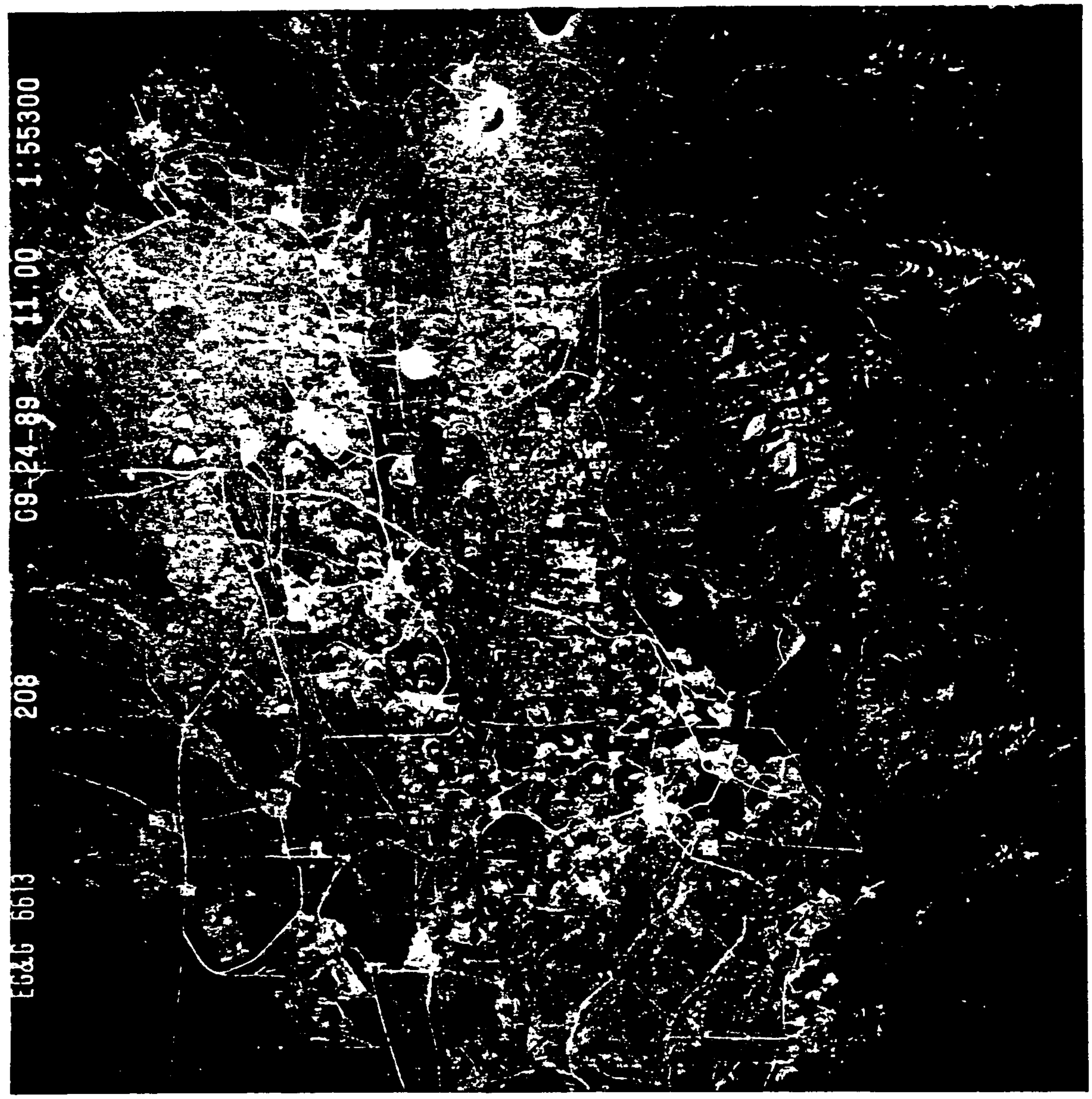


Plate 6: Surface Drainage.

DOE/RSL NTS-95-050.1



N

Plate 7: Aerial View of the Many Craters within Yucca Flat.

DOE/RSL PHOTO 6613-208

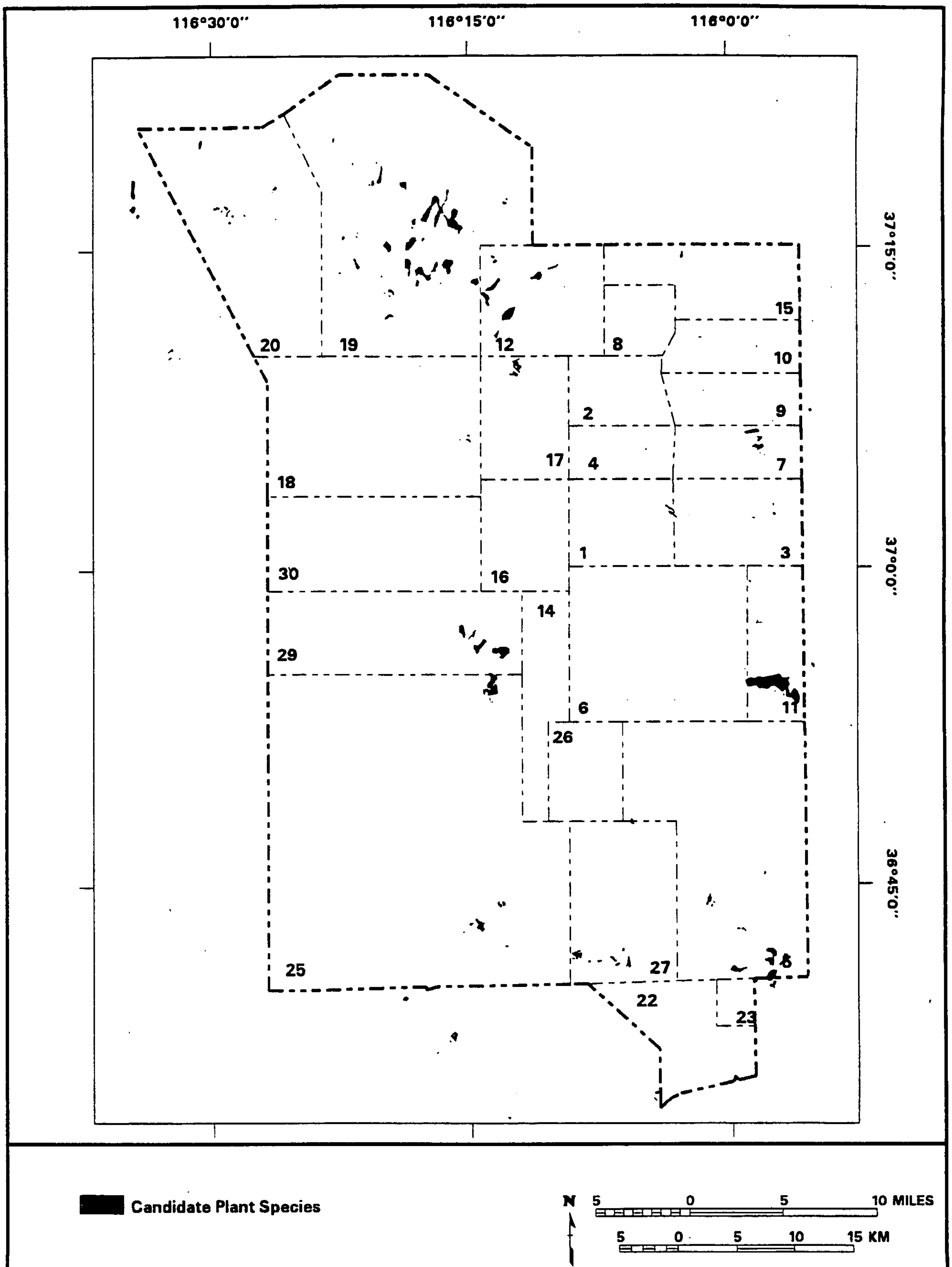


Plate 8: Distribution of Candidate Plant Species.

DOE/RSL NTS-95-051.1

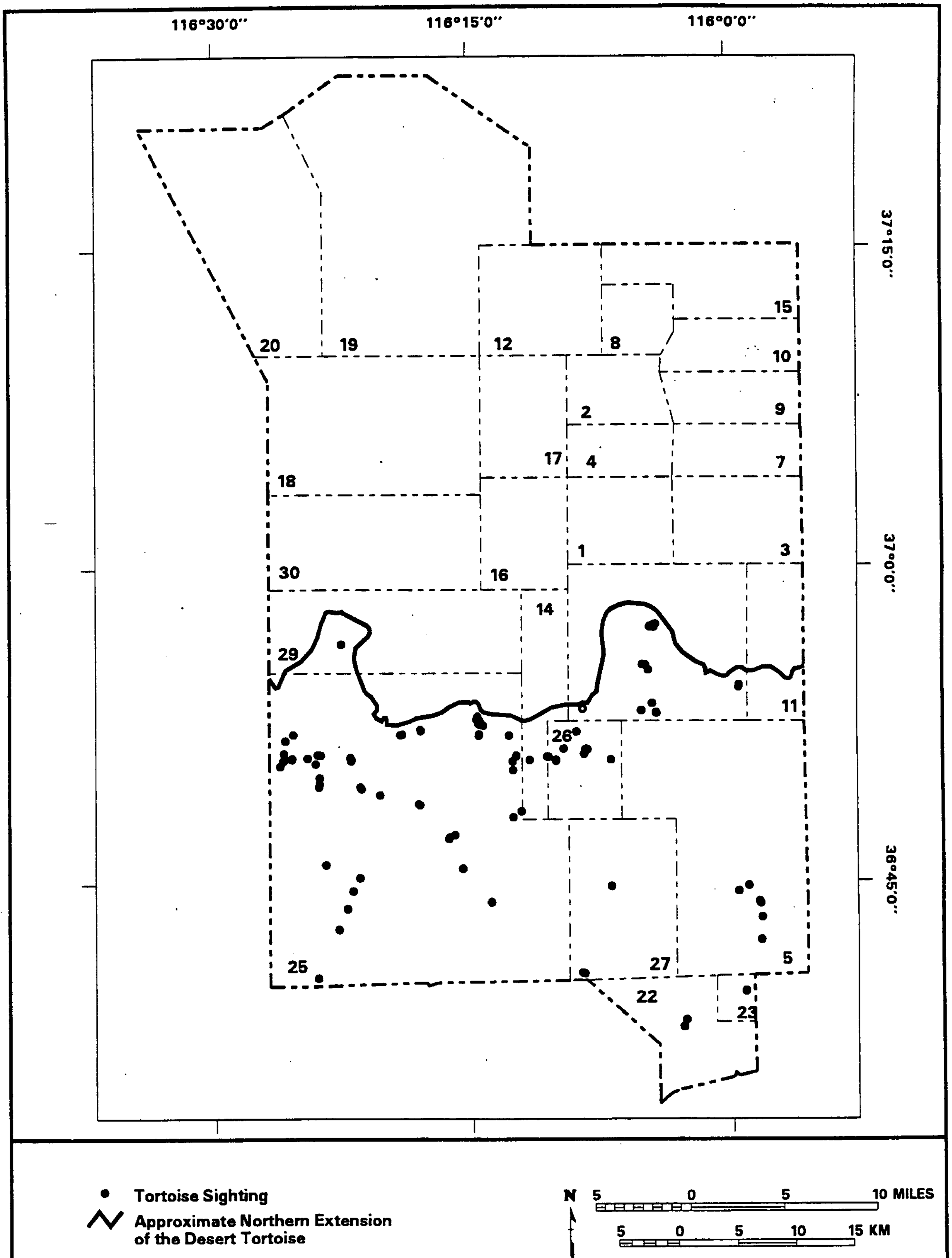
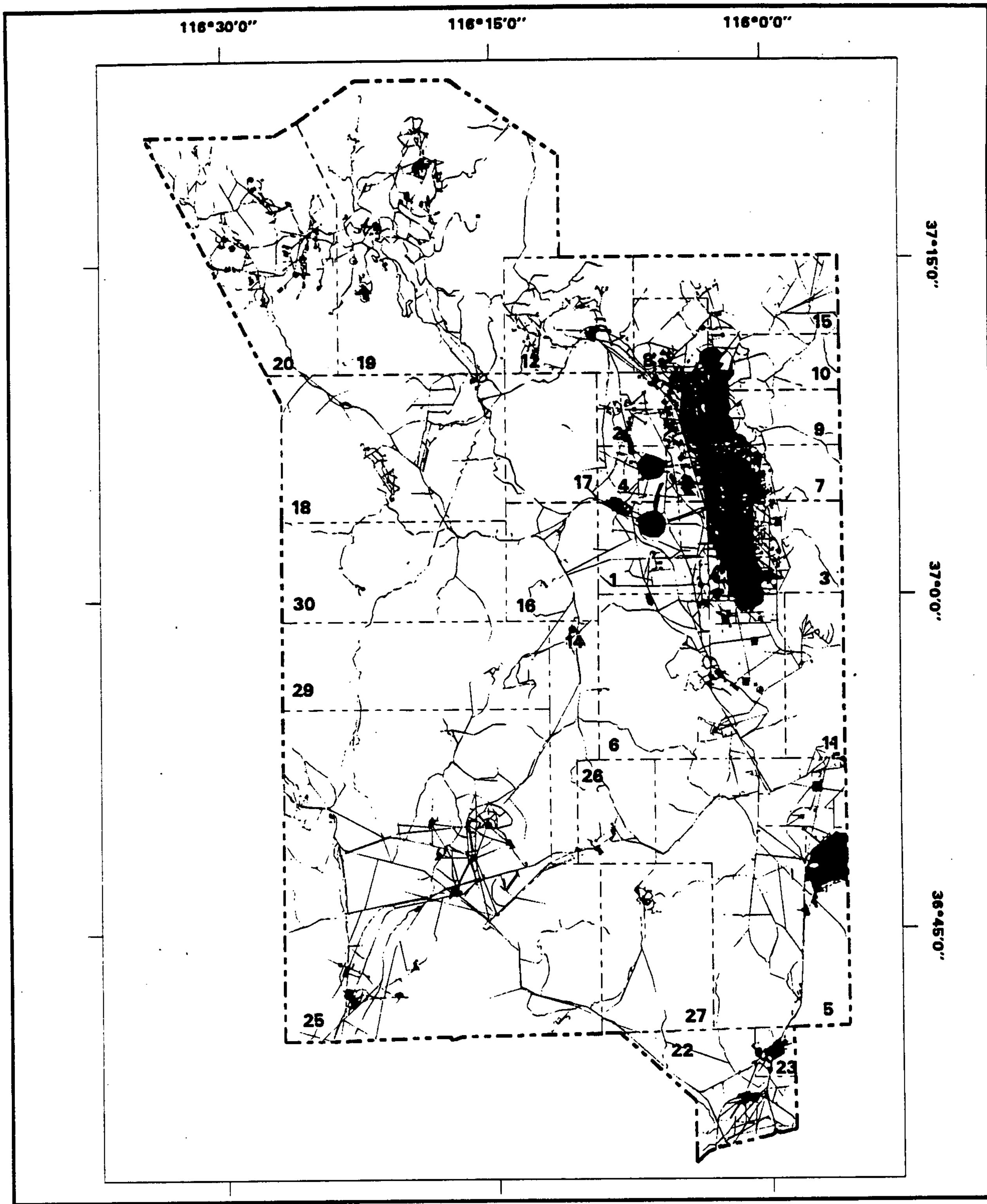


Plate 9: Tortoise Sightings.

DOE/RSL NTS-95-052.1



Surface Disturbance

Note: Disturbance information shown is preliminary.

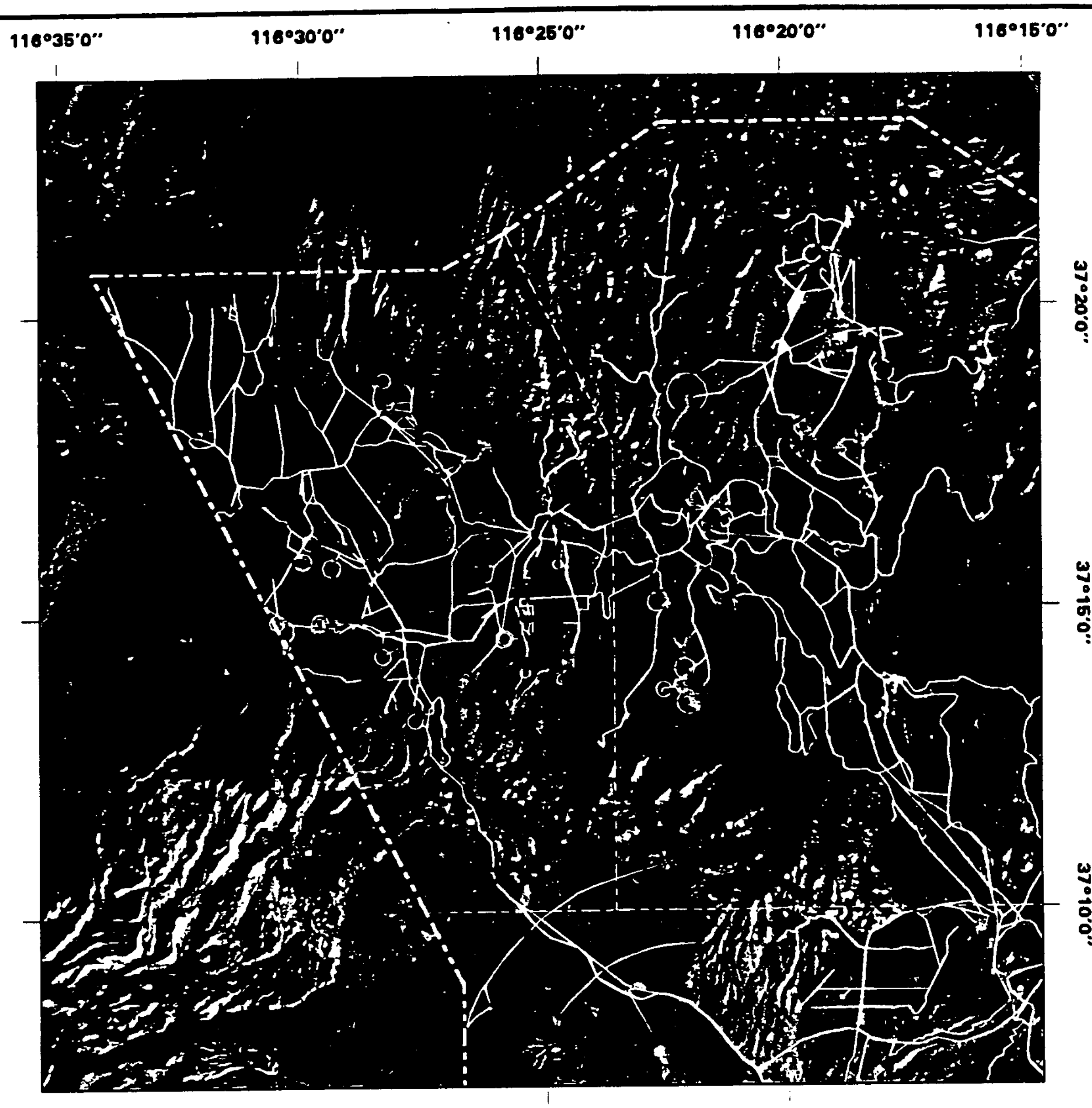
N

5 0 5 10 MILES

5 0 5 10 15 KM

Plate 10: Surface Disturbances.

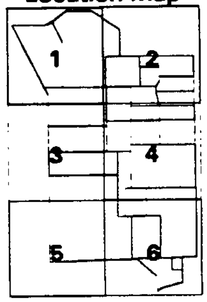
DOE/RSL NTS-95-056.1



2 0 2 4 MILES

2 0 2 4 6 8 KM

Location Map



N

Facility Related

Suspected Event Related

Scrape or Clearing

Earthen Structure

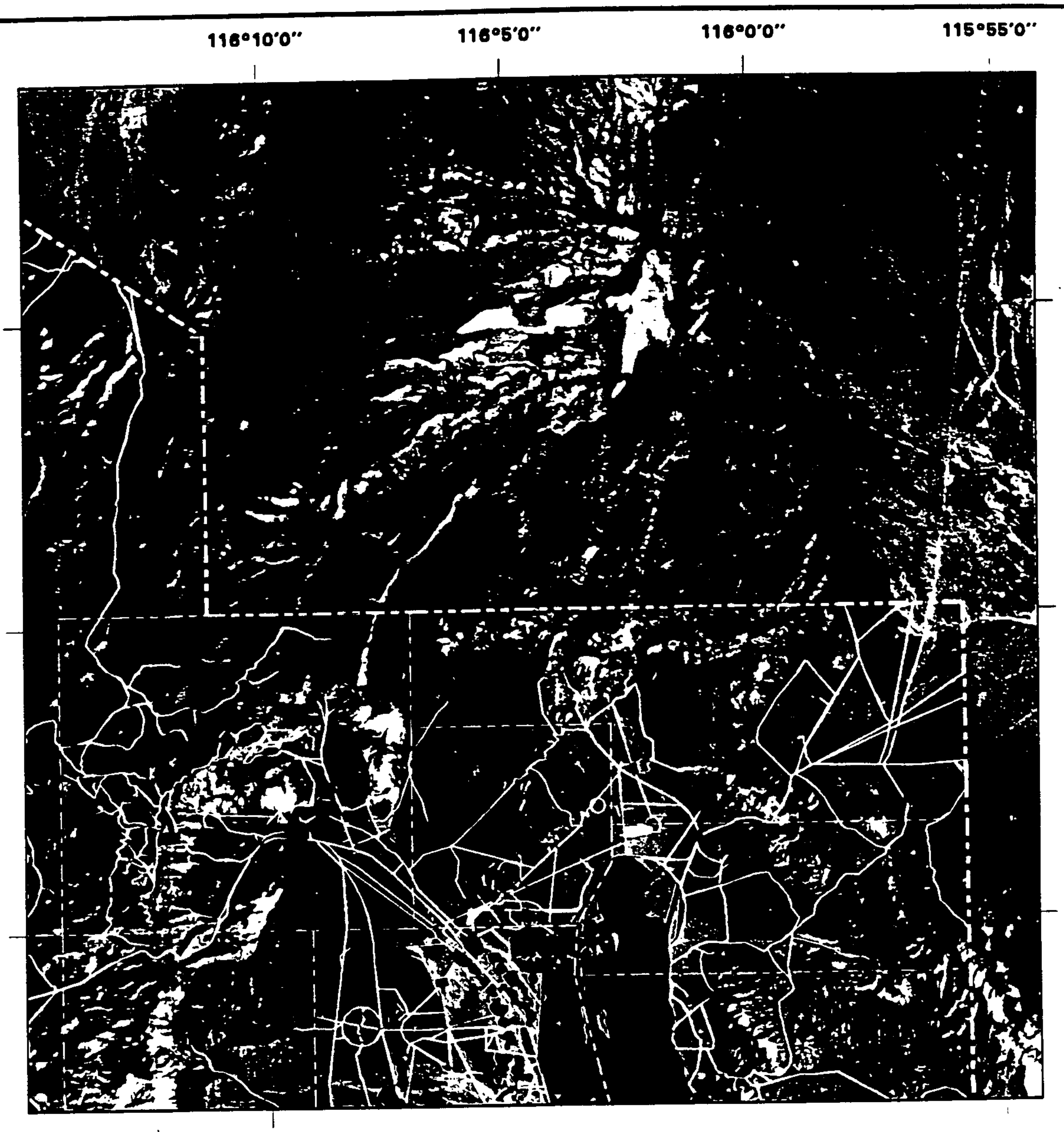
Road or Linear Feature

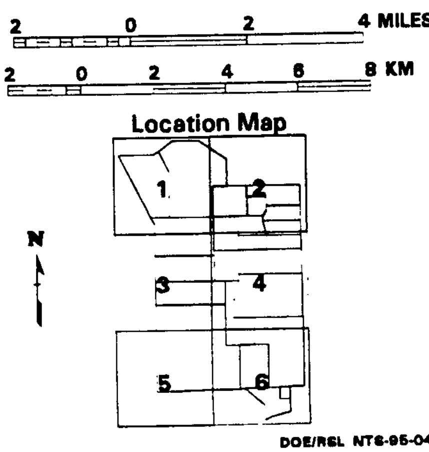
Unknown Type

Note: Disturbance information shown is preliminary.

Plate 11: Surface Disturbances - Sheet 1 of 6.

DOE/NSL NTS-95-044.2



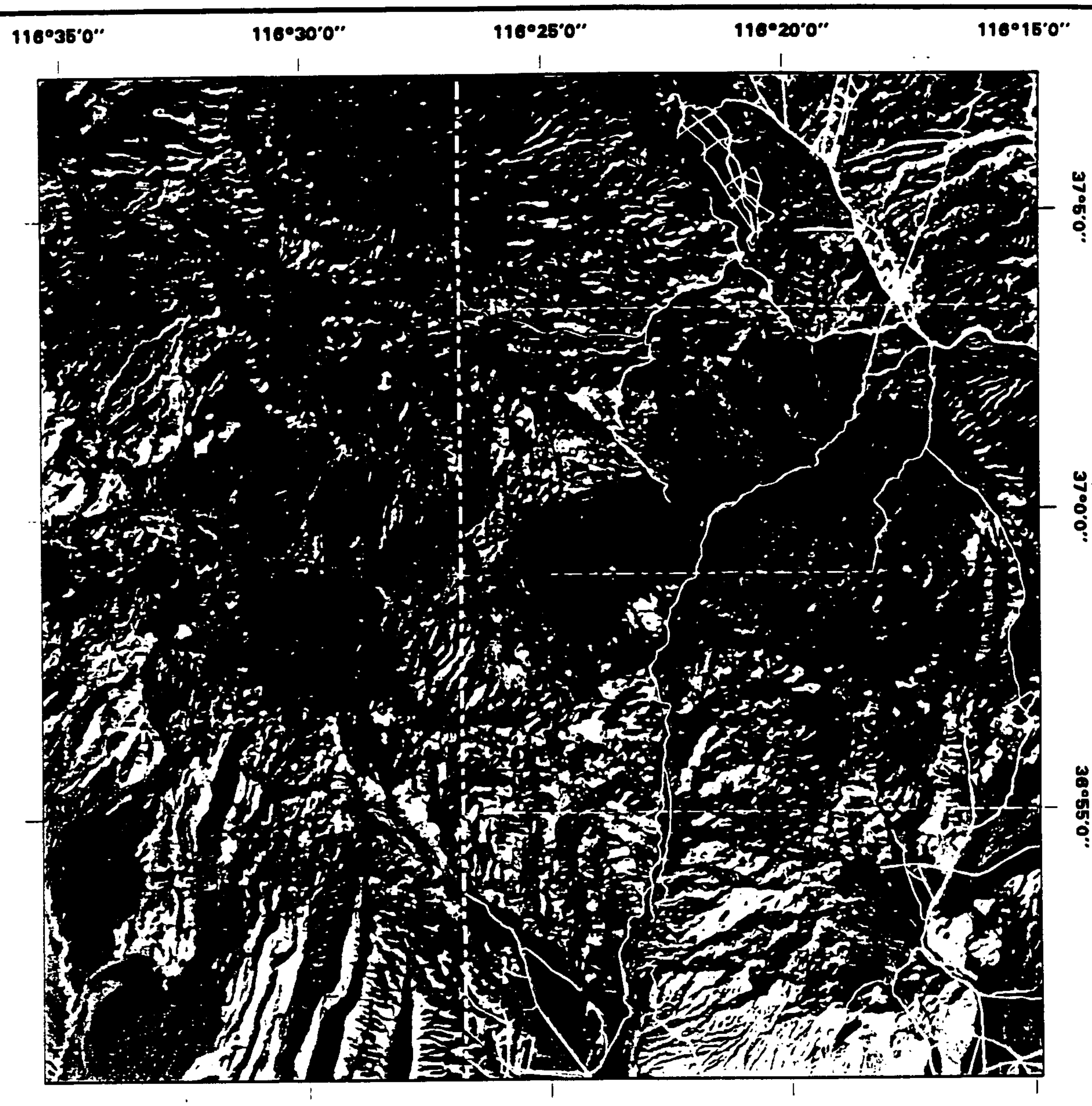


Facility Related
Suspected Event Related
Scrape or Clearing
Earthen Structure
Road or Linear Feature
Unknown Type

Note: Disturbance information shown is preliminary.

Plate 12: Surface Disturbances - Sheet 2 of 6.

DOE/RSL NTS-95-045.2



2 0 2 4 MILES

2 0 2 4 6 8 KM

Facility Related
Suspected Event Related
Scrape or Clearing
Earthen Structure
Road or Linear Feature
Unknown Type

Note: Disturbance information shown is preliminary.

N

Location Map

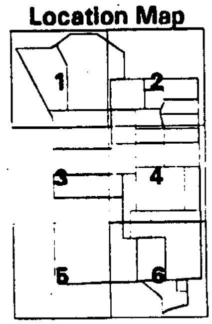
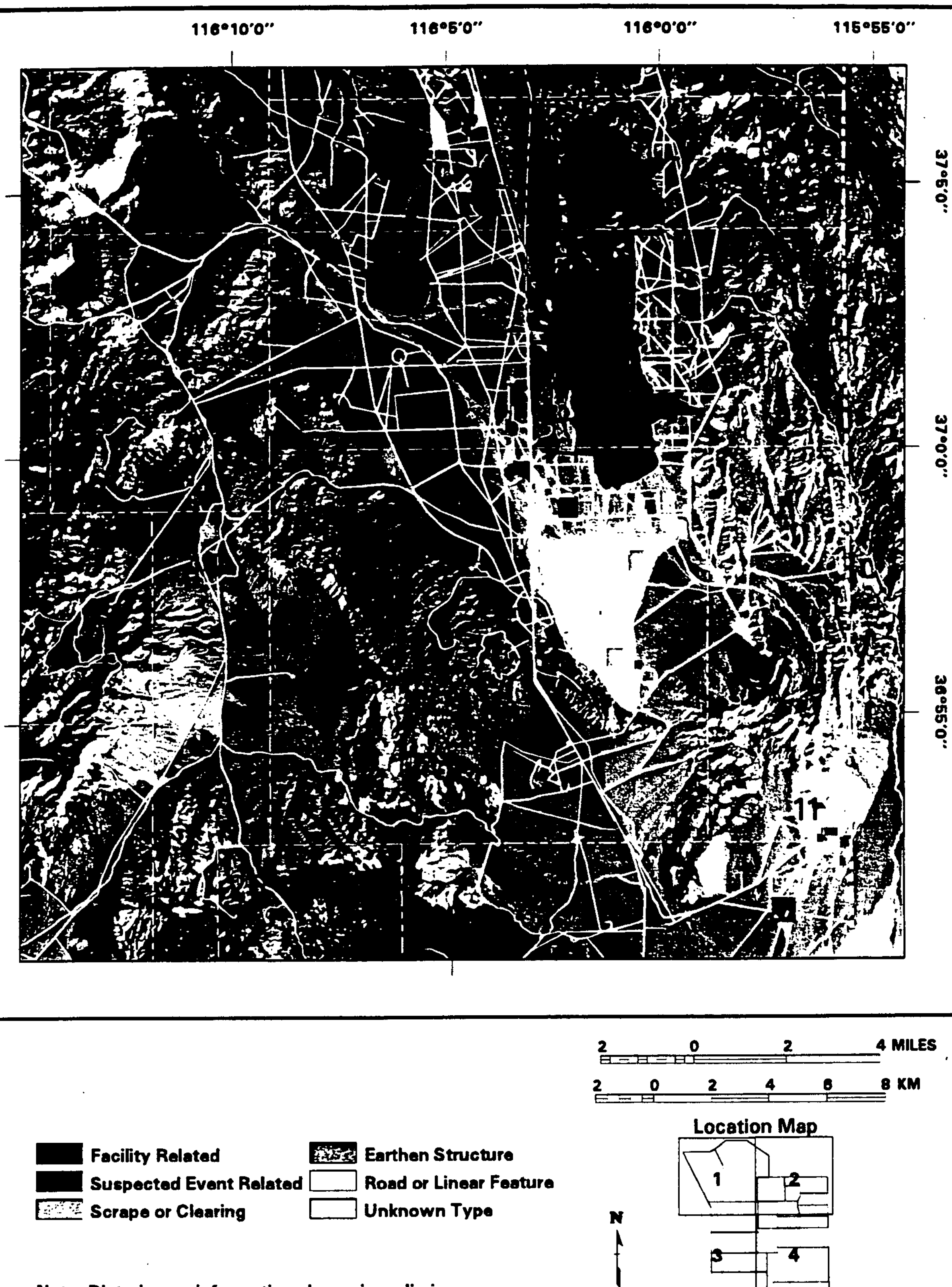


Plate 13: Surface Disturbances - Sheet 3 of 6.

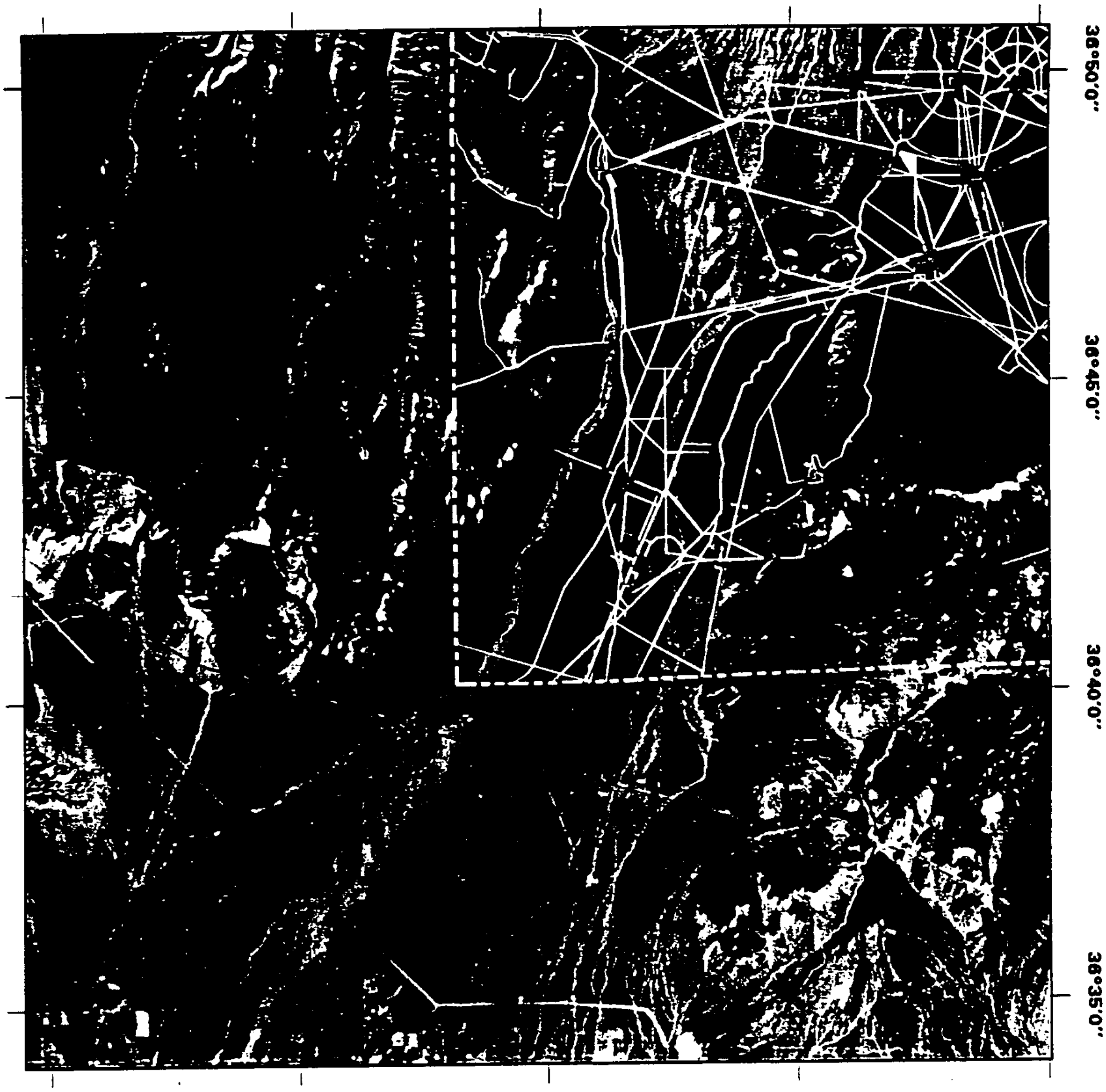
DOE/RSL NTS-95-046.2



Note: Disturbance information shown is preliminary.

Plate 14: Surface Disturbances - Sheet 4 of 6.

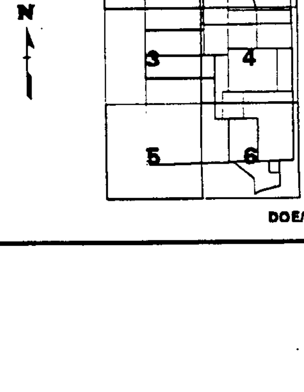
DOE/RSL NTS-95-047.2



2 0 2 4 MILES

2 0 2 4 6 8 KM

Location Map

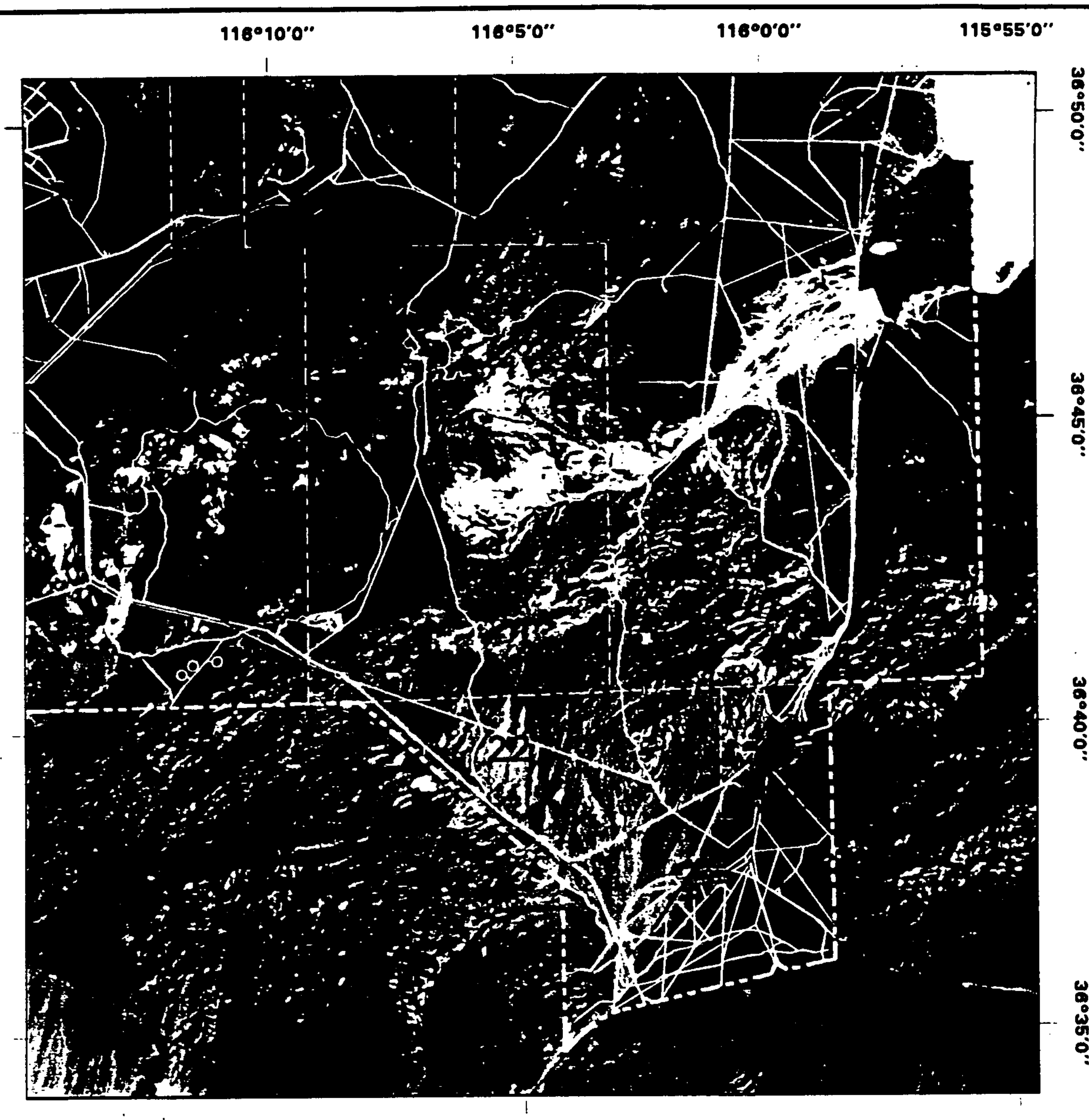


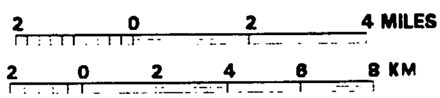
- Facility Related
- Suspected Event Related
- Scrape or Clearing
- Earthen Structure
- Road or Linear Feature
- Unknown Type

Note: Disturbance information shown is preliminary.

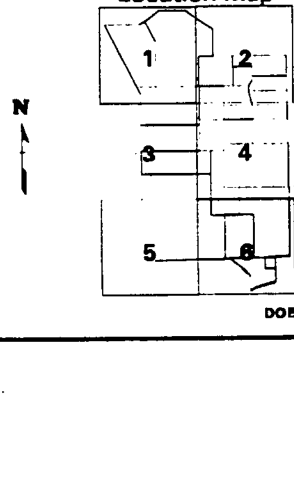
Plate 15: Surface Disturbances - Sheet 5 of 6.

DOE/NSL NTS-95-048.2





Location Map



- Facility Related
- Suspected Event Related
- Scrape or Clearing
- Earthen Structure
- Road or Linear Feature
- Unknown Type

Note: Disturbance information shown is preliminary.

Plate 16: Surface Disturbances - Sheet 6 of 6.

DOE/NSL NTS-95-049.2

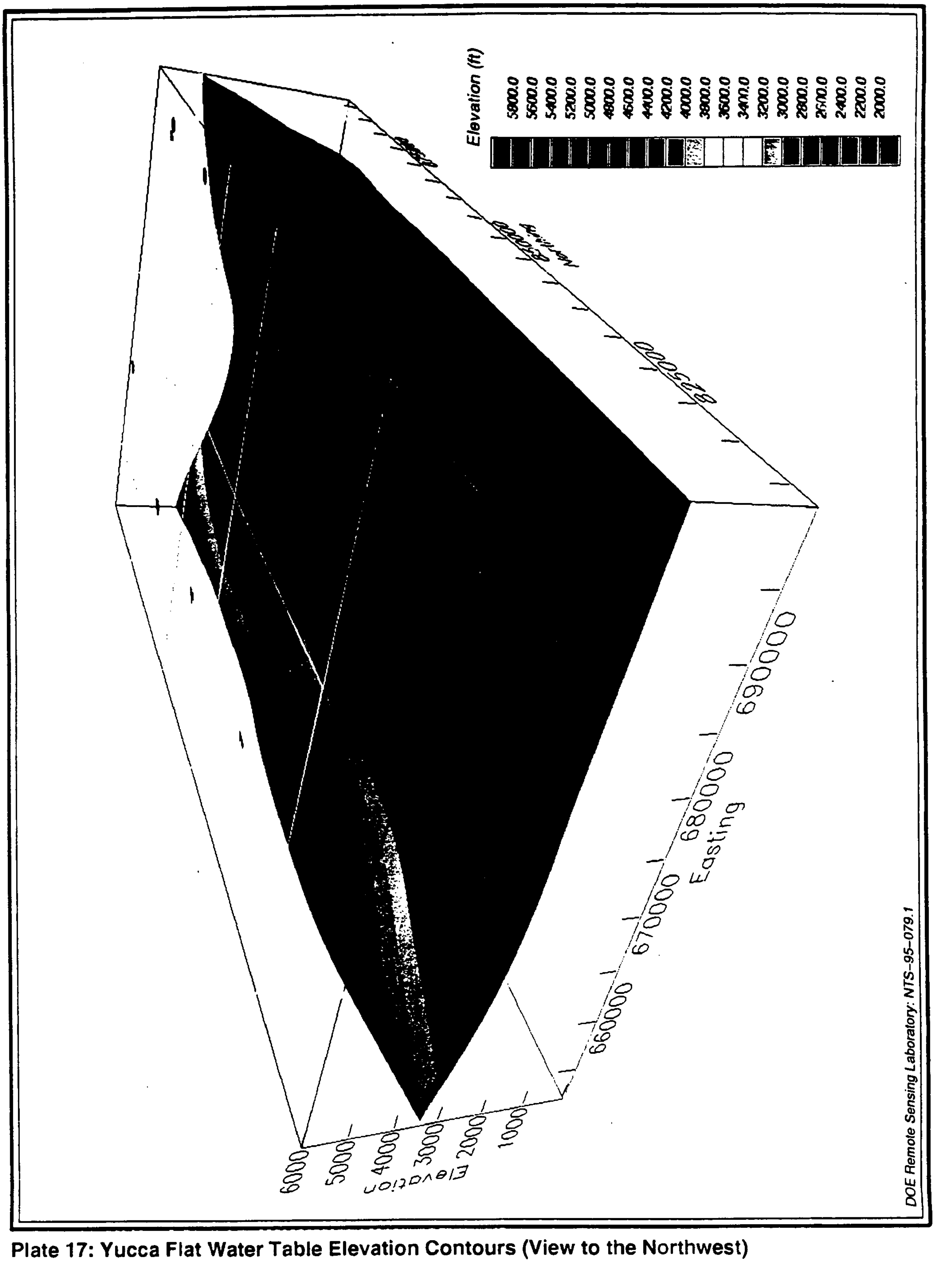


Plate 17: Yucca Flat Water Table Elevation Contours (View to the Northwest)

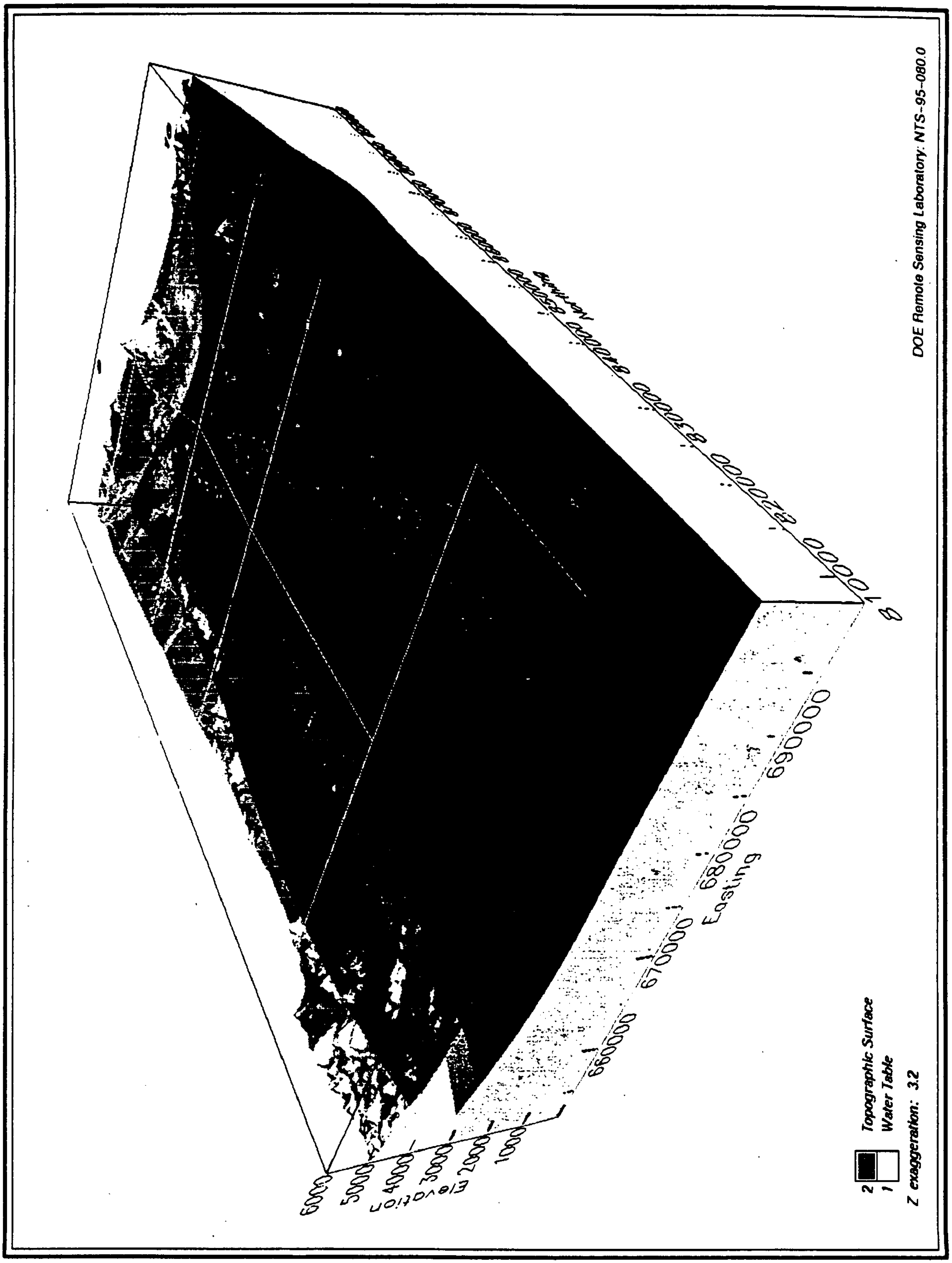


Plate 18: Yucca Flat Water Table Elevation Contours and Transparent Topographic Map Image (View to the Northwest)

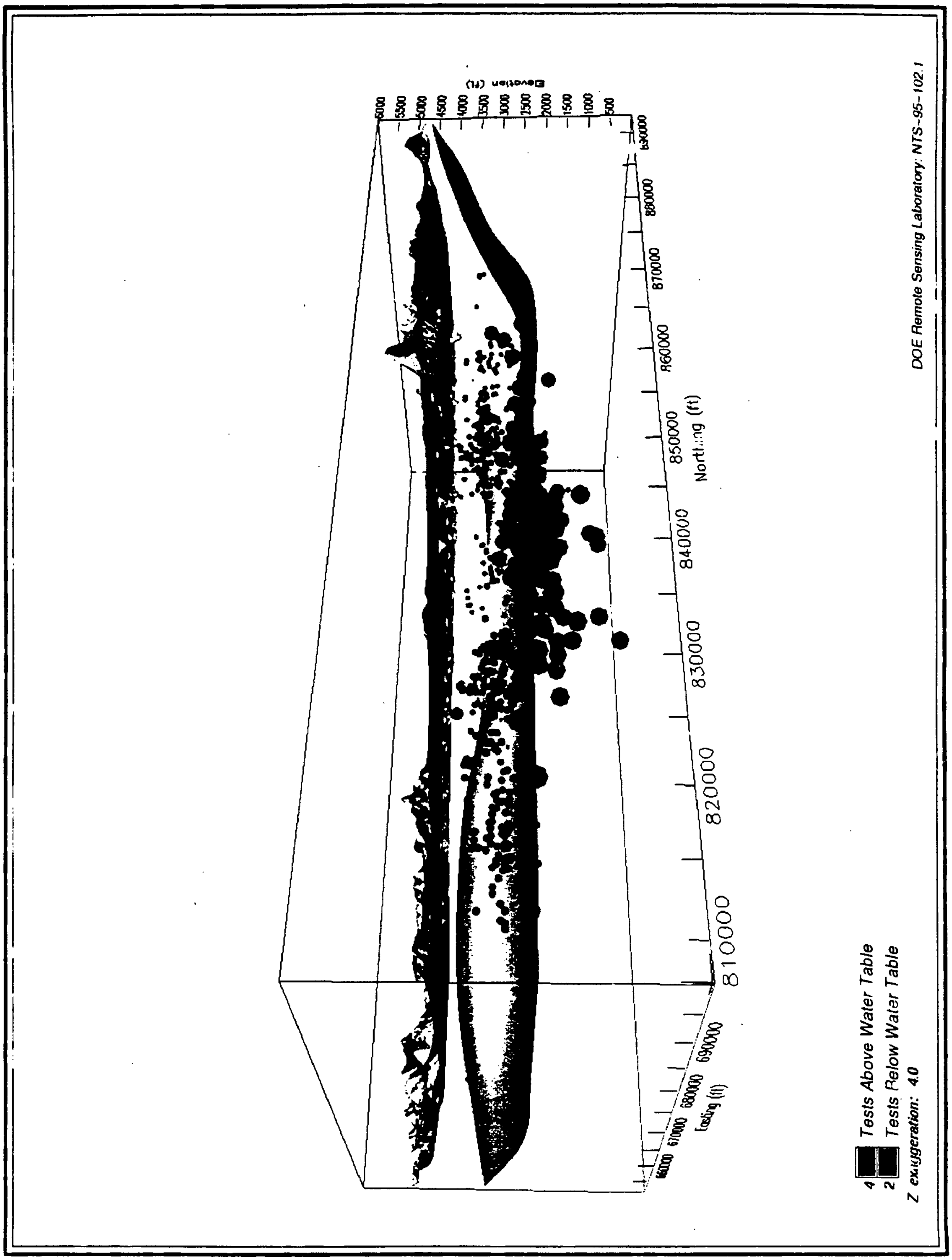


Plate 19: Yucca Flat Showing Location of Tests Both Above and Below the Water Table (View to the Northwest)

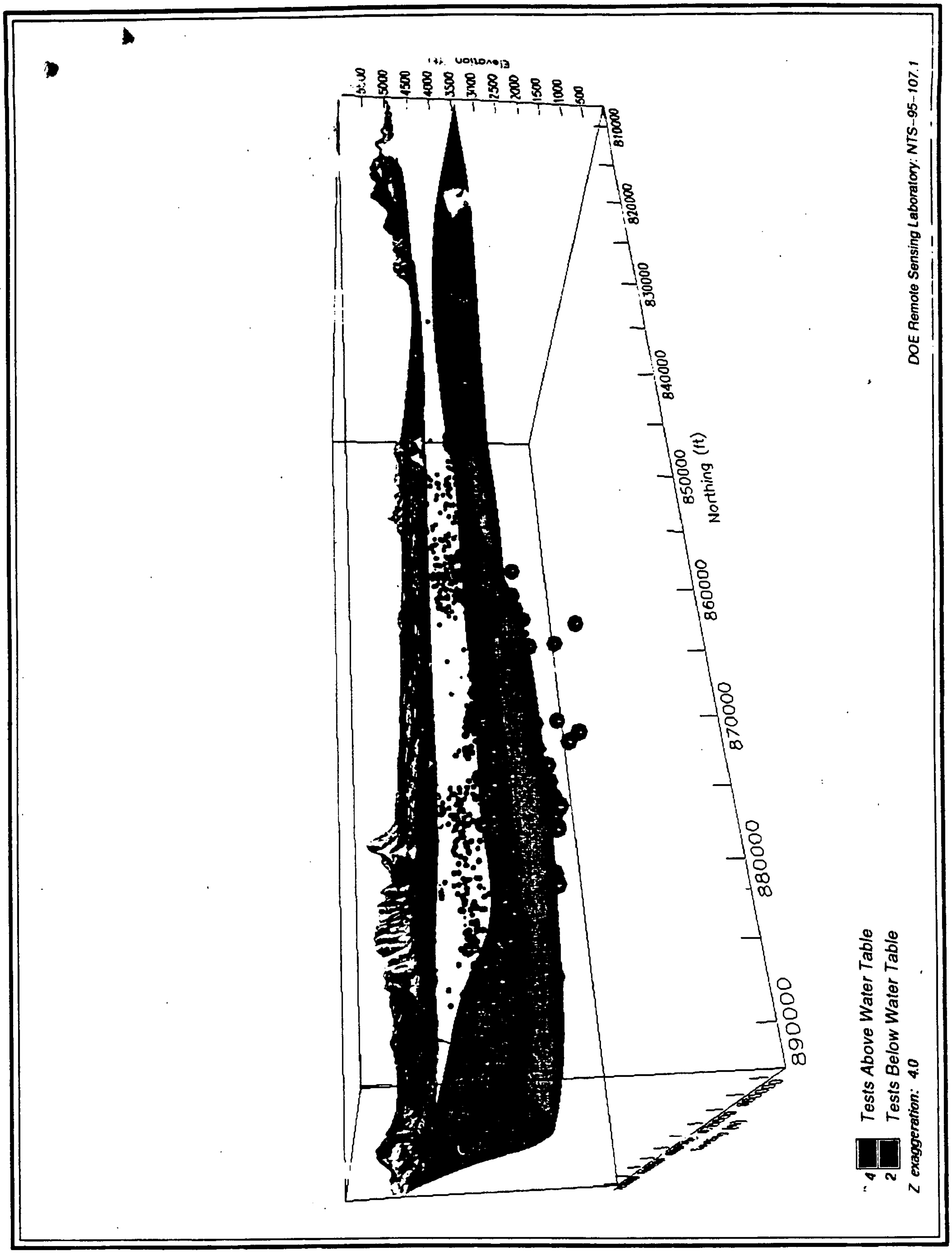


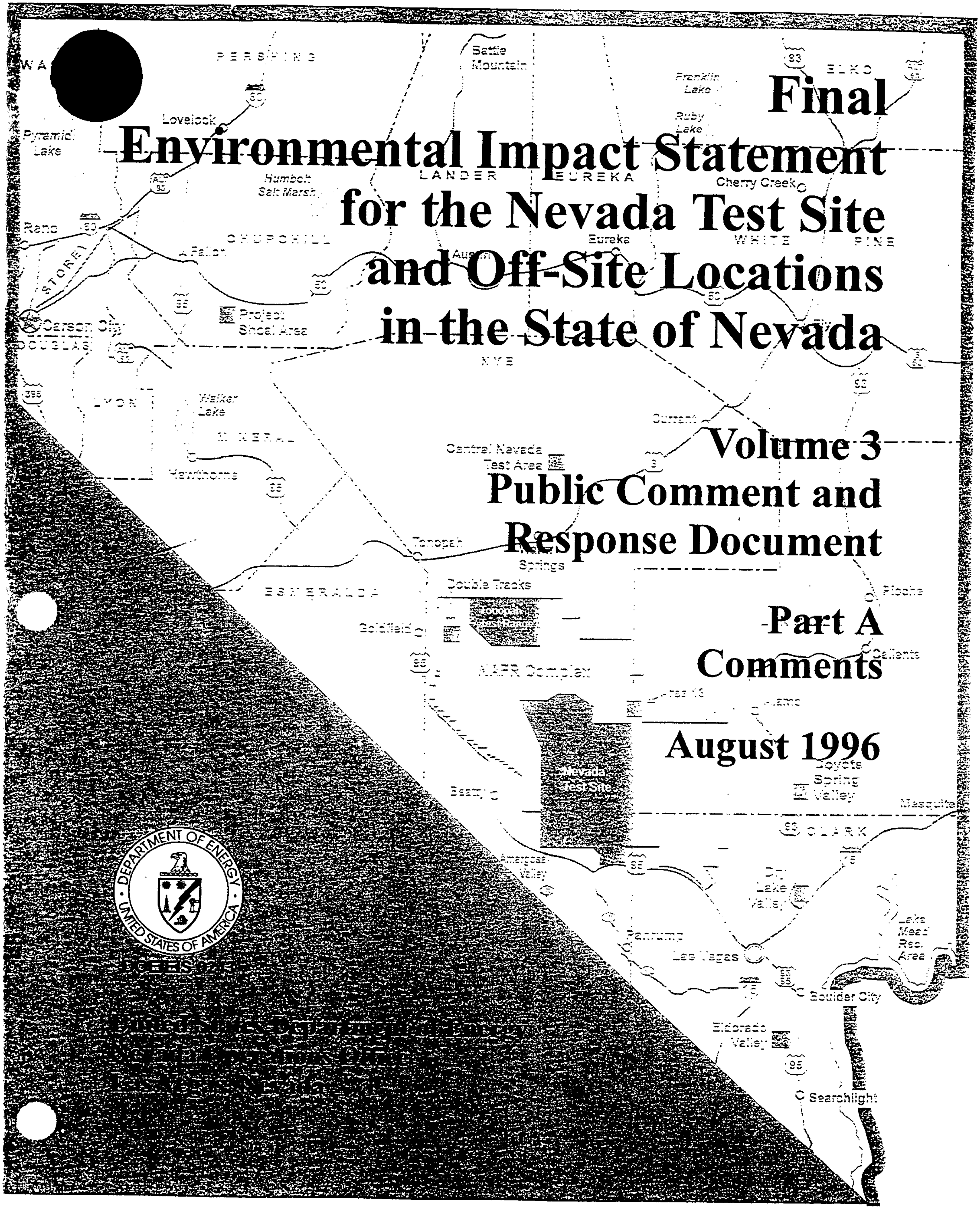
Plate 20: Yucca Flat Showing Location of Tests Both Above and Below the Water Table (view to the Southeast)

Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada

Volume 3
Public Comment and Response Document

Part A
Comments

August 1996



DEPARTMENT OF ENERGY
UNITED STATES OF AMERICA

DOE/EIS 0243

United States Department of Energy
Nevada Operations Office
Las Vegas, Nevada

Final
Environmental Impact Statement

for
the Nevada Test Site and Off-Site Locations in the State of Nevada

Volume 3

Part A

U.S. Department of Energy
Nevada Operations Office
Las Vegas, Nevada

TABLE OF CONTENTS
Part A

REFER TO PART B FOR CHAPTERS 3 (RESPONSES) AND 4 (REFERENCES)

SUMMARY

INTRODUCTION

On February 2, 1996, the U.S. Department of Energy (DOE) issued the Draft Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (NTS EIS) for review by the state of Nevada, Indian tribes, local governments, other federal agencies, groups and organizations, and the general public. The formal comment period lasted 90 days, ending May 3, 1996.

As part of the comment process, the DOE held public hearings in St. George, Utah, and in Pahrump, Reno, and Las Vegas, Nevada. Community Workshops were held in Caliente, Tonopah, Boulder City, and North Las Vegas, Nevada, in conjunction with the University of Nevada Las Vegas to discuss the Draft NTS EIS.

Volume 3 of the Final NTS EIS contains 3 chapters. Chapter 1 summarizes the major issues raised by the public. Chapter 2 contains the full text of the public comments on the Draft NTS EIS received by the DOE; it includes public hearing transcripts, written comments, and comments received via a toll-free comment "hot line." Chapter 3 contains the DOE's responses to the public comments and describes how the comments were considered in the Final NTS EIS.

METHODOLOGY

The DOE reviewed all comments on the Draft NTS EIS. Many of the comments required that the text of the Final NTS EIS be corrected, clarified, or otherwise revised. Each comment was reviewed for content and relevance to the environmental analyses and data contained in the NTS EIS, and addressed accordingly.

Spoken comments at public hearings and workshops were recorded by a court reporter and a verbatim transcript was produced (see Public Hearing Transcripts and Workshop Notes in Chapter 2 of this volume). The written comments and transcripts were reviewed and individual comments and questions were identified. Each comment and question identified is addressed in Chapter 3 of this volume. If a letter or transcript raised the same comment or question more than once, it is responded to the first time and subsequent comments and questions are cross referenced to this first response. The responses also indicate whether or not the text of the NTS EIS was corrected or revised because of the comment and, if so, which section of the NTS EIS contains the revision.

Many commentors raised similar issues and trying to answer each similar comment resulted in duplication of responses. In order to facilitate the review of the comment response document, Chapter 1 includes a discussion of these broader issues and a specific comment is referenced to the general discussion section of Chapter 1.

Some comments raised topics that are not pertinent to the EIS. In those cases, the DOE answered the questions or addressed the concerns; but no change to the text was made. Some comments indicated an agreement or disagreement with options within a specific alternative or certain aspects of an analysis. The DOE acknowledged these comments, but these comments did not result in changes in the text.

This Page Intentionally Left Blank

CHAPTER 1
MAJOR ISSUES

Public comments on the Draft NTS EIS raised 12 topics of broad interest or concern. These topics, categorized as "Major Issues," are addressed in this chapter, and include the following:

1.1 Exclusion of the Yucca Mountain Project

1.2 General Anti-Nuclear Sentiment

1.3 American Indian Claims - Ruby Valley Treaty

1.4 Use of Lands Withdrawn from the Public Domain

1.5 Land Use under Interagency Memoranda of Understanding or Agreement

1.6 Transportation of Radioactive Waste

1.7 Role and Authority of the Resource Management Plan

1.8 Release of Withdrawn Lands

1.9 Perception Based Impacts on Prosperity and Economic Development

1.10 Residual Radioactive Contamination - Source Term

1.11 Hydrology and Water Resources

1.12 Radioactive Waste Shipments and Waste Types.

In Chapter 3 of this volume, when one of these topics is raised, the commentor and other readers are referred to these discussions to provide a comprehensive answer to the question raised.

MAJOR ISSUE DISCUSSION

1.1 Exclusion of the Yucca Mountain Project

Many comments questioned the exclusion from the NTS EIS of the possible disposal of spent nuclear fuel and high-level radioactive waste in a deep geologic repository at Yucca Mountain.

Concern was expressed over the separation of the analysis of DOE actions at Yucca Mountain and the NTS, especially waste disposal and transportation issues. Comments received strongly urged that these impacts be evaluated and included as part of the NTS EIS. Yucca Mountain-related transportation issues included many of the same issues as those discussed in Section 1.6.

The scope of the NTS EIS is limited to reasonably foreseeable operations and activities with the potential to occur at, or be associated with, the management and use of the NTS over the next 10 years. During the public scoping process, the DOE identified the potential construction, operation, and closure of a spent nuclear fuel and high-level radioactive waste repository at Yucca Mountain as outside the scope of the NTS EIS. Should the Yucca Mountain site prove suitable, Congress must authorize development of the site, and a license must be obtained from the Nuclear Regulatory Commission prior to the initiation of any construction activities. Construction of the repository would not begin within the 10-year timeframe covered by the NTS EIS.

The DOE's Civilian Radioactive Waste Management Program, which includes the Yucca Mountain Project, is governed by the provisions of the Nuclear Waste Policy Act of 1982, as amended, and is under the purview of the DOE's Office of Civilian Radioactive Waste Management. The

Office of Civilian Radioactive Waste Management's mission is different than that of DOE/NV. Both organizations coordinate ongoing activities through a Memorandum of Agreement. The overall intent of the agreement is to foster coordination and communication between the two organizations in order to avoid conflicts in the performance of their respective missions.

Yucca Mountain is a geological feature adjacent to the western boundary of the NTS. The Office of Civilian Radioactive Waste Management is currently engaged in the extensive characterization of Yucca Mountain and the surrounding area. The evaluation of the data and information gathered during this characterization process will be used to determine if Yucca Mountain is a suitable location for a permanent repository for spent nuclear fuel and high-level radioactive waste. Under Section 113 of the Nuclear Waste Policy Act, site characterization activities are designated as "preliminary activities" and are specifically excluded from the requirement of the National Environmental Policy Act to prepare an EIS for major federal actions. However, the NTS EIS takes Yucca Mountain site characterization activities into account as part of the description of the existing NTS environment in Chapter 4, as well as in the discussion of cumulative impacts in Chapter 6.

The Council on Environmental Quality's National Environmental Policy Act regulations, 40 CFR 1501.7(a)(5), require the DOE, as a lead agency, to indicate any public EISs that will be prepared and that are related to, but are not part of, the scope of the impact statement under consideration. The Office of Civilian Radioactive Waste Management will prepare an EIS to evaluate the potential environmental impacts from the construction, operation, and eventual closure of a repository at Yucca Mountain for the geologic disposal of commercial and DOE-owned spent nuclear fuel and high-level radioactive waste (60 FR 40164, August 7, 1995). The repository EIS will consider relevant information and analyses, including the NTS EIS, as appropriate, in its description of the existing environment, as well as in the analysis of cumulative impacts. The analysis of cumulative impacts will include the combined effects of transporting waste to the repository and to the NTS. In this way, the DOE will ensure that the cumulative effects from activities taking place or in the immediate vicinity of the NTS are considered in its decisionmaking process along with the public's comments on these activities.

1.2 General Anti-Nuclear Sentiment

Many comments expressed a general opposition to nuclear weapons, weapons testing, the generation of electricity by nuclear power, and the land disposal of nuclear waste.

Some comments opposed the proposed conduct of subcritical experiments and expressed concern about the relationship between subcritical experiments and the successful completion of the ongoing negotiations of the Comprehensive Test Ban Treaty. Other comments reflected public support for the testing program and the positive economic benefit to the surrounding rural communities from NTS activities, and a desire for future stockpile activities to be located at the NTS.

The DOE recognizes that many people are opposed to the development and testing of nuclear weapons and the commercial use of nuclear power. These views, as important as they may be to the individuals holding them, are not relevant to the issues and alternatives examined in the NTS EIS. Since the 1940s, Congress has directed the DOE and its predecessor agencies to develop and produce the nation's nuclear weapons, and to ensure the reliability and safety of the nuclear weapons stockpile. With the end of the Cold War, Congress directed the DOE to stop producing nuclear weapons, dismantle some existing weapons, and maintain a smaller enduring stockpile. As a result, the DOE has closed or consolidated some of its former weapons production facilities.

In 1992, the United States declared a moratorium on underground nuclear testing. In 1995, the President extended the moratorium, and is pursuing a Comprehensive Test Ban Treaty. Even with these significant changes, the Congress passed the

National Defense Authorization Act for Fiscal Year 1994 (Public Law 103-160) which directed the DOE to maintain a high level of confidence in the safety, reliability, and performance of the nuclear weapons stockpile, and to maintain the ability to design, develop, manufacture, and test nuclear weapons. The NTS has been, and remains, the nation's only location for nuclear weapons testing, to meet the national defense mission.

Commentors have expressed concern about the conduct of subcritical experiments described in this EIS. The term, "subcritical experiments," does not define a new form of activity. It is intended to clarify the fact that such experiments could not achieve the condition of criticality, and they would meet current and prospective United States commitments to the moratorium on nuclear testing and the anticipated Comprehensive Test Ban Treaty. Although the term "subcritical" was not used in previous EISs for the NTS, some tests and experiments conducted over the past four decades, as well as the impacts of those tests and experiments, are substantially the same as those contemplated by the new terminology.

With regard to nuclear waste, Congress has directed the DOE to decontaminate surplus facilities, remediate contaminated areas no longer required for defense purposes, and dispose of defense-related nuclear waste in a safe and environmentally sound manner. See additional discussion under Section 1.1 and 1.12 of Volume 3.

1.3 American Indian Claims to Withdrawn Lands - Ruby Valley Treaty

Many comments referenced the long-standing claims, by the Western Shoshone Indians, to 24 million acres of land in Nevada, including the western half of the NTS. Some comments asserted that these lands should be returned to the Western Shoshone Indians, and that the federal government has no right to use the land for any purpose whatsoever, including those potential uses addressed in the NTS EIS.

In the early 1950s, the Western Shoshone filed a claim concerning the lands at issue under the Indian Claims Commission Act. This Act provided that if a claim against the government for unkept treaty promises was upheld, the tribe making the claim could receive only a monetary award, not land or other remuneration. In 1962, the Commission ruled that all Western Shoshone land titles had been extinguished, and later, to establish valuation for a monetary award, set July 1, 1872, as the date the land was taken. In 1976, the Commission awarded the Western Shoshone $26 million as payment for the land. The Western Shoshone refused to accept payment, arguing that rejection of the money meant that they had not been compensated and their claim to the land was still alive. With interest, the award, held in the U.S. Treasury in trust for the Western Shoshone, is now more than $100 million.

The land ownership issue has been brought to court on several occasions. In 1984, the U.S. Supreme Court agreed to hear the case, considering only the issue of whether "payment" for the land had been made. In 1985, the Supreme Court held that the payment had been made in accordance with the Indian Claims Commission Act of 1946. This constituted full and final settlement for the land. Whether or not the Western Shoshone accepted the payment had no effect on the transaction; the land was ruled to belong to the United States. Subsequent challenges to this ruling have been made before the U.S. Circuit Court of Appeals for the Ninth Circuit who reiterated the Supreme Court decision: the Western Shoshone have no right to the land. In response to a subsequent appeal, the U.S. Supreme Court refused to hear the case, letting the appellate court decision stand.

The DOE is aware of significant disagreement with the rulings, especially by the Western Shoshone, and recognizes that there may be additional challenges and appeals. The U.S. Government and the DOE will abide by any new rulings made on this subject.

1.4 Use of Withdrawn Lands for Purposes Other than Weapons Testing

Several comments questioned the inclusion and consideration of potential activities and operations on the NTS that are viewed as inconsistent with the original purpose and use of the withdrawn lands.

These comments expressed the concern that because the land withdrawals for the NTS are for the purpose of nuclear testing, other activities such as waste management, the construction and operation of solar power generating facilities, and the defense and heavy industrial facilities described in the EIS are inconsistent with the Public Land Orders.

The NTS was created through the issuance of four Public Land Orders. Public Land Order 805, dated February 12, 1952, reserved lands for the use of the U.S. Atomic Energy Commission, the DOE's predecessor, as a weapons testing site. Subsequent withdrawals in 1958, 1961, and 1965 reserved the withdrawn lands for use of the Atomic Energy Commission in connection with the NTS. The 1961 withdrawal was more specific in that it reserved the lands for use of the Atomic Energy Commission in connection with the NTS for test facilities, roads, utilities, and safety distances.

In 1983, the U.S. Bureau of Land Management, in accordance with the Federal Land Policy and Management Act of 1976 (Public Law 94-579), conducted a review of the existing four land withdrawals that comprise the NTS. The Bureau of Land Management report compiled during its review acknowledged that, while the primary mission of the NTS continued to be weapons testing, other activities and projects were also being pursued. The reports specifically referred the readers to the Final EIS (ERDA, 1977) for "a more detailed explanation of activities and projects." Thus it is clear that the Bureau of Land Management was well aware of the DOE's multiple land uses, including radioactive waste disposal, NTS farm experiments, emergency response tests, etc. Thus informed, the Bureau of Land Management District Manager concurred with the review's conclusion that the lands were still being used for the purpose for which they were withdrawn. The Bureau of Land Management found that any new land uses at the NTS at the time were not inconsistent with that original use.

The Federal Land Policy and Management Act of 1976, its implementing regulations, and the Public Land Orders themselves are silent on the use of withdrawn lands for related purposes. There are no specific prohibitions against additional use, if the purpose for which the withdrawal was authorized remains valid. There is clearly no prohibition of the consideration of alternative uses, through an EIS or otherwise, of withdrawn lands as a management or administrative action to assess the potential for additional beneficial uses of such lands.

The Department of the Interior is vested with oversight responsibility to review existing land withdrawals under the Federal Land Policy and Management Act. The Department of the Interior has suggested in its comments on this EIS that substantial changes in land use at the NTS may require a new land withdrawal. While the DOE believes that land use at the NTS is compatible with the primary purpose of each land withdrawal, the most recent comments from the Department of the Interior indicate that a review of the existing land withdrawals may be prudent.

As has been its past practice, the DOE continues to be committed to ensuring that all future activities contemplated in this EIS are conducted in compliance with Federal Land Policy and Management Act and federal land withdrawal policy. In this regard, the DOE will consult with the Department of the Interior to ensure that the appropriate process is followed to enable DOE to fulfill this commitment.

1.5 Land Use Under Interagency Memoranda of Understanding or Agreement

Some comments asked about the interagency and intra-agency land use agreements that cover use of lands discussed in the NTS EIS.

These comments focus more directly on the interrelationship and significance of the agreements between the Department of Defense and between the DOE/NV and the Yucca Mountain Site Characterization Office. Some comments questioned the authority of the DOE to enter into such agreements, others asserted that DOE cannot authorize the use by other federal agencies of lands under its jurisdiction.

There are three land use agreements that involve some of the lands that are the subject of the discussions and evaluations contained in the NTS EIS. Two of these agreements are interagency agreements between the U.S. Air Force and the DOE. The first of these agreements is a Memorandum of Understanding between the DOE and U.S. Air Force that grants the DOE use of Pahute Mesa on the Nellis Air Force Range Complex. The second interagency agreement is a Memorandum of Agreement that grants the DOE use of portions of the U.S. Air Force's Tonopah Test Range. These Memoranda of Agreement are authorized under Section 3(f) of the Military Lands Withdrawal Act (Public Law 99-606, November 6, 1986), which allows other activities to occur on lands reserved for military purposes.

The third land use agreement is an intra-agency Memorandum of Agreement between the DOE/NV and the DOE Yucca Mountain Site Characterization Office. This Memorandum of Agreement allows the temporary use of a portion of the lands withdrawn for the NTS under Public Land Order 2568, and some of the existing facilities of Area 25 of the NTS for various site characterization activities required under the Nuclear Waste Policy Act of 1982, as amended. The Memorandum of Agreement further allows the use of other areas of the NTS for field studies associated with site characterization activities, conditional on those activities' noninterference with approved NTS programs. This Memorandum of Agreement serves to coordinate activities and infrastructure support services such that the mission objectives established by Congress for both the DOE organizations can be accomplished in an organized and efficient manner.

1.6 Transportation of Low Level Radioactive Waste

Many comments raised issues relating to the transport of radioactive wastes from other DOE facilities and operations to the NTS. These comments range from demands for the DOE to select transportation routes in the NTS EIS to the suggestion that the DOE should contractually obligate selected carriers to specific rest stop locations along specified routes. Transportation-related comments also included requests for additional institutional interaction and communication. State, county, and municipal governments also recommended specific mitigation measures regarding enhanced communication and training, and provision and maintenance of equipment.

Transportation of materials and waste were identified as a primary concern by stakeholders prior to the initial scoping process for this EIS. The stakeholders formed several working groups to further their discussions with the DOE on transportation. One of the primary groups was the Transportation Protocol Working Group, established to work with the DOE to better define stakeholder concerns and develop a set of recommendations. The recommendations request services from the DOE that would assist the stakeholders in resolving their concerns. The summary of the Transportation Protocol Working Group concerns are as follows:

Vehicles, Routing and Parking

Major issues in this area include routing and routing methodologies, use of contract rather than common carrier, multiple drivers, adherence to drivers advisories, the safety inspection program for carriers and the need for secure parking for vehicles after duty hours at the NTS.

Emergency Response and Management

Emergency response concerns include the need for radiation detection and emergency response equipment, emergency response training, and emergency management plans.

Communication

The major concerns in this area include shipment notification and other associated data and information from the on-going and future activities associated with transportation of low-level radioactive waste, including annual reports for transportation activities. A continued commitment from the DOE to meet with the Transportation Protocol Working Group to resolve ongoing transportation issues was requested.

The DOE presently is reviewing these recommendations. Its response could include implementation of some of the recommendations in the near future, such as secured parking for the shipments during off-duty hours and access to equipment. The DOE and Transportation Protocol Working Group have agreed to meet several times a year, or when necessary, as well as to keep all other avenues of communication open to assist the stakeholders with their concerns with transportation. Presently, the DOE/NV is reviewing inventories for radiation equipment to see if any of this equipment can be donated to the local communities and counties.

The routing of radioactive materials (including waste) being shipped on the nation's highways and roads is subject to regulations that are administered and enforced by the U.S. Department of Transportation. The primary objective of these regulations is to ensure that the motor vehicle transporting a regulated quantity of radioactive material is operated on routes that minimize radiological risk (49 CFR 397.101[a][1]). The DOE will continue transporting radioactive materials in accordance with these regulations.

Route Selection. The shipper selects the carrier, and it is the carrier's responsibility to select a route between the shipper's location and the destination that is in compliance with all applicable Department of Transportation regulations. The same regulations apply whether the carrier is a common carrier, contract carrier, or if the shipper operates its own transport vehicle. No individual, entity, organization or jurisdiction may select or require routing that is not in compliance with these regulations which require that when evaluating routing options and the radiological risk of transport, the carrier must consider:

1. Known accident rates along potential routes
2. Transit time
3. Population density and activities
4. Time of day and day of the week that transport will occur.

Written Route Plans. Before departing, the carrier must prepare a written route plan and supply a copy of the plan to the motor vehicle driver and shipper. Any departure from the route plan and the routes actually used, and the reason for it, must be reported in an amendment to the route plan delivered to the shipper as soon as practicable, but within 30 days following the deviation. The route plan must include:

1. A statement of the origin and destination points, the route selected, all planned stops, and estimated departure and arrival times

2. Telephone numbers which will access emergency assistance in each state to be entered.

Safe Haven and Parking. The Department of Transportation regulations provide a State the authority to identify safe haven parking areas, to impose limitations on time of day that transport takes place and holiday and peak traffic limitations. The State of Nevada has not chosen to implement any of these requirements. Clark County and numerous cities within Clark County have implemented regulatory notification requirements for hazardous and radioactive materials, including waste, prior to entry. In response to the stakeholders concern, the DOE will provide parking inside the secured area of the NTS for shipments arriving after duty-hours.

Transport Motor Vehicle Operator Training. The Department of Transportation regulations stipulate that no person may transport a regulated quantity of radioactive materials on a public highway unless the driver has been trained in:

1. Requirements of 49 CFR Parts 172, 173, and 177 pertaining to the radioactive materials being transported

2. The properties and hazards of the radioactive materials being transported

3. Procedures to be followed in case of an accident or emergency.

Emergency Management. The Superfund Amendments and Reauthorization Act of 1986 requires state and local jurisdictions within the United States to plan for and have the capability to respond to incidents involving all hazardous materials, including waste, that reside in or pass through their jurisdiction. This process is implemented through the Local Emergency Planning Committee and the State Emergency Response Commission. As part of this program, local communities and counties are required to implement an Emergency Response Plan. These plans define chain-of-command, notification procedures, and evacuation procedures for each community.

Emergency Response Training. For the past 15 years the DOE has provided training to responders in Nevada through the First-On-Scene Program. This training will continue to be made available to state regulators, educators, the public, and authorities (firefighters, law enforcement, and emergency medical personnel) within Nevada. Training courses for environmental protection, safety and health, transportation, radioactive materials management, and environmental restoration, and classes that meet or exceed federally mandated training requirements for personnel involved with the generation or disposal of radioactive or hazardous waste, can be provided by the DOE/NV.

1.7 Role and Authority for the Resource Management Plan

Several comments requested additional information on the role and authority of the NTS Resource Management Plan in shaping the future use of the NTS. Comments included questions on how the Resource Management Plan will be developed and the public's ability to provide input in its formulation, challenges to DOE's concept of the principles of "ecosystem management," and suggestions that the Resource Management Plan would have little or no authority to protect natural resources on the NTS.

The goal of the *Resource Management Plan* is to establish a process for managing resources to ensure long-term diversity and productivity of affected ecosystems and sustainable use of land and facilities on the NTS. The DOE/NV will use the *Resource Management Plan* to assess the impact of existing facilities and activities, and evaluate the selection, design, location, and impact of proposed facilities and activities. The *Resource Management Plan* will be an essential part of the comprehensive land-use process required by DOE Order 430.1, Life-Cycle Asset Management. Interested parties will have opportunities to provide input into the selection of goals developed to guide management of resource issues on the NTS and to assist in the development of management actions needed to achieve those goals.

The *Framework for the Resource Management Plan* was developed using principles of ecosystem management that are widely accepted. Reports, including those by the U.S. Interagency Ecosystem Management Task Force, were reviewed to help establish a solid basis for the *Resource Management Plan*. Public participation is an essential element of these principles. The DOE's efforts to gather public input for the "framework" document in the NTS EIS prior to developing the actual plan is intended to reflect the DOE's commitment to public participation in this effort. The framework document includes commitments to work closely with surrounding land managers, government agencies, tribal organizations, and other interested parties.

1.8 Release of Withdrawn Lands

Several comments suggested that all DOE activities and operations at the NTS should cease and that the withdrawn lands which comprise the NTS, or portions of the site, should be returned to the State of Nevada, the public, the Western Shoshone, or the Bureau of Land Management. Many comments emphasized that environmental restoration should occur prior to release.

Alternative 2 of the NTS EIS addresses the environmental impacts of discontinuing DOE and interagency programs and operations at the NTS. While this alternative does not include the return of withdrawn lands, the relinquishment of these lands from DOE control would be subject to certain laws, regulations, and withdrawal agreements.

The NTS was created through four Public Land Orders that reserved the land for use by the DOE's predecessor, the U.S. Atomic Energy Commission, for weapons testing. Should it be determined that the NTS, or portions of the site, are no longer required for the purpose for which it was reserved, the lands must be returned to the U.S. Department of the Interior under the provisions of the Federal Land Policy and Management Act, and the four Public Land Orders.

Before a withdrawal (or portions thereof) may be terminated and lands relinquished to the Department of the Interior, the issue of the suitability of lands for return to the public domain must be resolved. The Department of the Interior's Bureau of Land Management must determine if hazardous substances exist on the withdrawn land. The Bureau also has the discretion to conduct a hazardous substance survey to verify the representations of the holding agency regarding the presence or absence of such substances. If hazardous substances exist on the land, the holding agency can be required to decontaminate all affected lands according to the standards promulgated by the state regulatory authority, the U.S. Environmental Protection Agency (EPA), or both, prior to terminating the withdrawal. The Bureau of Land Management will weigh the cost of long-term monitoring, inspection, cleanup, and rehabilitation against the value of the resources for existing Bureau programs before accepting jurisdiction of any contaminated lands. If the lands are accepted for return to the public domain, the Bureau will determine the proper management prescriptions for the lands being returned. These prescriptions may range from a recommendation that a new withdrawal be pursued to multiple-use management consistent with area land-use policies.

1.9 Perception-Based Impacts on Regional Prosperity and Economic Development

Several comments alleged a direct link between the public perception of activities conducted at, or in relationship to, the NTS and regional prosperity and economic development. The activities of concern included the shipment of waste to Nevada and especially through Las Vegas, the disposal of radioactive waste, and defense related nuclear activities. Many comments asserted adverse impacts, such as loss of jobs in Las Vegas and the state of Nevada, while others concluded that beneficial impacts, as the result of economic diversification and increased employment opportunities, were likely.

It is well established that the perception of the risk of adverse impacts is outside the sphere of topics that are subject to examination under the National Environmental Policy Act. Nevertheless, the DOE believes that the perception of NTS-related activities by the public has not negatively impacted the regional economy.

The prosperity or economic development of an area depends on the characteristics or factors that define the region. The character of an economy is comprised of variables that combine to form an overall perception of an area. How these factors are interpreted depends on the value systems of individuals. These factors (industrial development, entertainment resort destination, gambling, legalized prostitution, nuclear complexes, etc.) can be perceived as either positive or negative depending on the underlying value systems of the individual.

The DOE is aware of no information that describes a deterioration of the economic environment in southern Nevada based on development activities or perceptions associated with the NTS. In fact, southern Nevada is one of the fastest growing urban areas in the United States. Between 1980 and 1990, the population of Clark County increased from 463,087 to 797,142 (72 percent), and the total jobs increased by 182,776. Total visitor volumes in Clark County increased from 14.2 million in 1985 to 29 million in 1995, an increase of 104 percent over the 10-year period.

Based on the foregoing, it is reasonable to conclude that the perceptions of southern Nevada have not adversely affected the prosperity and economic opportunities of the region. In addition, there is no evidence to indicate that the past activities associated with the NTS over the past 40 plus years, or the potential future activities discussed in the NTS EIS, would alter the potential for continued prosperity and development in the region.

1.10 Residual Radioactive Contamination - Source Term

Several comments questioned the accuracy of estimated levels of residual radioactive contamination on the land surface, in the underground environment, and in groundwater resources beneath the NTS. Concerns were expressed about the methodology and data used to make these estimates, asserting that the low values used resulted in an underestimate of potential risks to public health and safety. Many comments indicated that confidence in the estimates provided in this EIS could be improved if the DOE released classified information on historical nuclear weapons testing.

The accuracy of estimated contamination is a central issue in any study conducted to clean up contaminated sites. Surface soil, subsurface rock, and groundwater contamination on the NTS are being characterized by the Environmental Restoration Program to determine the best approach for cleanup and monitoring. These efforts rely on an extensive historical database and on newly collected data.

New data are collected under protocols prescribed by the EPA and the state of Nevada. Some methodologies were developed by DOE specifically to detect contaminants not commonly present at other sites, such as certain radionuclides. All these methodologies are designed to meet objectives for data quality agreed upon with the EPA and the State. Existing data are used whenever possible to reduce the cost to taxpayers by avoiding duplication of earlier studies. As might be expected, some existing data meet or exceed present quality standards, while other data are of lower quality. The DOE attempts to maximize the use of existing data, consistent with its quality for the intended use. Extensive documentation of the work plans, standard operating procedures, and quality assurance checks are maintained for all data, but are too extensive to include in this EIS.

The classified nature of some of the data presents a challenge to the DOE. While national security is of paramount importance, the DOE recognizes that the public may perceive the DOE as using classification as a cloak to avoid scrutiny of basic data. In particular, the total radionuclide inventory remaining in the subsurface at the NTS raises significant classification issues. Release of radionuclide inventories for specific nuclear tests can reveal much about the types and amounts of special nuclear material used in weapons design and the efficiency of these weapons. In fact, the DOE routinely analyzed samples of the residual melt glass to determine the success of the test. So, although researchers from the nation's weapon-design laboratories have developed extensive data to help estimate the nature and extent of contamination underlying the NTS, the data remain classified.

The DOE is trying to resolve this issue with a two-fold approach. First, declassification actions have been proposed which would sum, or lump together, data from many tests so that no classified information would be revealed. The data presented in this EIS are the result of one declassification action and are made available to the public here for the first time. Other declassification actions are pending which, if approved, will allow the lumping of data in smaller areas. The second approach is to grant access to classified data to organizations with persons having an appropriate security clearance and need-to-know. To date, several representatives of the State of Nevada's Division of Environmental Protection have been given access to the source term inventory data. In addition, a representative of the University of Nevada Las Vegas, Harry Reid Center for Environmental Studies, has been granted access to the source term data. It is hoped that these two approaches will raise confidence in the accuracy of the source term data.

1.11 Hydrology and Water Resources

Several comments expressed concern about the impacts of the proposed action on the regional groundwater flow system, especially with respect to drinking water supplies in Amargosa Valley and the environmentally sensitive areas of Ash Meadows, Devils Hole, and Death Valley. Other comments requested clarification of water rights issues concerning actions that are not perceived to be within the DOE's mission.

A cornerstone of the DOE's environmental policy is the protection of water resources. This policy has been put into action through monitoring, characterization studies, and investigations of contaminant sources. Since 1972, the DOE has conducted an extensive groundwater monitoring program, with samples taken routinely at wells and springs located on and off the NTS. Because Amargosa Valley and other environmentally sensitive areas are downgradient of the NTS, the DOE monitors springs in Ash Meadows and as far away as Death Valley. This monitoring network provides the DOE with a first line of water resource protection by detecting water-quality problems before they extend to these downgradient areas.

The DOE sponsors research on the hydrology of the NTS and the fate of radionuclides in the environment. Characterization studies for the DOE's Environmental Restoration Program focus on defining the transport of radionuclides in the vicinity of past underground tests; the installation of an extensive array of new characterization wells; and detailed studies on the effects of past testing on infiltration, the mechanics of the aquifers present, and water level changes in the vicinity of detonations. The DOE has been an active participant in evaluating the conditions that support the endangered pupfish at Devils Hole and has been a partner with other agencies in defining the complex hydrologic conditions of the Death Valley groundwater flow system.

An inventory of past hydrologic studies is underway and has identified more than 2,000 documents that are relevant to the water resources and hydrologic conditions of the region. The information presented in this EIS must be of a summary nature; it is not possible to include all of the information that the DOE has accumulated over the decades. A large amount of unclassified information is available in the public reading room, or upon request, to interested parties who seek more detailed information on the specific hydrologic characteristics of this region.

It is not practical to present in this EIS detailed information on the 3-dimensional distribution of contamination around each underground test site. The information from these studies is referenced in this EIS and dozens of more-detailed reports are available to the public and interested groups and agencies. This information will, however, be provided, to the extent available, in the Environmental Restoration studies of the testing areas.

With respect to water use at the NTS, the DOE would pursue water rights for activities determined to be outside of the NTS mission.

1.12 Radioactive Waste Shipments and Waste Types

Several commentors noted differences between the radioactive waste volumes and resulting waste shipment estimates presented in the Draft Waste Management Programmatic EIS, the Baseline Environmental Management Report, and the Draft NTS EIS. Comments noted that these differences in the data also resulted in different risk assessment results. It was further noted that the waste transportation risks reported in the Draft Waste Management Programmatic EIS, were higher than those reported in the Draft NTS EIS.

Commentors also questioned the relationship between various terms used to refer to low-level waste in the Draft NTS EIS. Commentors were confused by the terms "greater-than-Class C," "similar to greater-than-Class C," "inappropriate for shallow land disposal," and "special case waste," and questioned whether the Draft EIS had devoted adequate attention to waste represented by these terms. In particular, commentors criticized the Draft EIS's lack of any mention of special case waste, and the lack of analysis of disposal of greater-than-Class C waste, in view of a recent announcement that the DOE is studying the co-disposal of greater-than-Class C waste with DOE special-case waste that is similar to greater-than-Class C waste.

Comparison between the NTS EIS and the DOE Waste Management Programmatic EIS

Commentors compared the NTS EIS and the DOE Waste Management Programmatic EIS and pointed out various differences between the two documents in terms of waste volumes, numbers of shipments, and risk estimates. These differences arise from the different purposes and scope of the two documents. The Waste Management Programmatic EIS is designed to establish a broad framework of reasonable alternatives for consideration by the public and DOE decisionmakers in support of broad programmatic decisions. Data used for analysis of this type often must be aggregated or summarized for consistent application, and to ensure that the relative differences in impacts among programmatic alternatives are clear to decisionmakers. In contrast, the NTS EIS has a sitewide focus and uses more detailed data specific to the site. Also, broadly scoped programmatic EISs make more conservative assumptions to ensure that the range of possible alternatives across a complex array of program activities are adequately bounded. As a result, the DOE would expect the estimates of waste volumes and health risks in the Waste Management Programmatic EIS to be at least as high or higher than related estimates in sitewide or project-specific National Environmental Policy Act documents. Other differences arise because the analyses presented in the NTS EIS assess the range of reasonably foreseeable activities at the NTS over the next 10 years, whereas the Waste Management Programmatic EIS is designed to support DOE programmatic decisions affecting DOE-wide waste management activities over the next 20 years. Given these differences, the DOE believes that the results presented in the two documents are reasonably comparable.

Special Case Waste

Commentors criticized the Draft EIS because it did not address "special case waste." Text has been added to the Final NTS EIS to explain this term in the context of the NTS's waste management program.

The designation of a particular waste as "special case waste" is a site-specific determination which, if made at one DOE site, may or may not be applicable at another DOE site. "Special case waste" is not a formal technical waste category in the same sense as "transuranic waste" or "low-level waste"; rather, "special case waste" is a temporary, informal designation by the generating site to identify waste that exhibits characteristics which indicate that further analysis may be necessary to properly categorize it, or that may require special handling, storage, or disposal methods. These characteristics are taken into account in determining whether waste can meet a potential disposal site's acceptance criteria. In making this determination, the DOE considers a number of factors, including safety analysis reports and hazard assessments, performance objectives, disposal site characteristics and operational restrictions, applicable federal regulations and DOE orders, as well as input from stakeholders and from the Defense Nuclear Facilities Safety Board. If a designated "special case waste" is determined to meet a disposal site's acceptance criteria, it is no longer considered to be "special case waste," and is considered acceptable for disposal notwithstanding its earlier "special case" designation. At that point, the fact that the waste was once classified as special case waste is irrelevant as far as disposal is concerned.

The DOE intends to clarify its use of the term "special case waste" in the Final Waste Management Programmatic Environmental Impact Statement. The clarification will reflect the dynamic nature of the DOE's special case waste inventory. The Final Waste Management Programmatic EIS will also reflect the DOE's intent to manage this waste within existing waste categories to the extent possible, consistent with the process described above. The DOE will prepare any necessary additional National Environmental Policy Act documentation for proposals for actions regarding special case waste not covered by existing National Environmental Policy Act documents.

Greater-Than-Class C Waste and Similar to Greater-Than-Class C Waste

Some commentors urged that DOE use the NTS EIS to evaluate options for disposal of greater-than-Class C low-level waste. In urging this course of action, one comment referred to a 1995 DOE Federal Register notice as evidence that the DOE is formulating plans for the co-disposal of greater-than-Class C waste and waste that is similar to greater-than-Class C. Also, some commentors either did not understand the distinction between the terms "greater-than-Class C" and "similar to greater-than-Class C," or believed that the DOE was trying to create an artificial distinction between two types of waste to avoid discussing greater-than-Class C waste in this EIS.

The confusion surrounding these two terms arises from the legal definition of greater-than-Class C waste. The Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240) made the federal government responsible for the disposal of certain high-specific-activity, low-level waste with concentrations of radionuclides that exceed the limits for Class C radioactive waste established by the Nuclear Regulatory Commission. This waste is commonly referred to as "greater-than-Class C low-level waste." Most of this waste is generated by commercial facilities, and is therefore also referred to as "commercial greater-than-Class C waste." The same section of Public Law 99-240 also made the federal government responsible for all DOE-generated low-level waste as a separate category, without regard to class. The DOE waste with characteristics comparable to those of greater-than-Class C is referred to as "similar to greater-than-Class C low-level waste," in order to distinguish it from the category of greater-than-Class C waste created by the statute.

This distinction is important in understanding the purpose of the Federal Register notice referenced by the comment. The notice was entitled, "Strategy for Management and Disposal of Greater-Than-Class C Low-Level Radioactive Waste (60 FR 13424, March 13, 1995). The notice requested public comments on several options for managing greater-than-Class C waste, including collocated disposal of greater-than-Class C waste and DOE waste with similar characteristics. The notice indicated that this approach presents a regulatory issue. Specifically, Public Law 99-240 requires that greater-than-Class C waste that is generated by the Nuclear Regulatory Commission licensees must be disposed of in Nuclear Regulatory Commission-licensed facilities. DOE-generated waste with similar characteristics does not have to be disposed of in licensed facilities, and there is a question whether the Nuclear Regulatory Commission can exercise jurisdiction over DOE-generated waste without additional legislation.

This issue arises only where co-disposal is considered, and thus it does not affect any current or proposed waste management activities for disposal at the NTS, since-co-disposal is not being proposed at this time. If co-disposal ever is proposed, it will be as part of a comprehensive plan for the management of greater-than-Class C low-level waste. As stated in the 1995 notice, implementation of the greater-than-Class C waste provisions of

Public Law 99-240 may not occur for 20 years or more, well beyond the timeframe for this EIS. In the interim, the DOE intends to continue to dispose of DOE waste that is similar to greater-than-Class C waste so long as such waste meets the NTS's waste disposal criteria. The environmental impacts of this activity are addressed in this EIS. Appropriate National Environmental Policy Act documentation will be prepared when federal plans for disposal of greater-than-Class C waste have progressed to the point where a proposal for action can be formulated.

Greater-Than-Class C Waste, Similar to Greater-Than-Class C Waste, and Special Case Waste

The 1995 Federal Register notice discussed above caused one commentor to mistakenly equate greater-than-Class C waste with special case waste. The 1995 notice stated that "[t]he term Special Case Waste (SCW) denotes DOE waste having characteristics similar to those of GTCC LLW [greater-than-Class C low-level waste], and generally lacking firm disposal plans." This statement is an oversimplification of the relationship between these two terms. As discussed above, unlike the term "greater-than-Class C waste," the term "special case waste" is not a formal waste category with well-defined characteristics. The DOE did not intend to suggest that there is always a similarity in the physical or radiological characteristics between special case waste and greater-than-Class C waste (or between special case waste and DOE-generated waste that is similar to greater-than-Class C, for that matter). Not all special case waste is low-level waste, nor is all of it similar to greater-than-Class C waste. Conversely, DOE waste that is similar to greater-than-Class C waste is not special case waste if it meets the NTS's waste disposal criteria (see above). The primary attribute shared by all waste represented by the terms "special case waste" and "greater-than-Class C waste" is that it is "lacking firm disposal plans." In contrast, the DOE can dispose of waste it generates that is similar to greater-than-Class C waste if that waste meets the NTS's waste disposal criteria.

Waste Inappropriate for Shallow Land Disposal, and Special Case Waste

Commentors also incorrectly assumed that these two terms referred to the same waste; in fact, the opposite is true. As these terms are used by the DOE, they are mutually exclusive. As described above, waste is considered special case waste if it has not been determined to meet a disposal site's criteria. Such waste cannot be disposed of at the NTS. In contrast, the DOE applies the term "inappropriate for shallow land disposal" to waste that does meet NTS's disposal criteria, but which the DOE has determined, through the waste acceptance process, to require greater isolation for the protection of the environment and the workers than low-level waste disposal procedures normally would provide. Consistent with the foregoing discussion, these wastes may include DOE waste that is similar to greater-than-Class C waste, or waste that was originally designated by the generator as special case waste.

The two terms do have in common the fact that neither is a formal waste category. Rather, they both are informal management designations that the DOE uses to describe whether a particular waste can meet the NTS's disposal criteria, and whether it requires any measures beyond normal low-level waste disposal procedures to meet those criteria.

This Page Intentionally Left Blank

CHAPTER 2
PUBLIC COMMENTS

INTRODUCTION

On February 2, 1996, the U.S. Department of Energy (DOE) issued the Draft NTS EIS for review by the state of Nevada, Indian tribes, local governments, other federal agencies, and the general public. The formal public comment period lasted 90 days, ending on May 3, 1996. Public hearings and workshops were held throughout the comment period at a number of locations in Nevada, and in St. George, Utah. Transcripts of these hearings and workshops were produced to capture oral comments from members of the public. Public comments were received throughout the public comment period and, to accommodate as many respondents as possible, comments were accepted after the close of the public comment period. The last comment was received on May 15, 1996.

2.1 Comment Categories

The comments are presented by source category in the following order:

- Federal Agency
- Sovereign Nations
- State Government
- Municipal Government
- Company
- Organization
- Private Citizen
- Public Hearing Transcript
- Workshop Notes.

The complete transcripts of the public hearings and workshops are presented at the end of the individual comment letters.

2.2 Comment Coding System

Comments are identified by a numeric code to indicate the individual respondents and comment number. Written comments within each comment category are coded in numeric order beginning with the number "1" based on the order they were received and entered into the comment tracking system. Transcripts from public hearings and workshops are coded in a similar manner. Numbers following a hyphen in the comment code indicate an individual comment contained within a letter, transcript, or other comment document. Examples of comment codes are:

- Private Citizen 4-7 refers to the 7th comment from the letter coded 4
- Public Hearing Transcript 2-15 refers to the 15th comment on the Public Hearing Transcript coded 2.

Sidebars in correspondence, transcripts, and other written comment documents indicate the specific lines on which the numbered comment appears. An index to the public comments, as they appear in this document, is provided in the following section. Responses to comments are presented in Chapter 3 of Volume 3 using the same numerical coding system.

This Page Intentionally Left Blank

FEDERAL AGENCY 1

United States Department of the Interior

BUREAU OF RECLAMATION
Lower Colorado Regional Office
P.O. Box 61470
Boulder City, NV 89006-1470

IN REPLY REFER TO:
LC-2212
ENV-5.00

MAR 06 1996

Dr. Donald R. Elle
Director
Environmental Protection Division
US Department of Energy
Nevada Operations Office
PO Box 14459
Las Vegas, Nevada 89114

Subject: Comments on the 8 Volume EIS for the Nevada Test Site

Reclamation's Lower Colorado Regional Office environmental compliance staff has reviewed the subject documents and find that the proposed actions on lands constituting the Nevada Test Site under the control of the Department of Energy Nevada Operations Office have, in general, no significant impact on Reclamation withdrawn lands and/or facilities.
1 The exceptions to this statement involve the proposed Solar Experimental Facility in the El Dorado Valley that conceivably could require power line rights-of-way and/or other infrastructure improvements that would cross Reclamation withdrawn lands in the vicinity of Boulder City, Nevada.
2 More generally industrial, mining or residential reuse of Nevada Test Site lands could involve use of additional water supplies and/or power requirements that in turn could impact Reclamation projects and/or facilities such as Lake Mead, Hoover Dam and/or the Southern Nevada Water Project.
Beyond these indirect and hypothetical impacts the proposed actions and/or alternatives are believed to have no impact on Reclamation lands or activities and hence Reclamation has no objections nor concerns with respect to the proposed actions with respect to the Nevada Test Site.

Sincerely,

William E. Rinne

William E. Rinne, Office Director
Resource Management and Technical Services

FEDERAL AGENCY 2

The comments in Federal Agency Comment Letter Number 2 were included in Federal Agency Comment Letter Number 3. Therefore, the Department of Interior responses (Fish and Wildlife Service and Bureau of Land Management) to Federal Agency Comment Letter Number 3 also address comments advanced in Federal Agency Comment Letter Number 2

United States Department of the Interior

FISH AND WILDLIFE SERVICE
911 NE 11th Avenue
Portland, Oregon 97232-4181

IN REPLY REFER TO

APR 16 1996

Memorandum

To: State Director, Bureau of Land Management
Reno, Nevada (Attn: Neil Talbott)

From: Regional Director, U.S. Fish and Wildlife Service
Region 1, Portland, Oregon

Subject: Review of and Comments to Draft Environmental Impact Statement (DEIS) for the Nevada Test Site and Off-Site Locations in the State of Nevada (ER 96/0065)

As directed by acting Director Martin's February 5, 1996, Memorandum from the Office of Environmental Policy and Compliance, we have reviewed on the subject document. Please collate the attached comments in the Department of the Interior response.

Please refer any questions to Ms. Mary Jo Elpers of our Reno Field Office at 702/784-5227 or Mr. Merle Richmond of my Regional Office staff at (503) 231-2068.

Thomas Dwyer

Attachment

cc: Field Supervisor, Reno Field Office

Donald R. Elle, Director
Environmental Protection Division
U.S. Department of Energy
Post Office Box 14459
Las Vegas, Nevada 89114

FEDERAL AGENCY 2 (CONTINUED)

ER 96/0065

Carol M. Borgstrom, Director
Office of Policy and Assistance
U.S. Department of Energy
Attention: SSM PEIS
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Ms. Borgstrom:

The Department of the Interior has reviewed the Draft Environmental Impact Statement (DEIS) for the Nevada Test Site and Off-Site Locations in the State of Nevada (Test Site). The following comments are provided for your information and consideration when preparing the Final Environmental Impact Statement (FEIS).

GENERAL COMMENTS

The FEIS should clarify whether or not a programmatic Environmental Impact Statement (EIS) is intended. Some sections indicate further environmental analysis under the National Environmental Policy Act (NEPA) would be done in association with other projects, such as the solar energy proposals. Other sections do not indicate any further analyses would be done for most projects on the Nevada Test Site (NTS). This issue is further complicated by some project activities being currently evaluated under separate EIS's (for example, the Stockpile Stewardship and Waste Management project). Thus, the DEIS uses analytical methods used in both site-specific EIS's and programmatic EIS's referencing other project-specific EIS's. Further, the limited analysis of impacts to biological resources may necessitate a separate environmental analysis for every project to comply with the NEPA. These issues should be clarified in the FEIS.

Terminology and Standards The DEIS uses technical terms which may be unfamiliar to persons not versed in the fields of nuclear physics or nuclear waste management. Many such terms either are not defined, are defined in technical terms, or have explanations scattered throughout the DEIS. Examples include intrusion scenario, intruder pathway, and total source-term analysis, curie, rem, and others. Such terms should be either defined in the FEIS glossary or when they are used in the text. The definitions should be given in non-technical terms and in language easily understood by the general public. The differences between exposure and breakdown rates and the resulting implications for biological resources need to be explained. The reviewer should be referred to a table that defines the levels of exposure critical for plants and key wildlife species or groups found on the NTS and other affected areas.

FEDERAL AGENCY 2 (CONTINUED)

Carol M. Borgstrom, Director
Office of Policy and Assistance

The DEIS uses general terms which are not defined. Definitions for terms, such as negligible, minor, minimally, localized impacts, slight, moderate, substantial, and significant, should be clearly stated early in the FEIS.

Some sections reference Environmental Protection Agency standards for transuranic wastes. These and other standards should be summarized or referenced to an appendix.

Alternatives The DEIS has not analyzed the effects of every alternative activity on each resource factor. For example, the evaluation of "Work for Other Impacts" to "Air Quality" does not address rocket motor destruction, even though this activity may release an extensive amount of gases to the atmosphere. The FEIS should provide an evaluation of the effects of every activity on each resource that may be affected.

In Chapter 2, the DEIS provides a cursory overview of NTS programs. Only minimal information is provided on how bulk and packaged low-level waste are disposed. Brief discussions are provided on disposal of low-level wastes in pits and trenches; however, the FEIS should discuss whether wastes are contained or prepared in any manner before they are placed in pits and trenches and covered with soil. This comment relates to the discussions on shallow land radioactive waste disposal, crater disposal, and greater confinement disposal in Chapter 4.

An activity within the Defense Program under Alternative 3 in Chapter 3 calls for construction of a generic, heavy industrial site. The FEIS should discuss what heavy industry would be accommodated. This section also should list rocket motor destruction since this activity is already discussed in the Evaluation of Alternatives Section. Appendix A lists proposed Defense Program tests under Alternative 3; however, what the smoke obscuration operations or thermal and climatic tests may involve needs to be addressed. Each activity to be pursued in Chapter 2 and Appendix A needs to be described in sufficient detail to ensure what is proposed to occur is clear to the uninformed reader.

Preferred Alternative On March 15, 1996, the Department of Energy (DOE) provided the Fish and Wildlife Service (Service) with a copy of a memorandum on development of the preferred alternative to be presented in the FEIS. The memorandum states the NTS EIS schedule has been modified and the FEIS was scheduled to be released on May 17, 1996. Furthermore, the memorandum states the NTS EIS Technical Working Groups would begin developing the preferred alternative to be presented in the FEIS and this alternative likely would be a hybrid created by selecting specific uses from the alternatives analyzed. Development and approval of the preferred alternative was scheduled for March 28, 1996, and then it would be provided to the DOE headquarters integration team for review and approval. This process implies public and agency comments would not be considered in selecting the preferred alternative or in development of the FEIS. Also, the preferred alternative selection process should be explained in the FEIS.

Carol M. Borgstrom, Director
Office of Policy and Assistance

<u>Contaminants</u> The DEIS does not present an overall evaluation of toxicological (radiological and chemical) impacts to biota resulting from past, present, or future activities. At several points, the DEIS references studies which have been performed on the NTS to address this question. However, the FEIS needs to summarize what is known about past activities, present the impacts related to current activities, and speculate on the potential impact of future activities. Such information is particularly important for the Yucca Flat weapons test basin, Frenchman Flat, Plutonium Valley and other locations in the western and northwestern parts of the facility. Because impacts to wildlife populations have occurred from past and ongoing activities, the FEIS should also provide information on how long radiation could affect wildlife and describe any impacts from other contaminants for each alternative.

<u>Biological Resources</u> Only brief general descriptions of plant communities have been provided in both Chapter 4 Affected Environment and Chapter 5 Environmental Consequences and generally throughout the DEIS. The FEIS needs to address the acres of each plant community that is either currently on the project sites or would be affected by various alternatives. This information is needed for assessing the overall impacts to these communities and their associated wildlife.

The DEIS indicates ephemeral flows occasionally form ponds on several playas found on the NTS. The FEIS should provide information on 1) the length of time this water remains, 2) the extent to which the playas are used by migratory shorebirds, and 3) the potential for migratory birds using the playas to be exposed to radionuclides and other contaminants.

The springs occurring on the NTS may support sedges, rushes, and other hydrophytic vegetation, which likely constitute wetlands that are regulated by the Corps of Engineers (Corps) pursuant to section 404 of the Clean Water Act. Activities that may affect these springs should be described in more detail, and if the springs are to be modified in any way, the potential need for a Corps permit should be stated. We are particularly interested in the potential for such springs to support endemic invertebrates and for alternative 3, which would involve substantial increases in ground water pumping, to affect such invertebrates.

Chapter 5 does not adequately address impacts to biological resources resulting from extensive surface disturbance and removal of native vegetation. Such activities, if done during the avian breeding season, likely would kill individuals and/or destroy nests and nest contents of migratory birds protected under the Federal Migratory Bird Treaty Act. Other activities may expose birds to drilling mud, surfactant in drill sumps constructed for monitoring wells, or other contaminated surface waters. Protected species include, but are not limited to, passerines, waterfowl, hawks, and owls. The FEIS should discuss the resulting impacts, and mitigation measures should included developed to prevent migratory bird mortalities.

FEDERAL AGENCY 2 (CONTINUED)

Carol M. Borgstrom, Director
Office of Policy and Assistance

Many sections in Chapter 5 state various effects would not have a negative impact on the viability of most species found in this area. Although this is likely true for species overall, the viability of populations may be adversely affected. The effect on viability should be discussed in the FEIS.

Several sections on biological resources in Chapter 5 indicate much of the land to be cleared for the Environmental Restoration Program would be stabilized and/or revegetated. We fully support such measures to restore contaminated sites on NTS. However, the FEIS should discuss the problems associated with clearing vegetation from desert soils. These problems include length of time for the area to revegetate on its own, air quality problems associated with expansive areas of non-vegetated land, and movement of sediments onto adjacent playas that may adversely affect the ecology of the playa. Revegetation of Mojave Desert lands also is problematic. As we are unaware of any successful revegetation that actually restores the native plant community, the FEIS should reference examples and discuss impacts associated with such mitigation measures.

<u>Endangered and Threatened Species</u> In reference to sections on candidate species, the Service no longer maintains a list of category 1 and 2 candidate species (see Notice of Review, dated February 28, 1996, 61 FR 7595). In place of these two categories, a single candidate category has been established. It includes species for which the Service has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list the species as threatened or endangered under the Endangered Species Act of 1973, as amended (ESA). Such species were identified as category 1 candidates in earlier candidate notices of review. Species identified as category 2 candidates in earlier notices of review are no longer regarded as candidates for listing under the new policy.

The Service remains concerned about the former candidate species (now informally known as "Species of Concern"), and recognizes further biological research and field study are needed to resolve the conservation concerns for these taxa. Even though many of these Species of Concern may eventually be found not to warrant listing as threatened or endangered under the ESA, others may become candidates for listing in the future.

Throughout Chapter 5, the DEIS states various candidate plants (now Species of Concern) may be adversely affected by project alternatives. The FEIS needs to provide information on the extent of these plant populations in relation to the status of the species over its range. This information is vital because elimination of a population at a given site, especially if it represents the majority of the population, would be considered a significant impact.

<u>Effects on National Wildlife Refuges</u> We are concerned possible impacts to three components of the National Wildlife Refuge (NWR) System (Ash Meadows, Desert, and Moapa Valley) from current and proposed operations at the NTS have not been adequately addressed. Concerns remain that either contamination or depletion of ground water may

Carol M. Borgstrom, Director
Office of Policy and Assistance

affect Ash Meadows and/or Moapa Valley (Muddy River) NWRs. The Service understands the underground aquifers feeding the NWRs are not sufficiently understood by geologists or hydrologists to assume adverse impacts would not occur. The FEIS needs to fully address this issue.

Several sections of the FEIS indicate the DOE ground water withdrawals in Yucca Flat have exceeded the published perennial yield. The FEIS should address potential long term implications of this exceedence, particularly for sensitive biological resources in Ash Meadows, Devils Hole, and the Death Valley NWRs. For example, the Ash Meadows NWR supports four fish species, one invertebrate species, and seven plant species which are listed as threatened or endangered and protected by the ESA. Additionally, critical habitat has been designated for these species. Potential impacts to these species and their critical habitat as a result of ground water contamination and how the DOE can coordinate with appropriate land managers to monitor ground water quality which may affect ESA listed species downgradient of the NTS should be discussed.

Potential adverse impacts near the west boundary of the Desert National Wildlife Range from the Spill Test Facility have not been sufficiently addressed. We also are concerned about the proposed transportation routes that would be in close proximity to Ash Meadows and possibly Desert NWRs. These concerns should be addressed in the FEIS.

Some sections of the DEIS indicate impacts to resources on refuges may be minor. Under the Refuge Administration Act of 1966, any activity is prohibited on Service land unless it is specifically approved.

Cumulative Effects The method used to evaluate cumulative effects appears to have evaluated the significance of the DOE's projects instead of the cumulative contribution of the impacts themselves. Therefore, the DOE determines they are an insignificant contributor. The FEIS needs to explain what the contribution of the DOE activities means in terms of total impacts. If activities of other entities result in a close to significant impact in the area, the DOE activities may raise cumulative impacts to a level of significance. The cumulative effects section should be fully reevaluated in the FEIS.

The section on cumulative effects to biological resources also is inadequate. It discusses impacts only to the desert tortoise, and the cumulative effects analyses should be expanded to include other biological resources. They include but are not limited to specific vegetation types, important groups of wildlife such as migratory birds, and species of special concern.

References Although inventories, studies, and effects of various perturbations on physical and biological subjects are referenced throughout the DEIS, few bibliographic references are provided. For example, Section 4.1.4.2, Geology: Radiological Sources in Soil (page 4-135, line 19) refers to a comprehensive study of a contaminated portion of Area 13 of the Nellis

FEDERAL AGENCY 2 (CONTINUED)

Carol M. Borgstrom, Director
Office of Policy and Assistance

Air Force Range (NAFR) Complex. Lines 21 and 22 mention research on the uptake of radioactive material by plants, but does not provide a summary and a bibliographic reference. The FEIS needs to provide a reference for determining 1) when, where, and by whom the research was conducted, 2) the validity of the research, and 3) the title of the research document to examine for further information. The FEIS also needs to document sources and references.

SPECIFIC COMMENTS

Page 2-2. Section 2.1. Background. Lines 18-19 A programmatic section 7 consultation under the ESA is in progress. It analyzes the effects on the desert tortoise (*Gopherus agassizii*) from DOE programs on the Nevada Test Site (NTS) as described in Alternative 3 of the DEIS. Activities proposed on the NTS which are not considered in Alternative 3 may not be covered under the biological opinion when issued and may require re-initiation of consultation.

Page 2-21. Section 2.5.6.1. Low-level Waste Performance Assessments. Lines 16-21 Regarding the release of radioactive material, the DEIS states the effective dose equivalent would not exceed 25 millirem per year to any member of the public. Even though the DOE may not have an objective dose limit for plants and wildlife, the FEIS should describe how effective dose equivalent levels for plants and animals would be monitored. The terms "reasonable effort" and "as low as reasonably achievable" in the last sentence should be defined more specifically.

Page 3-36. Section 3.3. Comparison of Alternatives and Environmental Impacts Lines 2 and 3 state additional Defense Program impacts under the alternatives considered in the DEIS are small in comparison to the impacts of previous testing. The implication is that additional impacts would, therefore, be of no concern. However, because the impacts of previous testing were so substantial, it would seem that any additional impact, regardless of how small, may be significant. The FEIS should discuss the rationale why this would not be the case.

Page 4-135. Section 4.1.4.3. Soils. Lines 16-24 Further discussion is needed on the uptake of radioactive material by plants and animals, particularly herbivores. It is reasonable to assume that radioactive material may accumulate in animals which feed on contaminated plants. Thus, the FEIS should discuss long-term effects of radioactive material accumulation in animals in greater detail. For example, is reproduction and recruitment affected by increased radioactive levels and, if so, to what degree? Results of surveys and research projects on soils should be included in the discussion in lines 26-33. We suggest the FEIS identify and discuss alternative methods for cleaning soils, including replacement of topsoil and cryptogamic crusts.

FEDERAL AGENCY 2 (CONTINUED)

Carol M. Borgstrom, Director
Office of Policy and Assistance

7

Page 4-141. Section 4.1.5.1. Surface hydrology Lines 4-8 states Forty Mile Canyon carries runoff beyond the NTS boundaries to the Amargosa Desert and Death Valley, California. The effect of perturbations on the NTS to organisms of special concern in those locations should be provided in the Biological Resources sections.

Page 4-146. Section 4.1.5.1. Surface Hydrology The DEIS does not explain in lines 6-7 why two of the nine springs on the NTS were not sampled. Considering these springs are a water source for wildlife, the FEIS should identify the potential effects to species which consume water at these sources. A discussion on levels of tritium in the samples and why they were not included in the analysis should be discussed.

Page 4-147. Line 21 The DEIS states all active containment ponds are fenced and posted with radiological warning signs. The FEIS should address the level of access to these ponds by various species of wildlife. We are particularly concerned with access by the threatened desert tortoise and migratory birds. The FEIS should clarify what is meant by the term, "annual average of gross beta analyses" from each sampling location. How does this relate to wildlife that may come into contact with these waters? What is the risk to various wildlife groups, such as amphibians, reptiles, birds, and small mammals. This information which is apparently not in the DEIS, should be provided in the FEIS. These comments relate to lines 31 to 33 on page 4-219, which mention the 230 contaminated areas on the NTS, Tonopah Test Range, and NAFR Complex as well.

Pages 4-149 Lines 27-31 state, in general, the effects of pumping NTS water supply wells is concentrated within a distance of a few thousand feet of the operating wells and that the impact is not considered significant in five locations. The FEIS should state whether there are significant impacts in other locations; whether the cone of depression around these wells have been mapped, or whether there are any biological resources in the vicinity of the wells that could be affected by pumping.

Page 4-150. Section 4.1.5.2. Groundwater The discussion on lines 17-25 states the downgradient subsurface discharge to Frenchman Flat may have been affected. However, we could not locate any discussion of the impacts to biological resources associated with Frenchman Flat. Such information should be provided in the FEIS.

Page 4-162 Lines 30-32 state when large volumes of ground water were pumped from the vicinity of the Cambric site cavity, migration of tritium and noble gases via ground water flow was possible. However, no information was provided on where contaminated ground water may have gone or where it is now likely to be located. Lines 1 and 2 on page 4-163 state there are three known nuclear test locations where the regional carbonate aquifer has been affected by radionuclides, but no information is provided on the levels of radionuclides

FEDERAL AGENCY 2 (CONTINUED)

Carol M. Borgstrom, Director
Office of Policy and Assistance

8

in these locations or what the potential effects are. Line 20 states that nonradioactive materials in the subsurface at NTS include numerous metals, organic compounds, and drilling products. However, specific identification of these materials and their potential toxic effects, if any, are not listed. This information should be provided in the FEIS.

Page 4-170. Section 4.1.6. Biological Resources. Table 4-30. The bald eagle (*Haliaeetus leucocephalus*) was reclassified to threatened in the lower 48 states on July 12, 1995 (60 Federal Register 36000).

With publication of the new candidate notice, the only category 1 candidate known from the NTS, Beatley's astragalus (*Astragalus beatleyae*) has been removed from the list of candidates. However, as with other species of concern, the Service will continue to track the species' status trends and threats to survival.

Pages 4-174 Lines 3 and 4 state most natural springs are on the mesas and mountains in the northern part of the NTS. If any other springs are located in valley bottoms and are affected by ground water levels, the FEIS should provide this information because current and future pumping of ground water on the NTS may affect these springs.

Page 4-175 Lines 7-9 state many of the birds on the NTS, including almost all of the waterfowl and shorebirds, use the playas in Frenchman and Yucca Flat weapons test basin, artificial ponds and springs, and sewage lagoons during migration and/or during winter. No information is provided, however, on whether data has been collected on exposure of these organisms to radionuclides or other contaminants and the potential effects therefrom. This information should be provided in the FEIS.

Pages 4-220 and 221 The section on ecological studies mention monitoring plants and animals on the NTS to assess changes over time in their ecological conditions. However, no information is provided on the results of these studies and no documents or study reports are referenced. The FEIS should summarize the results of these studies as specified in section 1502.21 in the Council on Environmental Quality's Regulations for Implementing the NEPA (CEQ Regulations).

Page 4-221. Section 4.1.11. Occupational and Public Health and Safety/Radiation. Lines 3-5. The discussion of the tortoises in the Rock Valley study enclosure should include the determination by the Service that these tortoises are considered pre-ESA and, therefore, not protected under the ESA. When hatchlings, these tortoises were confined to the enclosures by a barrier and isolated from the wild population. This event occurred prior to listing of the tortoise under the ESA. However, marking and measuring free-roaming tortoises may be in violation of section 9 of the ESA unless authorized under sections 7 or 10.

Carol M. Borgstrom, Director
Office of Policy and Assistance

Page 4-278. Section 4.5. Eldorado Valley The Eldorado Valley Land Act, Public Law 85-339 as amended, authorized the conveyance of 126,775 acres of Bureau of Land Management lands in the Eldorado Valley to the Colorado River Commission of Nevada. In 1995, 107,412 acres of these lands, which includes 69,930 acres of the Piute-Eldorado Critical Habitat Unit (CHU) for the desert tortoise, were transferred to the Boulder City government. Furthermore, approximately 85,617 acres of the transferred lands, including 65,256 acres of desert tortoise critical habitat, are being managed according to a conservation easement granted by Boulder City to Clark County for at least the next 50 years. The conservation easement requires that the 85,617 acres of land be managed for the conservation, protection, restoration, and enhancement of the desert tortoise and its habitat. Boulder City is responsible for supervising and regulating activities authorized or permitted within the area. This information should be incorporated into the FEIS.

Page 4-287. Section 4.5.6. Biological Resources The Eldorado Valley Solar Enterprise Zone occurs immediately adjacent to the Piute-Eldorado CHU and is occupied by desert tortoise. The Dry Lake Valley Solar Enterprise Zone is immediately adjacent to the Mormon Mesa CHU and the Coyote Springs Solar Enterprise Zone occurs within the Mormon Mesa CHU. If any proposed project actions in these areas affect the desert tortoise, formal consultation with the Service under section 7 of the ESA may be required.

Page 5-37. Section 5.1.1.5.2. Groundwater. The FEIS should further discuss potential adverse impacts to biological resources from large scale ground water withdrawals. In particular, project effects to hydrophytic vegetation, aquatic invertebrates, and desert organisms dependent on isolated water sources where spring discharge rates would be reduced and water quality impaired should be identified.

Line 33 of this section states that the grading of soils and other construction actions could alter slightly the quantity and quality of runoff. However, the significance of the impact would depend in part on the amount of grading that was done. Alterations of drainages, including those on alluvial fans, may significantly alter downgradient vegetation, including plant species composition and abundance associated with these communities. These impacts should be discussed in the FEIS.

Pages 5-161 to 5-166. Section 5.3.1.6. Biological Resources Regarding the alternative energy project proposed under the Non-defense Research and Development Program, we understand additional environmental analysis would be undertaken before a decision would be made on this proposed project. However, some project features and potential impacts should be discussed in the FEIS. The discussion should also include the four technologies being considered for development, the types of habitat to be cleared, and the potential for indirect impacts, such as habitat fragmentation and disruption of wildlife movement corridors.

Carol M. Borgstrom, Director
Office of Policy and Assistance

Page 5-282. Section 5.5.3.6. Coyote Springs Valley, Lines 23-25 The proposal for pumping and use of any ground water upgradient from the Muddy River warm springs system should be re-evaluated because the Moapa dace and several species of special concern may be impacted. If pumping may adversely affect any listed species, consultation pursuant to section 7 of the ESA may be required.

Volume 1, Appendix I, Transportation Study, Page 3-23. Figure 3-11 Regarding State Route NV-10 Southern Route 5, we object to this route due to its proximity to Ash Meadows NWR which provides critical habitat for numerous listed species. Also, State Route 373 is not a heavy haul road.

Appendix C, Page C-10. National Wildlife Refuge System Administration Act of 1966, 42 U.S.C. 668dd, (Public Law 91-135, as amended) The following text should be added in the FEIS to reflect the intent of this law:

> The National Wildlife Refuge System Administration Act of 1966 provides guidelines and directives for the administration and management of all lands within the system, including "wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, or waterfowl production areas." The Secretary of Interior is authorized to permit by regulations the use of any area within the system provided "such uses are compatible with the major purposes for which such areas were established."

Migratory Bird Treaty Act of 1918, 16 U.S.C. 703 et seq., 40 Stat. 755 The following text should be added in the FEIS to more accurately reflect the intent of this law:

> The Migratory Bird Treaty Act of 1918 establishes a prohibition, unless permitted by regulation, to "pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess... at any time, or in any manner, any migratory bird, included in the terms of this Convention ... for the protection of migratory birds ..., or any part, nest, or egg of any such bird."

Bald and Golden Eagle Protection Act, 16 U.S.C. 668, enacted by 54 Stat. 250 The proper name of this law is the "Bald Eagle Protection Act of 1940." The Service recommends the following text to more accurately reflect the intent of this law:

> The Bald Eagle Protection Act of 1940 protects bald and golden eagles by prohibiting the taking, possession, and commerce of such birds and establishes civil penalties for violation of this Act.

Carol M. Borgstrom, Director
Office of Policy and Assistance 11

Appendix E, Section E.2.6, Page E-19 to E-25, Biological Resources The criteria established to evaluate potential impacts resulting from the various activities should include an evaluation of the DOE's legal responsibilities under the Migratory Bird Treaty Act (MBTA) or the Bald Eagle Protection Act (BEPA) in the FEIS. While evaluating impacts to habitat, populations, and individuals of threatened or endangered species is proper, the MBTA and BEPA provide protection to individuals of these species.

Volume 2, Framework for Resource Management Plan, Page 1-2, Section 1.3, Policy and Procedures Section 7(a)(1) of the ESA requires all Federal agencies to carry out programs for the conservation of threatened and endangered species. Many Federal agencies also have policies for conservation and management of candidate species, species of special concern, and other sensitive species. If the DOE has such policies, they should be discussed or a statement should be given in the FEIS that no such policies exist.

Page 4-6 The DEIS states the DOE's goal for biological resources is to maintain habitat and ecosystem processes needed to support viable populations of all native plants and animals. However, the status, distribution, and life histories of many species of plants and wildlife are not well known. Thus, the implementation of a project activity, such as an increase in land use, could be underestimated and have a long term impact beyond acceptable levels. Guidelines should be incorporated into the Resource Management Plan to adequately conserve all natural resources on the NTS.

Page 2-7, Line 14 The taxonomic name for Beatley milkvetch is *Astragalus beatleyae* and not *Astragalus badly*. This should be corrected in the FEIS.

Thank you for the opportunity to comment.

Sincerely,

Patricia Sanderson Port
Regional Environmental Officer

United States Department of the Interior
OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
600 Harrison Street, Suite 515
San Francisco, California 94107-1376

April 24, 1996

ER 96/0065

Carol M. Borgstrom, Director
Office of Policy and Assistance
U.S. Department of Energy
Attention: SSM PEIS
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Ms. Borgstrom:

The Department of the Interior has reviewed the Draft Environmental Impact Statement (DEIS) for the Nevada Test Site and Off-Site Locations in the State of Nevada (Test Site). The following comments are provided for your information and consideration when preparing the Final Environmental Impact Statement (FEIS).

General Comments

The Test Site is comprised of public lands withdrawn by the Secretary of the Interior, who has continuing responsibilities at the Test Site, for a specific use. The original order (PLO No. 805) withdrew lands for weapons testing. Prior to the 1992 moratorium, nuclear weapons testing was the Test Site's primary mission.

1 The draft EIS acknowledges that other activities are now taking place and expansion of other activities is being considered. A substantial change in use would require a new withdrawal. The same is true for the public land orders that withdrew public land for the Shoal Project and the Central Nevada Test Area.

2 This Draft EIS discusses activities which have occurred, are occurring now, and which may occur in future at the Test Site. Since an EIS is prepared for a specific purpose/project, the purpose of this draft EIS is not clear. It does not address need to change the four public land orders which established the Test Site.

It has long been the practice of the Department of the Interior to specify the use and the administering agency when withdrawing land. Prior to the Federal Land Policy and Management Act of

1976, there were various authorities to make withdrawals. Each authority was for a specific use or purpose. For uses where there was no specific authority, the Supreme Court has recognized the inherent power of the President, as delegated to the Secretary of the Interior, to withdraw lands for public purposes (United States v. Midwest Oil Co., 236 U.S. 459; Mason v. United States, 260 U.S. 545). The Test Site was withdrawn by the inherent power of the President. Withdrawals are made for the use and benefit of the public at large.

The Bureau of Land Management will not accept contaminated lands from DOE. Clean up/remediation levels have not been established for nuclear activities where land was intentionally contaminated "as a national security sacrifice zone" during the cold war. BLM does not have financial resources or radiological expertise on hand to continue remediation and monitoring at DOE sites.

3 Remediation and restoration of DOE's facilities are to be coordinated with BLM as the majority of these sites are adjacent to BLM managed public lands. Any restoration activities that identify releases or contamination off-site which impact or threaten to impact BLM managed lands should be brought to the immediate attention of BLM.

4 Discussions of the Shoal and Central Nevada Test Area cover groundwater contamination. The EIS indicates that recent field studies revealed a higher probability of contaminant migration than previously assumed at the Central Nevada Test Area.

This is insufficient information from which to draw appropriate conclusions or recommendations. Monitoring contamination is not remediation. Since the sites are permanently contaminated, monitoring is a commitment to infinity or until a new, unknown technology to remediate these sites is discovered.

5 If monitoring shows contamination beyond the withdrawal boundaries, expansion of the withdrawal areas should be re-evaluated.

6 Recent studies by USGS at the Beatty facility indicate that a tritium and carbon 14 soil gas plume is moving at a greater rate than groundwater contamination. What are you doing to address this issue at all of these sites? Are the monitoring methods and existing well networks being adjusted to address this issue?

7 We recommend this issue be addressed for those sites where soil gas migration could easily impact BLM managed lands such as Shoal and the Central Nevada Test Area. If such a plume is detected, BLM is to be notified, and either remediation plans or re-evaluation of withdrawal boundaries will be required.

Any of the proposed offsite activities should be addressed on an eco-regional basis due to the surface disturbance and water needs. Each basin in Nevada has unique ecological diversity wherein disturbances can permanently alter the fragile balance found in the great basin and mojave deserts.

If you have questions contact Dennis Samuelson at 702-785-6532 or Sue Skinner at (702-785-6570). at the Bureau of Land Management Nevada State Office, Reno, Nevada.

Specific Comments

Executive Summary

8 **Page S-13, lines 27-28**, describe Coyote Springs Valley Region as a "designated wilderness management area" by BLM. This region has some areas managed by BLM as wilderness until such time as Congress designates them as wilderness or releases them for other uses. None of the study areas has, to date, been designated by Congress as wilderness. (contact Dawna Ferris, BLM Caliente Field Station, 702-726-8129)

Volume 1, Chapters 1-9, Part A Chapter 4.0, Affected Environment

9 **Page 4-9, Section 4.1.1.1 Public Land Orders and Withdrawals, line 13** - How was the management of the area withdrawn by Public Land Order (PLO) No. 1662 delegated to the Air Force? BLM records show PLO 1662 still in effect with DOE as the administering agency.

10 **Page 4-9, Section 4.1.1.1 Public Land Orders and Withdrawals, entire section** - At the time the 1983 withdrawal review was conducted, weapons testing was the primary use. However, this review was never forwarded to the Secretary of the Interior and to Congress in accordance with Section 204(l) of the Federal Land Policy and Management Act of 1976. (As a matter of fact, no review of any withdrawal, regardless of agency, has been forwarded to Congress as mandated).

11 Consequently, this review needs to be updated. The 100-year term was based on the fact that if nuclear weapons testing were to cease, the lands would remain withdrawn for public health and safety reasons due to contamination.

12 **Page 4-227, Section 4.2 Tonopah Test Range, line 3** - Should the 624 acres be 624 square miles? See section 4.2.1.1

13 **Page 4-228, Section 4.2.1.1 Public Land Orders and Withdrawals, entire section** - The lands comprising the Tonopah Test Range are within the Nellis Range Complex. The

FEDERAL AGENCY 3 (CONTINUED)

13 cont. Nellis Range was re-withdrawn by Public Law 99-606 in 1986. This withdrawal expires in 2001, unless it is extended by Congress.

14 **Page 4-251, Section 4.3, Project Shoal Area, lines 30-31** - The statement, "The site was released by the Atomic Energy Commission to the U.S. Bureau of Land Management in 1970 (DOE, 1988)" is not accurate; it should be deleted. The withdrawal is still in place and BLM has determined through the withdrawal review process that we will not take this site back due to the contamination and liability issue.

15 **Page 4-252, line 13** - There are no public highways on the Shoal site as such; the area is crossed by numerous roads frequently used by the public for access to surrounding public lands.

16 **Page 4-252, Section 4.3.1.1 Public Land Orders and Withdrawals, entire section** - BLM records show that the Project Shoal area was withdrawn by the Secretary of the Interior on September 6, 1962, under PLO No. 2771 (2,560 acres). This order is still in effect.

17 All special land use permits have expired or have been cancelled. We have no record of special land use permit being extended to the year 2007 **(page 4-254, lines 3 & 4)**. The BLM would like to see a copy of this permit.

18 Since passage of the Federal Land Policy and Management Act of 1976, special land use permits can no longer be issued to Federal agencies for use of public lands. Use of public lands by Federal agencies can only be authorized by withdrawal, right-of-way, or cooperative agreement.

19 **Page 4-254, Section 4.3.1.2 Land Use Designations, lines 15-16** - The southeast corner of the Shoal site is not Navy reservation. The Shoal site is withdrawn for use by the DOE.

20 **Page 4-263, Section 4.3.10 Cultural Resources, line 23** - Where does the figure 7,404 acres come from? The withdrawal for the Shoal site is for 2,560 acres.

21 **Page 4-266, Section 4.4.1.1 Public Land Orders and Withdrawals, entire section** - BLM records show that the Central Nevada Test Area was withdrawn by the Secretary of the Interior on December 6, 1967, under PLO No. 4338. This 640-acre withdrawal was for Project Faultless detonation site. The Secretary of the Interior also withdrew two additional parcels on December 12, 1969, under PLO No. 4748 (1,920 acres). These two orders are still in effect.

22 In 1984, as result of a BLM review, DOE indicated these withdrawals should be continued. All special land use permits have expired or have been cancelled. A portion of the Central Nevada Test Area is now within the Toiyabe National Forest.

FEDERAL AGENCY 3 (CONTINUED)

23 **Page 4-278, Section 4.5 Eldorado Valley, lines 31 to 33** - On July 9, 1995, 107,412.24 acres were patented to the State of Nevada. The State subsequently transferred the lands to Boulder City.

Volume 1, Chapters 1-9, Part B

Chapter 5.0, Environmental Consequences

24 **Nevada Test Site** - Under Alternatives 3 & 4, there would be a substantial change in use at the Test Site, which would require a new withdrawal. This was the case with the Department of Energy WIPP site in New Mexico (State of New Mexico v. Watkins, No. 91-5387, D.C. Cir.). The court held that a change in use requires a **new** withdrawal. (Alternatives 1 & 2 may also be a change in use, but further analysis is needed).

25 **Project Shoal Area and Central Nevada Test Area** - Under all four alternatives, all activities would have to be confined to the withdrawn areas. If additional lands are needed, a right-of-way, withdrawal, or cooperative agreement would be required.

26 **Eldorado Valley, Dry Lake Valley, and Coyote Springs** - If any public lands are needed for the solar enterprise zones, a right-of-way, withdrawal, or cooperative agreement would be required.

27 **Alternative 2 - Discontinue Operations** - This does not seem to be a viable alternative. In essence, DOE would be "walking away" from the Test Site, Shoal, and the Central Nevada Project.
28 (The Tonopah Test Range would still remain part of the Air Force Nellis Range). These are withdrawn public lands. The BLM does not want the lands back unless they can be cleaned of all contamination.

29 DOE acknowledges that they would maintain control of the Test Site under this alternative, but nothing is mentioned about Shoal and Central Nevada Project except for "monitoring activities." DOE remains responsible for the withdrawn lands at all these sites.

30 **Page 5-81, lines 10-11** - The Navy does not have authorization for military maneuvers from the BLM nor does DOE have the authority to allow the Navy to use the area. The Navy cannot use the area for maneuvers. Navy needs its own withdrawal.

GENERAL COMMENTS

31 The FEIS should clarify whether a programmatic Environmental Impact Statement (EIS) will be prepared. Some sections indicate further environmental analyses under the National Environmental

Policy Act (NEPA) would be done in association with other projects, such as solar energy proposals.

Other sections do not indicate any further analyses for most projects on the Nevada Test Site (NTS). This issue is further complicated by some project activities being currently evaluated under separate EIS's (for example, the Stockpile Stewardship and Waste Management project).

Further, the limited analysis of impacts to biological resources may necessitate a separate environmental analysis for each project
32 to comply with NEPA. These issues should be clarified in the FEIS.

Terminology and Standards The DEIS uses technical terms which may be unfamiliar to persons not versed in the fields of nuclear
33 physics or nuclear waste management. Many such terms either are not defined, are defined in technical terms, or have explanations scattered throughout the DEIS.

Examples include intrusion scenario, intruder pathway, and total source-term analysis, curie, rem, and others. Such terms should be either defined in the FEIS glossary, or when they are used in the text. The definitions should be given in non-technical terms and in language easily understood by the general public.

The differences between exposure and breakdown rates and the
34 resulting implications for biological resources need to be explained. The reviewer should be referred to a table that defines levels of exposure critical for plants and key wildlife
35 species or groups found on the NTS and other affected areas.

The DEIS uses general terms which are not defined. Definitions for terms, such as negligible, minor, minimally, localized
36 impacts, slight, moderate, substantial, and significant, should be clearly stated early in the FEIS.

Some sections reference Environmental Protection Agency standards
37 for transuranic wastes. These and other standards should be summarized or referenced in an appendix.

38 **Alternatives** The DEIS has not analyzed the effects of every alternative activity on each resource factor. For example, the evaluation of "Work for Other Impacts" to "Air Quality" does not address rocket motor destruction, even though this activity may release an extensive amount of gases to the atmosphere. The FEIS
39 should provide evaluation of effects of every activity on each resource that may be affected.

In Chapter 2, the DEIS provides a cursory overview of NTS programs. Only minimal information is provided on how bulk and packaged low-level wastes are disposed. Brief discussions are provided on disposal of low-level wastes in pits and trenches;

however, the FEIS should discuss whether wastes are contained or prepared in
40 any manner before they are placed in pits and trenches and covered with soil.

This comment relates to the discussions of shallow land radioactive waste disposal, crater disposal, and greater confinement disposal in Chapter 4.

An activity within the Defense Program under Alternative 3 in Chapter 3 calls for construction of a generic, heavy industrial
41 site. The FEIS should discuss what heavy industry would be accommodated. This section also should list rocket motor destruction since this activity is already discussed in the
42 Evaluation of Alternatives Section.

Appendix A lists proposed Defense Program tests under Alternative
43 3; however, what the smoke obscuration operations or thermal and climatic tests may involve needs to be addressed. Each activity to be pursued in Chapter 2 and Appendix A needs to be described in
44 sufficient detail to ensure what is proposed to occur is clear to the uninformed reader.

Preferred Alternative On March 15, 1996, the Department of Energy (DOE) provided the Fish and Wildlife Service (Service) with copy of a memorandum concerning development of the preferred alternative to be presented in the FEIS.

This memorandum states the NTS EIS schedule had been modified and the FEIS was scheduled to be released on May 17, 1996. Furthermore, the memorandum states the NTS EIS Technical Working Groups would begin developing the preferred alternative to be presented in the FEIS and this alternative likely would be a hybrid created by selecting specific uses from the alternatives analyzed.

Development and approval of the preferred alternative was scheduled for March 28, 1996, after which it would be provided to DOE headquarters integration team for review and approval. This process implies public and agency comments would not be considered
45 in selecting the preferred alternative or in development of the FEIS. The preferred alternative selection process should be
46 explained in the FEIS.

Contaminants The DEIS does not present an overall evaluation of
47 toxicological (radiological and chemical) impacts to biota resulting from past, present, or future activities. At several points, the DEIS references studies which have been performed on the NTS to address this question.

However, the FEIS needs to summarize what is known about past
48 activities, present the impacts related to current activities, and project potential impact of future activities. Such information

is particularly important for the Yucca Flat weapons test basin, Frenchman Flat, Plutonium Valley and other locations in the western and northwestern parts of the facility.

49 Because impacts to wildlife populations have occurred from past and ongoing activities, the FEIS should also provide information on how long radiation could affect wildlife and describe any impacts from other contaminants for each alternative.

Biological Resources Only brief general descriptions of plant communities have been provided in both Chapter 4 Affected Environment and Chapter 5 Environmental Consequences and generally throughout the DEIS. The FEIS needs to address the acres of each
50 plant community that is either currently on the project sites or would be affected by various alternatives. This information is needed for assessing the overall impacts to these communities and their associated wildlife.

51 The DEIS indicates ephemeral flows occasionally form ponds on several playas found on the NTS. The FEIS should provide information on 1) the length of time this water remains, 2) the extent to which the playas are used by migratory shorebirds, and 3) the potential for migratory birds using the playas to be exposed to radionuclides and other contaminants.

52 The springs occurring on the NTS may support sedges, rushes, and other hydrophytic vegetation, which likely constitute wetlands that are regulated by the U.S. Army Corps of Engineers (Corps) pursuant to section 404 of the Clean Water Act.
53 Activities that may affect these springs should be described in more detail, and if the springs are to be modified in any way, the potential need for a Corps permit should be stated.

54 We are particularly interested in the potential for such springs to support endemic invertebrates and for alternative 3, which would involve substantial increases in groundwater pumping, to affect such invertebrates.

55 Chapter 5 does not adequately address impacts to biological resources resulting from extensive surface disturbance and removal of native vegetation. Such activities, if done during the avian breeding season, likely would kill individuals and/or destroy nests and nest contents of migratory birds protected under the Federal Migratory Bird Treaty Act.

Other activities may expose birds to drilling mud, surfactant in drill sumps constructed for monitoring wells, or other contaminated surface waters. Protected species include, but are
56 not limited to, passerines, waterfowl, hawks, and owls. The FEIS should discuss the resulting impacts, and mitigation measures should be developed to prevent migratory bird mortalities.

57 Many sections in Chapter 5 state various effects would not have a negative impact on the viability of most species found in this area. Although this is likely true for species overall, the viability of populations may be adversely affected. The effect on viability should be discussed in the FEIS.

Several sections on biological resources in Chapter 5 indicate much of the land to be cleared for the Environmental Restoration Program would be stabilized and/or revegetated. We fully support such measures to restore contaminated sites on NTS. However, the FEIS should discuss the problems associated with clearing vegetation from desert soils.

58 These problems include length of time for the area to revegetate on its own, air quality problems associated with expansive areas of non-vegetated land, and movement of sediments onto adjacent playas that may adversely affect the ecology of the playa.
59 Revegetation of Mojave Desert lands also is problematic. As we are unaware of any successful revegetation that actually restores the native plant community, the FEIS should reference examples and discuss impacts associated with such mitigation measures.

60 Endangered and Threatened Species In reference to sections on candidate species, the Service no longer maintains a list of category 1 and 2 candidate species (see Notice of Review, dated February 28, 1996, 61 FR 7595).

In place of these two categories, a single candidate category has been established. It includes species for which the Service has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list the species as threatened or endangered under the Endangered Species Act of 1973, as amended (ESA).

61 Such species were identified as category 1 candidates in earlier candidate notices of review. Species identified as category 2 candidates in earlier notices of review are no longer regarded as candidates for listing under the new policy.

The Service remains concerned about the former candidate species (now informally known as "Species of Concern"), and recognizes further biological research and field study are needed to resolve the conservation concerns for these taxa. Even though many of these Species of Concern may eventually be found not to warrant listing as threatened or endangered under the ESA, others may become candidates for listing in the future.

62 Throughout Chapter 5, the DEIS states various candidate plants (now Species of Concern) may be adversely affected by project alternatives. The FEIS needs to provide information on the extent of these plant populations in relation to the status of the species over its range.

FEDERAL AGENCY 3 (CONTINUED)

63 This information is vital because elimination of a population at a given site, especially if it represents the majority of the population, would be considered a significant impact.

64 <u>Effects on National Wildlife Refuges</u> We are concerned possible impacts to three components of the National Wildlife Refuge (NWR) System (Ash Meadows, Desert, and Moapa Valley) from current and proposed operations at the NTS have not been adequately addressed.
65 Concerns remain that either contamination or depletion of groundwater may affect Ash Meadows and/or Moapa Valley (Muddy River) NWRs. The Service understands the underground aquifers feeding the NWRs are not sufficiently understood by geologists or hydrologists to assume adverse impacts would not occur. The FEIS needs to fully address this issue.

66 Several sections of the FEIS indicate DOE groundwater withdrawals in Yucca Flat have exceeded the published perennial yield. The FEIS should address potential long-term implications of this exceedence, particularly for sensitive biological resources in Ash Meadows, Devils Hole, and the Death Valley NWRs.

67 For example, the Ash Meadows NWR supports four fish species, one invertebrate species, and seven plant species which are listed as threatened or endangered and protected by the ESA. Additionally, critical habitat has been designated for these species.

Potential impacts to these species and their critical habitat as a result of groundwater contamination and how DOE can coordinate with appropriate land managers to monitor groundwater quality which may affect ESA listed species downgradient of the NTS should be discussed.

68 Potential adverse impacts near the west boundary of the Desert National Wildlife Range from the Spill Test Facility have not been sufficiently addressed.
69 We also are concerned about the proposed transportation routes that would be in close proximity to Ash Meadows and possibly Desert NWRs. These concerns should be addressed in the FEIS.

70 Some sections of the DEIS indicate impacts to resources on refuges may be minor. Under the Refuge Administration Act of 1966, any activity is prohibited on Service land unless it is specifically approved.

<u>Cumulative Effects</u> The method used to evaluate cumulative effects appears to have evaluated the significance of DOE's projects instead of the cumulative contribution of the impacts themselves. Therefore, DOE determines they are an insignificant contributor.

71 The FEIS needs to explain what the contribution of DOE activities means in terms of total impacts. If activities of other entities result in a close-to-significant impact in the area, DOE activities may raise cumulative impacts to a level of

FEDERAL AGENCY 3 (CONTINUED)

71 cont. significance. The cumulative effects section should be fully reevaluated in the FEIS.

72 The section on cumulative effects to biological resources also is inadequate. It discusses impacts only to the desert tortoise, and the cumulative effects analyses should be expanded to include other biological resources.

They include but are not limited to specific vegetation types, important groups of wildlife such as migratory birds, and species of special concern.

73 <u>References</u> Although inventories, studies, and effects of various perturbations on physical and biological subjects are referenced throughout the DEIS, few bibliographic references are provided.

74 For example, Section 4.1.4.2, Geology: Radiological Sources in Soil (page 4-135, line 19) refers to a comprehensive study of a contaminated portion of Area 13 of the Nellis Air Force Range (NAFR) Complex. Lines 21 and 22 mention research on the uptake of radioactive material by plants, but do not provide a summary and a bibliographic reference.

75 The FEIS needs to provide a reference for determining 1) when, where, and by whom the research was conducted, 2) the validity of the research, and 3) the title of the research document to examine for further information.
76 The FEIS also needs to document sources and references.

SPECIFIC COMMENTS

77 <u>Page 2-2, Section 2.1, Background, Lines 18-19</u> A programmatic section 7 consultation under the ESA is in progress. It analyzes the effects on the desert tortoise (*Gopherus agassizii*) from DOE programs on the Nevada Test Site (NTS) as described in Alternative 3 of the DEIS. Activities proposed on the NTS which are not considered in Alternative 3 may not be covered under the biological opinion when issued and may require re-initiation of consultation.

<u>Page 2-21, Section 2.5.6.1, Low-level Waste Performance Assessments, Lines 16-21</u> Regarding the release of radioactive material, the DEIS states the effective dose equivalent would not exceed 25 millirems per year to any member of the public.
78 Even though DOE may not have an objective dose limit for plants and wildlife, the FEIS should describe how effective dose equivalent levels for plants and animals would be monitored.

79 The terms "reasonable effort" and "as low as reasonably achievable" in the last sentence should be defined more specifically.

FEDERAL AGENCY 3 (CONTINUED)

Page 3-36. Section 3.3. Comparison of Alternatives and Environmental Impacts Lines 2 and 3 state additional Defense Program impacts under the alternatives considered in the DEIS are small in comparison to the impacts of previous testing. The implication is that additional impacts would, therefore, be of no concern. However, because the impacts of previous testing were so
80 substantial, it would seem that any additional impact, regardless of how small, may be significant. The FEIS should discuss the rationale why this would not be the case.

81 Page 4-135. Section 4.1.4.3. Soils. Lines 16-24 Further discussion is needed on the uptake of radioactive material by plants and animals, particularly herbivores. It is reasonable to assume that radioactive material may accumulate in animals which
82 feed on contaminated plants. Thus, the FEIS should discuss long-term effects of radioactive material accumulation in animals in greater detail.

83 For example, is reproduction and recruitment affected by increased radioactive levels and, if so, to what degree? Results of surveys
84 and research projects on soils should be included in the discussion in lines 26-33. We suggest the FEIS identify and
85 discuss alternative methods for cleaning soils, including replacement of topsoil and cryptogamic crusts.

Page 4-141. Section 4.1.5.1. Surface hydrology Lines 4-8 states Forty Mile Canyon carries runoff beyond the NTS boundaries to the
86 Amargosa Desert and Death Valley, California. The effect of perturbations on the NTS to organisms of special concern in those locations should be provided in the Biological Resources sections.

87 Page 4-146. Section 4.1.5.1. Surface Hydrology The DEIS does not explain in lines 6-7 why two of the nine springs on the NTS were not sampled. Considering these springs are a water source for
88 wildlife, the FEIS should identify the potential effects to species which consume water at these sources. A discussion on
89 levels of tritium in the samples and why they were not included in the analysis should be discussed.

Page 4-147. Line 21 The DEIS states all active containment ponds are fenced and posted with radiological warning signs. The FEIS
90 should address the level of access to these ponds by various species of wildlife. We are particularly concerned with access by the threatened desert tortoise and migratory birds.

The FEIS should clarify what is meant by the term, "annual average
91 of gross beta analyses" from each sampling location. How does this relate to wildlife that may come into contact with these waters? What is the risk to various wildlife groups, such as
92 amphibians, reptiles, birds, and small mammals?

This information which is apparently not in the DEIS, should be provided in the FEIS. These comments relate to lines 31 to 33 on

FEDERAL AGENCY 3 (CONTINUED)

page 4-219, which mention 230 contaminated areas on the NTS, Tonopah Test Range, and NAFR Complex.

Pages 4-149 Lines 27-31 state, in general, the effects of pumping NTS water supply wells is concentrated within a distance of a few thousand feet of the operating wells and that the impact is not
93 considered significant in five locations.

The FEIS should state whether there are significant impacts in other locations; whether the cone of depression around these wells has been mapped, or whether there are any biological resources in the vicinity of the wells that could be affected by pumping.

Page 4-150. Section 4.1.5.2. Groundwater The discussion on lines
94 17-25 states the downgradient subsurface discharge to Frenchman Flat may have been affected. However, we could not locate any discussion of the impacts to biological resources associated with Frenchman Flat. Such information should be provided in the FEIS.

Page 4-162 Lines 30-32 state when large volumes of groundwater were pumped from the vicinity of the Cambric site cavity,
95 migration of tritium and noble gases via groundwater flow was possible. However, no information was provided on where contaminated groundwater may have gone or where it is now likely to be located.

Lines 1 and 2 on page 4-163 state there are three known nuclear test locations where the regional carbonate aquifer has been
96 affected by radionuclides, but no information is provided on the levels of radionuclides in these locations or what the potential effects are.

Line 20 states that nonradioactive materials in the subsurface at NTS include numerous metals, organic compounds, and drilling
97 products. However, specific identification of these materials and their potential toxic effects, if any, are not listed. This information should be provided in the FEIS.

Page 4-170. Section 4.1.6. Biological Resources. Table 4-30.
98 The bald eagle (*Haliaeetus leucocephalus*) was reclassified to threatened in the lower 48 states on July 12, 1995 (60 Federal Register 36000).

With publication of the new candidate notice, the only category 1
99 candidate known from the NTS, Beatley's astragalus (*Astragalus beatleyae*) has been removed from the list of candidates. However, as with other species of concern, the Service will continue to track the species' status trends and threats to survival.

Pages 4-174 Lines 3 and 4 state most natural springs are on the
100 mesas and mountains in the northern part of the NTS. If any other springs are located in valley bottoms and are affected by groundwater levels, the FEIS should provide this information

FEDERAL AGENCY 3 (CONTINUED)

because current and future pumping of groundwater on the NTS may affect these springs.

101 Page 4-175 Lines 7-9 state many of the birds on the NTS, including almost all of the waterfowl and shorebirds, use the playas in Frenchman and Yucca Flat weapons test basin, artificial ponds and springs, and sewage lagoons during migration and/or during winter. No information is provided, however, on whether data have been collected on exposure of these organisms to radionuclides or other contaminants and potential effects therefrom. This information should be provided in the FEIS.

102 Pages 4-220 and 221 The section on ecological studies mentions monitoring plants and animals on the NTS to assess changes over time in their ecological conditions. However, no information is provided on the results of these studies and no documents or study reports are referenced.

The FEIS should summarize results of these studies as specified in section 1502.21 in the Council on Environmental Quality's Regulations for Implementing the NEPA (CEQ Regulations).

103 Page 4-221. Section 4.1.11. Occupational and Public Health and Safety/Radiation. Lines 3-5. The discussion of tortoises in the Rock Valley study enclosure should include the determination by the Service that these tortoises are considered pre-ESA and, therefore, not protected under the ESA. When hatchlings, these tortoises were confined to the enclosures by a barrier and isolated from the wild population. This event occurred prior to listing of the tortoise under the ESA.

104 However, marking and measuring free-roaming tortoises may be in violation of section 9 of the ESA unless authorized under sections 7 or 10.

Page 4-278. Section 4.5. Eldorado Valley The Eldorado Valley Land Act, Public Law 85-339 as amended, authorized the conveyance of 126,775 acres of Bureau of Land Management lands in the Eldorado Valley to the Colorado River Commission of Nevada.

105 In 1995, 107,412 acres of these lands, which include 69,930 acres of the Piute-Eldorado Critical Habitat Unit (CHU) for the desert tortoise, were transferred to the Boulder City government.

Furthermore, approximately 85,617 acres of the transferred lands, including 65,256 acres of desert tortoise critical habitat, are being managed according to a conservation easement granted by Boulder City to Clark County for at least the next 50 years. The conservation easement requires that the 85,617 acres of land be managed for the conservation, protection, restoration, and enhancement of the desert tortoise and its habitat.

FEDERAL AGENCY 3 (CONTINUED)

105 cont. Boulder City is responsible for supervising and regulating activities authorized or permitted within the area. This information should be incorporated into the FEIS.

106 Page 4-287. Section 4.5.6. Biological Resources The Eldorado Valley Solar Enterprise Zone occurs immediately adjacent to the Piute-Eldorado CHU and is occupied by desert tortoise. The Dry Lake Valley Solar Enterprise Zone is immediately adjacent to the Mormon Mesa CHU and the Coyote Springs Solar Enterprise Zone occurs within the Mormon Mesa CHU. If any proposed project actions in these areas affect the desert tortoise, formal consultation with the Service under section 7 of the ESA may be required.

107 Page 5-37. Section 5.1.1.5.2. Groundwater. The FEIS should further discuss potential adverse impacts to biological resources from large scale groundwater withdrawals. In particular, project effects to hydrophytic vegetation, aquatic invertebrates, and desert organisms dependent on isolated water sources where spring discharge rates would be reduced and water quality impaired should be identified.

108 Line 33 of this section states that the grading of soils and other construction actions could alter slightly the quantity and quality of runoff. However, the significance of the impact would depend in part on the amount of grading done. Alterations of drainages, including those on alluvial fans, may significantly alter downgradient vegetation, including plant species composition and abundance associated with these communities. These impacts should be discussed in the FEIS.

109 Pages 5-161 to 5-166. Section 5.3.1.6. Biological Resources Regarding the alternative energy project proposed under the Non-defense Research and Development Program, we understand additional environmental analysis would be undertaken before a decision would be made on this proposed project. However, some project features and potential impacts should be discussed in the FEIS.

The discussion should also include the four technologies being considered for development, the types of habitat to be cleared, and the potential for indirect impacts, such as habitat fragmentation and disruption of wildlife movement corridors.

110 Page 5-282. Section 5.5.3.6. Coyote Springs Valley. Lines 23-25 The proposal for pumping and use of any groundwater upgradient from the Muddy River warm springs system should be re-evaluated because the Moapa dace and several species of special concern may be impacted. If pumping may adversely affect any listed species, consultation pursuant to section 7 of the ESA may be required.

111 Volume 1. Appendix I. Transportation Study. Page 3-23. Figure 3-11 Regarding State Route NV-10 Southern Route 5, we object to this route due to its proximity to Ash Meadows NWR which provides

111 cont. critical habitat for numerous listed species. Also, State Route 373 is not a heavy haul road.

112 Appendix C. Page C-10. National Wildlife Refuge System Administration Act of 1966. 42 U.S.C. 668dd. (Public Law 91-135, as amended) The following text should be added in the FEIS to reflect the intent of this law:

113 The National Wildlife Refuge System Administration Act of 1966 provides guidelines and directives for the administration and management of all lands within the system, including "wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, or waterfowl production areas."

The Secretary of Interior is authorized to permit by regulations the use of any area within the system provided "such uses are compatible with the major purposes for which such areas were established."

114 Migratory Bird Treaty Act of 1918. 16 U.S.C. 703 et seq., 40 Stat. 755 The following text should be added in the FEIS to more accurately reflect the intent of this law:

The Migratory Bird Treaty Act of 1918 establishes a prohibition, unless permitted by regulation, to "pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess... at any time, or in any manner, any migratory bird, included in the terms of this Convention ... for the protection of migratory birds ..., or any part, nest, or egg of any such bird."

115 Bald and Golden Eagle Protection Act. 16 U.S.C. 668. enacted by 54 Stat. 250 The proper name of this law is the "Bald Eagle Protection Act of 1940." The Service recommends the following text to more accurately reflect the intent of this law:

The Bald Eagle Protection Act of 1940 protects bald and golden eagles by prohibiting the taking, possession, and commerce of such birds and establishes civil penalties for violation of this Act.

116 Appendix E. Section E.2.6. Page E-19 to E-25. Biological Resources The criteria established to evaluate potential impacts resulting from the various activities should include an evaluation of DOE's legal responsibilities under the Migratory Bird Treaty Act (MBTA) or the Bald Eagle Protection Act (BEPA) in the FEIS. While evaluating impacts to habitat, populations, and individuals of threatened or endangered species is proper, the MBTA and BEPA provide protection to individuals of these species.

117 Volume 2, Framework for Resource Management Plan, Page 1-2, Section 1.3, Policy and Procedures Section 7(a)(1) of the ESA requires all Federal agencies to carry out programs for the conservation of threatened and endangered species. Many Federal agencies also have policies for conservation and management of candidate species, species of special concern, and other sensitive species. If DOE has such policies, they should be discussed or a statement should be given in the FEIS that no such policies exist.

Page 4-6 The DEIS states DOE's goal for biological resources is to maintain habitat and ecosystem processes needed to support viable populations of all native plants and animals. However, the status, distribution, and life histories of many species of plants and wildlife are not well known. Thus, the implementation of a project activity, such as an increase in land use, could be underestimated and have a long term impact beyond acceptable levels.

118 Guidelines should be incorporated into the Resource Management Plan to adequately conserve all natural resources on the NTS.

119 Page 2-7, Line 14 The taxonomic name for Beatley milkvetch is *Astragalus beatleyae* and not *Astragalus badly*. This should be corrected in the FEIS.

120 General Comments:

NPS is concerned that DOE's proposed groundwater withdrawal, in combination with existing groundwater withdrawals in the Las Vegas area, may adversely reduce discharge at Lake Mead of Black Canyon springs and Aztec Spring (for example, as discussed at Page 5-200).
The EIS should reconcile this concern with the knowledge that groundwater withdrawals in the Las Vegas basin exceed the rates of groundwater recharge.

Death Valley is a regional groundwater sink and constitutes the lowest elevations in the Death Valley Groundwater Flow System. The Death Valley Groundwater Flow System (DVGWFS) is defined as those areas where groundwater flow is toward Death Valley. The flow system is complex and contains several subsystems.

121 We concur with the EIS's premise that much research has been completed on the hydrogeology, geology, and hydrology of the NTS and its associated off-site locations. However, many researchers concur that much uncertainty attends the full understanding of the DVGWFS due to geohydrologic complexities and large size of the aquifer system.

NPS must take this uncertainty into account in protecting its water rights and water-related resources, particularly in light of

121 cont. the numerous over-appropriated groundwater basins. This uncertainty should be more fully addressed in the EIS.

The principal aquifers comprising those subsystems are: carbonate-rock aquifers, volcanic-rock aquifers, and basin-fill or alluvial aquifers. Death Valley is a terminus of the overall system although significant water discharges also occur at several intermediate locations, for example Ash Meadows.

DVGWFS is supplied primarily by recharge from mountain ranges in the northern portion of the flow system, the Spring Mountains, and some subsurface inflow from the White River Flow System. The DVGWFS underlies about 15,800 mi^2 (40,100 Km^2) and includes 30 identified groundwater basins in southern Nevada and southeastern California (Harrill, 1995).

The few perennial streams present in Death Valley are located mainly along the west flank of the Panamint Mountains. Springs provide the majority of Death Valley's surface water and are generally widespread. Larger springs are the source of potable water supplies at developed areas at Furnace Creek and Scotty's Castle. Where present, spring water permits riparian vegetation growth and constitutes important focal points for resident and migratory animal life.

Major springs are those which flow constantly, discharge in excess of 25-30 gallons per minute, issue at elevations below 2,000 feet, and are believed to be of DVGWFS origin. Subsurface flow from the DVGWFS to the Death Valley Playa supports vegetation at the base of alluvial fans and sustains several playa pools.

Because protection of these critical water resources is mandated, all up-gradient activities potentially affecting the DVGWFS are of concern to the NPS.

The over-appropriation of the estimated perennial yield of many groundwater basins up-gradient and adjacent to Death Valley (as noted in the EIS) is of particular concern. NPS has therefore instituted a management policy of monitoring all up-gradient activities which may potentially impact water rights and water-related resources of Death Valley and Devils Hole (a detached management unit at Ash Meadows, Nevada).

Thus all applications made to appropriate groundwater from within DVGWFS are reviewed, and any which are found to exceed established parameters are protested to the Nevada State Engineer.

122 Our concerns include any proposed activities which may result in possible groundwater contamination, such as those associated with up-gradient mining operations (i.e., milling operations and tailings disposal).

123 The NTS, Tonopah Test Range, and portions of the NAFR Complex are within the DVGWFS and are up-gradient from Death Valley. Any groundwater-affecting activities in those management areas have potential to impact NPS water rights and water related resources and as such warrant a similar level of scrutiny.

Underground nuclear testing in those management areas is established to have resulted in radionuclide contamination of the groundwater which is inextricably moving toward discharge points in Death Valley and at Devils Hole. As stated in the §4.1.5.2 of the EIS (regarding NTS): "All potentially affected areas are located within the Death Valley flow system." These affected areas and their future management are of concern to the NPS.

The Devils Hole area and its associated Endangered pupfish population is in proximity to the NTS and is highly susceptible to impact from up-gradient activities. As noted in the EIS, a minimum water level at the Devils Hole pool has been established by Supreme Court order so as to protect the unique desert pupfish population.

124 An independent study (by Brown and Lehman, 1991 & 1995) indicates an unexplained, gradual pool decline at Devils Hole. Data analyses suggest a possible relationship between the declining pool level and pumping of Army Well No.1 and leads to questions concerning a possibly similar relationship from past heavy pumping from Production Well J-12 conducted in support of an earlier nuclear rocket engine testing program. This issue should be addressed in the EIS.

The EIS states that effects of NTS water withdrawals include lowering of water levels in the vicinity of NTS water supply wells and some localized changes in groundwater flow directions. 125 The study by Avon and Durbin (quoted on page 4-167 of the EIS) was presented at the third annual Devils Hole Workshop (which NPS organized). NPS staff, as well as consultants to NPS, were not in complete agreement with the conclusions presented concerning the relationship of pumping at Army Well No. 1 to groundwater levels.

126 We believe additional studies are warranted. NPS continues to implement projects, collect data, support research, and conduct studies investigating the probable cause of the decline of the Devil's Hole pool level. These or similar efforts should be identified in the EIS.

127 We request analysis in the EIS of some key deficiencies in data, which have been recognized by the Under Ground Test Area research team (under the leadership of Mr. Steve Lawrence). The EIS (Page S-19) states results of groundwater modeling indicate there will be no measurable contaminants from testing in areas not under control of the DOE or the U.S. Air Force.

This statement ostensibly contends there is agreement about high confidence levels in modeling. However, conclusions of recently completed studies (D'Agnese, 1994; Harrill, 1995) indicate that

FEDERAL AGENCY 3 (CONTINUED)

127 cont. low evapo-transporation values for the Death Valley playa, as have been used by some investigators, preclude developing and applying reasonable DVGWFS mathematical models.

If the postulates set forth by D'Agnese are correct, then adjustments will affect results of future modeling efforts--necessitating higher rates of transmissivity and inflow from adjacent groundwater basins or flow systems. This potential data deficiency should be addressed in the EIS, and necessary means to acquire more representative data should be identified.

Page Specific Comments

128 Page S-19 (lines 1-2): The summary notes that 2.2 million acre-feet flow beneath the NTS and surrounding region. This number appears to be excessive--we request information about how this quantity flow was calculated.

Volume 1, Part A

129 Page 3-43, Table 3-5: Impacts described refer to basin perennial yields and apparently are not "environmental impacts." Basins where the described lands are located are parts of regional ground-water flow systems. To describe the "environmental impacts", the effects on the systems caused by current water use, increased water use, and reduced water use should be addressed, in other words, the effect on groundwater levels and natural discharge areas.

130 Page 4-143 (¶ 1): The discussion tends to lead the reader to infer that wetlands have not been identified at the Ash Meadows National Wildlife Refuge. Actually, wetlands survey maps of the Ash Meadows area were completed by the U.S. Fish & Wildlife Service in 1991 and large acreages of wetlands have been identified. Clarification of this point would improve reader comprehension of the issues.

131 It should also be mentioned that Texas, Nevares, and Travertine springs in Death Valley (also located downgradient from the NTS) provide a potable water supply for park visitors and for a privately-owned resort which includes restaurants, motels, hotels, and golf course.

132 Page 4-149: We request that the statement "In the western part of the Tonopah Test Range, it (the groundwater) flows toward the Oasis Valley and Sarcobatus discharge areas" be corroborated. The discussion implies Oasis Valley and Sarcobatus Flats constitute terminal discharge areas.

133 Actually, presence of the very large Grapevine and smaller Sand, Johnson, Surprise, and Mesquite springs in northeastern Death Valley necessitates outflow of substantial quantities of

FEDERAL AGENCY 3 (CONTINUED)

133 cont. groundwater into northern Death Valley. There is, to our knowledge, no recognized discharge area in Sarcobatus Flats.

134 While the riparian area in lower Oasis Valley undoubtedly accounts for some evapo-transpiration, the springs constitute the "head waters" of the Amargosa River. The primarily subsurface flows along the course of the Amargosa River have been identified by the NPS as providing a significant contribution to the groundwater resources of Death Valley.

Pages 4-149 (lines 11-22); 4-150 (lines 17-25) & Table 4-23: The perennial yields for each NTS hydrographic basin are discussed. Perennial basin yield was calculated in one of two ways: (1) one-half of the underflow, or (2) evapo-transpiration (ET) rate.

135 Because most basins do not have ET areas, perennial yield includes groundwater moving as underflow from one basin to another. In other words, water is counted more than once. Thus, perennial yields, as presented in the EIS, imply there is much more water available for capture than what "actually" is available. The "actual" perennial yield of all the basins in total is the rate of ET in the Amargosa Desert, about 24,000 afy.

136 Other appropriations (including surface water appropriations in the Ash Meadows area) and groundwater withdrawals in the Amargosa Desert area should be included in this discussion to present a more accurate picture of the availability of groundwater for capture.

137 For an example of how water use information can be presented in a regional context, see DOE's 1988 Yucca Mountain Site Characterization Plan, Chapt. 3, Hydrology. Moreover, there is more recent water-use data available which should be presented in the EIS.

138 Page 4-149 (line 27): Seaber et al., 1995, is not listed in the references.

139 Page 4-153: Although groundwater flow rates have been estimated by some researchers to average from 2-200 meters per year, some uncertainty attends those estimations. It has been pointed out in workshops associated with the evaluation of the proposed nuclear repository site at Yucca Mountain that such water estimations (based on carbon 14 analyses) may be askew due to the exchange of carbon molecules between the groundwater and older carbonate rocks it flows within.

140 Also, groundwater flow rates accelerate substantially within up to 20 miles of major discharge areas such as at Ash Meadows and Devils Hole (Dettinger, 1989). This is cause for further NPS concern about proximity of some identified NTS contaminated groundwater plumes to that area of increased transmissivity surrounding Ash Meadows and Devils Hole, a point not currently identified or discussed in the EIS.

FEDERAL AGENCY 3 (CONTINUED)

141 Page 4-154 (line 28): EIS states discharge is estimated to be about 9,000 acre-feet year/from the Alkali Flat-Furnace Creek Ranch area (Rush, 1970). It should be clarified that this estimate is for the `Pahute Mesa' system and includes 2,000 afy of ET in Oasis Valley. As we understand it, the `Alkali-Flat Furnace Creek Ranch' system described by DOE in its 1988 site characterization plan does not include the ET in Oasis Valley.

142 Page 4-154 (lines 30-31): EIS states that as much as 5,000 afy may flow westward from the Amargosa Desert to springs in Death Valley. This may be interpreted to mean that 5,000 afy is the maximum amount of water thought to flow from Death Valley. However, Harrill and others (1988, USGS Hydrologic Atlas 694-C; and September 1991 addendum) show subsurface flow from Amargosa Desert to Death Valley to range from 3,000 to 19,000 afy.

143 Page 4-156 (line 4): Proper citation is lacking for the statement that "...some water does flow into the Alkali Flat-Furnace Creek Ranch area and discharges at springs near Furnace Creek Ranch."

144 Page 4-165 (lines 8-15): Federal reserved water rights for NTS have not yet been decreed. It is our understanding, from reading case law and discussing same with lawyers within the Departments of the Interior and Justice, that typically the court (state or Federal) establishes the right, assigns a priority date (which is the date of the establishment of the reservation), and quantifies the right.

145 State appropriative water rights which have priority dates older than that of reserved water rights (quantified or unquantified) are senior to the reserved rights. In other words, the reserved right is only for water unappropriated by others as of the date of the reservation. The right is also limited to the amount necessary for the purpose of the reservation.

146 Death Valley was established as a monument in 1933; reserved water rights for the park have not been adjudicated, except those attending Devils Hole. Devils Hole was established January 17, 1952. Water rights reserved to Death Valley would appear to be senior to those of NTS.

147 The NPS also has California appropriative water rights for regional springs in the park: Nevares Spring (License 4621, priority date February 17, 1939), and Texas Spring (License 7854, priority date February 17, 1941). An unquantified part of the water issuing through these springs flows through the NTS.

148 Page 4-167 (lines 11-17): The United States reserved right for the Devils Hole pool level is subject to senior appropriations. The Nevada State Engineer is required by law to ensure that the pool level is not adversely affected by junior appropriators, that

FEDERAL AGENCY 3 (CONTINUED)

148 cont. is, that junior appropriations do not cause the pool level to fall below the court-mandated level.

149 Page 4-241 (line 10) & Table 4-40: See comments pertaining to Pages 4-149 (lines 11-22) and 4-150 (lines 17-25) and Table 4-23, above. Also note that NPS has federal reserved rights for Death Valley proper, which have not yet been adjudicated, and California appropriative water rights at Unnamed Spring (Ranger Spring) (License 7577, Priority Date June 10, 1960), Mesquite Spring (License 7578, Priority Date July 13, 1960), and Unnamed Spring (formerly Surprise Spring) (License 10780, Priority Date February 17, 1964).

150 Pages 4-285 & 4-286: Rush and Huxel (1966, p.17) noted that groundwater flows from the Eldorado Valley towards the Colorado River through Lake Mead National Recreation Area (Lake Mead).

151 There are a number of hot and cold springs in this part of the Lake Mead area, particularly in the Black Canyon area downstream from Hoover Dam. Groundwater from Eldorado Valley may also discharge at a spring in Aztec Wash. NPS has unquantified reserved water rights for these springs.

Laney (1981) postulated that the larger part of the water issuing from the springs in the Black Canyon area is groundwater underflow from Eldorado Valley. McKay and Zimmerman (1983), however, found evidence insufficient to state that groundwater from the Eldorado Valley area affects the discharge from springs and the water chemistry of springs in Black Canyon.

152 Page 4-298 (lines 12-22): Recommend defining the California Wash flow system with reference to Lake Mead. As noted in the EIS, the groundwater in the system flows into the Muddy River. NPS has a right to water in the Muddy River with a priority date of December 1, 1937.

153 Rights to water in the Muddy River were decreed by the Tenth Judicial Court of the State of Nevada in the case entitled Muddy Valley Irrigation Company vs. Moapa and Salt Lake Produce Company. According to the January 21, 1920, Order of Determination and the March 11, 1920, Further and Supplemental Order of Determination of the Nevada State Engineer, there is no water available for appropriation in Muddy River, its headwaters, sources of supply or tributaries.

The court stated that Muddy River water is fully appropriated, including its tributaries and all sources of water to the river (which may be interpreted to include groundwater.)

154 Page 4-312 (lines 27-28): Coyote Spring Valley generally is considered part of the White River groundwater flow system.

155 Pages 4-313 (lines 6-7): EIS states groundwater in Coyote Spring Valley discharges in the Muddy Springs area. As noted above, the water in Muddy River is fully appropriated, including tributaries and all sources of water to the river (which may be interpreted to include groundwater).

156 Part of the water issuing from the Rogers and Bluepoint spring complex within Lake Mead in the Overton Arm area is thought to originate in the Muddy Springs area. The NPS has a Nevada state appropriative water right for Rogers Spring (priority date February 16, 1937) and unquantified reserved water rights to the springs.

Volume 1, Part B

Page 5-37 (lines 20-30): NPS appreciates DOE's continued efforts to protect Endangered pupfish in Devils Hole and ensure that court-mandated pool level is maintained. However NPS is concerned that DOE's NTS groundwater withdrawals, both existing and proposed, when combined with the existing groundwater withdrawals in the Amargosa Desert area, may adversely reduce the discharge of Death Valley springs and lower the pool level in Devils Hole.

157 We request that a calibrated groundwater flow model be used to determine potential effects of NTS' existing and proposed operations on Death Valley's water resources and water rights.

158 Page 5-160: See discussion above for Pages 4-149 (lines 11-22), Pages 4-150 (lines 17-25) and Table 4-23. Appropriations and groundwater withdrawals in the Amargosa Desert area should be included in this discussion to present a more accurate picture of the availability of groundwater for capture.

159 Again, the NPS is concerned that DOE's groundwater withdrawals at the NTS, existing and proposed, in combination with existing groundwater withdrawals in the Amargosa Desert area, may adversely reduce the discharge of Death Valley springs and lower the pool level in Devils Hole.

160 Page 5-205: Surface water in Muddy River is fully appropriated, including its tributaries and all sources of water to the river (which may be interpreted to include groundwater.) Groundwater in Dry Lake Valley is tributary to the Muddy River.

NPS is concerned that DOE's proposed groundwater withdrawal, in combination with existing groundwater withdrawals in the Muddy Springs area, may further reduce the discharge of Muddy River and the Rogers-Bluepoint Springs complex and thus injure Lake Mead's water rights.

161 Page 5-211: NPS contends Muddy River water is fully appropriated, including its tributaries and all sources of water to the river

161 cont. (which may be interpreted to include groundwater.) Groundwater in Coyote Spring Valley is tributary to Muddy River.

162 NPS is concerned that DOE's proposed groundwater withdrawal, in combination with existing groundwater withdrawals in the Muddy Springs area, may further reduce the discharge of Muddy River and the Rogers-Bluepoint Springs complex and thus injure Lake Mead's water rights.

Alternative 4 (Alternate Use of Withdrawn Lands)

Page 5-235: We reiterate our concerns as stated in discussion above for pages 5-37 and 5-160.

Page 5-262: We reiterate our concerns as stated in discussion above for page 5-200.

Page 5-264: We reiterate our concerns as stated in discussion above for page 5-205.

Page 5-268: We reiterate our concerns as stated in discussion above for page 5-211.

Mitigation Measures

163 Page 7-6 (lines 9-11): Another possible means of mitigating impacts to groundwater availability would be to purchase valid existing senior water rights in the flow system and change the place of use to the Nevada Test Site.

164 Page 7-6 (lines 13-17): NPS is concerned that, if large-scale groundwater withdrawals are implemented to ensure no contamination releases beyond the NTS boundaries, Death Valley's water rights could be adversely injured.

165 Volume 1, Appendices A-F
Changes in groundwater discharge at natural discharge areas, including Devils Hole (and Ash Meadows) as well as springs in Death Valley should be included in the impacts being considered.

166 Volume 2, Resource Plan Framework
Page 3-5 (lines 18-21): NPS should be included, since nationally significant resources and major visitor usage exist at Lake Mead National Recreation Area (to the east) and Death Valley National Park (to the west).

If you or your staff have need for more information or if questions arise on these comments, contacts are:

Resource Management: Richard Anderson, Environmental Specialist or Mel Essington, Mining Engineer at (619) 786-3251; Death Valley National Park. Water Rights\Water Resources: Owen Williams at (970) 225-3505; Chief, Water Resources Program, Denver, CO. Resource Management\Water Resources: Mietek Kolipinski at (415) 744-3955; Team Leader, Natural Resources and Research, Pacific Great Basin SSO.

Thank you for the opportunity to comment.

Sincerely,

Patricia S Port

Patricia Sanderson Port
Regional Environmental Officer

cc: Director, OEPC, w/original incoming
State Director, BLM, NV
Regional Director, FWS, Portland
Field Director, Pacific West Field Area

FEDERAL AGENCY 3 (CONTINUED)

Attachment 1 - References Cited

Brown, Tim P. and Lehman, Linda L., 1995: Updated analysis of water levels in Devil's Hole, Nevada: Private Consultants, L. Lehman & Associates, Burnsville, Minnesota, 5 pages.

D'Agnese, Frank A., 1994: Using geoscientific information systems for three-dimensional modeling of regional ground-water flow systems, Death Valley Region, Nevada and California: Unpublished Ph D dissertation, Department of Geology and Geological Engineering, Colorado School of Mines, Golden, Colorado, 331 pages. (ground-water model)

Dettinger, Michael D., 1989: Distribution of carbonate-rock aquifers in southern Nevada and the potential for their development, summary of findings, 1985-88: Program for the study and testing of carbonate-rock aquifers in eastern and southern Nevada, Summary Report No. 1, U.S. Geological Survey and Desert Research Institute, University of Nevada, 37 pages.

Harrill, James R., 1995: A conceptual model of the Death Valley ground-water flow system, Nevada and California: Private Consultant, Pal Consultants Inc., 14380 Story Road, San Jose, California, 70 p. plus appendixes.

Laney, R.L., 1981: Geohydrologic reconnaissance of Lake Mead National Recreation Area -- Las Vegas Wash to Opal Mountain, Nevada: U.S. Geological Survey Open-File Report 82-115, 23 p.

McKay, D.E., and Zimmerman, D.E., 1983: Hydrogeochemical investigation of thermal springs in the Black Canyon-Hoover Dam area, Nevada and Arizona: University of Nevada System, Desert Research Institute, Water Resources Center Publication 4109, 40 p.

FEDERAL AGENCY 4

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

MAY 3 1996

Kenneth A. Hoar, Director
Environmental Protection Division
Nevada Operations Office
US Department of Energy
PO Box 14459
Las Vegas, NV 89114

Dear Mr. Hoar:

The US Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for the **Nevada Test Site (NTS) and Off-Site Locations in the State of Nevada**. Our comments are provided pursuant to the National Environmental Policy Act (NEPA), Section 309 of the Clean Air Act, and the Council on Environmental Quality (CEQ) Regulations for Implementing NEPA (40 CFR 1500-1508).

The DEIS evaluates the potential environmental impacts which would result from anticipated DOE activities at the Nevada Test Site, the Tonopah Test Range, and at formerly operated DOE sites in Nevada (Project Shoal Area, Central Nevada Test Area, and portions of the Nellis Air Force Range Complex). A variety of DOE operations such as defense activities, waste management, environmental restoration, non-defense research and development, and work for other agencies were considered in the context of four general alternatives: No Action; Discontinue Operations; Expanded Use and; Alternate Use of Withdrawn Lands. Three additional sites in Nevada are also evaluated for co-location of solar energy production facilities. The DEIS does not identify a preferred alternative.

Since a preferred alternative is not identified, we have assigned Alternative 3, the "Expanded Use" Alternative, a rating of EO-2, Environmental Objections - Insufficient Information. The remaining three alternatives are rated EC-2, Environmental Concerns - Insufficient Information. The assigned EO-2 rating reflects our concerns that:

1 - Alternative 3 lacks mitigation measures to appropriately reduce or offset potential adverse impacts and thus could significantly impact the environment. For example, we are extremely concerned that the DEIS did not discuss possibilities for reducing habitat loss and habitat fragmentation associated with site specific projects.

2 - there is a tendency within Alternative 3 to propose the siting of new facilities in undisturbed areas rather than in areas that have been previously disturbed. For example, the DEIS did not discuss the feasibility of locating the National Ignition Facility (NIF) in an already-disturbed area.

FEDERAL AGENCY 4 (CONTINUED)

MAY 3 1996

3 - there is a lack of information concerning the various large scale projects envisioned under Alternative 3. This is particularly true for the proposed solar energy and heavy industrial facilities. While we would assume that DOE would complete site-specific NEPA documentation for these facilities, additional details concerning anticipated environmental impacts and mitigation measures, at this stage, would allow the public and other agencies the opportunity to evaluate the comparative merits of the various alternatives pursuant to 40 CFR 1502.14(b).

4 - there is a lack of proactive attention to preventing pollution. The DEIS did not specifically reference the CEQ's requirement that agency NEPA documents should integrate pollution prevention features, techniques, and mechanisms into their decisionmaking process. We believe this is a serious shortcoming, especially in terms of the large scale proposals suggested under Alternative 3.

Please refer to the attached comments & recommendations for details of our concerns regarding Alternative 3, as well as concerns relating to the other alternatives. In addition, the attached "Summary of Rating Definitions and Follow-up Action" explains EPA's rating system in more detail.

We do commend DOE's effort to convey the concerns of Native American communities who have historically used the NTS, in particular by preparing Volume 1, Appendix G, "American Indian comments for the Nevada Test Site Environmental Impact Statement." We believe that Appendix G is an important tool to carry out the goals of the Executive Order on Environmental Justice in Low-Income and Minority Communities (1994).

We appreciate the opportunity to comment on your DEIS. Please send two copies of the FEIS to our office at the letterhead address (code E-3) when it is filed with EPA's Washington, D.C. office. If you have any questions, or wish to discuss our comments or recommendations, please call me at 415-744-1566, or David Farrel, Chief, Office of Federal Activities at 415-744-1584, or have your staff call David Tomsovic at 415-744-1575.

Sincerely,

Deanna M. Wieman, Director
Office of External Affairs

Attachments:
1) Rating Sheet
2) Detailed Comments
3) Pollution Prevention Checklists

cc: Dr. Donald Elle, DOE, Las Vegas

MI #2590

FEDERAL AGENCY 4 (CONTINUED)

SUMMARY OF RATING DEFINITIONS AND FOLLOW-UP ACTION

Environmental Impact of the Action

LO-Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC-Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO-Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU-Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of environmental quality, public health or welfare. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommend for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1-Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2-Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3-Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From: EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

FEDERAL AGENCY 4 (CONTINUED)

MAY 3 1996

US EPA Comments on Nevada Test Site Draft Environmental Impact Statement (DEIS) - May 1996.

Issue: Many of the environmental impacts (and appropriate mitigation measures) associated with increased activities under Alternative 3 are not clearly portrayed in the DEIS.

Discussion: The DEIS frankly admits that Alternative 3 (Expanded Use) will have significant environmental impacts to the Nevada Test Site (NTS) and other areas subject to future projects. For example, in terms of water use, Volume 1 (p. 5-160) indicates that water demand for the Nondefense Research and Development Program "is likely to be large and would have a significant impact on the availability of the groundwater basin..." In a similar vein p. 5-163 states that "pumping the large quantities of groundwater needing during the operation phase of this project could impact off-site springs."

5 One of the most significant projects proposed under Alternative 3 is the development of solar energy. As noted on p. 5-164, "The fifth project within this program, alternative energy, would result in ...destruction of large areas of undisturbed habitat and might use massive quantities of water." (bold added). Approximately 2,400 acres of undisturbed habitat would be cleared for solar energy projects, and the Solar Enterprise Zone would more than triple water consumption at the NTS (p. 5-160). However, there is only a minimal discussion associated with the impacts of such a massive project, be it in terms of habitat loss, impacts to a listed species (desert tortoise), water consumption, water conservation potential, compliance with State water quality protection requirements, air impacts, pollution prevention opportunities, and other issues.

6 The discussion regarding potential environmental impacts associated with the new heavy industrial facilities proposed under Alternative 3 is similarly lacking in detail. As one example, p. 5-166 notes "There could be gaseous releases associated with new, large heavy industrial facilities." (underline added). However, the nature and probability of such gaseous releases is not identified for the reader. Other environmental impacts associated with the new, large heavy industrial facilities are also not spelled out for the reader. Before agencies and the public can weigh the comparative merits of the four alternatives, it is imperative that information concerning impacts and mitigation is available.

7 Recommendation: We strongly recommend that the Final Environmental Impact Statement (FEIS) devote considerably more attention to the environmental impacts and mitigation measures associated with the various proposals under Alternative 3, in particular the solar energy and heavy industrial facilities.

1

FEDERAL AGENCY 4 (CONTINUED)

MAY 3 1996

Issue: The habitat losses and habitat fragmentation portrayed in the DEIS are in some cases significant, for example, the projects proposed under Alternative 3. However there is no discussion as to whether such habitat loss and fragmentation can be minimized by DOE.

Discussion: We note that significant habitat losses are projected to occur under certain alternative scenarios, for example, the discussion in Volume 1 (pp. 5-161 and 5-162) about habitat losses associated with the solar energy complex and the National Ignition Facility. Page 5-162 contains the statement that "The National Ignition Facility would be constructed in undisturbed habitat on the edge of Mercury..." (underline added). Other proposals outlined in the DEIS involve the loss of undisturbed habitat as well. Most strikingly, the Solar Enterprise Zone
8 calls for the use of 2,400 acres of previously undisturbed habitat (Volume 1, p. 5-164). Preventing the possibly unnecessary loss of undisturbed habitat seems to be an area where DOE may be able to implement a significant pollution prevention opportunity, which is to reduce habitat loss if at all feasible (please refer to the pollution prevention checklist on habitat preservation and protection).

Recommendation: We encourage DOE to maximize options to protect habitat and to minimize habitat loss and habitat fragmentation. For example, a significant means to protect habitat is to locate the Solar Enterprise Zone, the NIF and perhaps other new facilities in already disturbed areas, if feasible. We strongly encourage appropriate commitments in the FEIS and NEPA Record of Decision to protect habitat on the test site and in the offsite areas as fully as possible.

Issue: The DEIS does not specifically recognize the Council on Environmental Quality (CEQ) memorandum (*Federal Register*, January 29, 1993) on incorporating pollution prevention features in Federal agency NEPA documents.

Discussion: CEQ encouraged Federal agencies to integrate pollution prevention features in NEPA planning and decisions. For your reference I have enclosed several checklists for different activities from EPA's **POLLUTION PREVENTION/**
9 **ENVIRONMENTAL IMPACT REDUCTION CHECKLISTS**. These include checklists for habitat preservation and protection; facility siting; vehicle maintenance; water use; hazardous waste storage and treatment; and waste site investigations and cleanup activities.

We recognize that a number of the checklist suggestions may already be part of the project or an integral element of daily facility operations, while other checklist items may prove inapplicable or inappropriate. Nevertheless, we encourage DOE to review the enclosed checklists as the basis for a sound pollution

FEDERAL AGENCY 4 (CONTINUED)

MAY 3 1996

prevention program for the project and facility. This is particularly critical in the case of major projects such as the
9 cont. solar energy and heavy industrial developments should DOE approve them.

Recommendation: The FEIS should specifically reference any items from the checklist that may be adopted by DOE, and the Record of Decision should reflect a commitment to implement feasible pollution prevention measures.

Issue: It is unclear whether polychlorinated biphenyls subject to US EPA regulations (40 CFR 761) are presently in use or in storage in transformers or equipment at the NTS.

Discussion: Volume 1, p. 4-48 indicates that PCB wastes are stored for up to nine months at the Area 6 Toxic Substances Control Act waste accumulation unit. The EIS indicates that Area 6 accepts only PCB and PCB-contaminated waste generated at the NTS and that, after a period of time, the PCB waste is shipped offsite to an approved treatment, storage and disposal facility. However, it is unclear whether PCBs subject to US EPA regulatory oversight (i.e., at concentrations of 50 parts per million or greater) are currently in use in transformers, electrical
10 equipment or elsewhere on the test site, or whether PCBs may be in storage at the facility. In an April 24, 1996 phone conversation (Don Elle, DOE and David Tomsovic, US EPA), DOE indicated that no PCBs are currently in use at the test site. However, if PCBs and PCB-contaminated wastes are being sent to Area 6, and such PCBs and PCB wastes are generated only at NTS, what is the source of such PCBs and PCB wastes?

Recommendation: The FEIS should clarify whether PCBs subject to 40 CFR 761 are in use or in storage at the test site. If PCBs are in use or in storage at the test site (i.e., not as PCB waste at Area 6), the FEIS should provide a discussion regarding their location, volume and related information. Additionally, it would be useful to indicate whether PCBs below the regulatory threshold of 50 ppm are currently in use or stored at the test site.

Editorial Comments

1. Volume 1, Appendix C, p. C-10. Under the section regarding the Toxic Substances Control Act (TSCA) of 1976, it states that the TSCA regulates certain toxic substances that are not
11 regulated by the Resource Conservation and Recovery Act or other statutes, including PCBs and asbestos. We suggest that the final document be modified to note that the Clean Air Act (National Emission Standards for Hazardous Air Pollutants, NESHAP) exercises regulatory control over asbestos. You may want to modify p. C-6 (a discussion of the Clean Air Act) to note that the NESHAP apply to radionuclides, beryllium and asbestos.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR HABITAT PRESERVATION AND PROTECTION

How Can Ecosystem Preservation and Protection Affect the Environment?

In the face of development activities, populations of indigenous plants and wildlife can be protected only through the protection and preservation of ecosystems necessary for their survival. Ecosystem requirements are species-specific and can include a variety of factors, such as soil type, water regime, climate, and plant and animal associations. Ecosystems are defined by the structure and function of plant and animal communities and by the habitats they utilize. The protection and preservation of ecosystems are important for a number of reasons, which include the protection of wildlife, climate control, maintenance of biodiversity sources, pollutant detoxification, erosion control, and CO2 sequestration.

Wetlands are ecosystems necessary for the survival of a host of aquatic and terrestrial species. In addition, wetlands are integral parts of the hydrological system and are necessary for the maintenance of water supplies and water quality.

Ecosystems face a number of threats that reduce the area available for wildlife, change the character of the species that inhabit particular habitats, or change their form through the alteration of features, including topography or water regime. Ecosystem preservation efforts are generally directed at protecting particular species, such as endangered or threatened species, recreationally or aesthetically important species, or commercially important species. It should be noted, however, that habitat preservation (or creation or enhancement) for one species can adversely affect other species.

Also see checklists on Pest Management, Siting, Landscaping, Water Use, Grazing, and Forestry Activities.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Habitat Fragmentation Concerns. Existing habitats are typically damaged through fragmentation, often due to encroachment. Reduction in the size of an existing habitat can reduce the number of individual organisms, as well as the diversity of species, that it can support. A number of techniques can help mitigate/reduce the effects of fragmentation.

- Have other sites been considered as an alternative to encroaching on the existing habitat? *
- Has the critical area necessary for survival of the ecosystem been determined? Can the area of the habitat that will be altered be minimized? *
- Has the project been designed to avoid the fragmentation of existing habitats into a number of smaller areas? *
- Have transportation corridors, such as roads and power lines, been designed to avoid encroaching on sensitive habitats? *
- Does the project establish a system of natural corridors (which take into consideration the behavior of the species in question) to link habitat areas? *

*Indicates an environmental impact reduction opportunity.

FEDERAL AGENCY 4 (CONTINUED)

- Will landscaping activities use native shrubs and other vegetation with high wildlife value (e.g., browse or cover)? *
- Will landscaping be designed to minimize grassy areas and maximize use of native habitats? *
- Will the effects of habitat encroachment on wildlife be mitigated by the installation of feeding stations for target species? *

Habitat Alteration Concerns. Existing habitats can be altered through changes in a number of abiotic factors. Wetlands are prone to destruction through inadvertent drainage or changes in the hydrological regime. Stream habitats can be damaged by increased siltation, reduced shading from overhanging trees, or pollution.

- Does the project include mitigation measures, such as restoration of damaged habitats or the creation of new habitats? *
- Does the project/development include adequate buffer zones between the developed area and wetlands or other habitats? *
- Has the potential to minimize hydrological impacts on wetlands through measures to reduce or control stormwater runoff and drainage been considered?
- Has project planning considered sources of water and controls of water flow to wetlands or other habitats?
- Have tree and vegetation buffer areas been maintained around streams to provide shading and reduce siltation and pollutant loadings?
- Has the project planning evaluated the vulnerability of the surrounding habitats to alterations in land use? *
- Has the timing and location of construction or other human activity included consideration of animal migrations and activity patterns? *
- Has the timing of construction or earth removal operations considered seasonal rainfall patterns to avoid sediment runoff to sensitive aquatic habitats?
- Will the project minimize the introduction of pollutants that bioaccumulate?
- Has the project considered possible impacts from increased activity or access to sensitive habitats, such as an increase in the numbers of pets and people near a wetland area? *
- Has the project considered impacts from habitat conversion? *
- Has the project considered impacts to habitats due to the air pollution it will generate? *

* Indicates an environmental impact reduction opportunity.

Species Introduction Concerns. The structure and function of existing habitats can be drastically altered through the inadvertent introduction of non-indigenous species. These species may be able to better compete for resources than can the local species.

- Will landscaping activities avoid (or at least minimize) the use of exotic species? *
- Will the spread of exotic weed species be monitored and controlled? *
- Have buildings and structures been designed to minimize nesting and brooding areas for undesirable species, such as pigeons, starlings, rats, and raccoons? *
- Have corridors designated or created to mitigate for habitat fragmentation been evaluated for potential negative effects? Do the benefits of having the corridors override other possible negative effects? *

Other References

Marsh, W.M. 1993. *Landscape Planning. Environmental Applications*. Second Edition. John Wiley and Sons.

* Indicates an environmental impact reduction opportunity.

FEDERAL AGENCY 4 (CONTINUED)

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR SITING

How Can Siting Affect the Environment?

Siting a building, facility, or project can affect the environment in a number of ways. Direct impacts can include destruction of existing habitats, alterations in topography and hydrology, and the introduction of pollutants into the environment. Indirect impacts include energy use and infrastructure construction for transporting people and materials to the facility, as well as environmental impacts from use and waste disposal activities.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Sensitive Ecosystems Concerns. Siting facilities in close proximity to sensitive ecosystems can result in damage or destruction of these areas. Improper siting with regard to slope and hydrology can affect sensitive areas through alterations in the hydrological regime, increased runoff and erosion, and destabilization of slopes or shorelines.

- Is it feasible to use or retrofit an existing building, structure, or developed site to locate the facility, rather than create new development and construction?
- Will facility siting avoid or maximize the distance away from sensitive areas, such as wildlife habitats, wetlands, streambanks, and other sensitive ecosystems? *
- Is the project site located away from streambanks/beds, shorelines, and flood-prone areas to avoid affecting these areas?
- Will buffers, such as forests or wetlands, be used between the development site and streams or shorelines to minimize impacts on aquatic systems? *
- If the development is linear (e.g., a road, bridge, or pipeline), does it take advantage of existing rights of way to avoid disturbing additional habitats?

Water and Air Quality Concerns. The siting and location of a development may increase the effects on water and air quality. Siting is particularly important if pollutants cannot be contained within the development. The potential for impact depends on the nature of water (e.g., existing drinking water sources) and air quality in an area and its potential to be affected by pollutants (e.g., depth to groundwater).

- If the project has the potential to affect groundwater quality through the use or disposal of chemicals or nutrients, has consideration been given to avoiding placement over aquifer recharge areas? *
- Will facility siting avoid direct contact with groundwater resulting from deep footings, foundation work, tunneling, or underground utilities?
- Is the project site designed to avoid or mitigate storm water impacts through the use of retention basins, infiltration fields, or other methods to reduce runoff?

* Indicates an environmental impact reduction opportunity.

FEDERAL AGENCY 4 (CONTINUED)

- Will siting facilities/buildings avoid steep slopes to prevent erosion or slope failures?
- Will erosion control measures be used if facilities are sited on slopes? Erosion control measures include maintaining vegetation cover and timing construction activities to avoid heavy seasonal rainfall.
- If siting must take place in an aquifer recharge area, will protective measures, such as liners and containment areas, be used to prevent the migration of wastes into groundwater?
- For major sources of air pollutants, such as refineries and incinerators, has the attainment status of the area for criteria air pollutants, including ozone and pm$_{10}$, been considered in the siting decision? *

Transportation Concerns. The siting of a facility should include consideration of the impacts of transporting workers, raw materials, finished products, and energy sources (electricity, natural gas). Efficiency is increased for facilities that are located in proximity to suppliers and to existing transportation corridors and infrastructure. Transportation savings can also be accomplished by concentrating development on a site rather than spreading services across many widely separated buildings

- Is the site located in proximity to existing rail lines, roads, and highways?
- Is the site located near an existing public transportation system that can be used by the workforce to access the facility?
- Can the facility take advantage of existing power lines and pipeline rights-of-way to supply its energy needs?
- Does the development design consider increased density to avoid the need for transportation within the facility?
- Is the site located near sources of raw materials, personnel, or markets?

Energy Concerns. Energy use within a facility often can be minimized through design and siting features. The orientation of buildings to take advantage of natural lighting, solar heating, and/or cooling can increase energy efficiency.

- Has the siting considered orientation for passive heating and cooling?
- Does the siting reduce solar radiation by shading critical surfaces and increasing the amount of vegetation surrounding the facility?
- Does the siting take advantage of natural topography features to increase shading during periods when cooling is required?
- Does the siting take advantage of natural wind patterns for cooling?

* Indicates an environmental impact reduction opportunity.

FEDERAL AGENCY 4 (CONTINUED)

Other References

American Planning Association. The Transportation/Land Use Connection. Planners Advisory Service Report. Telephone No. (312) 955-9100.

Marsh, W.M. 1993. *Landscape Planning. Environmental Applications.* Second Edition. John Wiley and Sons.

FEDERAL AGENCY 4 (CONTINUED)

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR VEHICLE MAINTENANCE

How Can Vehicle Maintenance Affect the Environment?

Vehicle maintenance shops can generate a variety of solid and hazardous wastes. Commonly generated wastes include out-of-date supplies, wastewater, oils, petroleum products and greases, solvents (both waste liquids and vapors), paints, and tires, as well as waste metal, cardboard, and paper. Each of these wastes has the potential to negatively affect one or more of the environmental media (i.e., land, water, and air). However, such activities and practices as segregating wastes, using proper inventory control, preventing spills, practicing preventive maintenance, improving process efficiency, and recycling can help minimize these impacts.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Procurement Concerns. Purchasing decisions are an important element of pollution prevention. Making environmentally sound purchasing decisions can help reduce the amount of waste generated by a vehicle maintenance shop. In addition, the purchasing of recycled content products helps support markets for materials collected for recycling.

Executive Order 12873, Federal Acquisition, Recycling, and Waste Prevention, directs Federal agencies to increase their purchases of recycled or environmentally preferable (EP) products.

- Will the facility use recycled automotive maintenance products and retread tires? Such products as refiltered or re-refined oil and hydraulic fluids, as well as recycled antifreeze and solvent, are available for use in vehicle maintenance operations.

- Will the facility identify and use the least toxic product available to complete a job? Many automotive maintenance products are formulated with high percentages of volatile organic compounds (VOCs) and toxic constituents. Safer, more environmentally sound materials are, however, available and perform as well as traditional products. For example, non-chlorinated solvents can be substituted for chlorinated solvents, detergent-based solutions can be substituted for caustic solutions in many applications, and water-based cleaners often can be used instead of organic solvents.

- Will long-lasting or synthetic oils be used when possible? Long-lasting oils reduce waste generation because they do not need to be replaced as often.

Hazardous Materials Storage. Vehicle maintenance operations often involve the use of hazardous materials. The use of these materials can affect the environment through improper storage, air emissions of volatile chemicals, and spills and other uncontrolled releases, as well as the potential generation of toxic waste materials.

- Will hazardous materials be properly stored and handled? Proper storage and handling can include labeling containers, protecting materials from the elements, maintaining secondary containment, ensuring the compatibility of stored materials to avoid explosion hazards, and following instructions on the product's Material Safety Data Sheets (MSDSs). *

FEDERAL AGENCY 4 (CONTINUED)

- Will the access to hazardous materials be limited? Limiting the access to hazardous materials allows a shop to keep track of chemical usage more easily and helps reduce unnecessary waste generation.

- Will a first-in, first-out inventory control system be used? This type of system helps prevent materials from expiring prior to use and becoming unnecessary waste. Efforts should also be made to minimize inventory levels by purchasing only the amount of material that will be needed in a reasonably short period of time (e.g., 30 days) to reduce loss from spoilage. At the same time, however, materials should be purchased in the largest containers appropriate to minimize excessive packaging.

Operating Practices. The use of oils, solvents, and other vehicle maintenance products can have significant effects on human health and the environment. The adoption of environmentally conscious operating practices can, however, reduce these impacts.

- Will vehicle maintenance bays be located to minimize the potential impacts of maintenance activities on the surrounding environment? *

- Will the facility avoid unnecessary maintenance on vehicles? One of the biggest sources of waste generated from vehicle maintenance shops comes from unneeded maintenance activities. An example of a way to minimize this waste is to change vehicle fluids on an as-needed basis rather than according to a fixed maintenance schedule not based on vehicle usage.

- Does the facility operating plan specify reducing the number and types of products, such as solvent, that will be used at the shop? Minimizing the types of different solvents used can simplify inventory procedures, reduce waste management issues, and facilitate recycling.

- Does the facility keep copies of its spill control and countermeasure plan for hazardous materials in each shop?

- Will the facility use drip pans, secondary containment, and other collection devices to help reduce the impact of spills and the use of absorbent products?

- Will a bulk fluids distribution system be cost effective? This type of system allows employees to dispense only as much product as is necessary for a job, in addition to reducing the potential for spills associated with the use of large, unwieldy containers. *

- Will the facility's solvent sink be operated to reduce environmental impacts? Environmentally preferable operating practices include pre-rinsing parts with dirty solvent before using fresh solvent to extend solvent life, removing parts from the sink slowly to reduce solvent dragout, using drip racks to reduce solvent loss, keeping sink lids closed when not in use to minimize the evaporation of solvent, not leaving solvent streams running, and cleaning out sludges regularly to maintain fresh solvent.

---

* Indicates an environmental impact reduction opportunity.

Vehicle Washing Activities. Vehicle washing can generate a large quantity of wastewater that may be contaminated with oils, greases, and dirt, as well as washing soaps and detergents. In some States, it is illegal to wash vehicles without wastewater recycling equipment under certain conditions.

- Does vehicle washing need to take place onsite? In some instances, offsite washing is a more efficient and environmentally preferable option. However, if properly implemented, onsite washing can be preferable since it can reduce the amount of fuel used expressly for moving the vehicle for washing.
- Will vehicle washing take place at a centralized, enclosed, and contained area to reduce potential impacts to the surrounding environment from runoff?
- Will vehicle washing be conducted on an as-needed basis, rather than according to a fixed schedule? Reducing unnecessary vehicle washing can significantly reduce wastewater generation.
- Will the wastewater from the wash rack's floor drains be properly treated onsite (e.g., by removing oils, greases, and other contaminants) prior to discharge to a waterbody? Will an oil/water separator be used?
- Will the wash rack use detergents that do not contain phosphates or toxics?
- Can water from the wash rack be captured, filtered, and reused rather than being released? If a facility will maintain a large fleet of vehicles that require washing, a custom designed washing facility may be cost effective. If vehicle washing must be performed by hand, a high volume, low pressure washer system will be more cost effective than a simple hose in terms of reduced personnel hours and energy usage.

Reuse and Recycling. Many of the waste materials generated during vehicle maintenance activities can be reused or recycled into usable products. Reuse and recycling are preferable to treatment and disposal because they remove materials that would otherwise become waste.

- Are there plans for adequate segregation and containment of waste oil, antifreeze, and solvent? Each of these materials can be reclaimed or recycled if segregated. However, commingling these wastes makes recovery more difficult or impossible and dramatically increases waste disposal costs. *
- Will the facility use solvent or antifreeze reclamation units? The onsite recycling of fluids is often a cost-effective pollution prevention option for larger shops. When onsite recycling is not cost effective, these materials can be segregated and picked up by a contractor for offsite recycling. *
- Will the facility collect scrap metals generated at the shop (e.g., used parts, empty material storage drums) for recycling? In some instances, punctured aerosol spray cans and drained oil filter casings may also be recycled as scrap. *
- Will automotive batteries be collected and stored for recycling? *

* Indicates an environmental impact reduction opportunity.

FEDERAL AGENCY 4 (CONTINUED)

- Will the facility reuse cardboard and other packaging received in the delivery of parts and materials or collect it for recycling? *
- Will tires be collected and stored for recycling? *

Painting Operations. Wastes associated with painting operations include unused paints and dirty thinner. Thinners and solvents can also be sources of VOC emissions. Used spray booth filters are also waste products that may be generated from these shops. Proper training of employees and the use of high efficiency equipment can help reduce waste generation.

- Can water-based coatings be used instead of solvent-based coatings? The automobile industry is working closely with paint manufacturers to develop acceptable substitutes for solvent-based paints.
- Will the facility use high efficiency painting technologies? When properly used, high volume, low pressure (HVLP) and electrostatic painting systems can reduce the amount of paint needed for a job and the amount of VOCs released to the air.
- Will employees be trained to use as little solvent/thinner as possible to clean up after painting activities?
- Will the facility employ a gun cleaning station? Gun cleaning stations capture the thinner/solvent shot through the gun and condense it for reuse instead of venting the substance to the air. In some cases, it may be possible to use water-based gun cleaners as an alternative to solvent thinner. *
- Will the paint shop utilize reusable polystyrene booth filters? Traditional paint booth filters often must be handled as hazardous waste because of the presence of wet paint or paint containing lead or chromium. Polystyrene filters can be cleaned with compressed air and reused (with the paint residue captured for disposal). Once it can no longer be used, the cleaned filter often can be disposed of by dissolving it in a waste thinner drum.
- Will painting operations be located in an enclosed and properly ventilated area to reduce potential environmental releases?
- Will employees be trained to minimize the amount of waste paint generated by mixing only the amount of paint needed for a job?

Pollution Prevention/Environmental Reduction Impact Training. Pollution prevention and environmental impact reduction in vehicle maintenance shops is closely linked with employee attitudes toward their work and the environment. A facility that provides basic environmental awareness/pollution prevention training and enthusiastically supports pollution prevention on a daily basis will have a noticeable effect on worker attitudes and can help reduce vehicle maintenance waste streams through such procedures as good housekeeping, spill prevention, and improved materials handling.

* Indicates an environmental impact reduction opportunity.

FEDERAL AGENCY 4 (CONTINUED)

Other References

U.S. Environmental Protection Agency, Office of Research and Development. October 1991. "Guides to Pollution Prevention: The Automotive Refinishing Industry." EPA/625/7-91/016.

U.S. Environmental Protection Agency, Office of Research and Development. October 1991. "Guides to Pollution Prevention: The Automotive Repair Industry." EPA/625/7-91/013.

FEDERAL AGENCY 4 (CONTINUED)

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR WATER USE

How Can Water Use Affect the Environment?

The procurement and delivery of water for domestic, commercial, and industrial use, as well as the treatment of wastewater generated by these users, affect the environment. Water procurement can affect the quality and quantity of both surface water and groundwater, cause land subsidence from groundwater overdraft, and destroy habitat. Water delivery systems can destroy habitat and ecosystems from canal and pipeline construction and consume energy for pumping. Wastewater affects surface water quality and habitats and requires energy to treat. The employment of water conservation techniques can reduce the environmental effects of water use.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Executive Order 12902, Energy Efficiency and Water Conservation, directs all Federal agencies and facilities to improve their water efficiency. Every Federal facility is required to contribute toward agency water use reduction and conservation goals.

Heating and Cooling. A study by Denver Water, supplier to Denver, Colorado, determined that 48 percent of the water used by manufacturers is used for heating and cooling purposes. A significant amount of water use and wastewater production can be minimized by increasing the efficiency of heating and cooling equipment and by decreasing heating and cooling requirements.

- Will energy conservation measures be employed to reduce the need for heating or cooling?
- Will the most efficient heating and cooling equipment available be used to reduce water needs?
- Can air-cooled equipment be used instead of water-cooled?
- Will heating and cooling equipment be maintained according to manufacturer recommendations and will leaks be repaired in a timely manner? Proper maintenance can help reduce the use of water by this equipment.
- Will once-through cooled water be used? If once-through cooling is used, will the water be reused for irrigation or make-up water? Whenever feasible, once-through cooling should be eliminated from any facility design.

Sanitary and Kitchen Fixtures. Water conserving fixtures can significantly reduce water use in sanitary and kitchen facilities in commercial offices, industrial buildings, and residential dwellings.

- Are ultra-low flush toilets specified for installation?
- Will flow restrictors be installed on faucets and showers?
- Will notices be posted to encourage minimizing shower time and turning the tap off when the water is not needed?
- Will aerators be used on all faucets?

FEDERAL AGENCY 4 (CONTINUED)

- Will fixtures be routinely inspected for leaks and other problems, and will they be repaired promptly?

Process Water. Manufacturers, food and beverage processors, schools, health care facilities, and laundries use substantial amounts of water in their processes. Reductions can be achieved in the amount of water used by installing water saving devices, implementing new or modified processes, and reusing water.

- Have process modifications that would use less or no water been evaluated for implementation? Have water-less processes been considered?
- Could rates be structured to reduce peak water demand?
- Will automatic valves and water level sensors be employed to turn water off when not in use and to provide the precise amount when needed?
- Will process water be recirculated until it is too dirty for use?
- Will process water be recycled onsite and returned to the process or used to meet other onsite needs (e.g., landscaping)? *

Landscaping. Landscaping plans tailored to the specific nature of the local environment can greatly reduce water use. Appropriate landscaping includes using water conserving plants in hot and dry regions. Landscape irrigation is also a key area where water use can be reduced.

President Clinton recently signed a Presidential Memorandum calling for the establishment of guidelines for Federal facility managers on how to implement water conservation techniques in conjunction with landscaping activities.

- Will vegetation be planted that is drought tolerant and uses low levels of water?
- Depending on the type of landscaping, is the most efficient type of water application specified for use?
- Will daytime watering be prohibited?
- Will automatic timers be employed, and will watering duration be monitored to prevent overwatering?
- Can non-potable, treated wastewater be used for irrigation? *

Other References

Maddaus, W.O. 1989. *Water Conservation*. American Water Works Association.

Water Efficiency: A Resource for Utility Managers, Community Planners, and Other Decisionmakers. 1991. The Water Program, Rocky Mountain Institute.

*Indicates an environmental impact reduction opportunity.

FEDERAL AGENCY 4 (CONTINUED)

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR HAZARDOUS WASTE STORAGE AND TREATMENT FACILITIES

How Can Hazardous Waste Storage and Treatment Facilities Affect the Environment?

The construction and operation of hazardous waste storage and treatment facilities can have a variety of effects on the environment. Construction impacts may include the destruction or alteration of wildlife habitats, wind and water erosion of soils, compaction of soils, and sedimentation of waterbodies. Operations may introduce chemical pollution to soils, groundwater, surface waters, or air resulting from spills, equipment failures, improper handling, or fires. Facility processes may consume energy and water and require the transportation of hazardous wastes to and from the facility. New roadways may need to be constructed depending on the selected site location, as waste facilities are often sited in remote or undeveloped areas.

Also see checklists on Hazardous Waste Incinerators, Waste Site Investigation and Cleanup Activities, Chemical Demilitarization, Base Closure and Reutilization, Solid Waste Landfills, Highways and Bridges, and Water Use.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Facility Construction. The construction of hazardous waste storage and treatment facilities can have significant impacts on the environment, such as degradation of wildlife habitats, erosion and/or compaction of soils, dust and noise, and discharges of sediments to surface water. Pollution prevention techniques can help mitigate or reduce construction effects.

- Have attempts been made to avoid construction in environmentally sensitive areas? *
- Does the project minimize construction activities in the vicinity of rivers or streams that could be affected by runoff or the erosion of construction wastes?
- Does the project make use of existing roadway alignments (if possible) to reduce the amount of waste generated as a result of construction activities?
- Does the construction plan provide for erosion (wind and water) and sediment control during and after construction?
- Are the effects of soil compaction, which result from construction activities, minimized to prevent an increase in runoff?
- Does the construction plan include revegetation of areas disturbed by construction to minimize erosion and sedimentation?

Facility Operation. Operation of a hazardous waste storage and treatment facility could potentially introduce chemical or other pollution to soils, groundwater, surface waters, or air resulting from leaks, spills, equipment failures, or fires. These facilities usually are regulated under the Resource Conservation and Recovery Act (RCRA) and closely monitored and inspected by regulatory agencies. Facility processes may

* Indicates an environmental impact reduction opportunity.

FEDERAL AGENCY 4 (CONTINUED)

consume energy and water resources and may require the transportation of hazardous wastes to and from the facility.

- Have measures been considered to promote the reduction and minimization of wastes generated prior to treatment and disposal?
- Has the containment system been designed to be compatible with the types of wastes to be treated and/or stored at the facility?
- Are spill control materials and equipment adequate and compatible with the hazardous wastes treated or stored at the facility?
- Have procedures been established to ensure that wastes are properly handled by facility personnel?
- Have facility personnel been trained in spill and emergency response procedures, as well as techniques to prevent pollution and minimize the generation of excess waste?
- Have adequate fire suppression equipment and materials been included in the spill control and emergency response measures to prevent the accidental release of hazardous constituents to the environment?
- Have emission control mechanisms been installed on treatment process equipment, ancillary equipment, and storage tanks to prevent releases? *

Facility Processes. Processes common to hazardous waste treatment and storage facilities consume water and energy resources, as well as generate wastes. Such processes as flocculation, neutralization, chemical reduction, oil-water separation, dewatering, and filter pressing can generate wastewater and sludge residues that may be hazardous.

- Will the facility employ processes to recycle and reuse wastes (or waste components, such as heavy metals) brought to the facility and wastes (or waste components) generated by the facility? *
- Have waste treatment processes been assessed to consider the amount of water and energy that will be consumed and how much waste (wastewater/sludge) will be generated?
- Have measures been considered to minimize the amount of treatment materials used and the amount of wastes generated from treatment processes?
- Will the facility apply pollution prevention techniques to secondary processes, such as facility maintenance, equipment, and vehicle maintenance, to minimize releases to the environment?
- Will the facility maintain the smallest possible inventory of shelf life sensitive hazardous materials to prevent the disposal of expired chemicals?

* Indicates an environmental impact reduction opportunity.

FEDERAL AGENCY 4 (CONTINUED)

Transportation of Hazardous Wastes to and from the Facility. Hazardous wastes must be delivered to the facility for treatment and or storage, either by roadway (trucks) or rail (railcars). The transportation of hazardous wastes presents significant threats to the environment in the event of a crash or spill, which could cause a release of hazardous constituents to soils, surface waters, air, or groundwater. The transportation of wastes from regulated facilities usually is closely monitored by regulatory agencies.

- Has the facility been located to minimize transport requirements to and from the facility?
- Have measures been considered to minimize the potential for releases resulting from crashes or problems while transporting waste to or from the facility (such as choosing the safest and least populated routes of travel for the transportation of hazardous wastes)?
- For facilities with rail transport capabilities, has the facility rail spur been built with secondary containment to prevent releases during the transfer of wastes?

Other References

Lawrence Livermore National Laboratory. May 1988. Environmental Assessment for the Environmental Compliance and Cleanup Project.

Lawrence Livermore National Laboratory. July 1990. CERCLA Feasibility Study for the LLNL-Livermore Site (including a NEPA Environmental Assessment).

FEDERAL AGENCY 4 (CONTINUED)

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR WASTE SITE INVESTIGATIONS AND CLEANUP ACTIVITIES

<u>How Can Waste Site Cleanup Activities Affect the Environment</u>?

The activities associated with waste site investigations and cleanups can have a variety of impacts on the environment. Activities may include the construction of roadways or trenches, installation and operation of remediation and treatment systems, soil/waste sampling and groundwater well installation and monitoring, and removal and transportation/cleanup of contaminated soils and groundwater. Effects may include wildlife habitat alteration or destruction, wind and water erosion of soils, soil compaction, and sedimentation of waterbodies. The extraction of contaminated groundwater can cause land subsidence from groundwater overdraft. Waste site cleanup operations may introduce chemical pollution to soils, groundwater, surface waters, or air resulting from excavations, soil groundwater treatment, spills, improper drilling techniques, equipment failures, or fires. Cleanup operations may consume energy and water resources and could require the transportation of wastes that contain hazardous constituents to and from the site.

Also see checklists on Hazardous Waste Incinerators, Waste Treatment and Storage Facilities, Chemical Demilitarization, Base Closure and Reutilization, Solid Waste Landfills, Building/Housing Construction, Highways and Bridges, and Water Use.

<u>What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated</u>?

<u>Site Access and Construction</u>. Construction activities can have significant impacts on the environment, including degradation of wildlife habitats, erosion and/or compaction of soils, dust and noise pollution, and sedimentation of surface waters. Pollution prevention techniques can help mitigate or reduce construction effects.

- Have attempts been made to minimize or avoid construction in environmentally sensitive areas? *
- Will the project make use of existing roadway alignments (if possible) to reduce the amount of waste resulting from road construction activities?
- Does the construction plan provide for erosion (wind and water) and sediment control during and after construction?
- Do construction plans consider the effects of soil compaction on runoff quantity from the site?
- Does the construction plan include revegetation of areas disturbed by construction to minimize erosion and sedimentation?
- Will material and waste storage areas be adequately contained to reduce exposure? *
- Will site access routes and equipment storage areas be planned and located to minimize erosion potential?
- Will secondary containment be provided in equipment fueling areas?

---

* Indicates an environmental impact reduction opportunity.

FEDERAL AGENCY 4 (CONTINUED)

<u>Waste Site Investigation and Cleanup Operations</u>. Waste site investigation and cleanup operations could introduce chemical or other pollution to soils, groundwater, surface waters, or air resulting from inadequate containment of processes, spills, equipment failures, or fires. Cleanup operations may consume energy and water resources and may require the transportation of wastes that could contain hazardous constituents to and from the site.

- Have efforts been taken to prevent or minimize the introduction of hazardous constituents to soils, groundwater, surface waters, and air before, during, and after waste site investigation and cleanup activities?
- Have measures been considered to prevent the release of pollutants from contaminated soils at the cleanup site to surface water via runoff and air via wind?
- Will the site be capped with a natural or synthetic protective covering?
- Have measures been considered to prevent spills or releases of contaminated groundwater that has been extracted from the site?
- Does the cleanup plan prevent noxious or hazardous gas emissions, including volatile organic compounds, from being vented or released to the air?
- Are leachate collection systems designed to prevent spills or releases after the leachate has been extracted?
- Have measures been considered to provide for the safe transportation of leachate from the site?
- Have the proposed waste site cleanup operations been assessed to consider the amount of water and energy that will be consumed and how much waste (wastewater/sludge) the processes may generate?
- Have measures been considered to minimize the amount of water and energy resources that will be consumed?
- Have measures been considered to minimize the amount of materials used during cleanup and the amount of wastes generated from materials usage?

<u>Transportation of Cleanup Wastes from the Site</u>. Cleanup wastes may contain hazardous constituents that will have to be transported from the site for treatment, storage, or disposal. The transportation of hazardous wastes presents significant threats to the environment in the event of a crash or spill, which could cause a release of hazardous constituents to soils, surface waters, air, or groundwater.

- Have measures been considered to minimize the potential for releases resulting from crashes or problems while transporting waste from the site?
- Have the safest and least populated routes of travel been identified for the transportation of wastes from the facility by trucks?
- Are the transporters of cleanup site wastes certified to transport those wastes?

FEDERAL AGENCY 4 (CONTINUED)

- Are wastes transported in a contained manner (i.e., contaminated soils properly covered and secured)?
- Have waste treatment, storage, or disposal destinations been chosen to minimize the potential for the release of contaminants to the environment?

Other References

Lawrence Livermore National Laboratory. May 1988. Environmental Assessment for the Environmental Compliance and Cleanup Project.

Lawrence Livermore National Laboratory. July 1990. CERCLA Feasibility Study for the LLNL-Livermore Site (including a NEPA Environmental Assessment).

FEDERAL AGENCY 5

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, DC

03 MAY 1996

MEMORANDUM FOR Mr. Terry A. Vaeth, Acting Manager
Department of Energy
Nevada Operations Office
PO Box 98518
Las Vegas, NV 89193-8518

FROM: HQ USAF/CEVP
1260 Air Force Pentagon
Washington DC 20330-1260

SUBJECT: Review of the Draft Environmental Impact Statement (EIS) for the Nevada Test Site (NTS) and Off-site Locations in the State of Nevada

We have completed our review of the subject document. A number of comments are summarized on the attached sheets. We are asking Headquarters Air Combat Command to ensure Nellis Air Force Base provides you input regarding the important subject of aircraft noise.

My point of contact for this action is Mr. John Baie at 703-695-8942.

K. Reinertson

KENNETH L. REINERTSON
Chief, Environmental Planning Division
Office of The Civil Engineer

Attachment:
NTS EIS Review Comments

cc:
HQ ACC/CEV

FEDERAL AGENCY 5 (CONTINUED)

COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) NEVADA TEST SITE AND OFF-SITE LOCATIONS IN THE STATE OF NEVADA

AIR ISSUES:

1 1. The DEIS needs to show that the proposed actions (including construction) do not impact the PSD I area(s).

a. Are there any other PSD I areas present besides the Grand Canyon? Other parks could be classified as such.

b. As long as the actions are greater than 10 km, a more precise analysis is not required.

c. Any emissions greater than 1 ug/m-to-the-3rd, is significant.

2 2. Even though the areas are in attainment areas, comformity should be addressed. In other words, include a generic statement that the actions do not negatively affect the State Implementation Plan (SIP).

3 3. In the Summary DEIS, Page S-22, Line 16: delete "most likely" (be more positive).

4 4. In the Summary DEIS, Page S-44, Lines 24-27: Add more information on air. Any new major air emission sources planned for? If none, so state. Address: No significant impacts, PSD I area, and conformity.

5 5. In Vol I, Page 5-201. Lines 28 and 30: Typos - delete hyphen in carbon monoxide. See above comments for Pages 5-191 and 5-201.

AIRCRAFT NOISE:

6 Analysis of aircraft noise impacts needs to be expanded. Vol I, Paragraph 4.1.8 states "The major noise sources within NTS include...aircraft operations." Vol I, Paragraphs 5.1.1.8 and 5.3.1.8 indicate supersonic aircraft from Nellis AFB might fly over the site producing sonic booms, and subsonic low-level flights might also create significant noise. Among the questions still needing answers are "How much noise from what type of flying operations?" and "What are and how significant are the environmental impacts?"

This Page Intentionally Left Blank

SOVEREIGN NATION 1

Tuesday:

1 1. Whats wrong with nuclear generation at the test site (maybe with low level waste?) Even the human toxic dump

2 2. Could be drilled for methane gas, and hooked up to a methane gas motor + generator for electricity!

3 There are people at this meeting who have realatives buried here.

C.W. Lynch

SOVEREIGN NATION 2

Transportation Study - Response of CGTO

Consultation

1 The compilers of the NTS EIS Transportation Study refer to meeting with various American Indian individuals, groups, and tribes. The interactions are listed as tables and discussed throughout the text. These meetings do not constitute full government-to-government consultation with American Indian tribes nor have they led to an American Indian transportation study. Instead, the meetings simply informed Indian people that a NTS EIS transportation study was being conducted. Information about pending studies is an important first step in consultation with American Indian tribes and organizations; however, no additional consultation steps were taken. The Transportation Study, therefore, cannot be supported by the American Indian tribes and organizations represented by the CGTO.

2 Especially disturbing to the CGTO is an apparent confusion regarding the purpose of CGTO consultation during the NTS EIS. For example, the response to Question #16 (D-8, D-9) where a public response raised the issue of the DOE going to the tribes for consultation, rather than them having to come to the DOE. The writers of the Transportation Study responded by referring to the CGTO involvement with other portions of the NTS EIS as though it was an example of consultation on the transportation study. This is an incorrect statement, inasmuch as, the CGTO were informed by the DOE EIS Transportation Study team that the CGTO did not have to respond to transportation issues because the Transportation Study team were working directly with the tribes in a parallel but separate consultation. The CGTO is only now responding to the Transportation Study because it neither identifies nor assesses American Indian impacts.

3 American Indian tribes are not "Stakeholders" and thus meetings designed to elicit the opinion of public stakeholders are not an appropriate method for consulting with tribes who are to be addressed on a government-to-government basis according to the President of the United States. Thus, there are misleading and incorrect statements in section 2.O Stakeholder Issues which indicate that American Indian tribes were given the opportunity to identify issues during public meetings. No public meetings should be considered as a replacement for government-to-government consultation. All reference to American Indian consultation should be removed from this section of the report unless it specifically referrs to American Indian consultation on a government-to-government basis.

American Indian Transportation Issues

4 Although some American Indian transportation issues were suggested during the NTS EIS scoping period and again raised in the CGTO meetings with the Transportation Study team, the report does not include these issues. Despite a record of meetings with American Indian people, groups, and tribes, the study does not present critical American Indian concerns. These include, among others, the impact of radioactive and hazardous waste travel along rail and highway on nearby existing and planned American Indian businesses, especially those of the Moapa Paiute Tribe and the Las Vegas Paiute Tribe. American Indian people, especially elders,

4 cont. express a fear of radiation as an 'angry rock" which can impact people as it travels, even though it remains packaged and no transportation accident occurs to spill the contents of the package. Although this perception of radioactivity was expressed by American Indian people in an 1987 DOE study, the nature and extent of this fear has not been addressed by the transportation study. American Indian people also express concern that places of spiritual power are being and could be additionally harmed by the transportation of radioactive and hazardous waste. American Indian people are currently reacting to these concerns by worrying about the past and current impacts of waste transportation and by avoiding certain places they believe have been adversely impacted by the transportation of radioactive and hazardous waste.

5 The CGTO would like to express the opinion that the cultural concerns of other American Indian tribes and organizations should be included in the Transportation Study. The CGTO understands that the Transportation Study is focussed on what it called "local issues" (Vol. 1, Appendix I, 1-1), but is not certain why other Indian tribes in the West and Southwest are not included in this study? When most statistics cited in the report are state-wide from Nevada, why are other Nevada Indian tribes not considered in this transportation study.

6 The CGTO would like to know if probability calculations are based on transportation safety nation-wide or within the local area of the Transportation Study. If the calculations are based on national satistics, why were local statistics not used instead; especially given the local-issue focus of the analysis.

7 The CGTO would like to express the opinion that recent rail derailments in the West and Southwest be incorporated into the probability calulations of railroad accidents.

8 The CGTO would like to express the opinion that the probability of either railroad or highway accidents has increased and is increasing owing to domestic acts of violence directed at the Federal government, its' employees, and its' activities. These increased accident probabilities should be calculated into the Transportation Study and the report should clearly inform readers how these accident trends and potential domestic terrorist activities were incorporated into the transportation analysis.

A Faulty Transportation Assessment (Attachment F. Nevada Test Site Rail Access Study)

9 Attachment F contains a faulty assessment of potential impacts to American Indian cultural resources that would occur if a variety of new railroad tracks were constructed connecting the NTS with existing railroads. The cultural resource analysis contained in this study was conducted without the involvement of the CGTO who serve as guides, participants, and monitors of all cultural resource studies associated with the NTS. As a result, the study cannot be considered to be even a preliminary assessment of potential American Indian cultural resource impacts.

Some of the more significant flaws in the study are as follows.

SOVEREIGN NATION 2 (CONTINUED)

10 • The study in Attachment F is limited to an analysis of archaeological remains, thus failing to consider the full range of American Indian cultural resources which include, among others, Indian plants, animals, Traditional Cultural Properties, mineral deposits, water, sites of historical importance, and cultural landscapes.

11 • The archaeologial site analysis in Attachment F is limited to a review of previously recorded sites. While such an analysis is certainly appropriate as a beginning of an assessment, it cannot be used to make conclusions about potential impacts to these sites unless their cultural significance has been evaluated by American Indian people. Also, previous archaeology studies were not conducted with the railroad development in mind, thus their sampling methods and their study locations do not correspond with the ground disturbing activities that would be associated with the construction of a railroad. Also, previous archaeological studies were not conducted with the guidance, participation, and review of American Indian tribes and organizations and thus do not reflect current DOE/NV policies of involving Indian people in these studies.

12 • The cultural resource analysis in Attachment F fails to reflect the well known and well documented cultural significance of the area all around the Spring Mountains. The area is where the Creator transported all Southern Paiutes into existence, and therefore gave them the mandate to use and protect these lands. As such, the area around the Spring Mountains is the center of the Southern Paiute Holy Land, and it is literally filled with places of utmost cultural significance.

13 • Much of this analysis suggests it is about Yucca Mountain rather than about proposals properly considered in the NTS EIS. Beyond the frequent reference to Yucca Mountain in the study, there is Figure F-1 which specifically indicates that all of the considered routes lead only to the Yucca Mountain Site. If the Transportation Study is to be used as part of the Yucca Mountain EIS, then the CGTO would like the opportunity to respond to the Transportation Study as a component of the Yucca Mountain study.

Some other flaws in the Attachment F study are as follows:

14 • The Moapa Paiute Indian Reservation is missing from the transportation maps.

15 • Figures F-2 and F-4 incorrectly identifies the "Las Vegas Paiute Indian Reservation" as the "Paiute Indian Reservation"

SOVEREIGN NATION 2 (CONTINUED)

16 • The term "Southern Paiute Reservation" is used in the text (F-29) to refer to the "Las Vegas Paiute Indian Reservation."

17 • The term "Indian Reservation" is used without a defined boundary on Figure F-1 (F- 4). Since there is no such place with this name, the term could be refering to the "Walker River Paiute Indian Reservation" or the "Yomba Shoshone Reservation." It should also be pointed out that the "Duckwater Shoshone Reservation" is located between railroad routes #8 and #9, but this important place is missing from the figure. The "Ely Shoshone Reservation" is also missing from the map.

18 • The analysis of Stateline Route (F-30) fails to mention the Pahrump Paiute Tribe (who is currently seeking Federal Recognition and a member of the CGTO). An especially important omission is the Pahrump Paiute Tribe's plan to have lands withdrawn for a new reservation in the Pahrump Valley once the Pahrump Paiute Tribe receives tribal recognition.

19 • The study has an "error of omission," when it states that impacts on cultural resources are regulated though Section 106 of the National Historic Preservation Act of 1966 (F-28). In fact, cultural resources are also regulated by the American Indian Religious Freedom Act of 1979 and the Native American Graves Protection and Repatriation Act of 1990. All three cultural resource acts specify the critical role of American Indian tribes and Indian organizations in the identification and assessment of cultural resources.

Conclusion - A Fatally Flawed Attachment F

20 The study in Appendix F is fatally flawed and should not be used for its' expressed purpose which is

> to support a dialogue with Nevada stakeholders...(and be) a basis for starting a formal discussion of this issue (Vol. 1, Appendix I, Attachment F, F-1)

The CGTO believes that a reasonable dialogue about potential impacts cannot be begun with Attachment F, because it fails to involve an American Indian assessment component in the cultural resources sections. Were a dialogue to begin without involving American Indian issues, it would be a violation of both cultural resource protection laws and regulations, and not be in keeping with past DOE/NV commitments to involve American Indian tribes and organizations in such discussions.

SOVEREIGN NATION 2 (CONTINUED)

Consolidated Group of Tribes and Organization Meeting
April 15-17, 1996

Recommendations

1. The CGTO recommends that a letter be written in support of the Timbisha Shoshone Tribe and their on-going land dispute with the U.S. Park Service. The CGTO recommends that all participating Tribes and groups write their own letters of support.

2. The CGTO recommends the expansion of the NTS American Indian Rock Art study to include: Monitor training, American Indian monitors and the development and inclusion of a Rock Art Study Subgroup for FY1996.

3. The CGTO recommends that the rate of the honorium provided to the Official Tribal Contact Representatives be increased to $200 per day. This request is based upon the lack of any increases by the US DOE since 1987.

4. The CGTO recommends the following individuals to serve as monitors for the NTS/American Indian Rock Art Study:

Western Shoshone Monitor:	Maurice Frank
Western Shoshone Alternate:	To Be Determined.
Southern Paiute Monitor:	Orlando Benn
Southern Paiute Alternate:	Lalovi Miller
Owens Valley Paiute Monitor:	Lee Chavez
Owens Valley Paiute Alternate:	Vernon Miller

5. The CGTO recommends the following individuals to serve as members of the American Indian Rock Art Subgroup for the NTS/American Indian Rock Art Study:

Western Shoshone:	Maurice Frank
Western Shoshone Alternate:	To Be Determined
Southern Paiute:	Richard Arnold
Southern Paiute Alternate:	Betty Cornelius
Owens Valley Paiute:	Michelle Saulque
Owens Valley Paiute Alternate:	Lee Chavez

SOVEREIGN NATION 2 (CONTINUED)

6. The CGTO recommends the following individuals to serve as American Indian representatives for the NTS/NAGPRA repatriation efforts:

Western Shoshone:	Corbin Harney - spiritual leader
Western Shoshone :	Pauline Esteves
Southern Paiute:	Clifford and Yetta Jake - spiritual leaders
Southern Paiute Alternate:	Lalovi Miller
Owens Valley Paiute:	Neddeen Naylor
Owens Valley Paiute Alternate:	Eleanor Hemphill

7. The CGTO recommends that the DOE/NV provide travel expenses, and per diem for the American Indian Writers Subgroup members to attend and present a paper on the American Indian Perspectives to the NTS/EIS at the Conference for Environmental Professionals in Houston, Texas on June 2-6, 1996. The estimated cost for this trip is $ 8,500 provided that registration is completed and air fare is reserved by May 15, 1996.

8. The CGTO opposes the Desert Research Institute's efforts to auction off replicas of ceremonial artifacts found on the Nevada Test Site for purposes of raising funds. This practice is viewed by the CGTO as a sacrilege and blatant exploitation of culturally sensitive information shared in confidence between American Indians and project archaeologists. This type of information was never intended to be used to place more importance and cultural value to certain artifacts in hopes of generating funds. The sale of these replicas serves no scientific value or protection of artifacts whatsoever. This practice must cease immediately.

SOVEREIGN NATION 3

WESTERN SHOSHONE NATIONAL COUNCIL
POST OFFICE BOX 210
INDIAN SPRINGS, NEVADA 89018-0210
TELEPHONE / FACSIMILE: (702) 879-5203

May 01, 1996

Tara O'Toole, M.D., M.P.H.
Assistant Secretary, E.S.H.
Department of Energy
Washington, D.C. 20585
By Fax

Dear Ms. O'Toole,

We are responding to your solicitation for comments to the Department of Energy's Draft Environmental Impact Statement for the Nevada Test Site and off site Locations within the State of Nevada (DOE/EIS-0243). Please include our comments to the record.

On January 15, 1995, the Western Shoshone National Council wrote to President Clinton with our concerns in relation to US nuclear activities conducted within Western Shoshone Territory. We have attached: 1) the letter to President Clinton of January 15, 1996. 2) a copy of the Western Shoshone Nation Declaration of a Nuclear Free Zone. 3) a copy of the Treaty of Ruby Valley. These documents may serve as our comments on DOE/EIS-0243.

Sincerely,

Ian D. Zabarte
Assistant to Chief Yowell

WESTERN SHOSHONE NATIONAL COUNCIL
Post Office Box 210
Indian Springs, Nevada 89018-0210
Telephone/Facsimile: (702) 879-5203

January 16, 1996

The Honorable William J. Clinton
President of the United States
The White House
Washington, DC 20500

Mr. President:

This past year you were sent a notice of service reaffirming the sovereignty of the Western Shoshone Nation. The Western Shoshone National Council is the national governing body of the Western Shoshone people.

This letter is to inform you, as representative of the United States government, of a declaration passed by the Western Shoshone National Council on December 2, 1995 (copy enclosed). This declaration, which designates the interior of the Western Shoshone National boundaries as a nuclear-free zone, is now a part of Western Shoshone law.

The creation of this law is necessary because of our religious belief that our mother earth is the most sacred in all respects. As such only renewable resources may be used with the greatest of respect by humankind, non renewable resources are to be left alone. Your past nuclear related activities have violated our laws both natural and written laws.

Not only has your government conducted nuclear weapons testing at the Nevada Test Site on Western Shoshone land, but it is proposing a high-level nuclear waste repository on the edge of the Nevada Test Site at our sacred Yucca Mountain. Such activities and promotion of our lands for such activities are blatant and direct violations of the Treaty of Ruby Valley of 1863, both in spirit and in terms.

SOVEREIGN NATION 3 (CONTINUED)

Among our concerns in relation to those nuclear issues are:
- Analysis of cumulative health risks, both short- and long-term, from past, present, and future radiological exposure
- Accurate measurement and monitoring of dosage and exposure scenarios to our citizens and to the general population
- Impact on the ecosystem of air, land, and water contamination both above and below ground
1 - Environmental restoration and waste management, including transportation-related risks and neutralizing radioactive waste
- Damage to historic and prehistoric archaelogical, sacred, and religious sites, plants, and animals
- Socioeconomic effects on our economy, employment, and tourism, and political controversy over quality of life and risk perception
- Compensation and mitigation for victims and for damages to the ecosystem

Because these points are of mutual importance to us, there is much work to be done between our two nations. The United States government must become responsible for the damages caused by these and other treaty violations. The continued actions of the United States government through development, testing, and promotion of Western Shoshone lands for United States nuclear-related activities, in violation of the Ruby Valley Treaty and of our laws, can only be considered an act of genocide.

We expect your immediate response to our concerns.

Sincerely,

Raymond D. Yowell

Raymond Yowell, Chief
Western Shoshone National Council
Western Shoshone Nation

SOVEREIGN NATION 3 (CONTINUED)

WESTERN SHOSHONE NATION
DECLARATION OF A NUCLEAR FREE ZONE

WHEREAS, The people of the Western Shoshone Nation find the presence of radioactive materials, nuclear power facilities and nuclear weapons facilities within the lands, the watershed or the airshed of the lands of the Western Shoshone Nation, known in the Shoshone language as Newe Sogobia, as set forth in the Treaty of Ruby Valley of 1863, to be in conflict with the maintenance of the community's economic well-being, health, and general welfare, and,

WHEREAS, Nuclear weapons testing by the United States government on Western Shoshone lands, in direct conflict with Western Shoshone National Council law and policy, has left portions of Newe Sogobia scarred and permanently contaminated with radiation, and,

WHEREAS, The aforementioned nuclear weapons testing by the United States government on Western Shoshone lands has already caused widespread cancer, bringing illness and death to Western Shoshone, members of other Indian nations, and the non-Indian people of the Great Basin region; and,

WHEREAS, The U S. government continues to contaminate Western Shoshone lands at the Nevada Test Site by importing and dumping radioactively and chemically contaminated soil and other waste products; and,

WHEREAS, The United States Geological Service has found that the acquifer under the Beatty radioactive waste dump site is about to become contaminated with long-lived radionucleides, endangering drinking water on Western Shoshone lands, and

WHEREAS, The government of the United States, against the expressed wishes of the Western Shoshone National Council, is proposing to store highly-irradiated fuel from commercial nuclear power plants, which will remain deadly for hundreds of thousands of years, at Yucca Mountain, within Western Shoshone lands, and,

WHEREAS, A high volume of truck transportation of radioactive wastes can be expected through the Western Shoshone Nation's lands and the surrounding region, increasing the likelihood of an accident and the rapid disperal to the environment of deadly, long-lived radioactive wastes, and,

WHEREAS, The presence of radioactive waste dumps in the region, and the publicity surrounding it, will severely harm the economy of the Western Shoshone and neighboring peoples, and,

WHEREAS, Over 4,500 local communities throughout the world, 25 nations, and the regions of the Antarctic, Latin America and the South Pacific have been declared nuclear free zones, and,

WHEREAS, The National Council of the Western Shoshone encourages the development of clean, renewable energy resources in order to create jobs that maintain the traditional Native American values of caretaking and balance with natural creation, and,

WHEREAS, The National Council of the Western Shoshone encourages research into radioactive waste neutralization techniques and demands the stabilization and/or clean up, if possible, of existing radioactive waste on the lands of the Western Shoshone Nation;

NOW, THEREFORE

SECTION 1. BE IT ORDAINED BY THE WESTERN SHOSHONE NATIONAL COUNCIL, That the following declaration be added to and made a part of the laws of the Western Shoshone Nation:

NUCLEAR FREE ZONE

1. DEFINITIONS.

FOR THE PURPOSES OF THIS ARTICLE, THE FOLLOWING DEFINITIONS APPLY

(A) "RADIOACTIVE MATERIALS" ARE ANY RADIOACTIVE WASTE PRODUCTS OR MATERIALS GENERATED, REFINED OR MADE RADIOACTIVE BY ANY UNITED STATES GOVERNMENT AGENCY OR PURSUANT TO FEDERAL OR STATE GOVERNMENT CONTRACT OR LICENSE, AND INCLUDING THAT WHICH THE UNITED STATES NUCLEAR REGULATORY COMMISSION CLASSIFIED AS LOW-LEVEL RADIOACTIVE WASTE AS OF JANUARY 1, 1989, BUT WHICH MAY BE CLASSIFIED AS BELOW REGULATORY CONCERN WASTE AFTER THAT DATE.

SOVEREIGN NATION 3 (CONTINUED)

(B) "NUCLEAR WEAPON" IS ANY DEVICE, THE PURPOSE OF WHICH IS USE AS A WEAPON, A WEAPON PROTOTYPE, OR A WEAPON TEST DEVICE, THE INTENDED DETONATION OF WHICH RESULTS FROM THE ENERGY RELEASED BY FISSION AND/OR FUSION REACTIONS INVOLVING ATOMIC NUCLEI. "NUCLEAR WEAPON" INCLUDES THE WEAPON'S GUIDANCE AND PROPULSION SYSTEM AND TRIGGERING MECHANISM, I.E., THE MEANS OF TRANSPORTING, GUIDING, PROPELLING, TRIGGERING, OR DETONATING THE WEAPON, PROVIDED THAT SUCH MEANS IS DESTROYED OR RENDERED USELESS IN THE NORMAL TRANSPORTING, GUIDING, PROPELLING, TRIGGERING, OR DETONATION OF THE WEAPON.

(C) "PERSON" MEANS A NATURAL PERSON, AS WELL AS A CORPORATION, INSTITUTION, OR OTHER ENTITY.

2. PROHIBITION OF STORAGE, USE OR DISPOSAL OF RADIOACTIVE MATERIALS.

EXCEPT AS SPECIFICALLY EXEMPTED IN THIS ARTICLE, NO PERSON SHALL IMPORT, STORE, INCINERATE, TREAT, PROCESS, OR DISPOSE OF RADIOACTIVE MATERIALS, FOR ANY PURPOSE, WITHIN THE LANDS OF THE WESTERN SHOSHONE NATION, OR WITHIN LANDFILLS OR INCINERATORS OWNED OR LICENSED BY THE WESTERN SHOSHONE NATION.

3. PROHIBITION OF NUCLEAR WEAPONS WORK.

NO PERSON SHALL KNOWINGLY, WITHIN THE LANDS OF THE WESTERN SHOSHONE NATION, DESIGN, TEST, PRODUCE, DEPLOY, LAUNCH, MAINTAIN, OR STORE NUCLEAR WEAPONS OR COMPONENTS OF NUCLEAR WEAPONS

4. PROHIBITION OF NUCLEAR REACTORS.

NO PERSON SHALL CONSTRUCT, OR OPERATE, A NUCLEAR REACTOR WITHIN THE LANDS OF THE WESTERN SHOSHONE NATION.

5. PROHIBITION OF URANIUM MINING AND MILLING.

NO PERSON SHALL CONSTRUCT OR OPERATE A URANIUM MINE OR MILLING OPERATION WITHIN THE LANDS OF THE WESTERN SHOSHONE NATION.

5. TRANSPORTATION OF RADIOACTIVE MATERIALS.

NO PERSON SHALL TRANSPORT RADIOACTIVE MATERIALS TO OR THROUGH THE LANDS OF THE WESTERN SHOSHONE NATION.

6. MIGRATION OF RADIOACTIVE MATERIALS.

NO PERSON OR OTHER NATION SHALL ALLOW THE MIGRATION OF RADIOACTIVE MATERIALS FROM NEIGHBORING LANDS INTO THE LANDS OF THE WESTERN SHOSHONE NATION.

7. NUCLEAR FREE ZONE SIGNS.

THE WESTERN SHOSHONE NATIONAL COUNCIL SHALL POST AND MAINTAIN APPROPRIATE SIGNS AT ALL RECOGNIZED ENTRANCES TO THE LANDS OF THE WESTERN SHOSHONE NATION, AT ENTRANCES TO THE YUCCA MOUNTAIN FACILITY AND THE NEVADA NUCLEAR TEST SITE, AND AT THE NATIONAL COUNCIL OFFICE IN CACTUS SPRINGS, PROCLAIMING THE WESTERN SHOSHONE NATION'S STATUS AS A NUCLEAR FREE ZONE

8. ENFORCEMENT.

EACH VIOLATION OF THIS SECTION SHALL BE PUNISHABLE BY A $1,000,000 FINE. EACH DAY OF VIOLATION SHALL BE DEEMED A SEPARATE VIOLATION. ENFORCEMENT WILL BE BY DULY AUTHORIZED AGENTS OF THE WESTERN SHOSHONE NATION.

THIS DECLARATION IS HEREBY ENACTED ON THIS 2ND DAY OF DECEMBER, 1995 BY CONSENSUS OF THE WESTERN SHOSHONE NATIONAL COUNCIL.

Raymond D. Yowell

RAYMOND YOWELL, CHIEF

Attachments: Boundary Description and map of Newe Sogobia as defined by the Western Shoshone National Council.

SOVEREIGN NATION 3 (CONTINUED)

Treaty of Ruby Valley 1863

Treaty between the United States of America and the Western Bands of Shoshone Indians. Concluded October 1, 1863; Ratification advised, with amendment, June 26, 1866; Amendment accepted June 17, 1869; Proclaimed October 21, 1869.

ULYSSES S. GRANT, PRESIDENT OF THE UNITED STATES OF AMERICA, TO ALL AND SINGULAR TO WHOM THESE PRESENTS SHALL COME, GREETING:

Whereas a Treaty was made and concluded at Ruby Valley, in the Territory of Nevada, on the first day of October, in the year of our Lord one thousand eight hundred and sixty-three, by and between James W. Nye and James Duane Doty, Commissioners, on the part of the United States, and Te-moak, Mo-ho-a, Kirk-weedgwa, To-nag, and other Chiefs, Principal Men, and Warriors of the Western Bands of the Shoshone Nation of Indians, on the part of said bands of Indians, and duly authorized thereto by them, which Treaty is in the words and figures following to wit:

Treaty of Peace and Friendship made at Ruby Valley, in the Territory of Nevada, this first day of October, A.D. one thousand eight hundred and sixty-three, between the United States of America, represented by the undersigned Commissioners, and the Western Bands of the Shoshone Nation of Indians, represented by their Chiefs and Principal Men and Warriors, as follows:

ARTICLE I.

Peace and friendship shall be hereafter established and maintained between the Western Bands of the Shoshonee nation and the people and Government of the United States; and the said bands stipulate and agree that hostilities and all depredations upon the emigrant trains, the mail and telegraph lines, and upon the citizens of the United States within their country, shall cease.

ARTICLE II.

The several routes of travel through the Shoshonee country, now or hereafter used by white men, shall be forever free, and unobstructed by the said bands, for the use of the government of the United States, and of all emigrants and travelers under its authority and protection, without molestation or injury from them. And if depredations are at any time committed by bad men of their nation, the offenders shall be immediately taken and delivered up to the proper officers of the United States, to be punished as their offences shall deserve; and the safety of all travellers passing peaceably over either said routes is hereby guaranteed by said bands.

Military posts may be established by the President of the United States along said routes or elsewhere in their country; and station houses may be erected and occupied at such points as may be necessary for the comfort and convenience of travellers or for the mail or telegraph companies.

ARTICLE III.

The telegraph and overland stage lines having been established and operated by companies under the authority of the United States through a part of the Shoshonee country, it is expressly agreed that the same may be continued without hindrance, molestation, or injury from the people of said bands, and that their property and the lives and property of passengers in the stages and of the employees of the respective companies, shall be protected by them. And further, it being understood that provision has been made by the government of the United States for the construction of a railway from the plains west to the Pacific ocean, it is stipulated by said bands that the said railway or its branches may be located, constructed, and operated, and without molestation from them, through any portion of country claimed or occupied by them.

ARTICLE IV.

It is further agreed by the parties hereto, that the Shoshonee country may be explored and prospected for gold and silver, or other minerals; and when mines are discovered, they may be worked, and mining and agricultural settlements formed, and ranches established whenever they may be required. Mills may be erected and timber taken for their use, as also for building or other purposes in any part of the country claimed by said bands.

ARTICLE V.

It is understood that the boundaries of the country claimed and occupied by said bands are defined and described by them as follows:

On the north by Wong-goga-da Mountains and Shoshonee River Valley; on the west by Su-non-to-yah Mountains or Smith Creek Mountains; on the south by Wi-co-bah and the Colorado Desert; on the east by Po-ho-no-be Valley or Steptoe Valley and Great Salt Lake Valley.

ARTICLE VI.

The said bands agree that whenever the President of the United States shall deem it expedient for them to abandon the roaming life, which they now lead, and become herdsmen or agriculturalists, he is hereby authorized to make such reservations for their use as he may deem necessary within the country above described; and they do also hereby agree to remove their camps to such reservations as he may in- [illegible]

ARTICLE VII.

The United States, being aware of the inconvenience resulting to the Indians in consequence of the driving away and destruction of game along the routes travelled by white men, and by the formation of agricultural and mining settlements, are willing to fairly compensate them for the same; therefore, and in consideration of the preceding stipulations, and of their faithful observance by the said bands, the United States promise and agree to pay to the said bands of the Shoshonee nation parties hereto, annually for the term of twenty years, the sum of five thousand dollars in such articles, including cattle for herding or other purposes, as the President of the United States shall deem suitable for their wants and condition, either as hunters or herdsmen. And the said bands hereby acknowledge the reception of the said stipulated annuities as a full compensation and equivalent for the loss of game and the rights and privileges hereby conceded.

ARTICLE VIII.

The said bands hereby acknowledge that they have received [illegible] said commissioners provisions and clothing amounting to [illegible] thousand dollars as presents at the conclusion of this treaty.

Done at Ruby Valley the day and year above written.

JAMES W. NYE
JAMES DUANE DOTY
TE-MOAK
MO-HO-A
KIRK-WEEDGWA
TO-NAG
TO-SO-WEE-SO-OP
SOW-ER-E-GAH
PO-ON-GO-SAH
PAR-A-WOAT-ZE
GA-HA-DIER
KO-RO-KOUT-ZA
PON-GE-MAH
BUCK

Witnesses:
J.B. MOORE, Lt. Col. 3rd Inf. Cal. Vol.
JACOB T. LOCKHART, Indian Agent Nev. Ter.
HENRY BUTTERFIELD, Interpreter

And whereas, the said Treaty having been submitted to the Senate of the United States for its constitutional action thereon, the Senate did, on the twenty-sixth day of June, one thousand eight hundred and sixty-six, advise and consent to the ratification of the same, with an amendment, by a resolution in the words and figures following, to wit:

IN EXECUTIVE SESSION, SENATE OF THE UNITED STATES
June 26 18[illegible]

Resolved, (two-thirds of the Senators present concurring) That the Senate advise and consent to the ratification of the Treaty of peace and friendship made at Ruby Valley, in the Territory of Nevada, the first day of October, A.D. one thousand eight hundred and sixty-three, between the United States of America, represented by their Commissioners and the Western Bands of the Shoshonee Nation of Indians, represented by their Chiefs and Principal Men and Warriors, with the following

AMENDMENT:

Fill the blank in the 7th article with the word five.

Attest:

J.W. FORNEY,
Secretary,

And whereas, the foregoing amendment having been fully explained and interpreted to the undersigned Chiefs, Principal Men, and Warriors of the Western Bands of the Shoshonee Nation of Indians, they did on the seventeenth day of June, one thousand eight hundred and sixty-nine, give their free and voluntary assent to the said amendment, in the words and figures following, to wit:

Whereas the Senate of the United States in executive session, did advise and consent to the ratification of the Treaty of peace and friendship, made at Ruby Valley, in the Territory of Nevada, on the first day of October, one thousand eight hundred and sixty-three, by the Commissioners on the part of the United States and the Western Bands of the Shoshonee Nation of Indians, represented by their Chiefs and Principal Men and Warriors, with the following amendment:

"Fill the blank in the 7th article with the word five."

And whereas the foregoing amendment has been fully interpreted and explained to the undersigned Chiefs and Principal Men and Warriors of the aforesaid Western Bands of the Shoshonee Nation of Indians, we hereby agree and assent to the same.

Done at Ruby Valley, Nevada on this 17th day of June A.D. 18[illegible]

Attest:

J.H. DAWLEY	TIM-OOK
R.E. SCOTT	BUCK
W.R. REYNOLDS	FRANK
LOUIS GRINNELL, Interpreter	CHARLEY TIMOOK
	TO-NAG

Now, therefore, be it known that I, ULYSSES S. GRANT, President of the United States of America, do, in pursuance of the advice and consent of the Senate, as expressed in its resolution of the twenty-sixth of June one thousand eight hundred and sixty-six, accept, ratify, and confirm the said Treaty, with the amendment aforesaid.

In testimony whereof, I have hereto signed my name, and have caused the seal of the United States to be affixed.

Done at the city of Washington, this twenty first day of October, in the year of our Lord one thousand eight hundred and sixty-nine, and of the Independence of the United States of America the ninety-fourth.

U.S. GRANT

By the President:
HAMILTON FISH
[illegible]

SOVEREIGN NATION 4

American Indian Comment

Environmental Impact Statement for Nevada Test Site
And Off-site Locations in the State of Nevada

Correction to Add to: V.1, Part B, Chapter 5
5.1 Nevada Test Site
5.1.1.12 Environmental Justice

1 The sentence is incorrect when it states on Line 16 "While not physically located in Clark, Nye, or Lincoln Counties, these groups..." The Yomba Shoshone Tribe, the Moapa Paiute Tribe, the Las Vegas Paiute Tribe, the Pahrump Tribe, and the Las Vegas Indian Center are all a part of the CGTO and all are located in these counties. In addition, all of the members of the CTGO have well established traditional or historic cultural ties to the NTS, so it is not clear why only Indian people in Clark, Nye, and Lincoln Counties would be especially impacted, to the exclusion of others. Note the American Indian cultural resource region of influence map (4-203), it does not imply some groups who live closer to the NTS are more concerned about cultural resources than less farther away.

Note: Other portions of Chapter 5 refer back to the 5.1.1.12, so this text should be clarified.

COLORADO RIVER INDIAN TRIBES

Colorado River Indian Reservation

ROUTE 1, BOX 23-B
PARKER, ARIZONA 85344
TELEPHONE (602) 669-9211

May 15, 1996

Mary Ellen Giampaoli
Department of Energy
2753 South Highland
Las Vegas, Nevada 89109

Dear Ms. Giampaoli:

We appreciate the opportunity to comment and endorse the Native American Resource Document to be included in the Environmental Impact Statement (EIS) for the Nevada Test Site and Off site Locations in the State of Nevada. The Native American Resource Document was produced in response to consultation required by the NTS - EIS, in accordance with DOE Order 123.2, American Indian Tribal Government Policy. The Department of Energy initiated and fulfilled their obligation as required by law to consult with Tribal governments in regards to the preservation of Native American cultural resources on the NTS lands.

The cultural resource management on the NTS lands and surrounding areas has seen the forming of a group called the Consolidated Group of Tribes and Organizations (CGTO), of which the Colorado River Indian Tribes has a representation, to interact with Field Operations and projects of the DOE. The primary focus for the group, who are recognized as culturally affiliated to the lands and surrounding areas, has been the preservation of cultural resources.

1 From this group came the American Indian Writers Subgroup (AIWS) who dealt directly with cultural issues and provided recommendation to the D.O.E. on the preservation of Native American religion, culture, society, and economy. As a result, the Native American Resource Document is a positive move to bring forth concerns of tribal governments regarding long-term impacts to cultural resources on NTS lands and surrounding areas. Other areas of concern include but are not limited to are:

1 cont.

- long-term effects of radiation exposure
- nuclear waste transportation and storage
- environmental justice
- health
- socioeconomic

We believe and stress the importance of addressing these concerns for future posterity not only for Native people but for mankind. The continuity of government - to - government protocol through communication paves the way as a guide to reach and resolve above stated concerns through establishing a long range management plan for the NTS lands.

We commend the participation of all involved in the D.O.E. NTS-EIS project implementation. Without the dedication, the project would not have taken place.

Sincerely,

Daniel Eddy Jr.

Daniel Eddy Jr.
Chairman

Colorado River Indian Tribes

STATE GOVERNMENT 1

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

May 1, 1996

Mr. Donald R. Elle, Director
Environmental Protection Division
US Department of Energy
Nevada Operations Office
PO Box 14459
Las Vegas, Nevada 89114

Dear Mr. Elle:

Enclosed are comments from the State of Tennessee, Department of Environment and Conservation for the *Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada, January 1996, Document No. DOE/EIS 0243.*

Please also note a copy of an enclosed letter from Governor Don Sundquist to Secretary Hazel O'Leary in reference to long standing policy held by the State of Tennessee concerning DOE waste management.

Your consideration of our interests is greatly appreciated.

Sincerely,

Dodd Galbreath
Staff Coordinator for State NEPA Reviews

Enclosures

c: Commissioner Justin Wilson
Ken Bunting, Administrator
Earl Leming, DOE-Oversight
NEPA Coordination File
Jim Hall, Manager, DOE ORR

LST-DG1.DOC
05/02/96

STATE GOVERNMENT 1 (CONTINUED)

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DOE OVERSIGHT DIVISION
761 EMORY VALLEY ROAD
OAK RIDGE, TENNESSEE 37830-7072

RECEIVED BY
APR 22 1996
TN. ENVIRONMENTAL POLICY OFC.

April 17, 1996

Mr. Justin Wilson, Commissioner
Tennessee Department of Environment and Conservation
c/o Tennessee Environmental Policy Office
14th Floor L&C Tower
401 Church Street
Nashville, Tennessee 37243 - 1553

Dear Commissioner Wilson

Document NEPA Review – Draft Environmental Impact Statement: Nevada Test Site and Off-site Locations in the State of Nevada, DOE/EIS 0243, January 1996

The Tennessee Department of Environment and Conservation, DOE Oversight Division has reviewed the above document for your concurrence and transmittal to the following DOE office:

Mr. Donald R. Elle, Director
Environmental Protection Division
US Department of Energy
Nevada Operations Office
PO Box 14459
Las Vegas, NV 89114

The Division's review was conducted in accordance with the requirements of the National Environmental Policy Act (NEPA) and associative implementing regulations 40 CFR 1500 - 1508 and 10 CFR 1021.

1 After review and research, the Division recommends that DOE consider Alternatives 1 or 3, or some variation of those alternatives for this project preferred alternative. The Expanded Use Alternative would include support for ongoing DOE/NV mission categories as described under Alternative 1 and provide for increased use of the Nevada Test Site and its related resources and capabilities.

STATE GOVERNMENT 1 (CONTINUED)

Commissioner Justin Wilson
Page Two
April 17, 1996

The Department of Energy has several Environmental Impact Statements that are ongoing that involve the Nevada Test Site. Because of extremely limited facilities for suitable disposal of radioactive waste, continued disposal operations at the Nevada Test Site are critical to waste management and environmental restoration planning at all DOE facilities.

The Division expects DOE to select alternatives that will facilitate sound environmental decisions for dealing with the many intricate waste management issues facing DOE sites. One of these issues is the disposal of Oak Ridge Reservation low-level wastes at the Nevada Test Site. Currently the Oak Ridge Reservation is awaiting approval for shipment of low-level wastes to the Nevada Test Site.

The State of Tennessee has noted in comments on the Waste Management Programmatic Environmental Impact Statement (PEIS) that the Oak Ridge Reservation does not possess the appropriate geologic or hydrologic character for large scale waste deposition activities. The Division is sensitive to the State of Nevada's concerns in dealing with the environmental impacts associated with DOE activities. However, it is our desire that decision-makers balance the environmental concerns of the State of Nevada with National needs and select alternatives that best limit impacts to the environment, and protect the human health of citizens affected by DOE's mission.

If you have any questions, please contact Bill Childres at (423) 481-0995 or Steve Nisley at (423) 481-0163.

Sincerely

Earl C. Leming
Director

STATE GOVERNMENT 1 (CONTINUED)

COPY

STATE OF TENNESSEE

DON SUNDQUIST
GOVERNOR

December 14, 1995

Secretary Hazel O'Leary
United States Department of Energy
1000 Independence Avenue, S.W.
Room 7A-257
Washington, D.C. 20585

Dear Secretary O'Leary:

Recently, agencies of the State of Tennessee submitted comments in accordance with the requirements of the National Environmental Policy Act (NEPA) for the ***Draft Waste Management Programmatic Environmental Impact Statement (D-PEIS) for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste, DOE/EIS-0200 D, August 1995.*** I have elected to communicate with you directly to insure that the State of Tennessee's policy interests concerning this important D-PEIS are clearly communicated.

My administration strongly opposes and will continue to oppose any attempt by DOE to "site" large waste deposition activities in Oak Ridge, Tennessee. It is disappointing to me that the United States Department of Energy (DOE) continues to seriously consider another short sighted option in a tiring string of waste deposition assessments for Oak Ridge. My administration views all of the alternatives in the current "Waste Management" D-PEIS that consider disposal of low level mixed waste and low level waste on the Oak Ridge Reservation as technically unsound.

It is commonly known, and widely supported inside and outside of Tennessee that Oak Ridge is one of several sites in the DOE complex that does not possess the appropriate geologic or hydrologic character for such large scale waste deposition activities as currently proposed in your D-PEIS. The National Governor's Association/DOE Disposal Working Group specifically recommended that the Oak Ridge complex be considered only for disposal of a very restrictive list of radionuclides due to an emphasis on protection of human health and the environment.

Your own agency's data summary for waste management sites in the current D-PEIS indicates that the Oak Ridge Reservation currently produces the highest "population dose" among the 54 DOE sites around the nation. We believe that a large scale low level mixed waste and low level waste disposal facility at Oak Ridge would add additional risk to an already unacceptable situation.

State Capitol, Nashville, Tennessee 37243-0001
Telephone No. (615) 741-2001

STATE GOVERNMENT 1 (CONTINUED)

Page Two
Secretary Hazel O'Leary
December 14, 1995

Despite our concerns, the State of Tennessee recognizes and appreciates the historic role Oak Ridge, Tennessee has played for the nation and the economic contributions DOE has made to the Oak Ridge community and Tennessee over the past 50 years. We will continue to promote and will accept our responsibility to the nation as a potential site for one or several of the complex suite of activities that DOE must perform. However, I believe that DOE's continued consideration of the most technically unsuitable disposal site in the DOE complex for large scale waste deposition is truly a waste of precious national and state resources. I urged you to invest your agency's energies in alternatives that better meet both the short and long term interests of waste storage.

Sincerely,

Don Sundquist

Don Sundquist

c: United States Representative Zach Wamp
United States Senator Fred Thompson
United States Senator Bill Frist
Commissioner Don Dills, Tennessee Department of Environment and Conservation
US DOE Headquarters PA Office
Mr. Greg Rudy, Acting Director, Office of Fissile Materials Disposition
NEPA File

STATE GOVERNMENT 2

BOB MILLER
Governor

STATE OF NEVADA

JOHN P. COMEAUX
Director

DEPARTMENT OF ADMINISTRATION
Capitol Complex
Carson City, Nevada 89710
Fax (702) 687-3983
(702) 687-4065

May 3, 1996

Donald R. Elle, Director
Environmental Protection Division
U.S. Department of Energy
Nevada Operations Office
P.O. Box 14459
Las Vegas, NV 89114

Re: SAI # 95300110: State of Nevada Clearinghouse Comments on the Draft Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (DOE/EIS 0243)

Dear Dr. Elle:

Thank you for providing the State of Nevada the opportunity to review and comment on the Draft Environmental Impact Statement (EIS) for the Nevada Test Site (NTS) and Off-Site Locations in the State of Nevada. As you know, the State of Nevada submitted extensive scoping comments on the Notice of Intent and the Implementation Plan for the subject EIS. In addition, we conducted a detailed informal review of the preliminary draft Framework for a Resource Management Plan (RMP), i.e., Volume 2 of the EIS.

With the exception of the Draft RMP, our review of the main body of the document indicates that the EIS is inadequate in several major areas. Overall, the document fails to substantively describe or evaluate the environmental effects of alternatives that may be adopted, either entirely or in part, for the yet to be quantified proposed action for the EIS. As you know, the Draft EIS does not contain a proposed action. Subsequently, this affected the State's ability to conduct a detailed review of potential environmental impacts of the numerous alternatives and actions under consideration.

STATE GOVERNMENT 2 (CONTINUED)

2

If DOE intends to prepare a credible Final EIS for the Nevada Test Site, federal officials must pay careful attention to the detailed comments presented in the attached compendium. The State's comments were prepared so that the objections to the document would be clearly understood. Accordingly, we believe that the remedies necessary for rendering the Final EIS acceptable will require substantial textual and substantive changes throughout the body of the document. The State's comments include a summary of major issues, followed by a detailed section-by-section review. We expect DOE to address both the summary and the detailed review in the EIS comment response document. We have incorporated review comments from other executive branch State agencies directly, or as attachments.

We recognize that the ongoing moratorium on nuclear testing has significantly altered the scope of the nuclear testing mission at the NTS. The impact of this reduced testing mission has resulted in significant labor force reductions at the test site from nearly 10,000 in 1989 to less the 3,000 today. While it is difficult to assess the subsequent effects these reductions have had on the NTS EIS, other factors have unquestionably complicated the EIS process.

The scope and content of the alternatives presented in the EIS were developed to assess a reduced testing program, but they were also intended to "bound" several new national defense and non-defense program alternatives proposed through a number of DOE Programmatic Environmental Impact Statements (PEIS). Linking the NTS EIS to these national program alternatives (as per NEPA "tiering" requirements) was addressed under the NTS EIS Alternative labeled "Expanded Use." Unfortunately, the manner in which the Expanded Use Alternative was assessed in the Draft EIS, along with a conspicuous misrepresentation of the No Action Alternative, served only to further obfuscate the scope and content of the NTS EIS.

The last complication levied on the EIS development process was a recent directive from the Secretary of Energy that required all new EIS documents to meet a "start to finish schedule" of only 15 months. This requirement seems unreasonable for this EIS. The NTS is the only contiguous site where more than 900 nuclear tests were conducted, causing widespread contamination. The NTS is also the largest site in the DOE complex, containing an estimated 40 percent of all DOE land holdings.

STATE GOVERNMENT 2 (CONTINUED)

3

Given all these considerations, including the fact that it has been nearly 20 years since DOE prepared a comprehensive Site-Wide EIS for the Nevada Test Site, State officials were not surprised to find the EIS substantively inadequate. Nevertheless, the Nevada Test Site must undergo a comprehensive environmental analysis before any new major federal actions are undertaken at the site. In consideration of the requirements of NEPA, anything less is not acceptable. If you have any questions about these comments, please contact me or John Walker (NWPO) at (702) 687-3744.

Sincerely,

Julie Butler

Julie Butler, Coordinator
State Clearinghouse DOA/SPOC

Enclosure
JB/jbw

cc: Governor Robert Miller
Nevada Congressional Delegation
Leo Penne, Nevada, Washington Office
Lew Dodgion, Environmental Protection
Robert R. Loux, NWPO
State Commenting Agencies
Thomas Grumbly, DOE/HQ
Carol M. Borgstrom, DOE\HQ
Terry Veath, DOE/NV
Ann Morgan, State Director, BLM
Commanding Officer, Nellis AFB
Members, CAB - Nevada Test Site Programs
Affected Local Governments

STATE OF NEVADA COMMENTS

ON

THE DEPARTMENT OF ENERGY'S

DRAFT ENVIRONMENTAL IMPACT STATEMENT

FOR THE NEVADA TEST SITE AND OFF-SITE

LOCATIONS IN THE STATE OF NEVADA

May 3, 1996

**STATE OF NEVADA COMMENTS
ON THE
DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE NEVADA TEST SITE AND OFF-SITE LOCATIONS IN
THE STATE OF NEVADA**

TABLE OF CONTENTS

DETAILED COMMENTS (cont.)

STATE OF NEVADA COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE NEVADA TEST SITE AND OFF-SITE LOCATIONS IN THE STATE OF NEVADA

COMMENT SUMMARY

The sole commendable component of this draft Environmental Impact Statement (EIS) for the Nevada Test Site (NTS) is Volume 2, Framework for Resource Management Plan (RMP). This alone reflects the ongoing environmental policy changes occurring within the Department of Energy (DOE). The remainder of the draft EIS is poorly conceived and executed in the manner typical of many of DOE's National Environmental Policy Act (NEPA) compliance documents. The scientific, methodological, and empirical aspects of Volume 1 of the EIS are deficient well beyond acceptable professional standards for environmental impact assessment and NEPA compliance. Documentation concerning the conceptual bases and methodologies used for assessing impacts is exceedingly poor throughout the EIS. Omissions, oversights, discrepancies, and contradictions are commonplace. In addition, by not putting forth a proposed action in the EIS while simultaneously distorting the No Action Alternative, DOE has served only to encumber the State's ability to conduct a detailed review of the potential environmental impacts of the numerous alternatives and actions under consideration.

Furthermore, omissions of data and information throughout the draft EIS reflect a lack of attention concerning the use of documented environmental information that is readily available. The potential extent of this oversight repeatedly undermines any confidence that DOE may wish reviewers of the EIS to gain. More seriously, the obvious shortcomings contained in the draft EIS seem to reflect a lack of concern for truthfulness and openness regarding stakeholder interests in DOE's current and future management of the NTS.

The State's comments were mindfully crafted (by page and line) so that objections to the document are clearly articulated. We believe that the remedies necessary for rendering the Final EIS acceptable will require textual changes throughout the body of the document. Major points and highlights of particular concern to the State's review of the subject EIS are presented in this summary. Detailed comments follow after the summary.

NO ACTION ALTERNATIVE

1 A review of the existing public land orders that established the NTS clearly show that certain activities proposed in the EIS are inconsistent with both the purpose and intent of those orders. For example, the NTS was not established to serve as a waste disposal site for off-site generated defense wastes. In fact, the description of the NTS waste management program described under Alternative 2 (Discontinue Operations - Section 3.1.2.2) aptly describes the type of on-site disposal program that would be remotely consistent with the existing site mission stipulated under the public land orders.

In the State's scoping comments for this EIS, we indicated that "the only action appropriately described as no action at the NTS includes only national defense and nuclear weapons testing activities defined under the public land orders as consented to by the State of Nevada for the NTS withdrawal." We further stated that the activities described by DOE in its Notice of Intent as "No Action" was in fact "Expanded Use."
2 The State's position on this issue has not changed. Hence, receipt of waste from out-of-state waste generators can only be assessed in the EIS as "Expanded Use," not as part of the site's continuing current operations.

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site
May 3, 1996
State Clearinghouse
SAI # 95300110

In a related matter, State officials insist that DOE must safeguard future generations from exposure to radioactive contamination at the NTS. Such prevention, moreover, can only be achieved through permanent control of the contaminated surface and subsurface areas at the site. To achieve such safeguards, however, exclusive federal jurisdiction of these contaminated areas must be acquired in perpetuity. Alternatively, the only activities that can be performed on the NTS are those that were originally consented to by the Nevada Legislature, and/or activities that may not require exclusive jurisdiction.

In addition, as the original weapons testing activities are phased out, the site must be "cleaned" to meet natural background radiation levels and returned to public land status. However, since "cleanup" to active natural background conditions is not
3 proposed, the EIS must discuss how DOE intends to acquire exclusive jurisdiction over certain NTS lands, given the constitutional requirement that exclusive jurisdiction may only be acquired in the manner set forth in Art. 1, Section 8, Clause 17 of the United States Constitution. Of particular interest to Nevada in this regard is the requirement that DOE obtain the consent of the Nevada Legislature in order to acquire exclusive jurisdiction over the particular sites.

4 If the DOE intends to exercise less than exclusive jurisdiction, however, then the EIS must propose alternatives and actions that discuss the rationale upon which DOE bases its assumption that it can accomplish the isolation of contamination and radioactive waste at the site while preventing human intrusion. These are important considerations for the State, since it is the State's responsibility to protect the health and welfare of its residents.

RESOURCE MANAGEMENT PLAN

5 The relationship of the Framework for Resource Management Plan to the
6 remainder of the EIS should be stated early in Volume 1. An explanation is needed on

6 cont. DOE's changing environmental policy that involves resource stewardship and ecosystem
management. Much of this information is contained in Volume 2. However, both
volumes of the draft EIS fail to acknowledge DOE policies regarding ecosystem-based
7 initiatives, comprehensive land use planning, life cycle asset management, and
resourceful reuse of DOE-controlled lands. In addition, Volume 2 of the draft EIS should
be strengthened by discussing the concepts of resource stewardship and sustainable
development implied by DOE's Land and Facility Use Policy. This should include the
role to be played by ecosystem management, especially regarding conservation of
8 undisturbed land as an important resource for future development by DOE. The concept
of the health of ecosystems like those of the NTS and surrounding areas being tied to soil-
water-biota interactions also is directly associated with the importance of minimizing site
disturbances as a means of conserving undisturbed land.

9 Also, State officials contend that the Record of Decision (ROD) for the EIS should contain a schedule for implementing the RMP. By including such a schedule, DOE will demonstrate an enforceable commitment to the RMP process. This commitment will ensure that new facilities are sited using a systematic approach that will sustain and preserve the natural environment at NTS.

YUCCA MOUNTAIN

10 A discussion is needed early in Volume 1 on the reasons the portion of the NTS
dedicated to the Yucca Mountain Project and the project itself are excluded from the EIS.
11 The EIS should make use of the environmental studies conducted by the Yucca Mountain
Project. This information is extensive and addresses many of the database gaps that exist
for the NTS, such as soil productivity, revegetation success, and natural rehabilitation.

NATIONAL ENVIRONMENTAL RESEARCH PARK

12 The National Environmental Research Park program at the NTS and the activities involved should be included in the EIS. This is a major omission from the draft EIS.

TIMBER MOUNTAIN CALDERA

13 More information is needed regarding the Timber Mountain Caldera National Natural Landmark, such as what this designation signifies, environmental studies already performed or planned for the area, and DOE activities that have occurred within the landmark boundaries.

PERFORMANCE ASSESSMENT

The Final EIS must contain a discussion about the Department's plan to address
the Defense Nuclear Facilities Safety Board's Recommendation 94-2. That
recommendation outlines problems and issues concerning DOE's low-level radioactive
14 waste management and disposal program. DOE's subsequent response to the Board's
recommendations (i.e., DOE's implementation plan), as well as a discussion of pending
revisions and changes to the Department's waste management order (5820.2A) should be
discussed in the Final EIS. These discussions are particularly relevant concerning DOE's
potential plans to proceed with a co-disposal decision for dissimilar waste types at the
NTS. Dissimilar wastes classified as low-level, special case, or other wastes considered
not appropriate for shallow land burial (i.e., high activity low-level waste, transuranic
waste, etc.) are considered under the EIS Expanded Use Alternative for disposal in a
single contiguous facility at the NTS Area 5 disposal site. To proceed with such an
action, State officials contend that DOE must address the problems associated with the
"composite effects" defined by the Board's recommendation 94-2 (i.e., the disposal sites
ability to meet performance objectives for confining future, current, and pre-1988 waste
15 from the biosphere). The State also contends that before any more waste is disposed at

15 cont. either Area 3 or Area 5, DOE must complete a performance assessment for each site. Only then would DOE be in compliance with its own waste management orders.

Failure to address these disposal issues could subject federal decision makers to consider actions that may harm the environment and thus create unpredictable health risks for future generations. In other words, avoiding action concerning the Board's recommended detailed composite performance analysis will likely cause additive risks through additional waste disposal, which might cause unknown and unpredictable environmental impacts to the human and natural environments.

RADIONUCLIDE SOURCE TERMS AND SURFACE CONTAMINATION

16 More detailed information is needed on radiological source terms and surface contamination throughout all environmental media at the NTS, including the locations where radionuclide levels exceed regulatory standards. This includes the Tonopah Test Range, the Project Shoal Area, and the Central Nevada Test Area. The EIS provides certain data which indicates that nearly 40 percent of the source term at the site is bound up in the groundwater. However, statements in the EIS suggest that there is considerable uncertainty about the actual quantity of radioactivity that could enter the groundwater in the future from the release of radionuclides from the melt glass and cavity rubble within
17 each shot cavity. While the EIS suggests that future studies are needed to reduce the current levels of uncertainty concerning both the mechanisms and consequences of radionuclide transport via groundwater flow at the NTS, no information is provided about the radionuclide source term that is contained in soils above the water table (i.e., in the unsaturated zone).

18 State officials do acknowledge that DOE has sponsored two long-term studies concerning potential movement of radionuclides beneath the NTS: the Hydrologic

18 cont. Resources Management Program and the Long-Term Hydrologic Monitoring Program. However, initial conclusions from these programs are muddled, and results to date were
19 not discussed in detail in the EIS. Finally, the EIS suggests that there are over 200 significantly contaminated surface areas that collectively occupied 52 square miles, yet the EIS fails to provide a detailed map or suitable listing of these areas. Because radiological contamination is one of the primary environmental impacts caused by nuclear testing, the Final EIS must provide this information.

SPECIAL CASE WASTE (SCW)

20 The Department of Energy's NEPA compliance strategy for the management and disposition of SCW and its relationship to the NTS EIS must be clarified in the Final EIS. State officials are aware that SCW has been disposed at NTS in the past. Yet DOE has never conducted either a programmatic or site-specific NEPA analysis for the management and disposition of this waste type. SCW is generally long-lived, contains high concentrations of radionuclides, and thus represents a significant threat to human health and the environment. SCW must be isolated from the biosphere for thousands of years.

The NTS EIS contains language that clearly indicates that the disposal capability at NTS for wastes defined as "inappropriate for shallow land disposal" (i.e., SCW) will be increased under Alternative 3, Expanded Use. As indicated in the detailed comments presented below, State officials assume that this refers to expanding waste disposal through the "greater confinement disposal boreholes concept" and/or other deep trenches at the Area 5 disposal facility.

21 Accordingly, if either the Area 5 or Area 3 disposal sites at NTS are considered for confinement of SCW, the difficulties associated with meeting the waste acceptance criteria for dissimilar waste types must be acknowledged and assessed. Additionally,

22 DOE must complete a programmatic analysis at the weapons complex level that evaluates alternative storage and disposition strategies for SCW. In fact, State officials understand that alternatives for storage and disposal of DOE's SCW, along with Greater-Than-Class-C waste (GTCC), will be evaluated in a forthcoming Supplemental Environmental Impact Statement tiered from DOE's Waste Management Programmatic EIS.[1] This EIS will likely consider a disposal strategy which proposes co-disposal of SCW with GTCC waste in a single NRC-licensed disposal facility. This is an important policy consideration for Nevadans, since the proposed repository at Yucca Mountain would be one of the candidate disposal sites for such an activity. This NTS EIS fails, however, to discuss any of these issues. Hence, DOE's NEPA compliance strategy for the management and disposition of SCW waste and its relationship to the NTS EIS must be clarified.

ENVIRONMENTAL CONSEQUENCES

23 The basis for finding no adverse impacts should be given in each case, and the data to substantiate the finding should be cited. The draft EIS relies far too much on unsubstantiated subjective judgement that has no basis in fact. This shortcoming occurs even where scientific and technical information for a topic exists. 24 Credible attention to impact assessment methods and analyses is lacking in the draft EIS, and where methods are cited, their usefulness for assessing environmental impacts is questionable. Current state-of-the-art environmental assessment methodologies should be adopted by DOE for the NTS EIS.

CUMULATIVE IMPACTS

25 The coverage of cumulative impacts in the EIS is unnecessarily deficient with respect to methods of analysis, and none of the analyses discussed are empirically based.

[1] Notice of Inquiry: Strategy for Management and Disposal of Greater-Than-Class-C Low-Level Radioactive Waste. Federal Register Notice, Vol. 60, No. 48, Monday, March 13, 1995.

25 cont. While there is a considerable body of DOE literature regarding methods for analyzing cumulative environmental impacts, it appears that none of this literature was used in the EIS. The presentations of cumulative impacts in the EIS are subjective in nature and thus, unacceptable, given current scientific approaches for assessing cumulative environmental impacts.

26 A determination of whether actions are cumulative should be focused on the proposed action defined in the EIS instead of on several loosely defined alternatives or other unrelated factors. Since DOE has chosen not to put forth a specific proposed action in the draft EIS, and given the variable content of the existing alternatives, the Department's presentation of potential cumulative impacts is understandably deficient. 27 This is unfortunate, since certain "reasonably foreseeable future actions", such as massive increases in low-level and mixed waste shipments (from 6,800 to 25,000 shipments in ten years) along with shipments of special nuclear materials are conceivable and should have been subjected to a detailed cumulative impact analysis in the EIS. 28 However, no such analysis is provided. The potential cumulative impacts from the transportation, treatment, storage, and disposal of both radioactive waste and special nuclear materials are simply not assessed in the draft EIS. 29 Evidently, DOE has decided that no cumulative human health risks or risks to the environment would occur from these and other reasonably foreseeable future actions within the region of influence of the NTS. 30 For example, no mention is made of how cumulative impacts from the Yucca Mountain Project will be considered, and the claim that such impacts will build from those in the NTS EIS rings hollow in the face of the inadequacies of the draft EIS. 31 Accordingly, if a proposed action for the Final EIS is adopted that includes the transportation, treatment, and storage/disposal of special nuclear materials and radioactive waste at the NTS, then an objective, scientifically based cumulative impact analysis must be prepared.

SOCIOECONOMIC IMPACTS

32 The treatment of the possible socioeconomic effects from NTS activities for all of the alternatives is wholly inadequate. The draft EIS presents an overly optimistic picture of the "economic" implications of proposed alternatives and is entirely silent with respect to the "socio" or social/cultural/political impacts, which, in the case of controversial activities such as those proposed for NTS, can be very significant.

33 The analysis of economic effects focuses solely on those effects that are driven by employment and population increases resulting from various alternatives, and then does so only with respect to their potentially positive contributions to state and local economics. Such analysis is almost irrelevant, since, even for the most ambitious alternative, job and population growth related to NTS are not projected to be more than 1% of the total for Clark County and just a fraction of 1% for the State of Nevada. Even for Nye County, NTS-related population growth, job growth, and revenue impacts are relatively small (e.g., 3% or so increase in jobs in 2005) since most workers and their families are projected to live in Clark County.

34 What the EIS fails to assess, and what must be included in the Final EIS if economic impacts to affected jurisdictions and the State as a whole are to be adequately evaluated, are the implications of projected NTS population increases (related to employment) that do not pay for themselves in terms of the revenue (taxes, fees, etc.) generated. NTS-related growth has the potential to cause negative impacts in a variety of "standard" economic areas. While most types of economic growth and diversification are viewed positively in Nevada, one result of the State's rapid growth[2] is that public services and facilities are already under considerable stress. Nevada's tax structure is such that any growth that does not directly increase the contribution of revenues from visitors (i.e.,

[2] Nevada is currently the fastest growing state in the country, and the Las Vegas Valley has been designated the fastest growing metropolitan area.

sales and gaming taxes) will not pay its own way, except for mining with its legislative revenue tax. In recent years, the phenomenal growth of gaming and tourism has kept pace with other forms of development and population growth. However, it cannot be assumed that this will remain true into the next century. These standard economic effects associated with additional NTS-related population growth could, therefore, generate negative fiscal impacts for state and local jurisdictions in the event that tourism/gaming growth fails to maintain its current rate of increase. (As was seen during the recession in the early 1990's, gaming/tourism does not have to actually decline for serious negative consequences to occur. The rate of growth merely needs to slow.)

35 The most significant omission in the draft EIS with respect to socioeconomic impact assessment, however, is the lack of any attempt to identify potential impacts to the State that could result from the stigmatizing effects of various NTS activities, particularly those involving nuclear, hazardous, toxic, and related materials. Research conducted by the State of Nevada has demonstrated that nuclear-related activities (i.e., storage facilities, radioactive materials transportation, etc.) have the potential to result in significant socioeconomic impacts at all levels within the state, from the local communities to the state government. These effects originate in intense negative perceptions and avoidance behaviors by the public in response to nuclear facilities/activities which, combined with the unique vulnerability of the Nevada economy to changes in its public image, could produce large negative impacts. The great public and media interest in things nuclear makes it almost certain that any association with these negative perceptions will adversely affect Nevada's attempts to attract tourists, conventions, retirees and other in-migration, and new business investments. This could be especially troublesome in the event of a nuclear waste accident that was in or near Las Vegas, one of the world's major tourist destinations and the dominant contributor to Nevada's economy and tax revenues. While there is considerable uncertainty about the federal government's ability to manage radioactive materials safely and about future public responses to accidents and events, it is clear that over the last half century, the public has developed a very strong aversion to

STATE GOVERNMENT 2 (CONTINUED)

such wastes and the facilities associated with them. The conclusion of the Nevada researchers who have studied the issue is that, under certain circumstances, stigma impacts could be very negative and very large.

The existing research on stigma effects and potential impacts provides a viable theoretical and methodological base so that DOE should be able to provide a detailed assessment of these types of impacts on Nevada's economy, public revenues, public services, and community quality of life. These assessments should take into account the increasingly competitive gaming and tourist marketplaces and the important role that any negative perceptions could have. It is very possible that, through the social amplification of risk process, even relatively minor events or accidents could have serious economic consequences. Such impacts could dwarf any expected benefits to be derived from NTS employment and spending. Such "stigma" effects of NTS activities will be reflected in "standard" economic, fiscal, and other impacts that can be characterized in the same units of measurement as standard effects, such as tourist visitations causing employment, tax revenues, and other social responses. In fact, the standard and stigma impacts should be seen as interacting forces working on the same social-economic system. It is essential
36 that the NTS EIS thoroughly assess "standard" and "stigma" impacts in a comprehensive and integrated manner.

Research has also shown that there is widespread opposition to radioactive waste disposal and transportation based on health and safety concerns, the potential threats to the economy, the creation of divisive policy issues, distrust of the Department of Energy, and the fear of diminished quality of life. This public opposition is itself an impact that
37 the EIS must address, together with the implications for long term socioeconomic disruptions that may derive from it.

STATE GOVERNMENT 2 (CONTINUED)

COOPERATING AGENCIES

Insufficient use has been made by DOE of cooperating federal agencies for input into the NTS EIS. This is apparent in both Volume 1 and Volume 2 of the draft EIS,
38 especially with regard to ecosystem management policies and activities of the agencies of the Department of Interior.

BIG EXPLOSIVE EXPERIMENTAL FACILITY

The purpose of the Project-Specific Environmental Analysis for the Big Explosives Experimental Facility should be clarified, including the status of NEPA compliance for the facility. The information presented in the draft EIS does not include
39 impact analyses. It appears that DOE is attempting to satisfy NEPA requirements for this facility through the NTS EIS, rather than tiering, as required by federal regulations (CEQ 1508.28).

LYNER COMPLEX (Review of Classified Appendix J)

A review of the classified appendix of the EIS was undertaken by a qualified State official, and it was determined that the impact analyses of certain classified activities at the Lyner facility were incorporated in the overall evaluation of impacts assessed in the NTS EIS. The analyses of potential long-term impacts of classified activities to the
40 vadose zone are representative of the analysis presented in the EIS for other proposed defense testing activities at the site. In reference to potential human health and safety impacts associated with activities at the Lyner complex, the risk assessment for the Defense Assembly Facility (DAF) adequately bounds the potential above-ground risks and impacts.

HUMAN HEALTH

41 The approach to estimating human health consequences presented in the EIS
42 excludes the role of humans in the environment. The Final EIS must allow readers the

42 cont. ability to comprehend how health effects findings and conclusions are reached in a credible scientific manner. In addition, there is no attention given in the EIS to the transport of contaminants within ecosystems and landscapes. This requires an ecosystem

43 approach to managing resources at the site and should be described in Volume 2 of the EIS as a benefit to be derived from ecosystem-based management activities. The relevance of this to the DOE's environmental restoration program should be emphasized.

TRANSPORTATION

44 The EIS failed to provide a sufficiently detailed description of the transportation activities associated with each proposed alternative. Such information is needed to allow State and local officials and other affected parties the ability to accurately assess the on-site and off-site transportation risks and impacts of each alternative. Detailed transportation information is especially important for assessing the risks and impacts of

45 materials and waste shipments under Alternatives 1 and 3. Furthermore, for each alternative, the EIS did not fully describe expected shipments of the following categories of hazardous materials to and from NTS: (1) special nuclear materials; (2) radioactive and mixed wastes; (3) conventional explosives and non-nuclear weapons and munitions; (4) petroleum products, including liquefied petroleum gases; and (5) all other hazardous materials regulated under the Hazardous Materials Transportation Uniform Safety Act.

46 The EIS also failed to provide a detailed inventory of expected shipments within each category. For example, under radioactive materials, specific information was not provided on expected shipments for the following materials listed in Chapter 3.0: nuclear weapons; plutonium pits; nuclear weapons components; weapons-usable fissile material; transuranic wastes; transuranic mixed wastes; other radioactive materials requiring shipment in Type B packages; low-level radioactive wastes; and low-level mixed wastes.

47 If DOE adopts a proposed action for the Final EIS that includes the transportation of any of these nuclear materials and radioactive wastes, then a cumulative impact

47 cont. analysis for transportation must be prepared that covers the combined functions of DOE's Environmental Management and Defense Program activities at the NTS. At a minimum, this must include transportation information for each specific material. The information must include: (1) origin and destination; (2) quantity or volume shipped; (3) total radioactivity and maximum radioactivity per individual shipment; (4) shipping container characteristics and capacities; (5) shipment mode or modes; (6) transportation service options; (7) carrier qualifications and selection procedures; (8) shipment route or routes; (9) cumulative shipment miles; and (10) timing of shipments.

As presently written, the EIS provides useful information on only two of the twelve types of radioactive materials that could be shipped to NTS under Alternatives 1

48 and 3 (i.e., low-level radioactive waste(LLW) and low-level mixed waste). The EIS does not even attempt, however, to provide comparable information on the other, more highly radioactive materials or on high-hazard non-radioactive materials that would be shipped to NTS under Alternatives 1 and 3. State officials note that such information has been disclosed and assessed by DOE in other comparable EIS documents.[3]

Because the EIS fails to provide basic information on most of the hazardous materials expected to be shipped to NTS, it is not possible to fully evaluate the

49 transportation risk assessment provided in the Transportation Study. It is clear, however, that the transportation risk calculations used in the Transportation Study [Appendix I], and summarized in the EIS, Table 3-5 [p.3-41], apply only to shipments of low-level radioactive and mixed wastes. As mentioned above, this analysis will need to be expanded, depending on the proposed action selected in the Final EIS.

---

[3] U.S. Department of Energy, February 1994. Comparative Study of Waste Isolation Pilot Plant(WIPP) Transportation Alternatives, DOE/WIPP 93-058.

STATE GOVERNMENT 2 (CONTINUED)

50 With regard to the Transportation Study, the reported risks associated with off-site transportation accidents involving low-level radioactive and mixed waste cannot be verified based on the information provided. In particular, the Transportation Study fails to provide a detailed discussion of the consequences of a maximum credible severe accident or terrorist incident involving release of radioactive materials. Given the EIS's deficient transportation risk analysis, it is not surprising that it fails to adequately address the perceived risk impacts which may result from transportation activities under Alternatives 1 and 3. Large scale shipments of low-level radioactive and mixed wastes along Nevada highway routes, especially through the Las Vegas Valley, may potentially cause significant adverse socioeconomic and cultural impacts even if no accidents occur. The current level of shipments to NTS has already caused widespread public concern in
51 Clark County. The potential socioeconomic and cultural impacts resulting from shipments of more highly radioactive materials, particularly under Alternative 3, could be very significant. The EIS must address these impacts.

52 Finally, the EIS must clearly provide for a process by which routes are identified for shipping low-level waste, mixed LLW, Special Case Waste (SCW), and special nuclear materials to NTS. State officials contend that it is not acceptable to leave routing decisions solely to each carrier's discretion. DOE must commit to stipulating, by means of contract requirements with carriers, routes or segments of routes that cannot be used for waste and nuclear materials shipments to NTS.

53 The State of Nevada has analyzed this issue and has determined that the use of contract provisions that require adherence to routing preferences is not in violation of any federal or state law or regulation dealing with radioactive or hazardous materials route designations. DOE, as the shipper of these materials (or the facility operator acting on behalf of DOE), may incorporate provisions into contracts with carriers that require the carrier to perform in specified ways. As long as DOE is not attempting to bind contractors/carriers to provisions that are illegal or in violation of existing regulations,

STATE GOVERNMENT 2 (CONTINUED)

53 cont. there is nothing to prohibit DOE from using the contracting process to enforce the use of routes that are acceptable to DOE/NTS stakeholders (i.e., affected local governments and sovereign nations impacted by shipments to NTS).

54 The State has further determined that the process by which DOE is permitted to solicit and award contracts can readily accommodate the requirement that carriers use certain routes or avoid certain unacceptable segments of routes. Doing so may mean that DOE will need to forego the use of general freight for shipments of LLW and other materials to NTS for disposal, although it is not altogether clear that DOE cannot reach needed accommodations with carriers using general freight. If such accommodation is not possible, DOE should commit to the use of contract carriers (e.g., carriers that are willing to bid on and enter into contracts that contains stipulations with respect to shipment routing), even if that means incurring additional costs. State officials believe that DOE should commit to such a process in the Record of Decision for the EIS.

-- *DETAILED COMMENTS* --
ON
THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE NEVADA TEST SITE AND OFF-SITE LOCATIONS IN THE STATE OF NEVADA

EIS SUMMARY DOCUMENT

COVER SHEET **Abstract**

55 *COMMENT 001* There are two significant issues that are not mentioned in the Abstract. One is the relationship of Volume 2, Framework for Resource Management Plan, to the EIS. The information needed for this is in Section 1.4, Relationship to the Nevada Test Site Environmental Impact Statement, in Volume 2. The other issue is the reason why the portion of the NTS dedicated to the Yucca Mountain Project and the project itself are excluded from the EIS.

PAGE S-1 **Introduction**

56 *COMMENT 002* Comment 001 also applies here.

PAGE S-3 **Purpose and Need**

57 *COMMENT 003* A section should be added that discusses the National Environmental Research Park (NERP) designation for the NTS and the programs and activities involved. There is no significant discussion of NERP

STATE GOVERNMENT 2 (CONTINUED)

in the body of the EIS. Such a section should be added first in Chapter 2 and then followed through in Chapters 3, 4, and 5.

PAGE S-5 **Environmental Restoration Program**

"The goal of the Environmental Restoration Program is to ensure that risks to the environment and to human health and safety, as posed by inactive and surplus facilities and sites, are either eliminated or reduced to protective levels."

58 *COMMENT 004* The term "protective levels" should be specifically defined in the Final EIS.

PAGE S-15 Lines 9-10 **Transportation and Waste Management**

"Transuranic, mixed transuranic, mixed low-level waste, low-level, hazardous waste, and Toxic Substances Control Act wastes are stored at the NTS."

59 *COMMENT 005* The Implementation Plan for the NTS EIS proposes storage of classified transuranic waste at the NTS; storage is proposed for both Alternatives 1 and 3, (See Appendix D, Page D-4). While we believe this waste is currently stored at the site, the Final EIS must acknowledge that DOE is storing classified transuranic waste at NTS, along with disclosing the volume of the waste and planned waste treatment and disposal alternatives.

PAGE S-19 Lines 10-11 **Surface Hydrology and Groundwater**

"To date, no radioactive contamination has been detected in on-site water supply wells or in off-site monitoring wells."

DOE EIS
Nevada Test Site

May 3, 1996

State Clearinghouse
SAI # 95300110

60 ***COMMENT 006*** Review of other DOE documents suggests this statement is either misleading or incorrect. The Nevada Test Site Annual Site Environmental Report 1994 noted that water drawn from the UE-5n well contained high concentrations of tritium. In addition, sampling wells at the project Faultless site have recently shown radioactive contamination. Also, tritium contaminated water is flowing from the tunnels at the NTS Area 12 complex.

PAGE S-28 **Line 31**

61 ***COMMENT 007*** This paragraph should include a discussion of Section 2.5, Evaluation of Environmental Impacts and Risk, from Volume 1, with emphasis on human health risk assessment, performance evaluation, and performance assessment. Cross reference should be made to Appendix H, Human Health Risk and Safety Impacts Study.

PAGE S-29
Line 9 to 10

Environmental Restoration Program

"Under Alternative 2, environmental restoration activities would cease. This would result in a condition of noncompliance with environmental requirements and limit the future use of the land."

COMMENT 008 Council of Environmental Quality Regulations 1500.2(e) state that Federal agencies shall to the fullest extent possible "use the NEPA process to identify and assess the **reasonable** [emphasis added] alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment."
62 In reference to Alternative 2 and its effect on DOE's Environmental Restoration Program, State officials believe this alternative is not

DOE EIS
Nevada Test Site

May 3, 1996

State Clearinghouse
SAI # 95300110

62 cont. **reasonable**; moreover, if adopted, this alternative will violate NEPA implementing regulations.
63 Accordingly, the structure of Alternative 2 must be reconfigured in the Final EIS to avoid "compliance" conflicts with NEPA.

PAGE S-30
Line 4

Unavoidable Adverse Effects

"Other testing and experimental activity in support of stockpile stewardship programs would have smaller impacts [than impacts from conducting an underground nuclear test]."

COMMENT 009 State officials concur that unavoidable impacts to the environment would occur if the President directs DOE to conduct an underground nuclear test at the NTS. Most observers believe, however, that it is unlikely that nuclear testing will resume in the near or distant future. Nevertheless, other impacts from planned stockpile stewardship activities at the NTS will have significant impacts on the environment.
64 The description of the classified subcritical test proposed at the LYNER complex will cause the dispersal of substantial quantities of plutonium-239, along with the abandonment of the plutonium contaminated underground "shot" rooms. The Final EIS should clarify that this is an unavoidable adverse impact and that DOE is not planning to remediate these "permanently" contaminated underground areas.

DOE EIS Nevada Test Site	May 3, 1996	State Clearinghouse SAI # 95300110

VOLUME 1, CHAPTERS 1-9 (Part A)

1.0 INTRODUCTION

PAGE 1-2 **Introduction**

65 ***COMMENT 010*** Paragraphs should be added to the Introduction that discuss (i) the reasons for the exclusion of the Yucca Mountain Project from the EIS, (ii) the significance of Volume 2, Framework for Resource Management Plan, to the EIS, and (iii) that Appendix F is a NEPA compliance action. There is no mention anywhere in Volume 1 as to why the Framework for Resource Management Plan was undertaken, and, as in the abstract for the EIS, the Introduction must include such insight. The information needed for this is in Section 1.4, Relationship to the Nevada Test Site Environmental Impact Statement, in Volume 2.

PAGE 1-5 **Public Land Orders**
Section 1.3 Lines 27 through 30 indicate that the primary federal and State laws, regulations, Executive orders, and DOE orders that may apply to the proposed action and alternatives presented in the NTS EIS are appropriately summarized in Appendix C.

66 ***COMMENT 011*** A brief discussion of the public land orders for the NTS withdrawal should be noted on Page 1-5 followed by a detailed discussion in Appendix C. At present, Appendix C contains an inadequate discussion of the withdrawal orders.

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS Nevada Test Site	May 3, 1996	State Clearinghouse SAI # 95300110

PAGE 1-6 **Clarification: Line 6.**

67 ***COMMENT 012*** The reference citation for Yucca Mountain (3.2.7.1) is incorrect.

PAGE 1-7 **Generic, Heavy Industrial Facility**
Line 14 "The NTS is no longer considered a potential host site for the tritium supply and recycling facilities; they have been replaced with a generic, heavy industrial facility with similar footprint and resources requirements. In this way, the impact analysis for the expanded use of NTS resources is preserved."

68 ***COMMENT 013*** We concur that DOE has chosen not to site a major tritium production facility at the NTS. There are, however, other proposed actions at the NTS that could be construed as representing "a generic, heavy industrial facility." The most obvious example is a new fuel fabrication facility for the production of mixed oxide (MOX) fuel. The EIS fails, however, to identify this alternative activity.[4]

PAGE 1-7 **Defense Assembly Facility (DAF)**
Line 33 "Under stockpile management activities, the NTS Device Assembly Facility is proposed as an alternative site for weapons assembly and
69 disassembly." It should be mentioned that the Notice of Intent (NOI) for DOE's Stockpile Stewardship and Management Programmatic

---

[4] U.S. Department of Energy, March 1995. Office of Fissile Materials Disposition *Long-Term Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement*, Implementation Plan, pages 3-4 to 3-6.

69 cont. Environmental Impact Statement (PEIS) also acknowledges that there is a potential overlap with the Storage and Disposal PEIS regarding storage of strategic reserves of plutonium. (The DAF is, in fact, identified for multiple missions in both PEIS documents). The subject NOI does, however, suggest that preparation of the two PEIS documents will be coordinated to prevent conflicting analyses and to ensure that DOE reaches an appropriate decision.

70 ***COMMENT 014*** State officials are concerned that, if the DAF is selected for the management and storage of strategic reserves of plutonium and the Storage and Disposition PEIS proposes an alternative for plutonium disposition that includes use of the DAF, then cumulative impacts may occur without adequate environmental analyses, as required under the NEPA.

PAGE 1-8
Line 11
Storage and Disposition of Weapons-Usable Fissile Material Programmatic EIS

71 ***COMMENT 015*** The discussion in the EIS is inadequate. The Implementation Plan for the Plutonium Storage and Disposition PEIS (Footnote 4) identifies the NTS as an alternative site for nuclear reactor development and MOX fuel fabrication. The text in the EIS should be altered accordingly.

PAGE 1-9
Line 9
Nellis Air Force Range Complex EIS
In reference to the Nellis Air Force Range complex (NAFR), the statement is made that "the land withdrawal alternatives evaluated in

the NAFR Complex Withdrawal EIS [as per PL 99-606] may result in proposed changes that could affect the DOE operations".

72 ***COMMENT 016*** This statement is vague, unclear, and should be clarified. For example, how will decisions concerning future uses of the NAFR impact DOE programs and will the use/control of Pahute Mesa change?[5] Will access and control of the Double Tracks site and/or other plutonium contaminated soil sites on the NAFR change?

2.0 PURPOSE AND NEED FOR DOE ACTION

PAGE 2-6
Line 8
NTS Waste Disposal Mission
"While the NTS no longer accepts transuranic or mixed waste from other sites, the management of low-level wastes generated at the NTS and other DOE-approved facilities across the United States has been an ongoing mission of the NTS."

73 ***COMMENT 017*** State officials do not concur with this statement for the following reasons:

Performance Assessment: While we are aware that DOE has developed a waste acceptance program at the NTS, the acceptance criteria are not based on a completed performance assessment that

[5] Under a Memorandum of Understanding between DOE and the Department of the Air Force (Tactical Air Command -- Nellis), use and operational control of the Pahute Mesa has been granted to DOE for "execution of the nation's underground nuclear weapons test mission". See MOU E-AIO8-82NV10283.

clearly delineates the type and character of the wastes that can be
73 cont. disposed of at either the Area 3 or the Area 5 radioactive waste
management sites. Therefore, DOE is in violation of its own waste
management order (5820.2A, Chapter III, a & b).

Land-Use Constraints: There are existing legal constraints contained
in the public land orders for the NTS land withdrawal that must be
resolved before DOE can legally dispose of offsite-generated low-
74 level waste at the site. Specifically, the NTS land withdrawal orders
restrict the use of the site to atomic testing activities only. State
officials have long contended that DOE must seek both
congressional and State approval to use the site for disposal of
radioactive waste shipped from offsite generators.

We contend that to legally implement disposal decisions for low-
level and low-level mixed waste (as well as high-level waste, spent
nuclear fuel, and special nuclear materials such as plutonium), DOE
must obtain exclusive jurisdiction over the lands comprising the
disposal facilities on the NTS and/or adjacent public lands. The EIS,
however, omits any discussion of how DOE intends to acquire
75 exclusive jurisdiction over these lands, given that exclusive
jurisdiction may only be acquired in the manner set forth in United
States Constitution. Of particular interest to Nevada is the
requirement that DOE obtain the consent of the Nevada Legislature
in order to acquire exclusive jurisdiction. Moreover, if DOE intends
to exercise less than exclusive jurisdiction, at some point the
Department must present the rationale upon which it bases its
assumption that it can accomplish isolation of the waste and

prevention of human intrusion in the absence of exclusive
jurisdiction.

PAGE 2-9 **Waste Definitions** (Page Insert)

76 ***COMMENT 018*** DOE failed to include a specific definition for Special Case Waste
(SCW) in the definitions. Although a definition of Greater-Than-
Class-C (GTCC) waste is provided, the amount of this waste type
compared to the amount of SCW is not that significant. For
example, while DOE has publicly stated that as much as 70,000
cubic feet (2,000m^3) of GTCC waste will be produced through the
year 2035[6], the estimates for Special Case Waste are much larger and
may exceed 2.6 million cubic feet (75,000m^3). Because SCW has
been disposed at NTS and, since this waste type is generally long-
77 lived, contains high concentrations of radionuclides, and represents
a significant threat to human health and the environment, the waste
type should be specifically defined in the document.[7]

PAGE 2-14 **Evaluation of Environmental Impacts and Risk**

COMMENT 019 A subsection should be added that discusses the biological-
78 ecological studies and information as well as the reclamation studies
and information accrued by the Yucca Mountain Project. If this
information, which is extensive and significant, has not been used for

6 Lockheed Corporation, April 11, 1995. Stakeholder Workshop for GTCC LLW Management Program Strategy Development, (ACE-Federal Reporters, INC., page 19).

7 See Federal Register Notice 3/13/95: Strategy for Management and Disposal of Greater-Than-Class-C Low-Level Radioactive Waste.

the EIS, steps should be taken to incorporate it along with corresponding analyses in the Final EIS. (See Comment 136)

PAGE 2-15 **Figure 2-1**

COMMENT 020 The figure should include the biological-ecological studies and
79 information as well as the reclamation studies and information accrued by the Yucca Mountain Project.

PAGE 2-17
Section 2.5.5 **Performance Evaluation**

COMMENT 021 The discussion on the performance evaluation process established for screening DOE sites for disposal of mixed low-level and defense low-level waste should be expanded. The discussion in the EIS missed the point that the process was implemented across the entire
80 weapons complex and not just for the NTS. How this national performance evaluation process will be used to support forthcoming decisions for disposal of mixed low-level and low-level defense waste, via DOE's Final Waste Management PEIS, should also be discussed.

PAGE 2-20
Line 7 **Performance Assessment -- Groundwater Pathways**

"Therefore, the performance assessment for these waste management facilities will not focus on the groundwater pathway. If a groundwater pathway is demonstrated, the risk associated with the Waste Management Program (results of the performance assessment activities) would be integrated with the current underground test

area's remediation (part of the Environmental Restoration program)."

COMMENT 022 State officials do not concur with these statements and contend that, as part of the Performance Assessment process, DOE must include a detailed assessment of potential groundwater pathways for the Area
81 3 disposal site. The State expects DOE to commit to a performance assessment of the potential groundwater pathways for the Area 3 disposal site and provide a schedule for such an assessment in the EIS ROD.

In addition, statements in the EIS suggests that "scientific hypotheses" indicate that the rubble chimney beneath the low-level
82 waste unit at Area 3 will not enhance or promote vertical groundwater flow to the deep shot cavity.[8] Justification for this statement could not be found in the EIS. We also note the statement in Section 5.1.1.5.2. of the EIS which says "the Desert Research Institute has investigated the effects of craters on infiltration and soil moisture movement, and research is continuing in this area". . . [and] the study was inconclusive [and] additional studies are planned during 1997." Clearly the EIS itself is contradictory about the need
83 to develop additional information on groundwater pathway analyses for the disposal sites in Area 3.

84 State officials suggest that DOE re-evaluate and state in the EIS the need for a specific groundwater pathway analysis for the Area 3

[8] See EIS, Page 2-22, lines 26 - 30.

84 cont. disposal site. Also, relying on the model that was developed for the Area 5 site as a substitute for developing a specific analysis for the Area 3 site is not acceptable (See Page 2-22, lines 28-30). While we concur that the natural hydrological and geological environments beneath the two NTS disposal sites may have been similar in the past, nuclear testing has induced ground motion and fracturing at Area 3 and has clearly changed the natural conditions at this site. A total of 251 underground nuclear tests were conducted at Area 3 as opposed to only five tests at Area 5.[9]

PAGE 2-23
Line 32

Transuranic Waste in Trench T04C Performance Assessment

As disclosed in the EIS, in 1986, transuranic waste shipped from DOE's Rocky Flats plant in Colorado was buried at the Area 5 waste disposal site at the NTS. Yet the subsequent preliminary analysis of the site (as per CFR Part 191) suggests the waste site may not meet adequate disposal confinement requirements. The EIS states that "Preliminary performance assessment studies indicate that this source term [transuranic waste buried in Trench TO4C] is noncompliant with the containment and individual protection requirements [contained in 40 CFR 191]." To address this unfavorable situation, the EIS suggests that DOE officials will identify and assess appropriate corrective measures as a result of the preliminary performance assessment.

85 ***COMMENT 023*** State officials expect a discussion of one or more alternative actions to address compliance with the environmental radiation protections

---

[9] See EIS, Pages 4-14 and 4-15

85 cont. standards stipulated under CFR 191 for the referenced waste site. The discussion should be presented in the Final EIS. Moreover, a commitment to implement the identified remedies should be stipulated in the EIS Record of Decision.

86 The State also knows that the greater confinement boreholes at the Area 5 disposal site were shut down because these boreholes did not meet the requirements of the Safe Drinking Water Act. This is one more instance where the State expects DOE to develop alternative actions and corrective action plans to bring this activity into compliance. It is not acceptable mitigation to simply cease an activity that is in violation of requirements. Measures must be taken to adequately mitigate the contamination. DOE should commit to this action in the EIS ROD.

3.0 DESCRIPTION OF ALTERNATIVES

PAGE 3-3
Line 19

Section 3.1.1.1: Stockpile Stewardship; First Scenario

Destroying damaged nuclear weapons.

87 ***COMMENT 024*** A review of the existing public land orders that established the NTS reveals that this activity is inconsistent with both the purpose and intent of the withdrawal orders. The NTS was established for nuclear testing activities and related research and development programs only, not for destroying damaged nuclear weapons. Discussion of this activity should be excluded from activities classified as continued and current operations.

PAGE 3-4 **Section 3.1.1.2: Waste Management Program under Alternative 1**

88 ***COMMENT 025*** Again, a review of the existing public land orders that established the NTS clearly show that the activities discussed here are inconsistent with both the purpose and intent of the withdrawal. The NTS was not established to serve as a waste disposal site for off-site generated defense wastes. In reference to the No Action Alternative, the description of the NTS waste management program described under Alternative 2, Section 3.1.2.2 aptly describes the type of on-site disposal program that would be consistent with existing site mission requirements stipulated under the public land orders.

PAGE 3-6 Line 7 **Conventional Weapons Demilitarization**

89 ***COMMENT 026*** The EIS should reference the congressional action and/or direct appropriation made in support of this mission activity. If no such authorization is available, the function should be considered only as part of the expanded use alternative.

PAGE 3-6 **Land-Use -- Nuclear Test Zone**
Figure 3-1 and Line 23

90 ***COMMENT 027*** Several areas in the northeastern corner of NTS are identified in Figure 3-1 (Pages 3-8 to 3-9) as Nuclear Test Zones (areas 1-4 and 7-10) and Nuclear or High Explosive Test Zones (areas 12 and 16). Legislation currently pending in Congress (H.R.1020 and S.1271)

90 cont. directs DOE to construct a road for truck transport of spent nuclear fuel and high-level radioactive waste through these areas (along the "Chalk Mountain Route") to an interim storage facility in Area 25. Since these bills have been reported out of the congressional committees of jurisdiction, and the bills identify a specific route through these areas, the proposed heavy haul truck operations cannot be dismissed as speculative activities. If any of these proposals are enacted by Congress, the EIS must be supplemented. The supplement would need to discuss the compatibility or incompatibility of heavy haul truck operations with DOE's use of lands for underground nuclear weapons tests and underground and surface high-explosive tests or experiments proposed under Alternative 1.

91 ***COMMENT 028*** A significant portion of DOE'S proposed Nuclear Test Zone is located on the Pahute Mesa. While State officials are not necessarily opposed to this suggested land-use designation, the EIS should clarify that such a designation may not be within DOE's control. The Pahute Mesa constitutes public lands that have been temporarily withdrawn for military use -- and then subsequently "loaned" to DOE for nuclear testing activities (See footnote 5). As DOE is aware, any future use of the Pahute Mesa after 2001 is subject to Congressional approval per PL. 99-606. The Final EIS should clarify these facts.

PAGE 3-14
Lines 14-28 **Alternative 3, Expanded Use: Defense Programs**

COMMENT 029

92 The four public land orders that established the NTS fail to support activities covering storage, assembly, disassembly, and modification of nuclear weapons. Likewise, interim storage of plutonium pits and weapons components and long-term storage and disposition of weapon-usable fissile materials are not consistent with these land withdrawal orders.

93 In fact, if DOE selects any of the these activities as part of the preferred alternative, then the EIS must evaluate these activities for possible conflicts with the objectives of federal, state, and local land use plans, policies, and controls (See CEQ 1502.16 (c)). Our review of the draft EIS suggests that such an evaluation is clearly missing for the land use requirements contained in the NTS public land orders. Sections 5.1.1.1 and 5.3.1.1.1 and Appendix C of the EIS contain no such evaluation.

94 In a related matter, State officials do understand that decisions regarding waste disposal, weapons management, and storage and disposition of weapons-usable fissile materials are being assessed in three different and separate DOE Programmatic Environmental Impacts Statements (PEIS). We are also aware the NTS is considered a viable alternative in each of these PEIS documents. However, since these documents do not propose to address site-specific CEQ compliance issues, such as conflicts with "objectives

DOE EIS
Nevada Test Site
May 3, 1996
State Clearinghouse
SAI # 95300110

94 cont. of federal plans, policies, and controls", then we must again insist that the NTS EIS contain such an evaluation.

95 At a minimum, if the proposed action defined in the Final EIS conflicts with existing permitted land uses at NTS, then DOE must commit in the EIS Record of Decision to address the resolution of such conflicts. A detailed strategy to resolve such conflicts should be specifically defined in the Mitigation Action Plan for the EIS.

PAGE 3-15 **Section 3.1.3.2: Waste Management Program under Alternative 3**

COMMENT 030

96 Included in the list of waste management activities on this page is a proposal to expand the disposal capability at NTS for wastes defined as "inappropriate for shallow land disposal." We must assume this refers to waste materials buried in the 13 greater confinement disposal boreholes and/or other deep trenches at the Area 5 disposal facility.[10] According to the EIS, these waste materials could be defined as Greater-Than-Class-C low-level waste, high-specific-activity low-level waste, transuranic waste, transuranic mixed waste, and classified wastes.[11] As mentioned previously, State officials believe these wastes are defined as Special Case Waste, and accordingly, must be subjected to a broad programmatic analysis under the regulations of the National Environmental Policy Act.

---

[10] See EIS, Page A-29, lines 21-28

[11] See EIS, Page 4-45

In fact, State officials understand that alternatives for storage and disposal of DOE's SCW (along with GTCC waste) will be evaluated in a forthcoming Supplemental Environmental Impact Statement, "tiered" from DOE's Waste Management Programmatic EIS.[12] This EIS will likely consider a disposal strategy which proposes co-disposal of SCW with GTCC waste in a single NRC-licensed disposal facility. This is important, since the proposed repository at Yucca Mountain would be one of the candidate disposal sites. (Presumably, if the discussion in the NTS EIS is to be believed, a disposal site on the NTS will also be considered.) Yet the NTS EIS
97 fails to discuss any of these issues. In fact, the entire discussion about waste defined as <u>inappropriate for shallow land disposal</u> is convoluted, misleading, and generally misrepresented in the EIS. Alternative 1, for example, proposes continued "Greater Confinement Waste Storage"[13] of this waste, while Alternative 3 proposes that "disposal capability for high-specific activity, low-level waste would be expanded."[14]

DOE's NEPA compliance strategy for management and disposition of SCW and its relationship to the NTS EIS must be clarified. In
98 addition , if either the Area 5 or Area 3 disposal sites are considered for confinement of SCW, as proposed under Alternative 3, the

[12] Notice of Inquiry: Strategy for Management and Disposal of Greater-Than-Class-C Low-Level Radioactive Waste. Federal Register Notice, Vol. 60, No. 48, Monday, March 13, 1995.

[13] See EIS, Pages S-9 and 3-333

[14] See EIS, Page A- 40, line 26

98 cont. difficulties associated with meeting the waste acceptance criteria for dissimilar waste types must be addressed. As DOE is aware, in 1994, the Defense Nuclear Facilities Safety Board (the Board) evaluated DOE's low-level waste management program across DOE's weapons complex. That review resulted in Recommendation 94-2.[15] One of the findings in Recommendation 94-2 covered the content and implementation of DOE standards, orders, and regulations concerning the disposal of low-level defense waste.

Specifically, the Board found that in establishing low-level waste sites, DOE guidance for meeting established performance assessment criteria constrained "evaluators to apply reference dose criteria to disposal facilities individually rather than assessing <u>composite effects</u> when contiguous burial facilities exist." This means that DOE has established low-level disposal sites in such a way as to significantly complicate performance assessment approaches for determining radionuclide migration to the biosphere. Hence, if DOE proceeds with a co-disposal decision at one of the existing disposal sites on the NTS, the problems associated with addressing the
99 "composite effects" will have to be acknowledged in the EIS and addressed in the Performance Assessments for the Area 3 and 5 disposal sites.

[15] Defense Nuclear Facilities Safety Board, <u>Recommendation 94-2, September 15, 1994</u>. Federal Register Vol. 59, No. 178, page 47309.

PAGE 3-16 **Section 3.1.3.5: Work for Other Programs under Alternative 3**

COMMENT 031 If a research and demonstration project for conventional weapons demilitarization is successfully implemented at the NTS and a full
100 scale demilitarization program is subsequently proposed, then DOE must assess land-use conflicts with the mission requirements set forth in the existing land withdrawal orders for the site. In addition, if the proposed activity results in a commitment in perpetuity of land
101 and resources at the site, then the expressed purpose of the State's cession of jurisdiction of the NTS would also require review.

PAGE 3-22;23 **Potential Use of Relinquished NTS Lands under Alternative 4**
Public Recreation

COMMENT 032 The Timber Mountain Caldera is a national natural landmark which has been designated as an Area of Critical Environmental Concern. Under Alternative 4 (Figure 3-4), the EIS suggests that portions of NTS, including the Timber Mountain Caldera, could be considered as a potential turn back area (i.e., released to the Bureau of Land Management for public use). State officials concur with this approach and propose that DOE pursue "turn back" of the area as part of the EIS RMP process discussed in Volume 2 of the EIS. One of the RMP goals for guiding the conservation and use of resources at NTS could be the pursuit of this turn back option.

Also, the discussion of the Timber Mountain Caldera National
102 Natural Landmark should explain what the designation involves and the role of the National Park Service. Any biological or other

environmental studies of the area should be cited and summarized, and any DOE activities that have occurred there should be described.
102 cont. Figure 3-4, page 3-24, should include the official boundaries of the Timber Mountain Caldera National Natural Landmark, as given in Map 6, page 11, of the Bureau of Land Management Approved Nellis Air Force Range Resource Plan and Record of Decision, February 1992.

PAGE 3-26 **Alternatives Eliminated from Further Consideration**
Line 17 Receipt of waste from out-of-state waste generators.

COMMENT 033 In the State of Nevada's scoping comments for this EIS[16], it was stated "that the only action appropriately described as no action at the NTS includes only national defense and nuclear weapons testing activities defined under the public land orders as consented to by the State of Nevada for the NTS withdrawal."[17] We further stated that the activities described by DOE in its Notice of Intent as "No Action" were in fact "Expanded Use". The State's position on this
103 issue has not changed. Hence, receipt of waste from out-of-state

[16] Nevada Department of Administration, November 10, 1994, Letter to Donald R. Elle, State Clearinghouse Scoping Comments, Notice of Intent (NOI) for a Site-Wide Environmental Impact Statement for the Nevada Test Site and Other Off-site Test Locations

[17] Public Land Order 805, February 12, 1952; Public Land Order 2568, December 19, 1961; Public Land Order 3759, August 3, 1965, as consented to by the Nevada State Legislature, NRS 328.135, .160, .170. (See First Amended Complaint, State of Nevada vs. O'Leary, U.S. District Court [Nevada], Case No. CV-S-94-00576-PMP (RLH), ¶3.2.)

103 cont. waste generators can only be assessed in the EIS as "Expanded Use", not as part of the site's continued current operations.

PAGE 3-28 Lines 9-13 **Alternatives Including Rail Routes for Waste Transport**

"....no decision on rail access to the NTS will be made in this [NTS] EIS or in the Record of Decision. The DOE/NV recognizes, however, that a rail option would be a feasible alternative should the NTS be named the sole low-level waste disposal site for the DOE complex and defers any decision to such time that a decision in made in the Waste Management Programmatic Environmental Impact Statement."

COMMENT 034 In concept, State officials concur with this decision strategy for assessing rail access to the NTS. CEQ regulations (1508.28) encourage major federal actions to be covered in broader environmental impacts statements and thereafter be assessed in detail in subsequent site-specific EIS documents. Notwithstanding this approach, there are two separate converging decisions concerning rail transport of nuclear waste to the NTS which are actively being contemplated: (1) The Office of Civilian Radioactive Waste Management (DOE/OCRWM) has initiated scoping for the Yucca Mountain Repository EIS, and the document will assess rail access of spent nuclear fuel and high-level waste; (2) As stated in the NTS EIS, "Should the DOE decide to construct and operate a rail spur [to Yucca Mountain], the DOE/NV would perform additional evaluations associated with the use of this resource by low-level waste generators."

To adequately comply with the CEQ implementing regulations for NEPA, State officials contend that these additional evaluations would require preparation of a Supplemental EIS to the NTS Site-Wide EIS.[18] We note the analysis of rail impacts such as effects to human health and the environment will be performed by DOE\ OCRWM at both the programmatic and site-specific level (i.e., programmatic for rail transport outside of Nevada and site-specific for rail transport inside Nevada). Such an analysis will not, however, include a cumulative impact analysis of transporting repository-destined waste as well as low-level waste to the NTS. This paragraph
104 should state where the cumulative impacts from the Yucca Mountain Project will be addressed and why such impacts are not addressed in this EIS.

PAGE 3-29 **Yucca Mountain Repository Construction, Operation, and Closure**

COMMENT 035 Section 3.2.6.1 about the Yucca Mountain Project should site and discuss the Memorandum of Agreement (MOA) between DOE Nevada Operations Office and the Yucca Mountain Project (UN-
105 207) executed on September 1, 1994. The MOA should be included among the citations in Appendix C, Relevant Regulatory Requirements.

[18] CEQ 1508.7 (Cumulative impacts): CEQ 1502.9 (1)(1) Draft, final, and supplemental statements.

STATE GOVERNMENT 2 (CONTINUED)

Lines 20-24 "In accordance with the Nuclear Waste Policy Act, the DOE prepared an environmental assessment in 1986 to determine the suitability of the Yucca Mountain site characterization. The current characterization activities occurring at Yucca Mountain are evaluated in existing National Environmental Policy Act documents and are included in the discussion of cumulative impacts within this NTS EIS.

106 ***COMMENT 036*** These statements are inaccurate, misleading, and must be corrected. First of all, the 1986 statutory Environmental Assessment (EA) was not prepared "to determine the suitability of the Yucca Mountain site characterization." In fact, the EA served only as a site screening document. Section 112.(D) of the Nuclear Waste Policy Act (NWPA), as Amended, specifies the purpose and intent of the document. It requires the Secretary of Energy to "evaluate whether such site [Yucca Mountain] is suitable for site characterization . . ." In other words, the EA was mandated by the NWPA to determine if the site was suitable to initiate a detailed site characterization program. The Act required a separate and subsequent evaluation as "to whether such site [Yucca Mountain] is suitable for development as a repository."

107 Second, DOE has never prepared any NEPA documentation to assess the impact of any "current characterization activities" at Yucca Mountain. The 1986 statutory Environmental Assessment was not prepared in accordance with CEQ's NEPA regulations under 40 CFR Parts 1500-1508.

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS Nevada Test Site | May 3, 1996 | State Clearinghouse SAI # 95300110

Lines 27-33 **Monitored Retrievable Storage (MRS) at NTS**

COMMENT 037 As stated earlier, if congressional legislation directs DOE to site an MRS facility at the NTS, then the NTS EIS will need to be supplemented. If this occurs, the supplemental EIS must fully evaluate the potential risks and impacts of spent nuclear fuel and high-level nuclear waste transportation to the interim storage facility at NTS Area 25, along with NTS transportation activities of radioactive waste and special nuclear materials. In particular, such an assessment must address the compatibility of NTS on-site and off-site routine operations using existing and new transportation infrastructures, the potential impacts of very severe accidents and terrorist attacks involving interim storage facility shipments to NTS, and related implications for NTS transportation activities such as public perception impacts and interim storage facility transportation risks.

PAGE 3-36
Lines 11-14 **Defense Program (continued from Page 3-31)**

"From data on the number and dates of the underground tests at the NTS, a total quantity of radioactivity remaining underground is estimated to be 300 million Ci [Curies]. Much of this radioactivity remains captured in the original cavity, and thus is not available to leach into the groundwater."

108 ***COMMENT 038*** This statement is misleading and, according to other statements in this EIS, inaccurate. The pronouncement that much of the radioactivity "is not available to leach into the groundwater" at the NTS is not supported by the analysis presented in the EIS.

A definitive discussion concerning the uncertainties about the radiological source term in the groundwater at NTS is provided on Page 4-159. In that discussion, it is noted that nearly 40 percent of the source term at the site is bound up in the groundwater (i.e., 112 million curies). In addition, while statements in the EIS suggest that "there is considerable uncertainty concerning the actual quantity of this radioactivity that can enter the groundwater regime" (Page 4-159, line 19), other statements conclude that "the release of radionuclides through the leaching pathway [leaching of radionuclides from the melt glass and cavity rubble within each shot cavity] continues to be an area of active research and with time, a better understanding of the true hydrologic source term could be had" (Page 4-161, line 37). Finally, the document states that "future studies covered by this EIS will help to reduce the current levels of uncertainty concerning both the mechanisms and consequences of radionuclide transport via groundwater flow at the NTS."

109 The Final EIS should, therefore, explain the uncertainties regarding the current knowledge of radiological source term contamination currently in the groundwater and the uncertainties associated with further contamination of the groundwater by leaching down through the shot cavities.

PAGE 3-37

Lines 14-15

Waste Management

"The majority of postulated injuries and fatalities would be a result of normal traffic accidents and not a result of exposure to the transported waste. Accidents that involve release of radioactive waste were factored into the risk evaluation."

110 ***COMMENT 039*** This statement cannot be verified based on the information presented in the EIS and the supporting Transportation Study (Appendix I).

111 The EIS fails to provide a detailed discussion of a maximum credible severe accident or terrorist attack. To the extent that the statement can be supported by information presented in the EIS, the conclusion would apply only to shipments of low- level radioactive and mixed wastes.

Lines 16-18 "The DOE is committed to working with stakeholders and the American Indian sovereign nations on transportation issues during the National Environmental Policy Act process and into the future as issues arise."

112 ***COMMENT 040*** DOE must address specific routing issues for low-level waste shipments to the NTS. Specifically, and in consultation with sovereign nations and affected units of local government, DOE must develop a preferred low-level waste route alternative(s) for inclusion in the Final EIS. In addition, the agency must stipulate specific routes in the EIS Record of Decision, as well as institute a process of contractually requiring shippers to adhere to the selected routes.

Lines 26-28 "Even if low-level waste disposal was to result in the downward movement of contaminants to the deep subsurface, the incremental contribution of contamination [from waste disposed in craters at Area 3] to the radiologic source contained at and near the point of detonation would be negligible."

113 ***COMMENT 041*** This statement is contrary to DOE policy which specifically promotes management of radioactive waste to protect and preserve the environment.[19] Furthermore, there is no data or performance assessment presented that substantiates this conclusion.

PAGE 3-41
Table 3-55
Summary Comparison of Environmental Impacts

114 ***COMMENT 042*** The statements made in this table cannot be verified based on the information presented in the EIS and the supporting Transportation Study (Appendix I).
115 The EIS fails to provide a detailed discussion of a maximum credible severe accident or terrorist attack. To the extent that the statements are supported by information presented in the EIS, the conclusions would apply only to shipments of low-level radioactive and mixed wastes.

4.0 AFFECTED ENVIRONMENTS

PAGE 4-3
Lines 3-6
Nevada Test Site and Surrounding Areas

"The NTS is in a remote and arid region, **surrounded** [emphasis added] by federal lands, with strictly controlled access . . . [and] the surrounding federal lands are not available for public use . . ."

[19] "DOE low-level waste operations shall be managed to protect the health and safety of the public, **preserve the environment** [emphasis added] of the waste management facilities, and ensure that no legacy requiring remedial action remains after operations have been terminated." (See DOE order 5820.2A {Chapter III 2. a. Policy}, Management of Low-level Waste.)

116 ***COMMENT 043*** This statement is misleading and incorrect. Most of the NTS is surrounded by "federal lands" that have been temporarily withdrawn for military use or for conservation, such as the Nellis Air Force Range and the Desert National Wildlife Refuge. However, a portion of the lands on the southern and southwestern borders of NTS is directly contiguous to public lands. Those public lands are managed for multiple use by the Bureau of Land Management. The text in the EIS should be corrected accordingly.

PAGE 4-8
Table 4-1
Summary of Remaining Radioactivity on the NTS

117 ***COMMENT 044*** In addition to the grouped data presented in Table 4-1 on remaining radioactivity at the NTS, the EIS should also provide an isotope inventory of radionuclides remaining in the vadose zone for various geographic areas such as Frenchman's and Yucca Flats. While Table 4-27 on Page 4-160 does provide limited information for areas considered under or within 330 ft. of the water table, the EIS fails to provide this type of data for the vadose zone.

PAGE 4-9
Lines 18-21
Public Land Orders and Withdrawals

"Pahute Mesa, located in the northern portions of Areas 19 and 20, which encompasses approximately 106,240 acres, is managed by the DOE as a part of the NTS in accordance with a 1963 Memorandum of Understanding with the U.S. Air Force."

118 ***COMMENT 045*** As mentioned previously (Comment 16), continued use of Pahute Mesa is uncertain and subject to Air Force compliance with PL 99-

DOE EIS Nevada Test Site | May 3, 1996 | State Clearinghouse SAI # 95300110

118 cont. 606. DOE officials should be aware that long term institutional management of Pahute Mesa should not be subject to temporary military withdrawals, where land is not being used or contemplated for use by the Air Force for ground defense activities. This EIS is for a 10 year period; the Air Force jurisdiction, and thus the MOU, will expire within this time period. Therefore, the EIS must describe the intended action.

Lines 23-28

119 ***COMMENT 046*** The discussion about the Bureau of Land Management's review process for the NTS public land orders is incomplete. The text in the EIS must be expanded to include the current status of the review process. See related Comments 11, 159, and 160.

PAGE 4-15
Line 7

Area 4

120 ***COMMENT 047*** The Big Explosives Experimental Facility is first mentioned here. There is no cross reference to Appendix F, which is a Project-Specific Environmental Analysis for the facility. The facility should be included in Chapter 2, Purpose and Need for DOE Action, and the purpose for Appendix F should be explained there. (See Comment 162)

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS Nevada Test Site | May 3, 1996 | State Clearinghouse SAI # 95300110

PAGE 4-25
Figure 4-4

NTS and Surrounding Land Use

121 ***COMMENT 048*** The referenced figure is incorrect. There is no Yucca Mountain Land Withdrawal.

PAGE 4-26
Line 3

Site Support Activities

122 ***COMMENT 049*** Reference to Section A.7 is incorrect; the reference should be A.6.

PAGE 4-29
Table 4-3

Active Water Supply Wells on the NTS

Army Well 1

123 ***COMMENT 050*** The information listed for Army Well 1 appears to be incorrect. The detailed discussion on the water supply presented in Appendix A (A.6.1.1.3) indicates that Army Well 1 provides water for the southern half of NTS only. (See Page A-86, lines 23-29.)

124 In a related matter, the overall discussion of the NTS water supply system presented in Section 4.1.1.3 of the EIS, as well as in Appendix A, clearly indicates that significant improvement to the existing water supply and distribution system would be needed to accommodate expanded use activities proposed in Alternative 3 of the EIS. Accordingly, a general statement as to the overall condition of the water supply and distribution system should be presented in the EIS under Section 4.1.1.3. Also, the impacts of any

124 cont. intended upgrades to the water supply system should be described as part of the analysis of the Expanded Use Alternative.

PAGE 4-32 **Electrical System**
Lines 17-34 General discussion

125 ***COMMENT 051*** The discussion of the NTS electrical system fails to note that, because of load reductions over the past 2 years, all planned improvements to the subtransmission lines at the site have been canceled. (See Appendix A, Page A-79, lines 23-27). Additionally, the discussion fails to mention that the 138-kV tie line between Frenchman and the Jackass Flats substation is permanently out of service, and that the power lines, insulators, and poles connecting the Area 12 camp and Pahute Mesa are in poor condition and difficult to repair, resulting in prolonged losses of power to the Mesa area. While these important facts are mentioned in the details provided in Appendix A, they should be highlighted in Section 4.1.1.3 of the EIS.

PAGE 4-37 **Airspace**
Lines 6-7 Restricted Areas 4808 and 4809

126 ***COMMENT 052*** The discussion about the need for and use of Restricted Area R4808 is missing from Section 4.1.1.4 of the document. Airspace area R4808 overlies the NTS and is managed by DOE. According to the EIS, civilian aircraft are never allowed to fly in this restricted airspace. Since nuclear testing has been halted, however, the need for maintaining this restricted airspace must be explained in the EIS.

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS Nevada Test Site — May 3, 1996 — State Clearinghouse SAI # 95300110

In the State's scoping comments, it was stated that DOE should "evaluate the potential for allowing the restricted airspace over the NTS [R4808] to be used by the Air Force at Nellis and\or other Department of Defense agencies." We argued that by allowing defense agencies to use this airspace, it would permit other special-use airspace to be returned to public domain status and/or avert additional planned military airspace withdrawals in Nevada. It was stated that "this is a significant issue in Nevada since more than 40 percent of the State's airspace (i.e., below 18,000 feet mean sea level) is designed for military use."

Under Alternative 4, Alternate Use of Withdrawal Lands, the EIS does point out that "the restricted airspace that overlies the NTS would be relinquished and would be available for commercial and general aviation use." Yet this action is predicated on the discontinuation of all defense-related activities at the NTS, something we generally consider a spurious alternative.

127 Hence, justification to retain exclusive control of the airspace over the NTS must be addressed in the EIS, given the continuing ban on nuclear testing along with presidential directives to maintain a zero yield underground testing program.

PAGE 4-44 **Disposal Operations**
Lines 9-24 Area 3 Disposal Site.

128 ***COMMENT 053*** The text in this section fails to describe the nuclear test events that created the subsidence craters now used and/or contemplated for use

128 cont. as low-level disposal units at the Area 3 disposal site, (i.e., U3ax/bl, U3bg, U3ah/at, U3az, and U3bh). Discussion of this information is relevant, since the rubble chimneys beneath the craters are considered potential pathways for radionuclide migration. The only reference to the depths of the shot cavities beneath these subsidence craters is a single notation concerning the U3bh exploratory borehole. This borehole is being developed to characterize the physical and hydrologic properties of the chimney and to assess the potential for downward groundwater movement and radionuclide transport (See Page A-31, lines 8-14).

129 In addition, the discussion covering Geology and Soils in the EIS (Section 4.1.4) fails to disclose this information, even though the text states that "discussion of specific administrative units [such as the Area 3 disposal site] are also included in separate subsections when information at a local scale increases understanding and assists in the evaluation of impacts." No discussion of the conditions of the existing geology and soils for the Area 3 site are provided in separate subsections.

PAGE 4-45
Lines 18-24

Selecting Subsidence Craters for the Disposal of Waste

COMMENT 054

130 The reference in this section (Hawkins, 1995) is not listed in the reference section on Page 4-318 of the EIS. 131 Moreover, since State officials are concerned about the process the DOE used in selecting subsidence craters for waste disposal, we are requesting a copy of the referenced document by Hawkins.

PAGE 4-46
Lines 21-26

Mixed Waste

COMMENT 055

132 The text in this section of the EIS suggests that the State of Nevada will defer action on a Resource Conservation and Recovery Act Part B permit application for new mixed waste disposal units at the Area 5 disposal site "until the completion of negotiations between all States and the DOE under the Federal Facility Compliance Act" are complete. While this statement may be true, completion of a Part B permit for mixed waste disposal at the NTS will not be considered in advance of a national disposal siting decision for mixed waste as per DOE's Waste Management PEIS. In other words, before Nevada officials consider the Part B permit for new mixed waste disposal units at the NTS, DOE must issue a Record of Decision which proposes the NTS as a disposal site for theses wastes and completes the requirements in NAC 444-8458, Certificate of Designation Process. Moreover, it is the State's position that a completed performance assessment for the Area 5 disposal site must be in place before any action is taken on the Part B permit. These conditions should be stipulated in the text of the Final EIS.

PAGE 4-47
Lines 4-24

Nonhazardous Solid Waste
Area 9 Landfill

COMMENT 056

The text in this section states that "changes in State regulatory requirements will cause the Area 9 landfill to undergo partial closure and reopen as a Class III construction and demolition landfill." The discussion also acknowledges that modification to the landfill and

the associated potential impacts to the environment are covered in a recently published Environmental Assessment (the EA for Solid Waste Disposal - DOE, 1995a). The text in this section fails, however, to provide a description of why the referenced EA was
133 prepared. It also fails to provide a discussion about both existing and potential environmental impacts at the Area 9 landfill site. Hence, the "Affected Environment" is not adequately described.

Accordingly, the Final EIS should reflect that new solid waste
134 regulations now require that NTS municipal landfills be permitted in order to meet groundwater monitoring, design, operation, and closure requirements. The Final EIS should also document that the Area 9 landfill is located in a subsidence crater formed as a result of a subsurface nuclear detonation, the Turf event detonated in the 1960s. According to DOE, the Turf shot created the U10c
135 subsidence crater, and the denotation was conducted only 150 feet above the water table in NTS Area 9.[20] The Final EIS should reflect that continued use of the site as a Class III landfill will require partial closure, which among other things will include installation of a well monitoring system to assess the movement of moisture beneath the confinement layer of the new disposal cell.

PAGE 4-48 ***Line 36*** **Waste Storage Operations**

"Mixed Waste -- Currently, no mixed waste treatment operations occur at the NTS."

[20] U.S. Department of Energy, 1995. Final Environmental Assessment for Solid Waste Disposal, Nevada Test Site, Nye County, Nevada (DOE/EA-1097).

COMMENT 057 While this statement is true, it is not representative of the current status and thus must be corrected in the Final EIS. Since the draft NTS EIS was published, DOE/NV issued a Site Treatment Plan (STP)[21] for the management of mixed waste. The STP identifies specific treatment facilities for treating existing and on-site generated mixed waste, and it contains enforceable schedules and milestones for waste management and treatment activities, as required under the Federal Facility Compliance Act (FFCAct). Section 1.5.2 of the referenced STP states that "NTS mixed waste treatment planning
136 will be an integral part of the NTS EIS process." Significant actions involving the treatment of mixed waste proposed in the NTS EIS are specifically limited, however, to Alternative 3, Expanded Use.[22] Federal law (FFCAct) required DOE/NV to prepare the STP along with a requirement for State approval of the STP. Given that DOE has now signed a Consent Order implementing the STP, federal actions required by this Order and the STP must now be considered as part of Alternative 1 - Continue Current Operations, the so-called No Action Alternative. Sections A.2.3.2, Page A-42, lines 1-32 and any other relevant sections (i.e., Sec. 4.1.2.3, line 12) of the EIS should be changed accordingly.

[21] U.S. Department of Energy, 1996. Nevada Test Site Treatment Plan, Nevada Operations Office, Waste Management Division (DOE/NV-397 (Rev.2).

[22] See EIS, Section 3.1.3.2

DOE EIS | May 3, 1996 | State Clearinghouse
Nevada Test Site | | SAI # 95300110

PAGE 4-61
Line 20

Low-Level Waste

"The **average annual** [emphasis added] low-level waste transported to the Area 5 Radioactive Waste Management Site during 1961 to 1991 was 14 million ft^3."

137 ***COMMENT 058*** This statement means that 14 million ft^3 of waste was received each year for the years indicated. Since this is incorrect, the text should be revised.

PAGE 4-68
Line 23

Socioeconomic -- Region of Influence

The draft EIS defines the region of influence as "the area in which the principal direct and secondary socioeconomic effects of the project are likely to occur and are expected to be of the most consequence for local jurisdictions." The draft goes on to identify Clark and Nye counties and their various subdivisions as the region of influence.

138 ***COMMENT 059*** The region of influence for socioeconomic analysis in the EIS must include the State of Nevada as a whole. Socioeconomic impacts of NTS activities will have localized impacts that will be manifest within counties and sub-county jurisdictions. However, NTS activities will also have impacts that will be felt at the State level, with possible implications for State revenues and services. These potential impacts must be examined in the EIS.

In addition, the principal area for socioeconomic risk to the State from various NTS activities derives from potential impacts to the tourism/gaming industry. While such risk may be greatest for Clark

DOE EIS | May 3, 1996 | State Clearinghouse
Nevada Test Site | | SAI # 95300110

139 County and the Las Vegas economy, it has very significant implications for the State as a whole because of Nevada's revenue and tax structure and the predominance of tourism/gaming in the overall economic functioning of the State. The EIS, therefore, must assess the potential for NTS activities (such as the transportation of nuclear and hazardous materials) to negatively affect tourism and then examine how such negative impacts would be manifested throughout the State's economic system.

Selected studies dealing with potential tourism and related risk impacts associated with the high-level radioactive waste program at Yucca Mountain can be found in the following publications. These publications are not intended to represent a complete listing of all relevant literature, but to provide examples of the voluminous amounts of information that are available and should be used in the NTS EIS. The Yucca Mountain project is a valid analog case for various proposed NTS activities that involve the handling, transport, storage, or disposal of nuclear materials.

NWPO-SE-022-89: "Yucca Mountain Socioeconomic Project: An Interim Report on the State of Nevada Socioeconomic Studies" (June, 1989)

NWPO-SE-056-93: "State of Nevada Socioeconomic Studies of Yucca Mountain 1986 - 1992: An Annotated Guide and Research Summary" (June, 1993)

"The Vulnerability of the Nevada Visitor Economy to a Repository at Yucca Mountain" by Doug Easterling in State of Nevada Socioeconomic Studies Biannual Report, 1993 - 1995, NWPO-SE-063-95 (July, 1995)

"Monitoring Stigma" by James Flynn, et al. in State of Nevada Socioeconomic Studies Biannual Report, 1993 - 1995, NWPO-SE-063-95 (July, 1995)

"The Social Amplification of Risk: A Conceptual Framework" by R.E. Kasperson, O. Renn, P. Slovic, H.S. Brown, J. Emel, R Goble, J.X. Kasperson, & S. Ratick in Risk Analysis, 8,177-187.

PAGE 4-69 **Economic Activity**

COMMENT 060

140 This section attempts to describe the economic and demographic context for each of the jurisdictions identified as regions of influence. It is apparently intended to serve as a quasi-baseline against which to examine possible project-induced economic effects. However, nowhere is the State's largest economic sector, the tourism/gaming sector, baselined. Indices such as the number of tourists that visit Las Vegas and Clark County, where they come from, the amount of money they bring into the State and local economies, their demographic characteristics, their propensities to be deterred from visiting Nevada as a result of various NTS activities or accidents related to such activities, and other important information are ignored completely. Likewise, the characteristics of the

140 cont. phenomenal, sustained growth that has occurred in Nevada's tourism/gaming over the past two decades is not examined anywhere in this so-called socioeconomic analysis. Without such baseline information, it is impossible to project what impacts are likely to occur as a result of the various EIS alternatives.

PAGE 4-89
Line 9 **Public Services**

This section describes public education, police protection, and health care in the counties and cities within the region of influence.

COMMENT 061

141 A glaring omission in the discussion of baseline conditions is the lack of attention to the status of emergency preparedness/emergency management in the affected counties and cities as well as at the State level. Since the EIS covers proposed activities that involve the handling, storage, and transport of nuclear, hazardous, and toxic materials in extraordinarily large volumes over an extended period of time, the EIS must contain a thorough assessment of the capabilities of Nevada's state and local governments to respond to potential accidents and emergencies involving radioactive and toxic materials, including incidents where such materials are released to the environment and come in contact with people and ecosystems. To do this, it is imperative that a baseline be established in the EIS that adequately reflects the response capabilities within the State and affected jurisdictions. This must be part of the socioeconomic baseline for the EIS so that the costs of any needed enhancements to these capabilities can be later assessed.

DOE EIS
Nevada Test Site
May 3, 1996
State Clearinghouse
SAI # 95300110

The establishment of accurate baseline information on emergency preparedness capabilities is also important for assessing the likely impacts of potentially stigmatizing events and accidents. The ability to respond quickly and effectively to high profile incidents where fear and strong negative public perceptions are involved could have an attenuating influence on the severity of impacts. Conversely, the lack of adequate response capabilities and health care facilities can seriously exacerbate and amplify any impacts.

PAGE 4-97 Lines 6-7 — <u>**Geology and Soils**</u>

"Discussions of specific administrative units are also included in separate subsections when information at a local scale increases understanding and assists in the evaluation."

142 ***COMMENT 062*** Specific discussion of the Area 5 and Area 3 disposal sites, the Area 9 landfill site, the Defense Nuclear Agency (DNA) tunnel complex, the specific sites which have been set aside for future nuclear tests (i.e., the defense readiness program), and the sites identified for solar development should be discussed as "separate subsections". All of these sites are proposed for expanded use activities that will impact geology and soils.

PAGE 4-106 Line 26 — <u>**Subsurface Radiologic Sources**</u>

"The major impacts of an underground nuclear test on the physical environment are ground motion, disruption of the geologic media, surface subsidence, and contamination of the subsurface geologic media and surface soils."

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site
May 3, 1996
State Clearinghouse
SAI # 95300110

143 ***COMMENT 063*** Assuming that the physical environment includes groundwater, then groundwater must be listed as a resource [in the referenced text] that would be impacted by an underground nuclear test. The EIS estimates that nearly 40 percent of the radiological source term at the NTS (112 million curies) is bound up in the groundwater. The EIS fails, however, to provide a radiologic source term estimate for radionuclides contained in the subsurface vadose zone.

PAGE 4-110 Lines 8-9 — <u>**Subsurface Radiologic Sources**</u>

"Site selection factors that are essential to ensuring both containment and the integrity of test data have also ensured that failures within the test areas have not and would not occur."

144 ***COMMENT 064*** While this statement may be true for recent and proposed underground nuclear tests, it is not true underground tests conducted in the past that have failed, resulting in significant venting of radionuclides to the ground surface and to the atmosphere. The EIS does acknowledge that past testing activities have failed to fully contain the release of radionuclides (See Page 4-187, line 28), but this should be further described in the document.

PAGE 4-113 Lines 34-35 — <u>**Seismicity**</u>

COMMENT 065 The text indicates that current design practices require facilities to be built to seismic Zone 4 Uniform Building Code standards. Lines 5-10 on the same page discuss damage to the Yucca Mountain Field Operation Center, located in Area 25, from the 1992 Little Skull

145 Mountain earthquake and state that the facility was built prior to the more stringent building codes presently followed on the NTS. Given that the NTS is located in a region with moderate to major earthquake damage potential, a table listing all engineered structures and whether these structures were built to current seismic Zone 4 standards or previous, less stringent standards would be appropriate. Such a table would provide a measure of the vulnerability of DOE facilities to damage from future moderate to large earthquakes.

PAGE 4-115
Lines 23-24

Volcanism

COMMENT 066 The text states: "Based on analysis of previous basaltic volcanism in the NTS region, there is no evidence of either an increase in the volcanic rate or the development of a large-volume volcanic field (Crowe et al., 1986)." The volcanism section makes no definitive statement as to whether a volcanic hazard exists at NTS, NAFR complex, or TTR.

146 The volcanism discussion is deficient because it fails to discuss or cite other literature that presents information that argues for future volcanic activity in the region. The following citations are some examples:

Bradshaw, T.K., and Smith, E.I., 1994, Polygenetic Quaternary volcanism in Crater Flat, Nevada: Journal of Volcanology and Geothermal Research, v. 63, p. 165-182.

Connor, C.B., and Hill, B.E., 1994, Estimating the probability of volcanic disruption of the candidate Yucca Mountain Repository using spatially and temporally nonhomogeneous Poisson models: American Nuclear Society Focus '93.

Faulds, J.E., Feuerbach, D.L., and Smith, E.I., 1991, New insights on structural controls and emplacement mechanisms of Pliocene/Quaternary basaltic dikes, southern Nevada and northwestern Arizona [abs.]: Geological Society of America Abstracts with Programs, 1991 Annual Meeting, October 1991, San Diego, California, v. 23, no. 5, A118.

Faults, J.E., Bell, J.W., Feuerbach, D.L., and Ramelli, A.R., 1994, Geologic map of the Crater Flats area, Nevada, (with 3 cross-sections): Nevada Bureau of Mines and Geology Map 101.

Feuerbach, D.L., and Smith, E.I., 1990, Structural control of Pleistocene volcanism in Crater Flat, Nevada [abs.]: Geological Society of America Abstracts with Programs, 86th Annual Meeting/Cordilleran Section, March 1990, Tucson, Arizona, v. 22, no. 3, p. 23.

Ho, C.H., Smith, E.I., Feuerbach, D.L., and Naumann, T.R., 1991, Eruptive probability calculation for the Yucca Mountain site, USA: Statistical estimation of recurrence rates: Bulletin of Volcanology, v. 54, pp. 50-56.

Ho, C.H., 1992, Risk assessment for the Yucca Mountain high-level nuclear waste repository site: Estimation of volcanic disruption: Mathematical Geology, v. 24, pp. 347-364.

Ho, C.H., 1992, Volcanic risk assessment for the Yucca Mountain high-level nuclear waste repository site: presented at the 29th International Geological Congress held in Kyoto, Japan, August 25-September 4, 1992.

Naumann, T.R., Feuerbach, D.L., and Smith, E.I., 1991, Structural control of Pliocene volcanism in the vicinity of the Nevada Test Site, Nevada: An example from Buckboard Mesa [abs.]: 87th Annual Meeting/Cordilleran Section, March 1991, San Francisco, California, v. 23, no. 2, p. 82.

Sheridan, M.F., 1992, A Monte Carlo technique to estimate the probability of volcanic dikes: Proceedings, High Level Radioactive Waste Management, v. 2, p. 2033-2038.

Smith, E.I., Feuerbach, D.L., Naumann, T.R., and Faults, J.E., 1990, The area of most recent volcanism about Yucca Mountain, Nevada: Implications for volcanic risk assessment: American Nuclear Society: Proceedings of the International Nuclear Waste Symposium, American Nuclear Society of Civil Engineers, April 1990, v. 1, pp. 90-97.

Smith, E.I., Feuerbach, D.L., Naumann, T.R., and Ho, C.H., 1991, Volcanic risk assessment studies for the proposed high-level

radioactive waste repository at Yucca Mountain, Nevada, USA [abs.]: International Conference on Active Volcanoes and Risk Mitigation, Naples, Italy, August 27-September 1, 1991, Abstract Volume.

Wells, S.G., McFadden, L.D., Renault, C.E., and Crowe, B.M., 1990, Geomorphic assessment of late Quaternary volcanism in the Yucca Mountain area, southern Nevada: Implications for the proposed high- level radioactive waste repository: Geology, v. 18, p. 549-553.

Wells, S.G., Crowe, B.M., McFadden, L.D., Turrin, B.D., Champion, D.E., and Fleck, R.J., 1992, Measuring the age of the Lathrop Wells volcanic center at Yucca Mountain: Science, v. 257, p. 555-558.

147 In sum, this literature assigns late Quaternary to early Holocene ages to the most recent volcanic activity in Crater Flat and the Sleeping Buttes volcanic center along the west side of the NAFR complex. Some of the literature (Smith et al. 1990) proposes an area of most recent volcanism that includes Crater Flat, Yucca Mountain, and Buckboard Mesa. The literature concludes that there is a significant probability of future volcanism activity occurring at NTS, most likely in the western portion. The volcanism section must be rewritten to present the current state of knowledge about volcanic hazard and the assessment of future risk.

PAGE 4-115 **Geotechnical Hazards**

148 **_COMMENT 067_** The Geotechnical Hazards section could benefit from a map that identifies those areas which are prone to slope instability, soil stability problems, and ground instability. Sites with such problems can be engineered to mitigate the hazard. The text discussion is generic, but the suggested inclusion of a map outlining the hazard-prone areas would resolve the comment.

PAGE 4-118 **Geologic Resources**

149 **_COMMENT 068_** The Geologic Resources section should be expanded to include a more comprehensive discussion. The potential for geologic resources must be considered in any discussions of future public access to all or portions of NTS, TTR, and/or the NAFR complex. The following reports provide a more definitive treatment of mineral and energy resources than that contained in the draft EIS:

Bell, E.J., and Larson, L.T., 1982, Overview of Energy and Mineral Resources for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, NVO-250, Nevada Operations Office, U.S. Department of Energy, Las Vegas.

Quade, J., and Tingley, J.V. (1983), A mineral inventory of the Nevada Test Site, and portions of the Nellis Bombing and Gunnery Range, southern Nye County, Nevada: DOE/NV/10295-1.

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site
May 3, 1996
State Clearinghouse
SAI # 95300110

Johnson, C. and Hummel, P., (1991), Yucca Mountain: Nuclear Waste or Resource Rich: Geotimes, American Geological Institute, v. 36, N. 8, August.

Cashman, P., and Trexler, J., The Mississippian Antler Foreland and Continental Margin in Southern Nevada: The Eleana Formation Reinterpreted in Cooper, J., and Sevens, C., (1991) Paleozoic Paleogeography of the Western United States II: Pacific Section SEPM, vol. 67, p. 271-280.

150 The text on Page 4-122, lines 1-4, describes an assessment of the geothermal resource potential of the NTS by the Harry Reid Center. This assessment is not cited as a reference to the draft EIS. However, on lines 3 and 4, the conclusion of the assessment is that the resource potential was judged to be suitable for the development of a binary geothermal power plant. This conclusion appears to be at odds with the conclusion on Page 4-120, line 29, that water temperatures in the region are insufficient for commercial power development. Also, the focus of the geothermal resource discussion is on electric power generation. The section is devoid of any discussion of geothermal resources for commercial and industrial applications.

PAGE 4-122 **Soils**

COMMENT 069 This section acknowledges the overall sparsity of information on soils of the NTS but suggests that "small areas of local interest" have been studied. The remainder of Section 4.1.4.3 on soils contains

STATE GOVERNMENT 2 (CONTINUED)

151 references to various activities that may have affected soils, but there are no references to literature that contains descriptive data on the soils. This oversight should be corrected by citing sources of existing soils information on "small areas of local interest" on the NTS.

PAGE 4-123 Lines 16-18 **Radiological Sources in Soil**

152 ***COMMENT 070*** The text states "this section describes the baseline soils conditions at the NTS, the NAFR Complex, and the Tonopah Test Range, as documented previously in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977)." As acknowledged on Page 4-122, lines 15-17, soil formation and loss is a dynamic process. Soil movement and loss is a common occurrence throughout the NTS and surrounding areas. The "baseline" soil conditions need to be updated to present-day conditions, so that any impacts can be appropriately assessed.

The ERDA 1977 document addressed the Nevada Test Site only; the NAFR complex and TTR were not addressed. This EIS must comprehensively address soils on the NAFR complex and TTR.

PAGE 4-124 Lines 19-33 **Radiologic Sources In Soil**

153 ***COMMENT 071*** This section of the EIS should include an estimate of radiologic sources in surface soils for different geographic areas of the NTS,

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site
May 3, 1996
State Clearinghouse
SAI # 95300110

153 cont. (e.g., Yucca Flat, Frenchmen Flat, Area 25, etc.) Without a detailed understanding and disclosure of any radiological contamination in the soils at NTS, DOE officials will be unable to make definitive short and/or long-term resource management and infrastructure development decisions for the site.

PAGE 4-125 **Safety Tests**

154 ***COMMENT 072*** The Safety Tests section could benefit from a table that lists all areas contaminated by safety tests of plutonium-bearing materials, the total acreage contaminated by each test, and the current estimates of the total inventory of the radiological source term remaining. Such a listing has relevance to discussions of future activities, future facility locations, and public access.

PAGE 4-138 Lines 16-19 **Surface Hydrology**

155 ***COMMENT 073*** The text states that the potential exists for sheet flow and channelized flow through arroyos to cause flooding throughout the NTS, however, because of the size of the NTS, no comprehensive floodplain analysis has been conducted in the NTS region. Yet Tables 4-16 and 4-17 on Page 4-140 indicate that, based on numerous DOE orders, Executive orders, and federal regulations, such comprehensive floodplain analyses are mandatory. The text identifies only five arroyos on NTS which have been assessed for flood hazard. Flood assessments for the Area 3 and Area 5 low-level waste sites are presented. It would appear DOE is in violation of

155 cont. these requirements. DOE should realize that the size of the facility does not constitute an exemption to these requirements. The EIS should describe plans for attaining compliance with these federal requirements and commit to implementing these plans in the ROD.

PAGE 4-138 **Surface Hydrology**

Lines 17-19 "However, because of the size of the NTS, no comprehensive floodplain analysis has been conducted in the NTS region to delineate the 100-and 500-year flood plains."

COMMENT 074 A specific flood plain analysis must be incorporated or referenced in the Final EIS for major projects included in the proposed action for the EIS, (e.g., infrastructure improvements to support assembly, disassembly, and storage of nuclear weapons, new or expanded nuclear waste disposal sites [Area 3 site], new waste treatment facilities, establishment of a NTS solar enterprise zone, etc.). 156

PAGE 4-141 **Springs and Impoundments**

COMMENT 075 The discussion of springs and impoundments focuses on springs at the NTS and impoundments in the Ash Meadows area south of the NTS. There is no mention of springs or impoundments which may exist at TTR or the NAFR Complex. A table listing all the springs in the region, their location, and discharges would be helpful. Also, a table listing all the impoundments in the region, their location, and storage capacity would be appropriate. 157

DOE EIS
Nevada Test Site
May 3, 1996
State Clearinghouse
SAI # 95300110

PAGE 4-143 **Springs and Impoundments**

Lines 7-10

COMMENT 076 The following statement is made: "Prior to any actions that may result in discharges to these limited surface water occurrences, reviews will be made to ensure compliance with the appropriate Executive orders and federal and State environmental laws and regulations." The text should also make the commitment that no actions shall be taken which could result in a lessening of spring discharge and a resultant reduction in vegetated area. 158

Lines 18-20 "Any actions that could affect these impoundments [Crystal Reservoir] will receive the same type of review for regulatory compliance as that discussed above for the springs discharge areas [on the NTS]."

COMMENT 077 Legal as opposed to regulatory actions may be triggered if the groundwater recharge flow from subbasins within NTS to Ash Meadows are altered (i.e., at Crystal Reservoir). Ash Meadows is important since it contains a water-filled cavern know as Devil's Hole where the endangered pupfish _Cyprinodon_ resides. Because of past litigation, judicial oversight of the water level in Devil's Hole is in effect.

In a related matter, while the State Engineer's Office has not historically pursued compliance with Nevada water law at the NTS, such compliance would be sought for significant changes in the use of the site. This is based on the contention that Congress reserved sufficient water to support the mission of the NTS. That mission is confined to nuclear testing and related research and development activities only, as opposed to waste disposal and/or management and disposition of special nuclear materials. Accordingly, if the proposed action in the Final EIS requires additional water

159 withdrawals at the NTS that are not directly related to the nuclear testing mission, the State will require permits for such withdrawals. The Final EIS should acknowledge this policy.

PAGE 4-143
Lines 24-25

Surface Water Characteristics

COMMENT 078

160 The chemical and radiological analyses for eight springs on the NTS as reported by Moore (1961) and presented in Table 4-18 are over 35 years old. More current analyses should be presented. Analyses from all other springs in the region should also be presented.

161 Also, the surface water characteristics section addresses chemical and radiological characteristics of surface water (springs and impoundments) on NTS only. The section should be expanded to include chemical and radiological characteristics of springs and impoundments on the NAFR Complex and the TTR.

PAGE 4-145
Lines 11-12

Surface Water Characteristics

"The containment ponds were constructed to catch contaminated runoff from the tunnel complexes [e.g., tritiated water]."

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site
May 3, 1996
State Clearinghouse
SAI # 95300110

COMMENT 079

Table 4-22 in the EIS presents containment pond gross beta analysis results for eight contaminated ponds and three seepages on the NTS. The data indicate that gross beta concentrations in at least three of the Area 12 containment ponds exceed the Derived Concentrations Guides (DCG) for ingested water under DOE Order 5400.5. (DCG is based on a strontium-90 value for drinking water of 4 mrem/yr

162 effective dose equivalent.) While we acknowledge the referenced pond water is not considered a drinking water source, the EIS nevertheless fails to describe remediation alternatives for the contaminated ponds. Since water discharges from the tunnels to the ponds at the Area 12 complex is a State permitted activity, the EIS must discuss alternative remediation strategies (i.e., re-infiltration to groundwater, tritium capture technologies, etc.). Of note, in the State's scoping comments, we stated that the EIS "should address remediation, waste management, and appropriate D&D [decontamination and decommissioning] activities for contaminated tunnel facilities on the test site . . . since some of the tunnels [have] released, and may still be releasing, radioactivity to the environment."

PAGE 4-148

Groundwater

COMMENT 080

163 This section should contain a map showing groundwater flow on the NTS, as Figure 4-41, Page 4-155, does for the Tonopah Test Range. The map should utilize or be consistent with such maps for the Yucca Mountain Project and also show groundwater flow for the Death Valley and Amargosa Valley regions.

PAGE 4-150 **Groundwater**

164 ***COMMENT 081*** Table 4-23, which lists perennial yields and peak historic water demands for the 10 hydrographic basins on the NTS, should be expanded to include hydrographic basins for the NAFR Complex and TTR, including all water supply wells. A map should be included which delineates the hydrographic basins. The text notes that an effect of the water withdrawals has been a lowering of water levels in the vicinity of some water supply wells and localized changes in groundwater flow directions. A table should be included which lists supply wells with documented annual pumpage rates, water level data, and the magnitude of any declines.

165 The text on Page 4-150, lines 17-25, should be revised to clearly state which wells in Yucca Flat have water level declines due to extraction rates which exceed perennial yield, and which have declines that may be affected by underground nuclear detonations. The effect of excess pumping in Yucca Flat cannot be assessed without a clear distinction between historic pumping rates and past underground detonations.

166 Seaber et al. (1995) and Clary et al. (1995) cited in this section are not included in Section 4.8 References.

PAGE 4-153 **Groundwater Flow and Gradients**

167 ***COMMENT 082*** The section on groundwater flow and gradients should be expanded to discuss in detail flow conduits between areas of high water supply

167 cont. pumpage and underground nuclear detonations on the NTS and down gradient areas of concern such as Beatty, Indian Springs, Ash Meadows, Amargosa Valley, and Death Valley. A federal requirement to maintain a certain water level in Devil's Hole to protect endangered pupfish is such a concern, among others.

168 ***COMMENT 083*** The text on line 16 states "the present conceptual groundwater flow model for the Death Valley flow system is derived primarily from Winograd and Thordarson (1975) and updated by Waddell et al. (1984) and by Laczniak et al. (1992)." In the past few years, based upon studies performed for the NTS environmental restoration program and the Yucca Mountain high-level nuclear waste repository siting program, additional conceptual groundwater flow models have been proposed.

The EIS should acknowledge these other models and discuss the variances in the models and possible effects on understanding flow magnitude and direction. Examples of other literature are the following:

PAL Consultants Inc., 1995, A Conceptual Model of the Death Valley Ground-Water Flow System, Nevada and California: Prepared for U.S. Department of Interior, National Park Service.

PAL Consultants Inc., 1995, Evaluation of Scientific Literature Pertaining to the Conceptualization of the Death Valley Ground-Water Flow System, Nevada and California:

Prepared for U.S. Department of Interior, National Park Service.

Prudic, D., Harrill, J., and Burbey, T., 1993, Conceptual Evaluation of Regional Ground-Water Flow in Carbonate-Rock Province of the Great Basin, Nevada, Utah, and Adjacent States: U.S. Geological Survey Open File Report 93-170.

D'Agnese, F.A., 1994, Using Geoscientific Information Systems for Three-Dimensional Modeling of Regional Ground-Water Flow Systems, Death Valley Region, Nevada and California: Colorado School of Mines, Ph.D. thesis.

Faunt, C.C., 1994, Characterization of the Three-Dimensional Hydrogeologic Framework of the Death Valley Region, Nevada and California: Colorado School of Mines, Ph.D. thesis.

Bredehoeft, J., King, M., and Tangborn, W., 1996, An Evaluation of the Hydrology at Yucca Mountain: The Lower Carbonate Aquifer and Amargosa River: Prepared for Inyo County, California and Esmeralda County, Nevada.

Dettinger, M., Harrill, J., Schmidt, D., and Hess, J., 1995, Distribution of Carbonate-Rock Aquifers and the Potential for their Development, Southern Nevada and Adjacent Parts of California, Arizona, and Utah: U.S. Geological Survey, Water-Resources Investigations Report 91-4146.

PAGE 4-153 **Water Balance**

169 ***COMMENT 084*** The text in the water balance section suffers from the lack of a map which graphically displays the Death Valley flow system, its recharge areas, generalized flow direction, and identified discharge areas. Figure 4-41 shows the generalized flow directions in alluvial material for the TTR. A similar map or maps are recommended for the NTS and the NAFR complex and for the volcanic aquifer and the carbonate aquifer.

PAGE 4-155 **Groundwater Flow**
Figure 4-41

170 ***COMMENT 085*** See Comment 080.

PAGE 4-155 **Groundwater Flow**
Lines 6-12

171 ***COMMENT 086*** For completeness, the discussion on lines 6-12 on spring discharge should tie back to Table 4-18, Chemical and radiochemical analyses of water from springs on the NTS (Page 4-144), with another table listing all springs on the NTS and their discharge rate.

172 As stated in a previous comment, any table that lists springs should be expanded to include springs in TTR and the NAFR complex

PAGE 4-159
Lines 5-6
Groundwater Quality

173 ***COMMENT 087*** The text states "Periodic monitoring of groundwater from drinking-water wells indicate that no volatile organic compounds are present." This statement should be supported with a literature or report citation.

PAGE 4-159 **Radiological Sources in Groundwater**

174 ***COMMENT 088*** This section is insufficient regarding information on groundwater at the NTS where radionuclide levels exceed the EPA standards for drinking water (See Comment 137). Information should be added here regarding contaminated groundwater as to location, extent, and type of contamination. A table similar to Table 4-27 and a map based on empirical data of where contaminated groundwater occurs at the NTS should be provided.

175 ***COMMENT 089*** On line 14, the text states "The total remaining inventory [at the NTS] under, or within 100 m (330 ft.) of the water table is estimated to be 112 million Ci [curies]." To validate the referenced 112 million Ci mentioned, data about the number of nuclear detonations by regional area (i.e., Yucca Flat, Pahute Mesa, etc.) should be provided in the EIS. Accordingly, the EIS should depict such information either graphically (3-D) or in table format. The data should indicate grouped shot locations by regional area, along with estimated depth of detonation. Such information would provide the

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site
May 3, 1996
State Clearinghouse
SAI # 95300110

reader a better understanding of groundwater contamination throughout the impacted regions.

176 ***COMMENT 090*** To evaluate the consequences of the entry of the hydrologic source term (the quantity of radioactivity that might actually enter the groundwater) into the hydrogeologic environment, the text indicates that DOE has sponsored two long-term studies: The Hydrologic Resources Management Program and the Long-Term Hydrologic Monitoring Program. Cursory conclusions from the Hydrologic Resources Management Program are presented. No results or conclusions from the Long-Term Hydrologic Monitoring Program are presented. Results to date from both programs need to be discussed in some detail so that impacts from contamination of the groundwater pathway can be adequately assessed.

177 The section on radiologic sources in groundwater also mentions on-going studies by the DOE Environmental Restoration Program to help reduce the current levels of uncertainty concerning both the mechanisms and consequences of radionuclide transport via groundwater flow at the NTS. This section should be expanded to discuss current results from studies under the Environmental Restoration Program. The discussion should include a characterization of the level of uncertainty involved with defining the groundwater pathway.

178 This section should also include a discussion of radiologic sources at TTR and the NAFR Complex. The Double Tracks site on the NAFR Complex is an example.

PAGE 4-163 **Water Supply**

179 ***COMMENT 091*** This section focuses entirely on availability. It should also discuss water availability for TTR and the NAFR Complex. Under the Federal Reserve Water Rights Doctrine, the NTS is entitled to withdraw water necessary to support the NTS missions. It is assumed that the same doctrine applies for the TTR and NAFR complex missions. The text indicates that water resources of the Alkali Flat-Furnace Creek Ranch Basin are fully appropriated and that any water appropriation beyond the missions of the NTS might not be possible.
180 Given that discussion, what scenarios does DOE envision for the NTS, TTR, and the NAFR complex which are beyond the current missions?
181 What unappropriated groundwater in the Ash Meadows Basin does DOE contemplate for future water supplies?

PAGE 4-164 **Table 4-28, Materials Used in Underground Nuclear Testing**

182 ***COMMENT 092*** Table 4-28 lists materials used in underground nuclear testing. Which of these materials is defined as a hazardous or toxic material by the U.S. Environmental Protection Agency? If any such materials are identified, their impact along the groundwater pathway must be assessed.

PAGE 4-165
Line 10 **Water Supply**
"Water used for other activities may [emphasis added] require the appropriation of the water in accordance with Nevada water law."

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site | May 3, 1996 | State Clearinghouse SAI # 95300110

183 ***COMMENT 093*** A previous comment concerning appropriation of water for new mission activities (See Comment 077) also applies here. Again, the State will require permits for appropriation of water that is considered outside of existing defense missions pursuant to the Public Land Orders for the NTS. The word "may" must be changed to "will" in the Final EIS.

PAGE 4-167 **Monitoring Programs**

184 ***COMMENT 094*** This section describes the current programs DOE sponsors on and around the NTS. The types of monitoring currently include water supply, ambient water quality, radioactive waste management, characterization and research, and water level. It is important that the EIS present, in tabular form, the historical data developed under each of these monitoring programs. Trends in these datasets with time is the key to detecting future impacts to the hydrologic regime and the environment.

PAGE 4-170
Line 3 **Biological Resources**

185 ***COMMENT 095*** The sentence about "the transition zone between the Mojave Desert and Great Basin" should contain citations to literature that supports the use of this term, e.g., Beatley (1975, 1976). The ecological significance of the so-called "Transition Desert" ecotone has been well documented and should be acknowledged in this section.
186 The overwhelming paucity of information on NTS ecosystems is apparent here and stands as an example of why the purpose of the

186 cont. Resource Management Plan Framework in Volume 2 must be acknowledged both in the Abstract and the Introduction of the EIS.

PAGE 4-196 Line 15 **Recorded Cultural Resources**

187 ***COMMENT 096*** This sentence states that only cultural resource sites within the boundaries of the NTS are addressed, yet Figure 4-47, Page 4-197, depicts sites outside the NTS. The figure should be revised to exclude sites outside the NTS to avoid confusion.

PAGE 4-197 **Figure 4-47**

188 ***COMMENT 097*** The bold boundaries within the NTS are shown on no other map in the EIS, yet there is no indication of what these borders depict. The legend to the figure should clarify this, or the boundaries should be deleted from the figure.

PAGE 4-219 Line 28 **Radiological Contamination**

"The *Contaminated Areas Report* (1992) published by Reynolds Electrical and Engineering Co. provides a complete listing and maps of all the identified radiation-contaminated areas on the NTS. This report also includes the contaminated areas that are found on the Tonopah Test Range and the NAFR complex."

189 ***COMMENT 098*** According to the referenced report, there are 230 contaminated areas on the NTS, the Tonopah Test Range, and the NAFR complex. Collectively, these areas cover 52 square miles. Because radio-

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site
May 3, 1996
State Clearinghouse
SAI # 95300110

189 cont. logical contamination is one of the primary environmental impacts caused by nuclear testing, the Final EIS must provide a map and a listing of the contaminants at the referenced sites. In fact, the EIS should identify each site in a table by number. The table should include a legal description of each site along with a general description of the type of contamination that is suspected at the site. The description should also include the date the site was contaminated, along with any planned remediation action for site cleanup. In any event, State officials are requesting a copy of the referenced "*Contaminated Areas Report*".

PAGE 4-220 Line 17 **Ecological Studies**

190 ***COMMENT 099*** This section should contain literature citations that support the information given here. Also, the section should acknowledge the detailed ecological information acquired for the Yucca Mountain Project and should reflect that such information was used in the EIS.

PAGE 4-221 Line 23 **Off-Site Environmental Surveillance**

191 ***COMMENT 100*** The EIS fails to provide any background or history that lead to the development of the NTS Off-Site Environmental Surveillance program. Without the historical background, the reader is deprived of DOE's "record" of offsite contamination. Since this is the first EIS to be developed for the site in nearly 20 years, such information is vital for understanding why radiological monitoring activities are

191 cont. conducted at the site, including the fact that current off-site monitoring typically shows no off-site contamination.

PAGE 4-228
Line 14

Land Use (Tonopah Test Range)

"Many of the consequences described in this chapter were previously presented in the 1975 Environmental Assessment (ERDA, 1975) and in the EIS prepared by the DOE for U.S. Air Force operations in 1990."

192 ***COMMENT 101*** The EIS fails to provide a specific reference to the EIS prepared by the DOE for the U.S. Air Force in 1990.

PAGE 4-239
Line 4

Soils

193 ***COMMENT 102*** Because of the unique situation regarding plutonium contamination in soils at the TTR, there should be a summary of that information here along with the literature references that apply. This should include the soil inventory for TTR developed by the Department of the Interior (DOI 1977). Omission of this in the draft EIS exhibits the lack of attention by DOE to using documented environmental information that is available.

PAGE 4-243

Biological Resources

194 ***COMMENT 103*** Because of the plutonium in the TTR ecosystem, there should be a summary of the related biological information here along with the literature references that apply. Neither Section 4.2.6, Biological

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site
May 3, 1996
State Clearinghouse
SAI # 95300110

194 cont. Resources, nor the references cited provide such information. The cross reference on line 18 to "Section 2.0 of Appendix E, Biological Resources" is incorrect. Section E.2, Page E-1, is "Methods and Assumptions of Analysis". "Biological Resources" is in Section E.2.6, Page E-19.

PAGE 4-254
Line 19

Land Use Designations (Project Shoal Area)

". . . however, the Project Shoal Area is periodically used by the U.S. Navy for military maneuvers. The U.S. Navy used this site pursuant to a Memorandum of Understanding with the Atomic Energy Commission. Because the Project Shoal Area was withdrawn for atomic testing, the DOE has no authority to grant use of the site to the U.S. Navy for military maneuvers."

195 ***COMMENT 104*** The referenced discussion about land use and control of the Project Shoal site is confused, misleading, and otherwise un-intelligible. The Final EIS must clarify ownership, management, and planned short and long-term land-use control of the site. The Project Shoal site contains groundwater contamination which DOE has committed to address through a corrective action strategy and closure program.

196 In a related matter, State officials recently submitted formal scoping comments on the U.S. Navy's proposed "Master Land Withdrawal EIS." The Navy's EIS specifically includes the withdrawal of the Project Shoal site, using congressional withdrawal under the Engle Act pursuant to PL. 99-606. Hence, the Navy's proposed withdrawal and its relationship to DOE's corrective action strategy for cleanup of the site along with short and long-term land use control and

196 cont. management responsibility -- given the "unknowns" about deep groundwater contamination and flows -- must be clarified in the Final EIS. DOE should also be aware that State officials will seek the development of an Environmental Assessment to evaluate alternative corrective action strategies contemplated for the Project Shoal site.

PAGE 4-256 **Project Shoal Area Airspace**
Figure 4-55

197 ***COMMENT 105*** Figure 4-55 contains a reference to B-18 (Bombing Range 18). There is no B-18; the correct designation is B-19.

PAGE 4-258 **Soils**
Line 10

198 ***COMMENT 106*** The absence of any site specific information on soils for the Project Shoal Area is disturbing and suggests that DOE failed to characterize the environment before having used it. Before proceeding with Environmental Restoration Program activities at the site, DOE must prepare an Environmental Assessment that characterizes the environment. Such a commitment must be included in the Record Of Decision for the NTS Final EIS.

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site
May 3, 1996
State Clearinghouse
SAI # 95300110

PAGE 4-270 **Soils**
Line 13

199 ***COMMENT 107*** The absence of any site specific information on soils for the Central Nevada Test Area is also disturbing and suggests that DOE again failed to characterize the environment before having used it, e.g., for Project Faultless. Before proceeding with Environmental Restoration Program activities at the site, DOE must prepare an Environmental Assessment that characterizes the environment. Such a commitment must be included in the ROD for the NTS Final EIS.

VOLUME 1, CHAPTERS 1-9 (Part B)

5.0 ENVIRONMENTAL CONSEQUENCES

PAGE 5-7 **Waste Management Program**
Lines 8-10 "Under Alternative 1, ongoing Waste Management Program activities at the NTS would continue at current levels and are consistent with current site and land-use designation definitions. Therefore, no new impacts to land use are expected."

200 ***COMMENT 108*** As mentioned earlier, the NTS was not established to serve as a waste disposal site for off-site generated defense wastes. In the State's scoping comments for this EIS, we stated that "the only action appropriately described as no action at the NTS includes only national defense and nuclear weapons testing activities defined under

the public land orders as consented to by the State of Nevada for the NTS withdrawal."

PAGE 5-18
Line 28

__Socioeconomics__

"This section [from Page 5-18 through 5-28] discusses the potential socioeconomic effects associated with Alternative 1 [No Action]. The purpose of this section is to identify and analyze the major socioeconomic issues related to each possible future activity at the sites."

COMMENT 109

The premise for this section and for the Socioeconomic sections for each of the other alternatives is fundamentally wrong. The section on socioeconomics does not discuss or address the "major socioeconomic issues" related to various activities. Instead, the EIS makes the unstated and erroneous assumptions that (1) all "major" socioeconomic issues/effects will be related to employment or population changes associated with the activity, and (2) all such changes are positive. This is not socioeconomic impact assessment.

201 No attempt is made to employ a systematic socioeconomic impact assessment methodology to identify the range of positive and negative impacts (i.e., costs vs. benefits) associated with NTS activities. Instead, population and employment projections for the No Action Alternative are cursorily examined in relation to population, employment, housing, and public services in each of the identified counties/cities. The results are predictably insignificant. No attempt is made to understand or model the socioeconomic systems within which the activities will be taking place.

202 The socioeconomic analysis does not examine the potential impacts of various NTS activities on Nevada's principal industry, tourism/gaming, especially the potential for negative impacts as a result of stigmatizing events associated with NTS nuclear/hazardous materials transportation (See Comment 059). This must be included if the Final EIS is to be adequate.

203 The socioeconomic section fails to assess the negative impacts associated with non-tourism/gaming population growth associated with NTS activities. This requires modeling the unique tax/revenue system of the State - one in which tourism/gaming revenues subsidize all other forms of growth. Without such an analysis, the costs to the State of increased NTS-related population growth cannot be assessed (See also the Comment Summary Section under "Socioeconomics").

Research on the impacts of non-gaming related growth can be found in:

NWPO-SE-022-89 "Yucca Mountain Socioeconomic Project: Interim Report on the State of Nevada Socioeconomic Studies." (June, 1989)

PAGE 5-20
Lines 33-34

__Economic Activity, Population, and Housing__

"It was estimated that a 6,576 person workforce would provide the necessary support to maintain current level of operations.

204 *COMMENT 110* The EIS fails to document where or how the "6,576" labor force number was generated. Currently, the NTS has a labor force of around 3,000 workers. Under conditions of the ongoing moratorium on nuclear testing, this lower number seems more reasonable as an employment baseline for planning purposes. In any event, the EIS must document and clarify the labor force number referenced above.

PAGE 5-28 **Defense Program**
Lines 11-12 "These stockpile tests would be conducted on Pahute Mesa and/or Yucca Flat . . ."

PAGE 5-29 "The yield or size of underground nuclear explosion is controlled by
Lines 4-6 the Threshold Test Ban Treaty to a maximum high-explosive equivalent of 150kt "

205 *COMMENT 111* The EIS fails to provide a rational for reserving Pahute Mesa for future weapons testing. Since any future tests would be limited to 150kt, the need for testing on Pahute Mesa must be specifically defined in the EIS. Also, the status of DOE's authority to use Pahute Mesa for testing during the next 10 years cannot be assured because of the pending Nellis withdrawal.

PAGE 5-31 **Defense Programs**
Line 16

206 *COMMENT 112* In view of the acknowledged paucity of information on NTS soils (See Section 4.1.4.3), the basis for considering that impacts to soils are not significant is not apparent. If DOE has simplistically

206 cont. considered the loss of 80 acres of soil to be insignificant, that fact should be stated. Otherwise, the empirical basis for the statement should be provided.

On line 25, DOE should again state the empirical basis for considering that impacts on soils will not be significant.

PAGE 5-31 **Waste Management Program**
Lines 33-34 "Craters resulting from underground nuclear tests in Area 3 that meet certain criteria . . ."

207 *COMMENT 113* The EIS fails to reference or document what "certain criteria" were used in selecting radioactive waste disposal craters at the NTS. The Final EIS must document and describe the existence of such criteria and how these criteria were developed.

PAGE 5-32 **Environmental Restoration Program**
Line 23

208 *COMMENT 114* The areal extent and nature of the soils that would be lost for the long term should be stated and not simply dismissed. Also, how the sites are to be reclaimed should be addressed in view of the soil to be lost. This is an example of where the use of information from the Yucca Mountain Project would be appropriate.

PAGE 5-34 **Waste Management Program**
Lines 1-4 "Potential flood hazards on the NTS and NAFR Complex are presented in Sections 4.1.5 of Chapter 4.0, Affected Environments.

STATE GOVERNMENT 2 (CONTINUED)

Siting of waste management facilities is a critical issue in terms of protecting the facilities from floods"

209 ***COMMENT 115*** While we concur with the need to protect waste management facilities from floods, the EIS fails to provide any detailed analysis concerning whether or not the disposal sites on NTS actually meet applicable federal flood regulations (see Comments 73 and 74).

PAGE 5-39
Lines 6-9

Defense Programs

"... because of the conditions at the NTS (long travel paths, sorptive geologic media, ... and the depth of the stockpiled holes), it is not considered likely that any significant impacts [from a future nuclear test] would occur in areas down gradient of the underground testing locations [i.e., contamination of groundwater]."

210 ***COMMENT 116*** Without specific data on the depth and location of existing nuclear test holes that might be used to conduct a future nuclear test, conclusions that suggest that the likelihood of any significant impacts to the groundwater would not occur are simply not supportable.

211 Evidently, DOE has prepared a number of undisclosed test holes that could be used for future nuclear tests. A map and listing of these holes, including their proximity to the groundwater must be included in the Final EIS to qualify statements that contamination of groundwater would be unlikely.

STATE GOVERNMENT 2 (CONTINUED)

PAGE 5-39
Lines 30-31

Waste Management Program

"No impact to groundwater from waste management operations would occur during the timeframe covered by this EIS and long into the future."

212 ***COMMENT 117*** Although the required Performances Assessments have not been completed for either the Area 5 or the Area 3 disposal sites, State officials do agree that DOE has conducted some tests that do indicate that soil moisture (i.e., water falling to the surface in the form of precipitation) may not reach the groundwater. However, such studies are limited to the Area 5 disposal site and cannot, as the EIS attempts to infer, be applied to the Area 3 disposal site. The text in the EIS should be modified to reflect these facts.

PAGE 5-41

Biological Resources

213 ***COMMENT 118*** Throughout this section, the inadequacy of the database on NTS ecosystems is apparent. A statement acknowledging this fact should be inserted with a cross reference to the Resource Management Plan Framework in Volume 2 of the EIS as a future remedy to the problem.

PAGE 5-61
Lines 31-32

Waste Management Program

"The results of the very conservative approach to estimating exposure is then used to establish design, operation, closure, and waste acceptance criteria for the waste management facilities."

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site | May 3, 1996 | State Clearinghouse SAI # 95300110

214 ***COMMENT 119*** A discussion about DOE's current plan to modify the performance assessment process (revision to 5820.2A) should be provided in the EIS to clarify any potential changes to the human intrusion pathway scenarios.

PAGE 5-66 Lines 17-18 **Waste Management Program**

" Failure to so certify would preclude the Secretary of the Interior from accepting the affected areas [NAFR] into public land status."

215 ***COMMENT 120*** This statement is not correct. PL. 99-606 provides authority to the Secretary of the Interior to accept jurisdiction over any lands proposed for relinquishment without regard to contamination issues.

PAGE 5-102 Line 13 **Socioeconomics**

"This section discusses the potential socioeconomic effects associated with Alternative 2 [Discontinue Operations]. ... The loss of employment and personal income and increase in unemployment associated with Alternative 2 would result in substantial short-term adverse effects to the regional economy; however, economic and natural growth in the region of influence is expected to compensate for these reductions over time."

216 ***COMMENT 121*** Because of the non-systematic way in which the socioeconomic analysis sections of the EIS have been done, there is no methodological basis for either of these conclusions. While shut down of NTS activities would result in worker layoffs and likely population out-migration to some degree, it is not clear that the short-term economic and other effects would be negative or that

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site | May 3, 1996 | State Clearinghouse SAI # 95300110

216 cont. negative economic impacts might not be compensated for by positive impacts in other socioeconomic areas (i.e., the opening of the NTS to other non-federal uses not considered in the EIS). Likewise, it is not possible to draw conclusions about the longer term ability of the economy to compensate for projected reductions. That is not to say the conclusion is patently false - only that the analysis in the EIS is not sufficient to substantiate it.

PAGE 5-113 Line 16 **Geology and Soils**

217 ***COMMENT 122*** The basis for finding no adverse impact to soils under Alternative 2 should be given. There is no such basis in Chapter 4 of the draft EIS.

PAGE 5-114 Line 1 **Biological Resources**

218 ***COMMENT 123*** The basis for finding no adverse impact to biota under Alternative 2 should be given. There is no such basis in Chapter 4 of the draft EIS. Information should be given on the extent and location of the man-made water sources at NTS along with lists of the species that use them and estimates of the numbers of animals involved.

PAGE 5-141 **Transportation of Materials and Waste**

219 ***COMMENT 124*** This section of the EIS should state that an estimated 25,000 shipments of radioactive waste (excluding in-state shipments to the

219 cont. NTS from contaminated sites in Nevada) would occur over a ten year period if the Expanded Use Alternative is adopted. Furthermore, nowhere in the EIS is the difference in estimated waste shipments presented for Alternatives 1 and 3. While the number of estimated waste shipments is contained in the tables of the EIS, they are not explicitly stated in the text of the document, which serves to obfuscate the purpose and intent the National Environmental Policy Act and its implementing regulation CEQ 1500.1(b).

PAGE 5-144
Line 25

<u>**Socioeconomics**</u>

This section contains a discussion of the potential socioeconomic effects under Alternative 3 [Expanded Use].

COMMENT 125

220 The same comments apply here as for the socioeconomic section for Alternative 1 (See Comment 109). However, with respect to the Expanded Use alternative, the lack of an adequate and systematic socioeconomic impact assessment methodology is especially destructive of the quality and veracity of the EIS. Without a systematic impact assessment where baseline conditions are established and projected into the future and where the full range of project conditions with the potential to impact baseline conditions are systematically evaluated against the baselines, it is not possible to draw conclusions about socioeconomic conditions.

As is the case of socioeconomic sections for all of the EIS alternatives, this section is not a socioeconomic assessment at all. Rather, it is a very limited, subjective, and incomplete review of an arbitrary set of economic variables (with no justification for the

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site | May 3, 1996 | State Clearinghouse
SAI # 95300110

220 cont. selection of those variables) that are exclusively related, in a positive way, to either population growth or population growth associated with NTS activities. As noted above, the potential negative consequences of population growth in Nevada, as a result of the State's unique revenue/tax system, are ignored altogether. This is especially problematic in the case of the Expanded Use alternative, where the EIS takes credit for possible positive effects of such growth without in any way examining the costs to the State and local communities.

221 The Expanded Use alternative is the EIS alternative most likely to cause negative risk and stigma effects. As such, the potential for such impacts must be examined in this section of the EIS.

222 Likewise, the Expanded Use alternative is likely to have the largest impact on socioeconomic variables not addressed, such as the potential impacts on the State and communities with respect to emergency response/preparedness for nuclear and hazardous materials incidents. Such impacts could be very large given the types and levels of activities contemplated under the Expanded Use alternative.

PAGE 5-144
Line 33

<u>**Economic Activity, Population, and Housing**</u>

"Under Alternative 3, it was assumed that direct employment would increase by 867 jobs in 1996, with a maximum of 6,718 jobs in 2000, and 4,513 jobs in 2005. It is estimated that direct payroll and purchases of goods and services would generate 2,017 additional secondary jobs in 1996; 12,774 in 2000; and 8,977 in 2005." The

STATE GOVERNMENT 2 (CONTINUED)

section goes on to summarize jobs and earning levels in Clark and Nye counties.

223 ***COMMENT 126*** No rationale whatsoever is given for the multipliers that are used in drawing these conclusions. In 1996, each new NTS job is assumed to create 2.33 secondary/indirect jobs; in 2000 the ratio is one NTS job to 1.9 secondary jobs; and in 2005 the ratio is one to 1.99. Notwithstanding the fact that all of the multipliers appear high, given the nature of the southern Nevada economy, it is not possible to evaluate the appropriateness of the numbers without the underlying assumptions and rationale being made explicit.

PAGE 5-156
Line 16 **Geology and Soils**

224 ***COMMENT 127*** This section contains no mention of soils. Soil information and assessment of any finding should be included.

PAGE 5-161
Line 14 **Biological Resources**

225 ***COMMENT 128*** Comment 118 applies here as well.

PAGE 5-226 **Socioeconomics**

226 ***COMMENT 129*** Given the information contained in the EIS and the level of analysis performed, it is not possible to determine if the jobs/population decreases postulated in the summary for Alternative 4 [Alternative

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site
May 3, 1996
State Clearinghouse
SAI # 95300110

226 cont. Use of Withdrawn Lands] are defensible or even reasonable. Similarly, the analysis is insufficient to conclude that such net employment and population declines would, in fact, result in net socioeconomic losses to the State and counties. A much more robust assessment is required, one that examines both costs and benefits associated with postulated changes in jobs and population.

PAGE 5-233
Line 22 **Geology and Soils**

227 ***COMMENT 130*** Section 5.4.1.4 states that the consequences to soils would be the same as given in Section 5.2.1.4. The basis for finding no adverse impact to soils under Alternative 2 is not given. There is no such basis in Chapter 4 of the draft EIS for either Section 5.2.1.4 or Section 5.4.1.4. Such information should be provided, as well as the logic for finding no adverse impact to soils under Alternative 2.

PAGE 5-236
Line 13 **Biological Resources**
Defense Program

228 ***COMMENT 131*** Section 5.4.1.6 refers to Section 5.2.1.6 for comparable findings on impacts to biota. The basis for finding no adverse impact to biota under Alternative 2 was not given. There is no such basis in Chapter 4 of the draft EIS. Such information should be given.

DOE EIS
Nevada Test Site | May 3, 1996 | State Clearinghouse SAI # 95300110

PAGE 5-270 **Underground Testing**

229 ***COMMENT 132*** For this paragraph, there are no data indicating the radionuclides involved in the given inventory. Information elsewhere in the report suggests that significant but unknown amounts of radionuclides have reached the groundwater from past activities. In this case, reasonable quantitative estimates of anticipated radionuclides should be given and the isotopes should be identified, as is done in Table 4-27.

PAGE 5-271 Line 28 **Biological Resources**

230 ***COMMENT 133*** The discussion of tortoise mortality should identify the "take" for the species allowed by the US Fish and Wildlife Service. Estimates of future tortoise mortality then should be derived from a table showing known accidental mortality by year since the take was established.

PAGE 5-288 **Relationship of Short Term Uses and Long Term Productivity**

231 ***COMMENT 134*** The discussion in this paragraph concerns a 10-year timeframe. Here and elsewhere where appropriate the fact should be noted that DOE Order 451.1, National Environmental Policy Act, requires that EISs such as this one be revisited each five years and updated as necessary.

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site | May 3, 1996 | State Clearinghouse SAI # 95300110

PAGE 5-294 Line 22 **Alternative 3**
Nevada Test Site

232 ***COMMENT 135*** The discussion in this paragraph about soil productivity, revegetation success, and natural rehabilitation is not based on information presented elsewhere in the draft EIS. These topics should be documented and discussed in Chapter 4, Affected Environment, then cross referenced where appropriate throughout Chapter 5, including here. This is a case where the use of information from the Yucca Mountain Project would be helpful.

PAGE 5-295 Line 20 **Tonopah Test Range**

233 ***COMMENT 136*** The sentence that begins here speaks of variables of amounts of soil removed and success in rehabilitation. Nowhere in the draft EIS are such variables addressed, particularly regarding re-establishing native plant species. That information should be added to Chapter 4, Affected Environment, and cross referenced here. For example, EG&G report EGG 11265-1118 (December 1994) addresses reclamation success and secondary succession for the NTS environs and should be used for this EIS.

PAGE 5-307 Line 9 **Alternative 2**
Nevada Test Site

234 ***COMMENT 137*** This sentence speaks of "contamination of groundwater above EPA drinking standards" but nowhere is such groundwater documented as

DOE EIS
Nevada Test Site | May 3, 1996 | State Clearinghouse SAI # 95300110

234 cont. to location, extent, and type of contamination. The information should be added to Chapter 4, Affected Environment, and cross referenced here. A table similar to Table 4-27 and a map of where contaminated groundwater occurs at the NTS should be provided.

PAGE 5-309 **<u>Alternative 3</u>**
Line 24 Nevada Test Site

235 ***COMMENT 138*** This paragraph discusses soil to be lost to environmental restoration and fails to consider how replacement soil for reclamation purposes will be acquired. Nowhere in the draft EIS is this matter addressed. The information should be added to Chapter 4, Affected Environment and cross referenced here. This comment is similar to Comment 136.

6.0 CUMULATIVE IMPACTS

PAGE 6-1 **<u>Cumulative Impacts</u>**

236 ***COMMENT 139*** This chapter is deficient with respect to methods of analysis used (See Line 23). While there is a considerable body of DOE literature regarding methods for analyzing cumulative environmental impacts, no references are included in the chapter. The reference list in Section 6.5 contains nothing but undocumented "Personal Communications." All of the so-called analyses presented in this chapter lack scientific and technical substance and are based totally on subjective judgement. This is unacceptable in view of the current state-of-the-art of the science of assessing cumulative environmental

DOE EIS
Nevada Test Site | May 3, 1996 | State Clearinghouse SAI # 95300110

236 cont. impacts. Furthermore, there is a significant amount of this information available within the DOE complex.

PAGE 6-4 **<u>Bureau of Land Management</u>**
Line 19

237 ***COMMENT 140*** This section should give references for the two BLM EISs mentioned in the first sentence. The discussion of the 1992 Stateline Resource Management Plan and draft EIS is seriously outdated in view of the BLM's 1994 supplement to the document. The discussion should reflect current BLM policies and the programs based on the six alternatives listed on Pages 6-5 and 6-6 and the BLM's commitment to ecosystem management (See ***Ecosystem Management in the BLM: From Concept to Commitment***, BLM/SC/G1-94/005+1736, January 1994). Because the BLM is a Cooperating Agency for the NTS EIS, it should write the section on its programs from Page 6-4 to 6-8. The same holds for the US Air Force on page 6-3 and the US Fish and Wildlife Service on Page 6-8.

PAGE 6-12 **<u>Nevada Test Site Alternatives</u>**
Lines 15-16 "A summary of the anticipated impacts associated with implementation of each of the NTS Alternatives, on a resource-specific basis, is presented in Table 3-1 (See Chapter 3.0)."

238 ***COMMENT 141*** Table 3-1 provides no such summary; the correct reference is Table S-4, beginning on Page S-14.

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site — May 3, 1996 — State Clearinghouse
SAI # 95300110

PAGE 6-13
Lines 22-29

Transportation

239 *COMMENT 142* The cumulative impact analysis presented in the EIS for transportation fails to assess the cumulative human health and environmental risks associated with the transportation of special nuclear materials and radioactive waste for Alternatives 1 and 3. In other words, nowhere in the document is a cumulative impact analysis presented for transporting both low-level waste and special nuclear materials like plutonium to the NTS. In fact, Appendix I states that "an evaluation of the transportation risks for consolidation of surplus plutonium and/or highly enriched uranium at the NTS is not within the scope of this study (Appendix I, Page 1-9, lines 19-20)."

If DOE adopts a proposed action for the Final EIS that includes the transportation of special nuclear materials and radioactive waste to the NTS, then a cumulative impact analysis for transportation must be prepared that covers the combined activities of DOE's Environmental Management and Defense Programs.

PAGE 6-15
Line 5

Biological Resources

240 *COMMENT 143* This section should mention the allowed "take" of desert tortoises for the NTS and the Yucca Mountain site and should report the annual take due to DOE activities since the take was established.

104

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site — May 3, 1996 — State Clearinghouse
SAI # 95300110

PAGE 6-15
Lines 18-31

Air Quality

241 *COMMENT 144* The cumulative impact analysis presented in the EIS for air quality is deficient of any scientific and technical substance. As mentioned above, the statements contained throughout Chapter 6 of the EIS are entirely subjective and unsupportable.

When DOE "creates" a proposed action for the EIS, an objective assessment must be conducted to determine any potential cumulative air quality impacts relevant to the proposed action, such as additional waste shipments to the NTS.

PAGE 6-16
Lines 25-29

Occupational and Public Health and Safety

242 *COMMENT 145* The cumulative impact analysis presented for occupational and public health and safety issues fails to assess the additive radiological risks (i.e., above background) for both site workers and the public that would be associated with the transportation, treatment, and storage/disposal of both special nuclear materials and radioactive waste. If DOE adopts a proposed action for the Final EIS that includes the transportation of special nuclear materials and radioactive waste to the NTS, then a cumulative impact analysis for transportation must be prepared that covers the combined activities of DOE's Environmental Management and Defense Programs. This cumulative impact analysis must include analysis of occupational and public health and safety risks to both site workers and the public

105

STATE GOVERNMENT 2 (CONTINUED)

from the transportation of special nuclear materials and radioactive waste.

7.0 MITIGATION MEASURES

PAGE 7-3 **Socioeconomics (Mitigation Measures)**

Line 17 "No adverse impacts are associated with implementation of any alternative for any socioeconomic issue (economic activity, population, housing, public finance, or public services); therefore, no mitigation measures are required."

COMMENT 146 The socioeconomic analyses contained in the EIS are so inadequate and so deficient that there is no support for this conclusion. The entire approach to socioeconomic impact assessment (if that is what this can be called) seems purposely designed NOT to look for possible or even likely impacts.

243 It is very likely that all of the alternatives contained in the EIS will have negative socioeconomic impacts that will require mitigation of some sort. Alternative 3, Expanded Use, has the greatest potential to generate negative impacts both in the "standard" effects area (i.e., significantly increased emergency preparedness/response costs, population growth that does not pay its way, additional burdens on State and local services, etc.) and in the "special" or risk effects area (stigmatization impacts to Nevada's tourism/gaming industry, etc.). The conclusion that none of the alternatives will have socioeconomic impacts that require mitigation is wholly unsubstantiated.

STATE GOVERNMENT 2 (CONTINUED)

PAGE 7-3 **Geology and Soils**

Line 27

244 ***COMMENT 147*** Section 7.4 contains no mention of soils. Mitigation measures for soil conservation and restoration should be discussed and documented. (See Comment 136)

8.0 CONSULTATION AND COORDINATION

PAGE 8-1 **Cooperating Agencies**

Line 10

COMMENT 148 Section 8.1 lists four general functions applicable to cooperating agencies (Lines 20-32). However, in the description of the specific contributions of the agencies on Pages 8-2 and 8-3, there is no insight to the four functions. This is especially notable with regard to the third function, "Ensure that ecosystem management concepts were applied to land-use impact analysis, where appropriate." The

245 US Air Force, the US Bureau of Land Management, and the US Fish and Wildlife Service each practice ecosystem management and have relevant policies and methodologies. Nowhere is this evident in Chapter 8 or elsewhere in the EIS. The DOE's own policy regarding ecosystem management, **Land and Facility Use Policy** (December 21, 1994) is not acknowledged or mentioned in Volume 1 of the draft EIS. These oversights must be remedied in the Final EIS.

STATE GOVERNMENT 2 (CONTINUED)

VOLUME 1, APPENDICES A-F

APPENDIX A: **Description of Projects and Activities**

PAGE A-7 Line 15 **Post-shot Operations.**
"Residual radiation is cleaned up at the site, and the hole is plugged back to the surface."

246 *COMMENT 149* The EIS should address how each post-shot operation is cleaned, including disposition of cleanup residues.

PAGE A-20 Lines 17-20 **Dynamic Experiments and Hydrodynamic Tests**
"Under Alternative 3, it is assumed that 1,100 dynamic experiments and hydrodynamic tests would be performed during the 10-year period; high-explosive charges would be larger, and potentially hazardous materials such as beryllium, depleted uranium, deuterium, and tritium would be used."

247 *COMMENT 150* The quantity and activity of this radioactive material should be defined here and on Page A-11 of the EIS. On the other hand, if this information is classified, then that should be so stated in the EIS.

PAGE A-25 Lines 8-13 **Interim Storage of Nuclear Weapons**

COMMENT 151 With the exception of nuclear testing and limited research and development activities connected directly to the testing mission at NTS, activities such as interim storage of nuclear weapons are not

addressed in the land withdrawal orders for the site . As stated elsewhere in these comments, if DOE adopts a proposed action that includes interim storage of nuclear weapons (or other non-testing activities), then issues concerning compliance with the restrictions in the existing land withdrawal orders must be evaluated through the NEPA process and/or consented to by the Nevada Legislature.

PAGE A-27 Lines 3-5 **Disposition of Weapons-Usable Fissile Material**
"The NTS has plans for the tritium production facility, which is a transmutation facility. The possibility exists that the facility could be used to process the plutonium into something benign while generating electrical power."

248 *COMMENT 152* DOE has issued a Record of Decision (ROD) for tritium productions and the ROD does not include the NTS as a future tritium production site; this statement should not be included in the Final EIS.

PAGE A-27 Lines 18-26 **Proposed Tests**
"Additional tests proposed under Alternative 3 would include the following: Robotics; Smart Transportation; Smoke Obscuration Operations; Thermal Test Operation Facility; Climatic Test Operation Facility; and Armor/Anti-Armor Tests"

249 *COMMENT 153* The reader must assume that these tests would be conducted on the Tonopah Test Range. If this is the case, NEPA compliance should be indicated for those tests that will cause significant environmental impacts.

PAGE A-30
Lines 29-33

<u>Performance Assessments</u>

"Treatability studies conducted on the vitrified waste form [Fernald byproducts vitrified silo wastes] indicated that the vitrified waste fully satisfies NTS waste acceptance criteria and may provide a higher level of long-term protectiveness. Performance assessment analysis will rigorously test various disposal scenarios over a 10,000 year period. The limiting analysis for waste acceptance for disposal is expected to be the inadvertent human intruder dose assessment."

COMMENT 154

250 **A copy of the referenced treatability studies are requested via submission of these comments. These studies must also be referenced in the Final EIS. In addition, the definition of "Corrective Action Waste" [line 23] must be provide in the Final EIS, including a discussion of how this waste type is different from waste consider as Special Case Waste, waste classified as Greater-Than-Class-C, or other wastes that are not suitable for shallow land burial.**

A review of the text in the EIS suggests that the silo waste from Fernald is not suitable for shallow land burial, as it is long-lived and characterized by high-specific activity. If this is indeed the case, then comments presented earlier concerning the need for DOE to prepare a complex-wide programmatic NEPA assessment of these waste types also apply here. Once again, State officials contend that such an analysis is necessary before any of these waste types are shipped, stored, or disposed of anywhere in the country.

PAGE A-37
Lines 16-18

<u>Closure Operations</u>

"No waste certification facilities would be constructed under this alternative. Waste certification activities required to meet the Waste Isolation Pilot Plant waste acceptance criteria [TRU waste] would not be conducted, and the transuranic mixed waste would be shipped to other DOE sites for certification, handling, and disposal."

COMMENT 155

251 **DOE has recently authorized construction of a TRU waste certification building at the NTS, which in essence renders this statement inaccurate; the statement should not be included in the Final EIS.**

PAGE A-40
Line 26

<u>Area 5 Radioactive Waste Management Site</u>

"Disposal capability for high-specific activity low-level waste would be expanded."

COMMENT 156

252 **The EIS should address whether DOE will define and assess high specific activity low level waste disposal alternatives through a separate programmatic environmental impact statement. As DOE is aware, on March 13, 1995 the agency published a notice in the Federal Register inviting comments concerning the development of strategies to deal with the disposal of high-specific activity low-level waste (i.e., wastes classified as SCW or GTCC). Subsequently, it was stated in DOE's Waste Management PEIS that "Based on the input received [from the Federal Register notice], alternative**

strategies will be evaluated in a NEPA review once a proposal is developed."[23]

PAGE A-42 Lines 26-32 **Treatment and Certification Operations**

253 ***COMMENT 157*** Treatment and disposal of the Cotter's concentrate waste is an activity mandated under the Federal Facility Compliance Act (FFCAct). Since DOE recently issued a final Site Treatment Plan (STP) for management of FFCAct waste at the NTS, proposed actions for treatment and disposal of FFCAct waste (i.e., Cotter's concentrates) must be discussed in detail in the Final EIS. Such discussions, moreover, must include the requirements stipulated in the Consent Order issued by the State of Nevada. The State's Consent Order implements the requirements of the NTS/STP as stipulated under the FFCAct.

PAGE A-63 Section A.4.3.1 **Alternative Energy**

254 ***COMMENT 158*** In reference to discussions, alternatives, and analyses for siting a Solar Enterprise Zone in southern Nevada, DOE must clarify the agencies involvement in this activity as it relates to the proposed action in the Final EIS.
255 In addition, if a site for a Solar Enterprise Zone is selected that excludes NTS, then a site-specific NEPA

[23] U.S. Department of Energy. Draft Waste Management Programmatic Environmental Impact Statement (DOE/EIS-0200-D), Page 1-17.

255 cont. evaluation of impacts at the selected site should be undertaken separately, and not containing in the Final NTS EIS. If DOE decides to ignore this concern, the agency should demonstrate or explain its legal obligation to proceed otherwise.

APPENDIX C: **Relevant Regulatory Requirements**

256 ***COMMENT 159*** Appendix C should include DOE's Land and Facilities Use Policy (December 21, 1994), Corporate Facilities Land Use Directive (pending), Life Cycle Asset Management Order (pending), and policies on the Resourceful Reuse and the Ecosystem Based Land Use Initiative programs.

Page C-1 Line 18 "Under Alternative 1 [and 3], the DOE would also continue its consultation with the Bureau of Land Management to define the appropriate actions necessary to address administrative issues related to the NTS and other land withdrawals."

257 ***COMMENT 160*** The EIS fails to provide an explanation of the consultation requirements and issues related to the NTS land withdrawal orders. Accordingly, Appendix C should be amended to include an adequate description of the Bureau of Land Management's review process of pre-FLMPA (Federal Land Management Policy Act) Public Land Orders that established the NTS. Past, present, and future plans for addressing the NTS withdrawal status must be disclosed in the EIS.

STATE GOVERNMENT 2 (CONTINUED)

APPENDIX E **Impact Assessment Methods**

258 ***COMMENT 161*** Appendix E, Impact Assessment Methods, suffers from a paucity of accepted methods for assessing environmental impacts. Section E.2, Methods and Assumptions of Analysis presents no methods whatsoever, and it is not until page E-12, line 22, that a methodology is first mentioned and cited (Cartwright 1981). The citation on Page E-15, line 27 (ICMA 1982), and Page E-16, line 6 (NFPA 1986) are not impact assessment methods, but rather are planning tools. The citations in Section E.2.5.2, Water Resources, are sound ones for characterizing hydrological resources, but their usefulness for assessing environmental impacts is questionable and has not been established. No analytical methods are presented for Section E.2.7, Air Quality and Climate. These deficiencies should be corrected by using state-of-the-art impact assessment methods.

259 In Section E.2.6, Biological Resources, the approach to assessment presented by Wright and Green (1987) is introduced. This procedure is a conceptual and systematic framework for a comprehensive, interdisciplinary environmental impact assessment for major resource developments. As such, the methodology is meant to identify, analyze, and integrate effects across all components of the environment including air quality, terrestrial ecology, occupational health and safety, and socioeconomic studies. The interdisciplinary nature of the procedure ensures that important relationships and interactions among components of the environment will be identified. To accomplish this, an interaction matrix of environmental components and project actions is constructed. Thus,

STATE GOVERNMENT 2 (CONTINUED)

259 cont. the purpose of the Wright and Green (1987) procedure is to identify interactions that subsequently must be analyzed. The procedure itself does not embody analytical methods for environmental components and their interactions. Therefore, it is unclear how DOE applied the matrix process to a single valued environmental component, in this case biological resources. That should be explained on Pages E-19 and E-20 of the draft EIS.

260 Because Appendix E lacks a comprehensive and interdisciplinary methodology like that of Wright and Green (1987), the impact assessment framework for the EIS should be restructured to be consistent with either Wright and Green, or a less dated and more current procedure such as **Jain, R., L. Urban, G. Stacey, and H. Balbach. 1993. *Environmental Assessment*. McGraw-Hill, Inc., New York, 526 pp.**

APPENDIX F **Project-Specific Environmental Analysis**

According to the EIS, the expanded use scenario for the Big Explosive Experimental Facility would allow high explosive denotations of quantities ranging from 1 to 70,000 pounds per test. Experiments would expand existing hydrodynamic testing, which include applications of "shape-charge" technology. Use of the assembly facilities in Area 27 is also proposed under both the Continued and Expanded Use alternatives.

261 ***COMMENT 162*** We question whether the EIS adequately evaluates the potential effects for continued and expanded use of the Big Explosive

STATE GOVERNMENT 2 (CONTINUED)

261 cont. Experimental Facility and surrounding environs. Moreover, potential environmental impacts and worker safety issues are not analyzed for the assembly facilities in Area 27 . According to recent documentation, these facilities may be inadequate in several important areas.[24] For example, the safety controls may be inadequate since structures may not fully meet current DOE safety guidelines and specifications. In the event of an accidental detonation, explosions at the assembly facilities in Area 27 could propagate from one assembly bay to the another and pose serious safety consequences to persons involved with operations in adjacent bays. CEQ regulations Sec. 1500.1(c) requires an analysis of potential environmental consequences of proposed actions and alternatives, yet the EIS does not provide this analysis for activities at the assembly facilities in Area 27 of the NTS.

262 Also, while Appendix F addresses the Big Explosives Experimental Facility, it fails to explain the purpose and intent of the analysis. The facility is first mentioned on Page 4-15, line 7 but without cross reference to Appendix F. The first 10 pages of the appendix discuss safety, not environmental analysis. Accordingly, the title of the appendix should be revised to include safety.

263 The appendix does not include environmental analyses of potential effects for the facility and nowhere does it mention the need for air emissions and waste effluent permits. The latter should at least appear on Page F-22, under Regulation, Order, Law.

264 A full explanation of Appendix F,

[24] US Department of Energy, May 1995. Final Environmental Assessment for Device Assembly Facility Operations, Nevada Test Site, Nye County, Nevada, pages 10, 11, and 28.

STATE GOVERNMENT 2 (CONTINUED)

264 cont. including the status of NEPA compliance for the Big Explosives Experimental Facility should appear both in the appendix itself as well as in Chapter 4, Affected Environments, of the Final EIS. (See Comment 047)

VOLUME 1, APPENDIX H, HUMAN HEALTH RISKS AND SAFETY IMPACTS STUDY

COMMENT 163

265 Appendix H provides a limited approach to estimating human health consequences that largely excludes the role of humans in the environment. On Page 2-1, line 16, the appendix states, "The risk assessment process follows the identified contaminant from its point of origin along various pathways in the environment." On line 19 is the following: "These transport mechanisms (to humans) can be air, water, soil, or food." There is no acknowledgment of the fact that transport of contaminants occurs in ecosystems and that understanding the transport mechanisms requires an ecosystem approach, a science lacking at the NTS, despite Volume 2 of the draft EIS which was prepared by a contractor for the Yucca Mountain Project. This conceptual deficiency is clear in Section 2.1.4, Page 2-8, where only a terse and insufficient one-page discussion is devoted to the topic of environmental pathways. The same deficiency appears in Section 2.2.1, Scenario Development, where the environment is mentioned only with respect to airborne radioactive releases. The whole concept of environmental restoration is ignored as are the native animal and human food chains. Thus, there is nothing stated to assure that the scenarios

265 cont. tabularized in Chapter 4, Risk Assessment Scenarios by Alternatives, are realistic environmental scenarios. The inclusion of Attachment A, Human Health Risk Scenarios and Equations, does nothing to dispel the doubt, meaning that the findings presented in Chapter 5, Results of the Human Health and Safety Analysis, and the judgements reached in Chapter 6, Conclusions, lack validity and credibility.

266 Care should be taken in the Final EIS to assure that readers can comprehend how the findings and conclusions are logically reached in a credible scientific manner. Chapters 1 and 2 should be grounded in sound approaches to environmental health risk assessment and should, for example, be based on methodologies such as:

(I) Kolluru, R., S. Bartell, R. Pitblado, and S. Stricoff. 1996. ***Risk Assessment and Management Handbook for Environmental, Health, and Safety Professionals***, McGraw-Hill, Inc. New York. 641 pp., and

(ii) Calabrese, E. and L. Baldwin. 1993. ***Performing Ecological Risk Assessments***. Lewis Publishers, Boca Raton, FL.

VOLUME 2, FRAMEWORK FOR RESOURCE MANAGEMENT PLAN

1.0 INTRODUCTION

PAGE 1-1 **Purpose**

267 ***COMMENT 164*** This section explains the purpose and rationale for having a Resource Management Plan (RMP) for the NTS included in the EIS. This should be reflected in the EIS Summary and in Chapter 1, Volume 1, as noted in the comments on those portions of the EIS.
268 DOE should also commit to including an implementation schedule for the RMP in the EIS ROD.

PAGE 1-2 Line 11 **Policy and Procedures**

269 ***COMMENT 165*** Section 1.3 notes the limitations of DOE Order 4320.1B, Site Development Planning, with respect to defining a system for managing the resources of a site. Reference is made to DOE's Land and Facility Use Policy, December 21, 1994, as a remedy for this shortcoming. This should be elaborated on by citing and discussing the pending Corporate Facilities Land Use Directing Order and the Life Cycle Asset Management Order. Likewise, mention should be made of the DOE Future Use Program initiative, the report, "Resourceful Reuse," and the role that the RMP for NTS will play in that regard. Quoting from the Land and Facility Management Policy

State Government 2 (continued)

DOE EIS
Nevada Test Site

May 3, 1996

State Clearinghouse
SAI # 95300110

269 cont. as is done below line 20 should be repeated in Chapter 2, Volume 1 of the EIS.

Section 1.3 should be strengthened by including a discussion of a sustainable environment while also sustaining economies, i.e., sustainable development. Sustainable development is implied in the Land and Facility Use Policy and DOE is fostering that concept with the RMP. The NTS RESOURCE MANAGEMENT PLAN GOAL between lines 10 and 11 on Page 1-3 is a laudable statement to which the remainder of Volume 2 adheres.

PAGE 1-4 Line 17 **Policy and Procedures**

270 ***COMMENT 166*** It is refreshing to see the Yucca Mountain Project and the memorandum of agreement between DOE/NV and the project acknowledged. This should be elaborated on in Volume 1 of the EIS.

PAGE 1-5 **Relationship to the Nevada Test Site Environmental Impact Statement**

271 ***COMMENT 167*** Section 1.4 is a commendable strategy that should also appear in Volume 1 of the EIS.

State Government 2 (continued)

DOE EIS
Nevada Test Site

May 3, 1996

State Clearinghouse
SAI # 95300110

PAGE 1-6 **Relation to Other Agency Resource Management Plans**

272 ***COMMENT 168*** Section 1.5 fails to carry through with the conceptual purpose and rationale for the RMP (See Comments 001 and 010). The Land and Facility Use Policy of December 21, 1994 shifts DOE's traditional policy toward one of stewardship for both man-made resources and natural resources. The discussion in this section should acknowledge that and expound on the links between a developed environment on the one hand and undeveloped natural resources and ecosystems on the other hand, as is done on Page 2-1 under Step 1 and Step 2.

2.0 DEVELOPMENT OF THE RESOURCE MANAGEMENT PLAN

PAGE 2-3 Line 20 **Step 3**

273 ***COMMENT 169*** The sentence beginning on this line is an example of the lack of logic in DOE's policy of excluding the Yucca Mountain Project from the NTS EIS and the RMP. Here the Yucca Mountain Project, by association, is given the status of a cooperating federal agency for the NEPA process in the EIS. The project simply is incongruous with the government agencies it is associated with under Step 3. This should be set straight in the final issue of Volume 2.

3.0 ECOSYSTEM MANAGEMENT

PAGE 3-2 **What Is Ecosystem Management?**
Line 12

274

COMMENT 170 The sentence beginning here recognizes desired natural resources, including undisturbed land. This acknowledgment conflicts with Section 1.5 of Volume 2 which attempts to separate DOE's interest in NTS from natural resources. Clearly, undisturbed land, air, and water resources at NTS are in DOE's interests with respect to uses of the site by future generations, especially for land that could require 800-1000 years to recover from surface disturbances. This should be recognized in Section 1.5.

PAGE 3-4 **Knowledge of Ecosystems on the Nevada Test Site**
Line 20

275

COMMENT 171 The sentence beginning on this line is another acknowledgment of the relevance of the Yucca Mountain Project to the NTS. Included here also should be the project's information on soil disturbance and reclamation. Especially relevant is "Secondary Succession on Disturbed Sites at Yucca Mountain, Nevada," EGG 11265-1118, December 1994. This report discusses the implications of information on site disturbances to restoration of disturbed land. As noted in the preceding comment, undisturbed land is a resource at NTS that should be valued by the DOE for future generations. If it is impractical to reclaim disturbed land on NTS in under 800-1000

275 cont.

years, then a prudent ecosystem management policy for the RMP to consider is that of minimizing surface disturbances at the site.

PAGE 3-5 **Surrounding Land**
Line 16

276

COMMENT 172 Section 3.2.3 relates to Step 3, page 2-3, for implementing ecosystem management. Ecosystem management occurs at the landscape level. In the NTS region, this will involve the agencies mentioned in Section 3.2.3. For that reason, the discussion should acknowledge and cite the ecosystem management policies of the other agencies with which DOE must coordinate and be consistent. In this respect, the Bureau of Land Management is especially relevant because it manages natural resources on the Nellis Air Force Range, as well as on public lands around NTS and Nellis. Coordination with BLM's rangeland ecosystem health program under 43 CFR Subpart 4180 is of paramount importance and should be acknowledged in Section 3.2.3 of Volume 2 of the draft EIS.

PAGE 3-6 **Principles of Ecosystem Management**
Line 17

277

COMMENT 173 Because of the importance of BLM's rangeland ecosystem management policies, Section 3.3 should incorporate the concept of rangeland ecosystem health being governed by the soil-water-biota relationships within ecosystems and landscapes. This fundamental association was established by the National Resource Council's report on ***Rangeland Health*** (1994) and was adopted by BLM for

277 cont. *Range Reform '94*. Both documents should be mentioned in Section 3.3. The concept of the health of ecosystems like those of the NTS and surrounding areas being tied to soil-water-biota interactions also speaks to the importance of minimizing site disturbances as a means of conserving undisturbed land for future generations.

PAGE 3-8 Line 21 **Improve Communications and Cooperation with Interested and Affected Parties**

278 ***COMMENT 174*** There should be a reference provided for the Five-Party Cooperative Agreement. The status of the initial 1977 agreement with respect to the May 24, 1994, proposed revision should be summarized.

4.0 DRAFT RESOURCE MANAGEMENT GOALS

PAGE 4-1 **Draft Resource Management Goals**

279 ***COMMENT 175*** Chapter 4 should embrace the concept of rangeland ecosystem health being governed by the soil-water-biota relationships within ecosystems and landscapes. (See Comment 173)

PAGE 4-8 Line 18 **Socioeconomics**

280 ***COMMENT 176*** Section 4.11 should acknowledge the concept of sustainable development achieved through ecosystem management as set forth by the Report of the Interagency Ecosystem Management Task Force, Volume I, Overview, June 1995. Volume 2 of the Final EIS

STATE GOVERNMENT 2 (CONTINUED)

DOE EIS
Nevada Test Site | May 3, 1996 | State Clearinghouse
SAI # 95300110

280 should also reflect the task force's Volume II-Implementation Issues, November 1995. If Volume III-Case Studies of the task force report is issued soon, as anticipated, it too should be cited and reflected in Volume 2 of the Final EIS for the NTS.

APPENDIX 1
OTHER STATE AGENCY COMMENTS

BOB MILLER
Governor

STATE OF NEVADA

PETER G. MORROS
Director

R. MICHAEL TURNIPSEED, P.E.
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
Capitol Complex
123 W. Nye Lane
Carson City, Nevada 89710
(702) 687-4380 • Fax (702) 687-6972

May 2, 1996

Nevada State Clearinghouse
Dept of Administration
Planning Division
Blasdel Bldg Room 202
Carson City NV 89710

RE: Nevada SAI# 96300110, Due Date: MAY 3, 1996

Dear Gentlemen,

Nevada Revised Statutes (NRS) chapters 533 and 534 require that a permit be gained prior to diversion or use of the public waters of the State of Nevada. NRS Chapters 535 requires notification of the State Engineer prior to building, altering or reconstructing a dam and, under certain circumstances, requires that a dam safety permit be acquired prior to starting construction. This office has not been pursuing compliance with these portions of the NRS on the Nevada Test Site (NTS) due to the presumption that the formation of the federal reservation included sufficient water to support the primary purpose of the reservation and that all hydraulic facilities constructed would be under the direction of the USA Corps of Engineers.

Regulation and allocation of the scant water reserves in this area of the state are difficult, especially in the light of groundwater movement through and out of the NTS, without an awareness of how much water the NTS has appropriated, has firm plans to appropriate, or decides to appropriate in the future. Compliance with Nevada's water appropriation permitting laws and regulations will provide this office with the necessary information and need not compromise national security or the NTS mission.

SAI # 96300110
page 2

281 Alteration of the mission of the NTS to broaden the scope of activity is not seen as the primary purpose for which the NTS was originally set aside. Applications for appropriation of the public waters of the State of Nevada must be made for any activities utilizing water on the NTS or related off-site locations that are not directly related to the original purposes for which the reservation was made. This specifically and emphatically includes the so-called Solar Enterprise Zone.

Sincerely,

Michael J. Anderson, P.E.
Hydraulic Engineer III

MJA/tdf

STATE GOVERNMENT 2 (CONTINUED)

APPENDIX 2
DISTRIBUTION LIST

US DEPARTMENT OF ENERGY

DONALD ELLE
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
P.O. BOX 14459
LAS VEGAS, NV 89114

TERRY VAETH
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
P.O. BOX 98518
LAS VEGAS, NV 89193-8518

JOSEPH N. FIORE
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
P.O. BOX 98518
LAS VEGAS, NV 89193-8518

LEAH DEVER
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
P.O. BOX 98518
LAS VEGAS, NV 89193-8518

ROBERT C. FURLOW, ACTING DIRECTOR
ENVIRONMENTAL PROTECTION DIVISION
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
P.O. BOX 98518
LAS VEGAS, NV 89193-8518

CARL GERTZ
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
P.O. BOX 98518
LAS VEGAS, NV 89193-8518

STATE GOVERNMENT 2 (CONTINUED)

STEVE MELLIGTON
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
P.O. BOX 98518
LAS VEGAS, NV 89193-8518

FRANK MAXWELL
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
P.O. BOX 98518
LAS VEGAS, NV 89193-85182

BOB GOLDEN
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
P.O. BOX 98518
LAS VEGAS, NV 89193-8518

KURT R. RAUTENSTRAUCH
EG&G ENERGY MEASUREMENTS INC
P.O. BOX 1912
LAS VEGAS, NV 89125

TIM KILLEN
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
P.O. BOX 98518
LAS VEGAS, NV 89518-8518

KEVIN ROHRER
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
P.O. BOX 98518
LAS VEGAS, NV 89193-8518

THOMAS P. GRUMBLY
ASSISTANT SECRETARY
U.S. DEPARTMENT OF ENERGY
WASHINGTON, DC 20585

STATE GOVERNMENT 2 (CONTINUED)

WESLEY E. BARNES, PROJECT MANAGER
YUCCA MOUNTAIN SITE CHARACTERIZATION OFFICE
U.S. DEPARTMENT OF ENERGY
P.O. BOX 98608
LAS VEGAS, NV 89193-8608

CAROL M. BORGSTROM, DIRECTOR
OFFICE OF NEPA POLICY AND ASSISTANCE
U.S. DEPARTMENT OF ENERGY
WASHINGTON, DC 20585

JOAN GLICKMAN
U.S. DEPARTMENT OF ENERGY
OFFICE OF ACCOUNTABILITY
WASHINGTON, DC 20585

NEVADA CONGRESSIONAL DELEGATION

THE HONORABLE HARRY REID
UNITED STATES SENATE
324 HART OFFICE BUILDING
WASHINGTON, DC 20510

THE HONORABLE RICHARD H. BRYAN
UNITED STATES SENATE
364 RUSSELL SENATE OFFICE BUILDING
WASHINGTON, DC 20102

THE HONORABLE RICHARD H. BRYAN
300 BOOTH STREET, ROOM 2014
RENO NV 89509

THE HONORABLE JOHN ENSIGN
HOUSE OF REPRESENTATIVES
414 CANNON HOUSE OFFICE BUILDING
WASHINGTON, DC 20515

STATE GOVERNMENT 2 (CONTINUED)

THE HONORABLE BARBARA VUCANOVICH
HOUSE OF REPRESENTATIVES
2202 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515

FEDERAL AGENCIES

U.S. DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

ANN MORGAN, STATE DIRECTOR
BUREAU OF LAND MANAGEMENT
STATE OF NEVADA OFFICE
P.O. BOX 12000
RENO, NV 89520

DISTRICT MANAGER
BUREAU OF LAND MANAGEMENT
LAS VEGAS DISTRICT OFFICE
P.O. BOX 26569
LAS VEGAS, NV 89126

U.S. DEPARTMENT OF INTERIOR
DESERT NATIONAL WILDLIFE RANGE
PROJECT LEADER
1500 NORTH DECATUR BLVD.
LAS VEGAS, NV 89108

DAN MORGAN
BUREAU OF LAND MANAGEMENT
AREA MANAGER- STATELINE
P.O. BOX 26569
LAS VEGAS, NV 89126

STATE GOVERNMENT 2 (CONTINUED)

DAVID BEDSUM
DEFENSE NUCLEAR AGENCY
TECHNICAL COMPLIANCE DIVISION
P.O. BOX 208
MERCURY, NV 89023-0208

U.S. FISH AND WILDLIFE SERVICE
1500 NORTH DECATUR BLVD.
LAS VEGAS, NV 89108

COMMANDING OFFICER
NELLIS AIR FORCE BASE
4370 NORTH WASHINGTON BLVD. SUITE 117
NELLIS AFB, NV 89191-7076

ELOISA HOPPER
ENVIRONMENTAL MANAGEMENT
4551 DEVLIN DRIVE
NELLIS AFB, NV 89191

STATE AGENCIES: CARSON CITY

INTERDEPARTMENTAL MAIL
GOVERNOR'S OFFICE
ATTN: TIM CROWLEY

INTERDEPARTMENTAL MAIL
GOVERNOR'S OFFICE
ATTN: DIANE WEIGEMANN, STATE SCIENCE ADVISOR

INTERDEPARTMENTAL MAIL
LEW DODGION, ADMINISTRATOR
DIVISION OF ENVIRONMENTAL PROTECTION
CARSON CITY

STATE GOVERNMENT 2 (CONTINUED)

INTERDEPARTMENTAL MAIL
DAVID COWPERTHWAITE
DIVISION OF ENVIRONMENTAL PROTECTION
CARSON CITY

INTERDEPARTMENTAL MAIL
PAUL LIEBENDORFER
DIVISION OF ENVIRONMENTAL PROTECTION
BUREAU OF FEDERAL FACILITIES
CARSON CITY

INTERDEPARTMENTAL MAIL
STAN MARSHAL
DEPARTMENT OF HUMAN RESOURCES
STATE HEALTH DIVISION

INTERDEPARTMENTAL MAIL
COMMITTEE ON PUBLIC LANDS
ATTN: DANA BENNETT
LEGISLATIVE COUNCIL BUREAU
CARSON CITY

INTERDEPARTMENTAL MAIL
ATTN: JOHN MEDER
LEGISLATIVE COUNCIL BUREAU
CARSON CITY

INTERDEPARTMENTAL MAIL
PAM WILCOX, ADMINISTRATOR
DIVISION OF STATE LANDS
CARSON CITY

INTERDEPARTMENTAL MAIL
MICHAEL TURNIPSEED, STATE ENGINEER
WATER RESOURCES DIVISION
CARSON CITY

STATE GOVERNMENT 2 (CONTINUED)

INTERDEPARTMENTAL MAIL
DIVISION OF MINERALS
EXECUTIVE DIRECTOR
CARSON CITY

INTERDEPARTMENTAL MAIL
COMMISSION ON ECONOMIC DEVELOPMENT
EXECUTIVE DIRECTOR
CARSON CITY

INTERDEPARTMENTAL MAIL
NEVADA DEPARTMENT OF TRANSPORTATION
KEITH MAKI, RESEARCH
CARSON CITY

STATE AGENCIES: LAS VEGAS\WASHINGTON DC

COLORADO RIVER COMMISSION
ATTN: JIM DAVENPORT
555 EAST WASHINGTON AVENUE, SUITE 3100
LAS VEGAS, NV 89101

ENVIRONMENTAL PROTECTION DIVISION
ATTN: JERRY SIERREN, FEDERAL FACILITIES
555 EAST WASHINGTON AVENUE, SUITE 3100
LAS VEGAS, NV 89101

WALTER LOMBARDO
DIVISION OF MINERALS
LA PLAZA BUSINESS CENTER, BLG. B
4220 S. MARYLAND PARKWAY, SUITE 304
LAS VEGAS, NV 89119

LEO PENNE, DIRECTOR
STATE OF NEVADA WASHINGTON OFFICE
HALL OF THE STATES
444 NORTH CAPITAL STREET
WASHINGTON, DC 20001

STATE GOVERNMENT 2 (CONTINUED)

CITIZENS ADVISORY BOARD -- NTS PROGRAMS

CHRIS BROWN
825 N. LAMB, SPACE 155
LAS VEGAS, NV 89110

RICHARD W. ARNOLD
P.O. BOX 341
PAHRUMP, NV 89041

DENNIS BECHTEL
319 ENCIMA CT.
HENDERSON, NV 89014

DIANE J. CRAVOTTA
P.O. BOX 91971
HENDERSON, NV 89009-1971

MARILYN HALL
8516 DEL REY AVE.
LAS VEGAS, NV 89117

JAMES HENDERSON
3308 CORONA DEL MAR
LAS VEGAS, NV 891087

STEPHAINE LAWTON
P.O. BOX 81
DYER, NV 89010

MARILYN J. LITTLEPAGE
1851 BALZAC DRIVE
LAS VEGAS, NV 89115

STATE GOVERNMENT 2 (CONTINUED)

LATHIA MCDANIELS
2396 VALLEY DR.
LAS VEGAS, NV 89108

RICHARD NOCILLA
823 SPYGLASS LANE
LAS VEGAS, NV 89107

MARY O'BRIEN
P.O. BOX 33099
PAHRUMP, NV 89133-3099

E. PAUL RICHITT, JR.
3575 W. BADURA AVE.
LAS VEGAS, NV 89118

WILLIAM ROSSE, SR.
HC61 BOX 6240
AUSTIN, NV 89310-9301

DALE SCHUTTE
4680 BELL VISTA AVE.
PAHRUMP, NV 89041

CONNIE SIMKINS
P.O. BOX 333
PANACA, NV 89042

JOANN S. STOCKILL
4625 KAY PLACE
LAS VEGAS, NV 89107

WILLIAM L. VASCONI
6565 WEST ATWOOD AVE.
LAS VEGAS, NV 89108

STATE GOVERNMENT 2 (CONTINUED)

STAN SIMS
P.O. BOX 1767
TONOPAH, NV 89049

LOCAL GOVERNMENTS

LES BRADSHAW
NYE COUNTY NUCLEAR WASTE PROGRAM
PO BOX 1767
TONOPAH, NV 89049

DENNIS BECHTEL, COORDINATOR
CLARK COUNTY NUCLEAR WASTE PROGRAM
500 SOUTH GRAND CENTRAL PARKWAY, SUITE 3012
LAS VEGAS, NV 89106

PETER CUMMINGS
CITY OF LAS VEGAS
400 EAST STEWART AVE.
LAS VEGAS, NV 89101

BRAD R. METTAM
COUNTY OF INYO
PLANNING DEPARTMENT
P.O. DRAWER L
INDEPENDENCE, CA 93526

OTHER PARTIES

JIM WILLIAMS, DIRECTOR
PLANNING INFORMATION CORPORATION
1836 GRANT ST.
DENVER, CO 80203

STATE GOVERNMENT 2 (CONTINUED)

RICHARD A. NIELSEN
CITIZEN ALERT
P.O. BOX 1681
LAS VEGAS, NV 89125

LEE DAISEY
CITIZEN ALERT
P.O. BOX 5339
RENO, NV 89513

BILL ANDREWS
HARRY REID CENTER
FOR ENVIRONMENTAL STUDIES
P.O. BOX 454009
LAS VEGAS, NV 89154-4009

ALLAN CHAMBERLAIN
SILVER CANYON RANCH
HIKO, NV 89017

NEVADA TEST SITE
ECONOMIC ADJUSTMENT TASK FORCE
3770 HOWARD HUGHES PARKWAY
SUITE 295
LAS VEGAS, NV 89158

PAUL STANDISH
IRG
101 CONVENTION CENTER DRIVE
LAS VEGAS, NV 89158

MARY HOLLAND
GOVERNMENTAL DYNAMICS, INC.
1655 NORTH FT. MYER DRIVE, STE. 700
ARLINGTON, VA 22209-3108

STATE GOVERNMENT 3

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
1263 S. Stewart Street
Carson City, Nevada 89712

BOB MILLER, Governor

TOM STEPHENS, P.E., Director

May 13, 1996

In Reply Refer to:

PSD 2.11

Dr. Donald R. Elle, Director
Environmental Protection Division
DOE/NV
P.O. Box 14459
Las Vegas, NV 89114

Dear Dr. Elle:

The following comments are offered in response to the publication by the DOE of the Draft "EIS for the NTS and Off-site Locations in the State of Nevada".

1 1. DOE must specify shipment notification procedures, including (1) state, tribal and local jurisdiction notification, (2) estimates of materials and volumes to be shipped, and (3) designations of points of contact for corridor jurisdictions.

2 The ROD should incorporate a shipment schedule identifying the generator(s), type of material and number of shipments of LLRM and LLRW expected to be received at the NTS LLW facility.

3 2. There should be regular meetings among representatives of DOE, corridor jurisdictions and other stakeholders and interested entities. These meetings should be used to:

a. provide updates regarding ongoing and planned shipment campaigns and reports and evaluations on past shipments (based on DOE monitoring program);

b. address issues that may arise when significant changes have occurred or are planned for the transportation system and in materials and/or volumes being shipped; and

c. identify and mitigate additional impact or concerns of local communities should transportation problems occur.

4 3. The DOE should commit to hosting and working with a group of state and local jurisdictions regarding route selection and selection of safer parking areas.

5 a. DOE and stakeholders should agree on a methodology for how routes utilized by carriers are selected. Under this option, DOE must commit in the Record of

STATE GOVERNMENT 3 (CONTINUED)

Dr. Donald Elle
May 13, 1996
Page 2

5 cont. Decision to a clearly-articulated process for routing of LLW shipments and to a mechanism that binds the shipper to adhering to the identified routing alternative, source and consistency of data used by the various carriers, with DOE acting as the data repository.

6 b. The DOE should provide state and local jurisdictions with copies of the route and risk analyses for each carrier transporting Class 7 materials as defined in 49 CFR 174.403.

7 c. DOE/NV should work with the State and corridor jurisdictions to develop criteria for selection of safe parking areas to be used by carrier vehicles.

4. Interim information can be made available though postings to an Internet home page, or through other electronic, hard copy or oral communication. In addition, DOE should also provide:

8 a. a mechanism for receiving and addressing concerns that may arise between regular meetings; and

9 b. annual reports to include, at the minimum, identification of carriers, sources and destinations of each shipment, the number and volume of shipments of each substance, highway and rail routes used, incidents/accident encountered and actions taken to address them, and evaluations of each shipment campaign.

10 5. The NTS EIS should address how other DOE facility EISs will be incorporated into the NTS EIS and Program Implementation Plan. Reiterates the overall used for a Programmatic EIS (PEIS).

6. The ROD should address the following specific emergency response issues:

11 a. DOE must ensure that local emergency responses agencies are able to identify low level waste shipments and provide immediate notification to federal and state agencies responsible for responding to or supporting the handling of accidents;

12 b. DOE/NV should provide responding jurisdictions/agencies with at least two new detection instruments per jurisdiction and ongoing calibration services in conjunction with local training in corridor communities in emergency response to incidents involving radioactive materials;

13 c. DOE/NV should provide or facilitate the provision of in-vehicle radio repeaters,

STATE GOVERNMENT 3 (CONTINUED)

Dr. Donald Elle
May 13, 1996
Page 3

13 cont. binoculars, cellular telephones and other equipment to corridor jurisdictions.

14 DOE should provide preference to local public safety and emergency response agencies for the free distribution of federal surplus emergency response equipment;

15 d. DOE/NV should work with corridor communities to make training opportunities as effective as possible. Consideration should be given to direct funding of training programs to the corridor communities, providing training opportunities on weekends to accommodate volunteer responders, and providing stipends to participants;

16 e. Communities which are not directly located on transportation routes should be provided the opportunity to participate in emergency response training courses offered to corridor communities;

17 f. DOE should provide financial and technical assistance as necessary to ensure that corridor communities have up-to-date emergency management and evacuation plans in place.

7. Carriers and shippers should ensure that the following list of operational procedures are followed for all shipments:

18 a. Transported loads should be covered or contained to prevent possible aerosol disbursement;

19 b. All shipments of low level waste arriving at NTS during off-hours should be directed to temporarily park loads at a secured area inside NTS gates;

20 c. Each truck carrying Class 7 materials should have two drivers present at all times;

21 d. Carriers should respond to all driver advisories and notifications of delays and make appropriate adjustments to primary routes; and

STATE GOVERNMENT 3 (CONTINUED)

Dr. Donald Elle
May 13, 1996
Page 4

22 e. All vehicles should be required to undergo quarterly CVSA inspections (based on enhanced North American standard) and should display appropriate safety inspection stickers.

Sincerely,

Thomas J. Fronapfel

Thomas J. Fronapfel, P.E.
Assistant Director - Planning

TJF:DKM:dg

cc: Joe Strolin, NWPO

This Page Intentionally Left Blank

MUNICIPAL GOVERNMENT 1

Lander County Commission

315 South Humboldt • Battle Mountain, NV 89820 • 702-635-2885 • Fax 702-635-5332

April 26, 1996

Dr. Donald R. Elle
Environmental Protection Division
U.S. Department of Energy
P.O. Box 14459
Las Vegas, Nevada 89114

Dear Dr. Elle:

Lander County appreciates the opportunity to review and provide comments to the Draft Environmental Impact Statement for the Nevada Test site and Off-site Locations in the State of Nevada.

The numerous volumes of the draft environmental impact statement (EIS) would suggest that the Department of Energy (DOE) has put forth considerable effort to address important issues. DOE must be commended for their efforts to cooperate with interested parties through participation at public hearings, the Transportation Protocol Working Group, and several presentations to the Affected Units of Local Government.

Enclosed are numerous specific comments related to the procedural aspects of the National Environmental Policy Act (NEPA) and the overall content and analysis presented in the document. Our review has identified several potential issues which
1 require your consideration. Most notably is the lack of a well defined proposed action. The purpose and need for the proposed action is not clearly stated and is confusing.

2 The alternatives in this document are alternative proposals and not alternatives to the proposed action. The relationship between this EIS and the resource management plan
3 is not clear. The EIS refers to the alternatives as "resource management alternatives" yet the resource management plan will not be completed for several years. Furthermore, the alternatives described in the document have little or nothing to do with resource
4 management, but instead describe potential uses of facilities and new programs which may be housed at NTS.

5 We question whether alternative 2 is a valid alternative. Alternative 1 (No action) is the baseline conditions yet there is an impact analysis for this alternative. The Department of Energy needs to reconsider the alternatives in this document.

MUNICIPAL GOVERNMENT 1 (CONTINUED)

Dr. Donald R. Elle
Page 2
April 26, 1996

6 The overall impact analysis is simply a description of the program or activity with some qualitative statements about generic impacts. Effects from past weapons testing are
7 ignored in the baseline description and the impact analysis, particularly the cumulative impact analysis.

8 The transportation impact analysis does not consider the more intangible aspect of waste shipments such as those related to socioeconomics, land use issues, and risk perception. The New Mexico lawsuit exemplifies the need to give more consideration to these issues. It appears that linkages among resource impacts are not well established.

9 The cumulative analysis is inadequate and does not consider all past, present and reasonably foreseeable actions. The cumulative analysis all but ignores impacts from past
10 weapons testing and makes no mention of the Yucca Mountain Site. Furthermore, the analysis ignores activities on the Nellis Range and Tonopah Test Range. Instead the
11 analysis attempts to compare impacts from NTS operation to growth impacts in Las Vegas Valley. It is not the intent of a cumulative analysis to draw such a comparison. The analysis consists primarily of qualitative statements and lacks quantitative assessment of impacts.

As part of our comments we have attached hereto and incorporated by reference recommendations regarding the NTS EIS compiled by the Transportation Protocol Working Group. The County participated in the development of these recommendations. We would ask that these comments be included in the proposed action and subsequent record of decision.

We hope the enclosed comments will assist the Department of Energy in the preparation of this environmental document. If there are any questions concerning these comments, please do not hesitate to call me.

Sincerely,

Heather Smith Estes, Chair
Lander County Commission

MUNICIPAL GOVERNMENT 2

Wayne Cameron
Julio C. Costello
Brent Eldridge
Carol O. McKenzie
Claude Rose

Courthouse Annex
953 Compton St.
Ely, Nevada 89301
(702) 289-8841
Fax. (702) 289-8842

White Pine County
Board of County Commissioners

April 26, 1996

Donald R. Elle, Director
Environmental Protection Division
U.S. Department of Energy
Nevada Operations Office
P.O. Box 14459
Las Vegas, Nevada 89114

RE: White Pine County
Comments on the Nevada Test
Site Draft Environmental
Impact Statement

Dear Mr. Elle,

White Pine County is submitting for Department of Energy consideration the attached comments on the Nevada Test Site Environmental Impact Statement (EIS). The Board of White Pine County Commissioners encourages the Department to thoroughly consider all of the attached comments on the Nevada Test Site Draft Environmental Impact Statement.

The Department is requested to employ a policy of adopting most of the issues which the county has raised. Inclusive treatment of county issues will help to ensure that the Nevada Test Site (NTS) Draft EIS adequately addresses potential risks which may accrue to White Pine County.

I trust that the attached comments on the NTS Draft EIS will assist DOE in determining the final NTS EIS. Please feel free to contact Mr. Ferd Mariani of the W.P. County Nuclear Waste Project Office at (702) 289-2033 if should you have any questions regarding the issues raised in this document.

Sincerely,

BOARD OF COUNTY COMMISSIONERS

Wayne Cameron,
Chairman

Enclosure as indicated.

WC/dm

MUNICIPAL GOVERNMENT 2 (CONTINUED)

WHITE PINE COUNTY COMMENTS
NEVADA TEST SITE
DRAFT ENVIRONMENTAL IMPACT STATEMENT

White Pine County's concerns with the NTS EIS can generally be described as focusing upon the cumulative exposure risks associated with past, present, and future activities at the NTS and transportation initiatives required to move low level radio active waste (LLRW) through White Pine County to the NTS.

The DOE Draft Environmental Impact Statement shows that the NTS may be used to dispose of extensive volumes of LLRW generated at defense sites around the United States. Certain of these studies, such as the Fernald Site EIS have suggested the desirability of shipping these materials by rail to the envirocare facility in Utah and possibly by truck to the Nevada Test Site. Although the Draft EIS for the Nevada Test Site has ranked Nevada 3, Route 5 as a high risk route, it is still an option which remains open for shipment of LLRW to the NTS.

Although the NTS EIS does not show I-80 as a route to be used for shipping LLRW, this interstate also remains an option.

There has been a great deal of concern expressed by Clark County about LLRW shipments through the "Spaghetti Bowl" and across Boulder Dam. Also, in written and oral comments by the City of Las Vegas expressing concern about the Las Vegas valley economy and Craig Road. It has become evident that interest of the State of Nevada and Clark County to minimize risks to health and safety of a majority of nevada's residents and economy of Southern Nevada will likely shift said risks to residents and businesses in rural counties, such as White Pine.

It is White Pine County's concern that if there is a reassessment of route selection methodology, Nevada 3 ,Route 5 might become a primary route.

If, in the Final Draft EIS this should be the case, then U.S. highway 93 and 6 and State Highway 318 through White Pine County might be designated for both LLRW and High Level Radioactive Waste shipments since this route is now a proposed route for HLW shipments.

White Pine County offers the following comments and recommendations:

1 The NTS EIS must consider alternatives for provision of effective emergency first response capabilities along legal weight truck routes in White Pine County.

MUNICIPAL GOVERNMENT 2 (CONTINUED)

White Pine County Comments
Page 2

A county sponsored assessment of existing response capabilities and possible constraints to effective emergency management, has revealed a general lack of preparedness to respond to accidents involving radioactive constituents.

2 Alternatives which should be investigated include enhanced local government response capabilities. Provision of specialized equipment to deal with an incident is primary. The EIS should address the risk management implications of alternatives strategies for when and how provision of local training and equipping of local first responders might occur.

The following recommendations are offered for your consideration:

3 I. DOE must specify shipment notification procedures, including (1) state, tribal and local jurisdiction notification, (2) estimates of materials and volumes to be shipped, and (3) designations of points of contact for corridor jurisdictions.

4 II. There should be regular meetings among representatives of DOE, corridor jurisdictions and other stakeholders and interested entities. These meetings should be used to:

a. provide updates regarding ongoing and planned shipment campaigns and reports and evaluations on past shipments (based on DOE monitoring program);
b. address issues that may arise when significant changes have occurred or are planned for the transportation system and in materials and/or volumes being shipped;
c. identify and mitigate additional impact or concerns of local communities should transportation problems occur.

Interim information can be made available through postings to an Internet home page, or through other electronic, hard copy or oral communication. In addition, DOE should also provide:

5 1. a mechanism for receiving and addressing concerns that may arise between regular meetings, and;
2. annual reports to include, at the minimum, identification of carriers, sources and destinations of each shipment, the number and volume of shipments of each substance, highway and rail routes used, incident/accident encountered and actions taken to address them, and evaluations of each shipment campaign.

MUNICIPAL GOVERNMENT 2 (CONTINUED)

White Pine County Comments
Page 3

6 III. DOE must ensure that local emergency response agencies are able to identify low level waste shipments and provide immediate notification to federal and state agencies responsible for responding to or supporting the handling of accidents.

7 IV. DOE/NV should provide responding jurisdictions/agencies with at least two new detection instruments per jurisdiction and ongoing calibration services in conjunction with local training in corridor communities in emergency response to incidents involving radioactive materials.

8 V. DOE/NV should provide or facilitate the provision of in-vehicle radio repeaters, binoculars, cellular telephones and other equipment to corridor jurisdictions.

9 VI. DOE should provide preference to local public safety and emergency response agencies for the free distribution of federal surplus emergency response equipment.

10 VII. DOE/NV should work with corridor communities to make training opportunities as effective as possible. Consideration should be given to direct funding of training programs to the corridor communities, providing training opportunities on weekends to accommodate volunteer responders, and providing stipends to participants.

11 VIII. Communities which are not directly located on transportation routes should be provided the opportunity to participate in emergency response training courses offered to corridor communities.

12 IX. DOE should provide financial and technical assistance as necessary to ensure that corridor communities have up-to-date emergency management and evacuation plans in place.

13 X. Transported loads should be covered or contained to prevent possible aerosol disbursement.

14 XI. All shipments of all materials arising at NTS during off-hours should be required to temporarily park loads at a secured area inside NTS gates.

15 XI. Each truck carrying Class 7 materials should have two drivers present at all times.

16 XII. Carriers should respond to all driver advisories and notifications of delays and make appropriate adjustments to primary routes.

MUNICIPAL GOVERNMENT 2 (CONTINUED)

.White Pine County Comments
Page 4

17 XIII. All vehicles should be required to undergo quarterly CVSA inspections (based on enhanced North American standard) and should display appropriate safety inspection stickers.

18 XIV. DOE/NV should work with the State and corridor jurisdictions to develop criteria for selection of safe parking areas to be used by carrier vehicles. This is related to the recommendation in the Mitigation, Procedures, and Operations, that all shipments of low level waste arriving at NTS during off-hours be required to temporarily park loads at a secured area inside NTS gates.

MUNICIPAL GOVERNMENT 3

Mayor
James K. Seastrand

Councilmen
Theron H. Goynes
Mary J. Kincaid
William E. Robinson
John K. Rhodes

City Manager
Linda Hinson

Deputy City Manager
Patrick P. Importuna

City of North Las Vegas
2200 Civic Center Drive • North Las Vegas, Nevada 89030-6307
Telephone: (702) 649-0276 • Fax: (702) 649-1302

May 2, 1996

Donald R. Elle, Director
Environmental Protection Division
U.S. Department of Energy
Post Office Box 14459
Las Vegas, Nevada 89114

RE: Nevada Test Site - Draft Environmental Impact Statement

Dear Dr. Elle:

Thank you for the opportunity to review and comment on the draft Environmental Impact Statement (EIS) for the Nevada Test Site and Off-site Locations in the State of Nevada. We especially appreciated the opportunity to make public comments at the April 11, 1996, meeting at the Department of Energy (DOE) facility in North Las Vegas. The DOE is to be commended for its efforts in actively soliciting and responding to concerns raised throughout the study period.

The following comments are organized into three groups: Group 1 - General Comments; Group 2 - Comments on Volume 1, Parts A and B; and Group 3 - Comments on Appendix I, Transportation Study.

General Comments

1 1. The area covered by the EIS did not sufficiently address concerns in North Las Vegas or the Las Vegas Valley. Health risks to the workers, the potential requirements for increased services and a generalized description of effects on the transportation system were given. Missing was any analysis of the effect an accident or incident would have on our primary industry, tourism. While the chances of a transportation related incident may be small, any incident involving a shipment destined for the Nevada Test Site carries the possibility of being attributed to Las Vegas.

MUNICIPAL GOVERNMENT 3 (CONTINUED)

2 2. The City has always maintained their first responsibility is to provide the highest level of safety for our residents, workers, and drivers. In this respect, we feel it is important to coordinate the test site activities with the Yucca Mountain Project since there is a strong possibility that high-level and low level nuclear waste will use the same transportation corridors.

3 3. The City has on several occasions expressed to DOE their opposition to transporting any nuclear wastes on Craig Road, and our position has not changed. A hazards assessment of Craig Road and the Union Pacific Railroad was completed in 1995 by Russell Di Bartolo, Ph.D., funded by the State of Nevada Nuclear Waste Project Office grant. This assessment includes a comparison of development for one mile on either side of Craig Road in 1989 to development in 1995. This study confirms the City's position that the Craig Road area residential development makes it unsuitable as a nuclear waste transportation route.

4 4. Although it is not required under current U.S. Department of Transportation regulations, the DOE should become more proactive in route selection, especially in the Las Vegas area. It should be possible to develop a route selection methodology based on a comparative analysis that takes into account our local concerns and conditions including population, potential risk for accidents and various other criteria. The present process of considering mainly time and distance is not adequate. Low-level waste transport is too closely allied with high-level waste transport to be dismissed until the Yucca Mountain EIS is completed. Any routes used for low-level waste transportation will assuredly be used for high-level waste.

5 5. The economy of the Las Vegas Valley depends on perceptions. The valley's primary industry and Nevada's primary source of income is tourism. The DOE may have an excellent record in transporting nuclear waste, but a negative perception caused by such shipments could result in economic damage to the entire state of Nevada. Route selection methodology must be explicit, transferrable to both high-level and low-level nuclear waste transportation, and account for local concerns and conditions.

6 6. In the event of an incident involving nuclear waste materials, the DOE must be ready to respond quickly and appropriately. To this end, the EIS should include a recommendation to maintain the radiation assessment team at the Nevada Test Site.

7 7. Regular meetings should be scheduled with DOE, carriers and affected units of government to discuss nuclear waste transportation issues.

8 8. DOE should notify local governments indicating the number of shipments, type, route, time of day and days of week.

Volume 1, Parts A and B

9 9. (Volume 1, Part A, p. 4-66) North Las Vegas Air Terminal is not a private airport. Owned and operated by the Clark County Department of Aviation, it is the second busiest airport in the state. Boulder City airport is owned by the City of Boulder City. Henderson Sky Harbor Airport is being bought by Clark County.

MUNICIPAL GOVERNMENT 3 (CONTINUED)

10 10. (Section 4.7.2.4) Dry Lake Valley is referred to in the section on the Coyote Spring Valley.

11 11. (Section 5.2.1.3) A total population decrease of 1,700 is related to Alternative 2 (Discontinue Operations). Of the total estimated population decrease of 1,700, how many would come from North Las Vegas? Estimates are given for other measures, but not for the population.

12 12. (Section 5.3.6.6.2) It is not clear whether the Off-Site Traffic estimates for I-15 south of Lamb Boulevard include the new race track (Las Vegas Motor Speedway), which is expected to have a significant impact on I-15.

13 13. (Section 5.4.6.6.2) US 95 is not near the Dry Lake Valley site.

14 14. Throughout Volume 1, there is a roadway segment described as "US 95 south of Jones Road (North Las Vegas Terminal)". What is the North Las Vegas Terminal?

15 15. The 1995 population for North Las Vegas should be 77,820, not 72,796.

16 16. The housing counts in the EIS are low. By the end of 1997, the 29,667 units projected for the year 2000 will have already been reached. The annual housing unit counts and projections for 1991 to 2000 should be as shown in the following table.

Year	Number of Housing Units
1991	17,360
1992	19,104
1993	21,226
1994	23,226
1995	25,876
1996	28,931
1997	31,986
1998	35,041
2000	38,096

17 17. (Page 5-110) The EIS forecasts show slow growth in population, personal income, and employment in North Las Vegas. There is no evidence to suggest that the substantial increases in population and employment that North Las Vegas has experienced since 1990 will suddenly end.

18 18. The EIS states that the cumulative impact of in- and out-migration associated with Nevada Test Site activities would contribute only negligibly to regional socioeconomic effects. On

MUNICIPAL GOVERNMENT 3 (CONTINUED)

18 cont. a regional basis this may be correct. As a higher percentage of the North Las Vegas population consists of NTS employees than probably any other Clark County jurisdiction, Alternative 2 would have a greater impact on North Las Vegas than on the region as a whole.

Volume 1, Appendix I - Transportation Study

19 19. (p. ES-3) We appreciate the fact that the Department of Energy recognizes the importance of reducing risk in the transportation system by selecting the route from a given generator site. Of equal importance is reducing the risk where the shipments will concentrate, most likely the Las Vegas Valley.

20 20. (P. 3-24) WE Are opposed to using NV-2, Eastern Route 8, down Craig Road. Craig Road serves primarily residential areas, except for the section near I-15. There was one signal on Craig Road between I-15 and Decatur in 1993. Since then four signals have been put into operation, three signals are under construction, and one signal is under design.

Again, thank you for the opportunity to comment on the draft EIS.

Sincerely,

Theron H. Goynes

Theron H. Goynes
Mayor Pro Tempore

CF

cc: Dennis Bechtel, Clark County
Charity Fechter
Nancy McNeill

MUNICIPAL GOVERNMENT 4

County of Inyo
Planning Department
P.O. Drawer L, Independence, CA 93526
Peter Chamberlin, Director of Planning

Planning Office
Charles Thistlethwaite
Curtis Kellogg
Earl Gann
Sandy Miller
(619) 878-0263
FAX(619) 872-2712

Yucca Mountain Office
Brad Mettam
Janet Cress
(619) 878-0030
FAX(619) 878-0382

May 3, 1996

FAXED 5-3-96

Donald R. Elle, Director
Environmental Protection Division
U.S. Department of Energy
P. O. Box 14459
Las Vegas, NV 89114

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada (DEIS-NTS). Historically, Inyo County has had to search for opportunities to become involved in the review of activities in and around the Nevada Test Site (NTS). Unfortunately, most documents prepared for federal activities in this area seem to use the California-Nevada border as a line of demarcation between areas of impact.

In many ways this is true of the DEIS-NTS. In the development of the Transportation Study (Appendix I), Inyo County has had an opportunity to comment, and has used that to expand the emphasis from strictly an in-state study to a more regional approach. However, other areas of the document still make the assumption that impacts need only be considered up to the state border. For example, the document makes the statement that "groundwater is an important resource in Nevada"[1]. This is also true of Inyo County and much of the west. In fact, one of the two regional groundwater systems that underlie the Nevada Test Site ultimately discharges in Inyo County (Death Valley)[2]. But the map referred to in the discussion of this groundwater system (Figure 4-39) does not show the California portion of the system.

Our comments to this document generally fall into two categories: transportation related, and; groundwater related.

Transportation

Alternatives for the continued or expanded use of the Nevada Test Site (NTS) will increase transportation needs. Especially waste management options, which include the potential shipment for disposal of vast, uncertain amounts of low-level and/or mixed wastes from across the nation. Two-way shipments of materials (such as transuranics) for storage at the NTS is likely also to occur. The analysis of transportation risks included in the Transportation Study (Appendix I),

[1] Draft Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada, January 1996, Volume 1, Chapter 5, page 5-37, line 2.
[2] Ibid., Volume 1, Chapter 4, page 4-241, line10.

MUNICIPAL GOVERNMENT 4 (CONTINUED)

generally treats these shipments as if they consisted of regular hazardous materials. Although the radiation risk is calculated and described, there is no specific consideration of the realities that have made transportation such an important issue to state and local governments and citizen groups. The reality is: the public considers radioactive materials to be different than other hazardous materials. All scientific risk assessments aside, the public considers the transportation of radioactive materials to be more dangerous — riskier — than the transportation of other hazardous materials. This reality was the driving force behind the involvement of the parties in the Transportation Protocol Working Group, and forms the rationale for the recommendations made by that group. Without an understanding of this real-world condition the Department of Energy may discount these recommendations, creating long term difficulties for their programs.

1. DOE must specify shipment notification procedures, including [1] state, tribal and local jurisdiction notification, [2] estimates of materials and volumes to be shipped, and, [3] designations of points of contact for corridor jurisdictions.

1

Because of the sensitivity of local citizenry to the transportation of radioactive materials through their community, local decision makers need shipping campaign information prior to the beginning of the shipments. Without information to respond to citizen inquiries, local officials will be placed in a reactive, rather than responsive, mode

2. There should be regular meetings among representatives of DOE, corridor jurisdictions and other stakeholders and interested entities. These meetings should be used to:

   a. provide updates regarding ongoing and planned shipment campaigns and reports and evaluations on past shipments [based on DOE monitoring program];
   b address issues that may arise when significant changes have occurred or are planned for the transportation system and in materials and/or volumes being shipped;
   c. identify and mitigate additional impact or concerns of local communities should transportation problems occur.

2 Interim information can be made available through postings to an Internet home page, or though other electronic, hard copy or oral communication. In addition, DOE should also provide

- a mechanism for receiving and addressing concerns that may arise between regular meetings; and,
- annual reports to include, at the minimum, identification of carriers, sources and destinations of each shipment, the number and volume of shipments of each substance, highway and rail routes used, incidents/accident encountered and actions taken to address them, and evaluations of each shipment campaign

The key is two-way **communication**. If local government officials are aware of the Department of Energy's transportation plans, and have been able to voice their concerns and have them addressed, there is less chance of confrontation over transportation issues.

MUNICIPAL GOVERNMENT 4 (CONTINUED)

3. DOE must ensure that local emergency response agencies are able to identify low level waste shipments and provide immediate notification to federal and state agencies responsible for responding to or supporting the handling of accidents.

3 In general, emergency responders are not likely to respond to incidents involving radioactive materials as often as they will to other types of hazardous materials such as gasoline. Every effort should be made to make responders familiar with low-level radioactive shipment characteristics, and to provide communications channels to agencies with specific expertise in dealing with response and recovery operations involving these materials.

4. DOE/NV should provide responding jurisdictions/agencies with at least two new detection instruments per jurisdiction and ongoing calibration services in conjunction with local training in corridor communities in emergency response to incidents involving radioactive materials.

4 The current national trend toward the reduction of federal and state support to local activities has resulted in the prioritizing of emergency management support activities. In many way this is a *direct result of the safety record of radioactive shipments* (*see the discussion of* "atrophy of vigilance" in Dr. Freudenburg's paper[3]). This means, however, that emergency responders are unlikely to be properly prepared without extra-ordinary effort from the Department of Energy. At a minimum this should include providing detection devices, calibration services, and training on the operation of the device and in response to a radiological incident.

5. DOE/NV should provide or facilitate the provision of handheld radios, in-vehicle radio repeaters, binoculars, cellular telephones and other equipment to corridor jurisdictions.

6. DOE should provide preference to local public safety and emergency response agencies
5 for the free distribution of federal surplus emergency response equipment.

Especially for rural responders, having the proper equipment and the ability to communicate with the rest of the world is essential. Every step the Department of Energy takes in that direction will have a mitigating effect on any incident.

7 DOE/NV should work with corridor communities to make training opportunities as effective as possible. Consideration should be given to direct funding of training programs to the corridor communities, providing training opportunities on weekends to
6 accommodate volunteer responders, and providing stipends to participants.

8. Communities which are not directly located on transportation routes should be provided the opportunity to participate in emergency response training courses offered to corridor communities.

[3] Nothing Recedes Like Success? Risk Analysis and the Organizational Amplification of Risks, *Risk Issues in Health & Safety*, Winter 1992, Volume 3, Number 1, pages 19-28.

MUNICIPAL GOVERNMENT 4 (CONTINUED)

7 9. DOE should provide financial and technical assistance as necessary to ensure that corridor communities have up-to-date emergency management and evacuation plans in place

Responders that are properly trained, and communities that are prepared, are less likely to over react to a radiological incident Therefor it is in the Department of Energy's best interests to provide sufficient training and support.

10. Transported loads should be covered or contained to prevent possible aerosol disbursement.

11. All shipments of low level waste arriving at NTS during off-hours should be required to temporarily park loads at a secured area inside NTS gates.

12 Each truck carrying Class 7 materials should have two drivers present at all times.

8 13. Carriers should respond to all driver advisories and notifications of delays and make appropriate adjustments to primary routes.

14. All vehicles should be required to undergo quarterly Commercial Vehicle Safety Alliance inspections [based on enhanced North American standard] and should display appropriate safety inspection stickers.

The Department of Energy should consider logistic considerations that will reduce the level of concern felt by the public, state, and local officials. Comments 10-14 all relate to the types of logistic considerations that the Department of Energy should entertain.

15. DOE/NV should work with the State and corridor jurisdictions to develop criteria for selection of safe parking areas to be used by carrier vehicles.

9 Due to the heightened public concern regarding radioactive materials, there should be areas designated for parking, should weather, roadway, or mechanical delays require vehicle down time. The Department of Energy should attempt to avoid the situation where local elected officials receive phone calls from their constituents asking why a truck carrying radioactive waste has been parked near the local elementary school all day. Sensitivity to these sorts of issues will help reduce the friction between levels of government, and help make shipping campaigns uneventful

Hydrology

1. The Environmental Impact Statement (EIS) should include an explicit discussion of plans for restoration of areas contaminated by underground nuclear testing, or the plans to monitor for groundwater contamination at such sites in the future.

10 Past, present, and future activities at the Nevada Test Site (NTS) can potentially cause adverse environmental impacts to the groundwater at the NTS. Particularly in the area of underground nuclear testing the potential is great for contamination of the underlying ground water (either

MUNICIPAL GOVERNMENT 4 (CONTINUED)

10 cont. directly through tests in or near the saturated zone, or indirectly through transport of radionuclides through the vadose zone to the saturated zone over time). The discussion of environmental restoration activities apparently redefines "completion" to mean the placement of monitoring devices in wells[4]. The DEIS is silent on the length of time monitoring should continue, given the implied decision to leave all underground nuclear testing byproducts in place.

2. The descriptions and depiction of the hydrogeologic basins in the EIS must be extended to include all of the basin(s), including the discharge points in Death Valley.

11 The description of the hydrogeologic basins in the report[5] is unclear, as it refers to a figure (4-39) that does not extend into California to show the discharge areas for the basins This could lead to the erroneous conclusion that there is no potential impact. While we have reviewed some of the work done by Geo-Trans on the hydrogeology of the area, as long as there is no plan for restoration of the areas contaminated by underground nuclear testing, these ultimate discharge areas need to be explicitly identified and discussed.

12 3 The reference to Section 4.1.3, as including a discussion of the effects of past underground testing on the groundwater[6], seems to be incorrect

4. The use of "significant existing contamination"[7] as a rationale reducing the significance of the impact to down gradient groundwater quality from future underground nuclear testing is in conflict with the discussion of the uncertainty concerning existing contamination[8].

13 Determining the amount, location, and travel time for groundwater contamination at the NTS will require significant additional resources, unless the Department of Energy chooses to "walk away" from the issue by adopting Alternative Two. Inyo County wishes to participate in the development and review of any additional environmental restoration studies contemplated in the future.

Again, thank you for the opportunity to provide comments to this document. If there are any questions please contact me.

Sincerely,

Brad Mettam

Brad Mettam
Associate Planner

---

[4] Draft Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada, January 1996, Volume 1, Appendix A, page A-47, lines 24-28
[5] Ibid., Volume 1, Chapter 4, Section 4.1.5, especially pages 4-148 to 4-152
[6] Ibid., Volume 1, Chapter 5, page 5-38, lines 17-19
[7] Ibid., Volume 1, Chapter 5, page 5-39, lines 4-9
[8] Ibid., Chapter 4, page 4-163, lines 7-15

BOARD OF COUNTY COMMISSIONERS
ESMERALDA COUNTY, NEVADA

MEMBERS
WADE M. BARTON, CHAIRMAN
SUSAN W. DUDLEY, VICE CHAIRMAN
JOYCE HARTMAN, LIQUOR BOARD

STAFF
MASON R. HAYES
ADMINISTRATIVE ASSISTANT
(702) 485-3406

May 1, 1996

Dr. Don Elle
Environmental Protection Division
U.S. Department of Energy
P.O. Box 14459
Las Vegas, NV 89114

RE: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE NEVADA TEST SITE AND OFF-SITE LOCATIONS IN THE STATE OF NEVADA
8
Dear Dr. Elle:

Esmeralda County welcomes this opportunity to offer comments on the Draft NTS EIS. We have been encouraged by the efforts of your staff and others at DOE\NVO to provide opportunities for public participation in planning the NTS EIS.

Esmeralda County strongly supports Alternative 3 - Expanded Use. We understand the importance of preserving a strong national defense including maintenance of the nuclear weapons stockpile. Historically NTS has been an integral part of America's defense strategy and this has been accomplished with the assistance of several generations of Nevadans. We regard NTS as an essential component in the national defense equation. At the same time, we see an excellent opportunity to augment employment of rural Nevadans with the expected increase in missions.
Esmeralda County has discovered several instances where the Draft EIS fails to adequately address specific issues. We also have several areas of concern regarding safe, routine transportation. We offer the following comments for your consideration:

1 The Summary (S-45) provides a list of the cooperating agencies including four federal agencies and Nye County. Esmeralda County is requesting status as a cooperating agency due to our proximity to NTS. We expect certain impacts over time and believe Esmeralda County should not be overlooked. As an example, in Volume 1 (Page 1-9, Section 1.5), it is explained that the Draft EIS was distributed to specific entities for review and comment.

COURTHOUSE, P.O. BOX 517, GOLDFIELD, NEVADA 89013

2 The county governments listed are Clark, Lincoln and Nye. Esmeralda County has historically been excluded when DOE has distributed information or solicited comments. The Draft NTS EIS has not adequately included Esmeralda County on an equal basis with Clark, Lincoln and Nye counties. We fail to understand why our county isn't recognized as a near neighbor. The Draft EIS illustrates DOE's attempts to consult with Clark, Lincoln and Nye counties while overlooking the nearest neighbor to a contaminated site.

3 Esmeralda County was recognized by the federal government as a labor surplus area due to continued high unemployment over several years. We have been vitally concerned with possibilities for employing local residents. In Volume 1 (Section 4.1.3 Socioeconomics, Page 4-68 through 4-96), DOE provides an extensive examination of socioeconomic trends and factors. The document only considers Clark, Lincoln and Nye counties. The Draft EIS again overlooks Esmeralda County. It is our opinion that the Draft EIS does not adequately address socioeconomics and its related trends because it does not consider Esmeralda County. As stated earlier, we are a near neighbor and the document repeatedly fails to analyze impacts to Esmeralda County.

4 In the same volume (Section 4.1.12 Environmental Justice), Clark, Lincoln and Nye counties are analyzed in terms of environmental justice. Again, Esmeralda County is not considered part of the equation. It is our opinion that the Draft EIS does not adequately address Environmental Justice since Esmeralda County is excluded from analysis.

5 It appears that the Draft EIS failed to consider Esmeralda County in other than generic terms throughout the document. Clark, Lincoln and Nye counties were analyzed extensively. Esmeralda County was not included for analysis. We believe that the Draft EIS cannot stand as written because Esmeralda County (the other near neighbor) was not considered for analysis of socioeconomics, environmental justice or even as an agency requiring notification. DOE's bypass of Esmeralda County suggests that the analysis and conclusions are incomplete and open to challenge.

Additionally, we have several transportation concerns. Esmeralda County actively participated in the Protocol Working Group meetings and we share the same belief in conjunction with other rural counties that Highway 95 through Goldfield will eventually become part of the route. We make the following suggestions for your consideration:

Recommendations for Institutional Interaction During Planning and Operations:

6 Formalization of shipment notification procedures, including local jurisdiction notification, with designation of point of contact for each corridor jurisdiction.

MUNICIPAL GOVERNMENT 5 (CONTINUED)

7 • Commitment to regular update meetings, reports and evaluations of past shipments. Meetings to also be scheduled when there are significant changes to the transportation system and in the materials and/or volumes shipped.

8 DOE to develop and maintain a monitoring program which addresses concerns of local jurisdictions in the event of problems with shipments and resultant issues. The monitoring program would also identify additional impacts and mitigation measures which might occur.

9 • DOE to provide annual report to State of Nevada including pertinent information (i.e. total amount of waste shipped, routes, etc.), problems and their resolution, description of accidents (if any).

10 • Availability of shipper/carrier data to all corridor jurisdictions.

<u>Recommendations for Planning and Training:</u>

11 • DOE to work with corridor jurisdictions to provide effective training opportunities with consideration of direct funding for training programs (with stipends for participants) and accommodation given to volunteers for their participation on weekends.

12 • Opportunity to be given to outside jurisdictions for participation in training offered to corridor jurisdictions.

13 • DOE to provide financial and technical assistance to assure corridor communities have evacuation plan in place.

<u>Recommendations for Procedures and Operations:</u>

14 • Transported loads to be covered or contained to prevent possible aerosol disbursement.

15 • All shipments arriving outside of normal hours required to be parked in NTS safe haven.

16 • Two drivers should be present on each shipment.

17 • Carriers to respond to all travel advisories, notifications of construction delays and make adjustments accordingly.

18 • All vehicles required to undergo quarterly CVSA inspections and must display safety inspection stickers.

MUNICIPAL GOVERNMENT 5 (CONTINUED)

<u>Recommendations for Routing and Selection of Parking Areas:</u>

19 • Primary routing to be on interstate, U.S. or state highways.

20 • DOE to consider working with affected jurisdictions to agree on route or specific segments to be prohibited with DOE gaining authority through contractual agreements with shippers. (Shippers could be prohibited from certain routes through their contract with DOE.)

<u>Route Selection Methodology:</u>

• DOE <u>must</u> commit in the RECORD OF DECISION to clearly understood process for routing of low level waste shipments and to a method that binds the shipper to adhering to the chosen routing alternative. In agreement with the Protocol Working Group, Esmeralda County suggests the following wording for a recommendation on route selection methodology and direction to carriers:

21 The Department of Energy, Nevada Operations Office (DOE/NVO) will address specific routes for low level waste (LLW) shipments to the Nevada Test Site (NTS). In consultation with the State of Nevada, affected local governments and sovereign Indian nations, DOE/NVO will develop a route selection methodology and identify preferred LLW routing alternatives for inclusion in the *Final NTS Environmental Impact Statement*. DOE/NVO will also stipulate these specific routes in the *Record of Decision* and institute a process for contractually requiring shippers to adhere to the selected routes.

22 • DOE to benefit from local knowledge to ensure the public/environment/economy' will experience the least potential hazard from LLW shipments. The Protocol Working Group should not recommend specific routes but help DOE to establish a methodology.

23 • The issue of routing of radioactive waste is extremely important to the State of
Nevada and local communities. The *Record of Decision* should include an agreement to work with local government entities to develop route selection criteria and methodology and to evaluate alternatives. Important criteria to be considered must include population exposure, traffic and accident rates, proximity of sensitive facilities and environmental areas. Contracts under which carriers operate should stipulate specific routes to be taken and those to be avoided.

MUNICIPAL GOVERNMENT 5 (CONTINUED)

24 • DOE to institute policies restricting shipments during holidays, peak tourist travel periods or during special events.

<u>Recommendations for Parking Areas:</u>

25 • DOE to work with State of Nevada and corridor jurisdictions to develop criteria for selection of safe parking areas to be used by carriers.

We have appreciated your efforts to inform the public and actively seek comments on the Draft NTS EIS. Esmeralda County is committed to being a good neighbor to DOE/NVO and we are willing to work closely with your agency to ensure safe, routine transportation of low level waste to NTS. Additionally, we ask you to carefully review our concerns about inadequate analysis in the EIS relating to Esmeralda County.

If you have any questions, don't hesitate to call.

Sincerely,

Wade M. Barton

Wade M. Barton
Chairman, Esmeralda County Commission

5

MUNICIPAL GOVERNMENT 6

Clark County

Department of
Comprehensive Planning

RICHARD B. HOLMES
DIRECTOR

CLARK COUNTY GOVERNMENT CENTER
500 S GRAND CENTRAL PKY STE 3012
PO BOX 551741
LAS VEGAS NV 89155-1741
(702) 455-4181
FAX: (702) 385-8940

May 2, 1996

U.S. Department of Energy
Nevada Operations Office
P.O. Box 14459
Las Vegas, Nevada 89114
Attention: Dr. Donald Elle, Director
Environmental Protection Division

SUBJECT: CLARK COUNTY DEPARTMENT OF COMPREHENSIVE PLANNING COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR THE NEVADA TEST SITE (NTS), AND OFF-SITE LOCATIONS IN THE STATE OF NEVADA

Dear Dr. Elle:

Attached are comments from the Clark County Department of Comprehensive Planning to the draft ***Environmental Impact Statement (EIS) for the Nevada Test Site (NTS), and Off-Site Locations in the State of Nevada.*** We appreciate the opportunity to provide input to this important set of documents. Staff has been especially impressed with the amount of time that Department of Energy (DOE) staff has spent with Clark County staff on deliberating the important issues considered in the EIS.

The Board is especially interested in issues that relate to potential effects to the health and safety of the citizens of Clark County, particularly with respect to the transportation of the waste. While we applaud the DOE's recognition that transportation is an issue of significance with regard to several of the alternative futures being considered in the EIS (notably Alternatives 1 and 3), we are not supportive of the disproportionate number of routing options in Clark County and in the urbanized and rapidly growing Las Vegas Valley.

We look forward to your written response to our comments, and concerns as well as their careful consideration in the final Record of Decision. If you have any questions please contact me.

Sincerely,

Richard B. Holmes

Richard B. Holmes
Director

cc: James Ley
Bonnie Rinaldi
Dennis Bechtel

01holmes.eis

Clark County Department of Comprehensive Planning
03 May 1996

Comments on the Draft Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada, DOE/EIS 0243, January 1996

1.0 Introduction

The Clark County [Nevada] Department of Comprehensive Planning is presenting these comments on the *Draft Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada, DOE/EIS 0243, January 1996 [the "Draft EIS"]*, in accordance with implementing procedures of the National Environmental Policy Act of 1969 and Council on Environmental Quality regulations. The focus of these comments is on *Alternative 3, Expanded Use*. While establishment of solar enterprise zones at Eldorado Valley and Dry Lake Valley in Clark County [*Alternative 4]* would eliminate some recreational opportunities in these areas, we feel that any unavoidable impacts are of a nature that may be mitigated satisfactorily. If *Alternatives 1 or 2* are chosen, present institutional interactions between the U.S. Department of Energy [DOE] and Clark County would need to
1 be modified to enhance county monitoring of DOE programmatic, maintenance, restoration, and/or security functions at the Nevada Test Site [NTS].

Staff members of a number of county departments and agencies have reviewed the *Draft EIS* and have provided their views for inclusion in this comment document. While these comments are being submitted within the established comment period, we reserve the right to provide written and oral comments about the *Nevada Test Site Environmental Impact Statement [NTS EIS]* and related processes throughout the course of its preparation. Further, we are interested in reviewing and submitting comments on any external drafts of the *Record of Decision* prior to its publication in final form.

Clark County planning staff have consulted with representatives of other affected counties, Indian tribes, jurisdictions within county borders and the State of Nevada. During this process, we have identified a number of common concerns and points of view as well as a divergence of positions in certain areas. In the following text, we have identified certain common issues where we feel that this will provide breadth or depth to our comments.

In actions internal to the county, professional and technical staff have identified, discussed and made recommendations regarding issues of greatest concern. In addition to the 11 potentially affected environments addressed in the *Draft EIS*, we have identified a number of process and substantive areas of concern to us. These include, under Alternative 3, *Expanded Use:*

[1] potential costs to county government and commercial enterprises for mitigation or
2 preventative measures [e.g., emergency response] made necessary by increased numbers of truck shipments, especially through the Las Vegas urban area;
3 [2] potential effects on property values roperty values along transportation routes;

MUNICIPAL GOVERNMENT 6 (CONTINUED)

4 [3] environmental justice with regard to transportation routes; and,
5 [4] the methodology for selection of highway routes and the establishment by DOE of safety and routing requirements for carriers.

Clark County planning staff is also interested in the way in which DOE views the issues of risk and impact assessment and the manner in which its representatives interpret and communicate any findings in these areas. These include concerns about the use of
6 probabilistic risk assessment techniques and the omission of estimates of impacts of importance to local governments [e.g., unrecognized costs, environmental justice, perceived risk].

While we understand that there are significant differences in program activities and materials to be handled, we submit that there are common elements and potential impacts that are best considered in an overall context. Among others, these include the design and operations of the DOE transportation system for a number of simultaneous shipping campaigns, related risks and impacts, perceptions of risk, and mitigation planning and implementation.

Further, we are most interested in the continuation and enhancement of dialogue among the DOE, local governments, Indian tribes, interest and environmental groups, and other stakeholders. Such scheduled and unscheduled interaction recently has been shown to be
7 valuable in the identification, clarification and addressing of issues important to stakeholders in the *EIS* process. This process is needed to ensure that the affected parties in Nevada will have the ability to respond to future events and recommendations that will not have been finalized prior to the completion of the NTS EIS.

A good example of this process is the functioning of the NTS Transportation Advisory Group and its Protocol and Risk Working Groups. These groups have met regularly over the past 18 months with the resultant open dialogue between staff and management of DOE and various jurisdictions. In some cases, this dialogue has led to immediate DOE response to particular action items, including the rerouting of low-level radioactive waste [LLW] shipments through North Las Vegas. Recently, the Protocol Working Group provided recommendations for DOE consideration in the *Record of Decision* for the *NTS EIS*.

This process would also be most effective in stakeholder participation in the development of the *Resource Management Plan*, to be completed after the *Record of Decision* is accepted.
8 We believe that *Record of Decision* for the EIS should contain a schedule for implementing the *Plan*. By including such a schedule, DOE will demonstrate its commitment to the process that must include full interaction with local governments and other stakeholders.

Some of our comments, concerns and questions were raised at hearings held in Las Vegas and are reiterated and expanded upon in the attached document. In general, our comments are related to Clark County government's mission of providing programs to support the health, safety, economic well-being and quality of life of its residents in a cost-effective and efficient manner. The commentary relates to [1] management of the EIS process and [2] present and potential and impacts due to uses of the Nevada Test Site as outlined in the *NTS*

MUNICIPAL GOVERNMENT 6 (CONTINUED)

2.0 DOE's Policy and Management of the EIS Process for the Nevada Test Site

9 **2.1 Potentially Affected Areas.** The definition of potentially affected geographic or
jurisdictional areas in the *Draft EIS* is unclear. For instance, the entire transportation system
10 of southern Nevada is used in the discussion regarding routing, but potential impacts along
11 these routes are not discussed. For example, probability risk assessment numbers are used
along the routes, but there is no discussion of such issues as environmental justice, impacts
12 on traffic congestion, infrastructure damage or costs of maintenance, except in the immediate
area of the NTS. Likewise, the *Draft EIS* states that 90% of NTS workers live in Clark
13 County but no attention is given to potential impacts on county services that may be needed
for additional NTS workers under *Alternative 3.* Other examples may be provided for each
of the affected environments addressed in the *Draft EIS.*

14 In effect, by limiting the regions of interest for affected environments to localized areas around the NTS, DOE precludes consideration of three issues of great importance to Clark County - potential increased county costs for mandated services, potential decrease in tax revenues due to perceived risk, and the development of mitigation programs that would become necessary if *Alternatives 3 or 4* are selected.

While the NTS itself is a large isolated section of land, transportation corridors which are used to move material to and from the site cut through a base population of approximately 1,000,000 people, a visitor population approaching 3,000,000 people per month, land and property assessed in excess of $26 billion, and extremely sensitive corridors where one accident could potentially cause the contamination of a water supply utilized by Nevada, Arizona, California and Mexico.

15 When discussing the NTS, all of southern Nevada must be taken into consideration as a potentially affected area. Any action associated with the NTS may have little noticeable impact on the Southern Nevada economy due to its tremendous growth rate. However, since this is a tourist-driven economy, even a minor downturn in the tourist industry due to a widespread perception of undue risk could have a major impact on tax revenues used to support county services.

16 **2.2 Assessment of Cumulative Effects and Interaction Among Environmental Impact Statements Affecting the Nevada Test Site.** The Draft EIS refers to 18 programs in various stages of EIS or NEPA processes but stops short of addressing or even identifying the impacts of the programs, taken together, over a period of time. The EISs and NEPA studies consider these programs separately, and in most cases, few significant negative effects are noted or anticipated. We feel, however, that if more than one program is implemented, the impacts may no longer be viewed as independent actions and all must be considered in conjunction with others.

MUNICIPAL GOVERNMENT 6 (CONTINUED)

17 We are concerned with the manner in which the NTS EIS will consider decisions based upon these assessments given the fact that they will be made at different times. We are especially interested in the proposed method of handling decisions that are in conflict with those reached in the *NTS EIS Record of Decision* and those supported by southern Nevadans.

18 In the EIS process, consideration should be given to past testing activities at NTS, all current or planned NTS activities as related to the DOE waste management and environmental restoration, nuclear stockpile stewardship and defense-related programs, and future high-level waste disposal and storage options.

For example, the *Waste Management Programmatic Environmental Impact Statement [PEIS]* is a nationwide study examining the treatment, storage or disposal of low level mixed wastes, low level waste, transuranic waste, high level defense waste, and other types. These wastes could be disposed of at one to sixteen DOE sites. The *PEIS* identifies the NTS as a major possible site for the management of wastes since it is the largest site in the DOE complex. In the PEIS, the NTS was found to have the least negative health and socioeconomic impacts on the surrounding population of any DOE site.

19 Thus, the potential for continued or expanded shipments of radioactive, mixed and hazardous wastes to the NTS is high. Such materials may include contaminated dirt, mixed wastes, plutonium pits and other low-level or high-level nuclear materials. All of these materials are dangerous and, taken cumulatively, they may pose greater risks and result in higher impacts than any one EIS could estimate. Until such time as each of these *EISs* are finalized, and the NTS is identified as an acceptable or unacceptable site, no informed decisions concerning any individual location may be made.

20 Each of these projects is supported by collection, management and analysis of data that would also be useful in the NTS EIS. Many of the assumptions regarding transportation mode and routing may be exactly the same, as would be the types of impacts that will be studied. This has implications for development and maintenance of common EIS data standards, management policies and analytic methods.

At this point, DOE has not published any plan for interactive data collection, management and analyses, and study methodology among the EISs for which they are responsible. Such a plan would be of great utility as a management tool for DOE and as a guidance document for local governments as they continue their responsibility to monitor the DOE environmental management and waste disposal programs.

21 We agree with the State of Nevada and other county jurisdictions that if DOE adopts a proposed action that includes the transportation of any of the materials addressed in other EISs, a cumulative impact analysis for transportation must be prepared. This EIS must address the combined functions of DOE's Environmental Management and Defense Program activities at the NTS and should include transportation information for each specific material, (1) origin and destination; (2) quantity or volume shipped; (3) total radioactivity and maximum radioactivity per individual shipment; (4) shipping container characteristics and capacities; (5) shipment mode or modes; (6) transportation service options; (7) carrier qualifications and selection procedures; (8) shipment route or routes; (9) cumulative shipment miles; and (10) timing of shipments.

Such a cumulative impact analysis for transportation would define a scenario that takes into account all possible actions. That is, a meta-evaluation of all impacts taken together, using integrated data management and analysis techniques, would be useful to provide a realistic assessment of the potential risk and impacts to affected areas over certain periods of time. Only in this way, would DOE decision-makers be able to see the potential consequences of their actions.

3.0 Impacts

3.1 Transportation Routes. There are ten highway routes examined for shipments of waste to the NTS under *Alternative 3*. Eight of the ten routes propose the transport of a relatively large number of shipments through Clark County with five of these through the most densely populated part of our community on I-15, U.S. 95, and U.S. 93. Only one alternative considers a rural routing in Nevada which would avoid metropolitan Las Vegas.

22 While the *EIS* does not specifically state a preferred route, it does name primary and alternate routes. The primary route would carry waste south on I-15 through the Spaghetti Bowl [interchange with U.S. 95], currently under reconstruction, and north on U.S. 95 to the NTS. This route utilizes areas of greatest hazard and lowest levels of service in the area. In addition, present roadway construction projects, particularly at the Spaghetti Bowl interchange, is planned to last at least seven years.

23 Clark County is in the early stages of a 10-year transportation improvement project that will see extensive construction, reconstruction and other modifications of its arterial road system. It has been demonstrated that construction projects are related to increased congestion, a slowing of traffic, and an increase in accidents, thus lowering of levels of service]. Given the ambitious clark County program, one must analyze the need for enhanced traffic management programs or other remediation programs to lessen its effect. A potentially significant increase in nuclear waste traffic must also be considered in such plans.

DOE's specificity in defining potential highway shipment route is useful in assisting local governments to assess the necessity and capabilities of public safety programs, potential economic costs to local governments and residents, health and safety risks to residents and visitors, and effects on the surrounding environment. However, this brings into question route selection methods utilized by DOE for different types of radioactive waste.

24 At present, federal regulations regarding the transportation of low level, mixed waste, and hazardous waste allow the carrier to select routes based, primarily, upon time and distance considerations. This is a major concern to Clark County since we feel that a careful route selection methodology should be agreed upon by DOE and affected jurisdictions and the resultant routing be used by carriers. The establishment or use of such a methodology, similar to that used for highway route-controlled quantities, would provide a basis for identifying and providing priorities for variables to be used in route selection.

3.2.1 Transportation Route Selection Methodology. Under current federal regulation and transportation practice, all waste that could be transported to the NTS would traverse the most populated areas and most congested traffic zones in Clark County. We feel that risk and impact methodologies, when properly conceived and used, would provide a approach to route selection that would take into account those factors believed to be important by jurisdictions through which the material would pass.

A valuable reference point for the development of such a methodology is the 1993 draft report, *Identification of Factors for Selecting Modes and Routes for Shipping High-Level Radioactive Waste and Spent Nuclear Fuel*, prepared for the U.S. Department of Transportation [DOT] under provisions of the Hazardous Materials Transportation Safety Act of 1990. This report may be regarded as a first step toward a more comprehensive examination of the problems of nuclear waste route selection and risk analysis. The report is useful because it highlights a number of factors not usually considered in risk analysis.

25 In fact, we believe that the suggested DOT route selection methodology places greater importance on impacts and risks of interest to local and state governments rather than probability-based risk measures used by DOE to assess routes. Given this, we suggest that DOE use the DOT material as a guideline for establishing comparative highway route selection methods that would place priority on impacts and risks most commonly preferred by state or local routing agencies.

26 In summary, we feel that probabilistic risk assessment is an appropriate first step in identifying eligible routes for further examination. The next step should be comparative route assessments that consider, among other variables, non-calculated risks, risk in context with other transportation system operations and area demographics, the relationship between identified risks and impacts, and other contingencies.

27 **3.2.2 Use of Selected Routes by Carriers.** Once the routes are selected, the *NTS EIS* must clearly provide for a process by which carriers are bound to use the routes. Clark County officials have documentation to show that DOE facilities have contracted or otherwise agreed with carriers that they use only designated routes. This is true for source facilities such as Fernald and destination facilities such as INEL. We feel that DOE must commit to stipulating, by means of contract requirements with carriers, routes or segments of routes that may be used for waste and nuclear materials shipments to NTS, except under special circumstances.

28 Clark County planning staff agree with State of Nevada officials that carrier contracts that require adherence to routing preferences may be crafted in compliance to federal or state laws and regulations that deal with radioactive or hazardous materials route designations. DOE, as the shipper of these materials (or the facility operator acting on behalf of DOE), may incorporate provisions into contracts with carriers that require the carrier to perform in specified ways. As long as DOE does not attempt to bind carriers to provisions that are illegal or in violation of existing regulations, there is nothing to prohibit DOE from using the contracting process to enforce the use of routes that are acceptable to DOE/NTS stakeholders (i.e., affected local governments and sovereign nations impacted by shipments to NTS).

29 The process by which DOE is permitted to solicit and award contracts can accommodate the requirement that carriers use certain routes or avoid certain unacceptable segments of routes. If such accommodation is not possible with general freight carriers, DOE should commit to the use of contract carriers who are agreeable to the requirements even if additional costs are incurred. We feel that DOE should commit to such a process in the *Record of Decision* for the EIS.

30 **3.3 Perceived Risk.** DOE must address perceived risk of nuclear waste shipments within Clark County. The current level of shipments to NTS has already caused widespread public concern in Clark County and possible large scale shipping campaigns of LLW and other wastes through the Las Vegas Valley could cause significant adverse socioeconomic and cultural impacts even if no accidents occur.

31 The failure to relate perceived risk and other non-tangible aspects of risk to public safety and concern is a significant omission in DOE thinking and makes the *Draft EIS* vulnerable to valid criticism. For example, despite improvements to the Three Mile Island facility after its accident, the perceived risk of nuclear power has curtailed that facility's use. In this case, perceived risk has had a more substantial effect on use of nuclear power than calculated risk. The effects of perceived risk may be even more pronounced when individuals are witness to large numbers of shipments passing near their neighborhoods or resort areas of their preference.

32 In Clark County's case, we are most concerned with the effect of perceptions and possible resultant stigma on the tourist and gaming industry of southern Nevada. DOE and other studies have shown that negative perceptions usually result in short term changes in behavior and impacts. However, even a short-term drop in gaming revenues could have a huge effect on the tax base of the county.

Ed. Note: The following was extracted from State of Nevada comments and placed here to emphasize the importance of the issue to Clark County. Nevada-sponsored research on stigma effects and potential impacts provides a solid theoretical and methodological base on which DOE may build to assess these types of impacts on local and regional economy, public revenues, public services, and community quality of life. These assessments should take into account the increasingly competitive gaming and tourist marketplaces and the important role that any negative perceptions could have. It is possible that, through the social amplification of risk, even relatively minor events or accidents could have serious economic consequences that would immediately supersede any expected benefits that would be derived from NTS employment. It is essential that the NTS EIS thoroughly assess standard and stigma impacts in a comprehensive and integrated manner.

33 There is evidence that individual property owners may be affected by negative perceptions of shipment corridors or roads that may carry nuclear waste shipments. The court case, *Komis vs. Santa Fe*, has demonstrated the consequences of such perceptions on property values. In this New Mexico case, it was determined that undeveloped land in a rural area had lost from 11% to 30% of its value because of the designation, even though not even one shipment had yet been made. If these diminished values are applied to the urban Las Vegas area, the results would be most serious not only to individuals but also to the county because of a decreased tax base.

34 **3.4 Public Safety Program Training and Preparedness.** Protection of the health and safety of its residents and visitors is of vital importance to Clark County. Health and safety risks to individuals as a result of expanded NTS operations must be delineated and risk management programs considered to minimize potential risks. Information requirements for such risk management programs include the identification of most likely shipping routes, federal, state, and local government emergency management and emergency medical resources and requirements, and hazardous and high accident locations along the potential routes and special populations, among others.

35 The *EIS* must also address such issues as institutional arrangements for shipment tracking,
need for escorts, prenotification to state, local, and tribal governments, vehicle safety and
radiological inspection programs, methodology for selection and ongoing review of routes,
36 37 ambient air quality, water supplies, and so on. Given these considerations, the *EIS* must
38 attend to roles and responsibilities of the DOE and local governments and methods of
interaction to assist the local governments in meeting their public safety obligations. We
39 agree with members of the Protocol Working Group that DOE should present detailed plans
and schedules for such a mitigation program in the *Record of Decision*.

3.5 Socioeconomic Impacts

40 Clark County planning staff feel strongly that the *NTS EIS* should consider the direct, indirect, and induced effects of employment and procurement associated with NTS activities. 90% of the NTS work force resides in Clark County and a large portion of the support activities occur in the Las Vegas Valley. NTS-related growth has the potential to cause negative impacts on the need for public services and facilities supported by tax revenues. In recent years, the phenomenal growth of gaming and tourism has kept pace with other forms of development and population growth. However, it cannot be assumed that this will remain true into the next century. These economic effects associated with additional NTS-related population growth could, therefore, generate negative fiscal impacts for state and local jurisdictions in the event that tourism/gaming growth fails to meet that of other areas of the economy.

3.6 Environmental Justice [Impacts on the Minorities and Low Income Groups]

41 Clark County officials feel that the *EIS* must seriously consider federal directives and comply with federal statutes regarding environmental justice to address the concerns and possible differential adverse impacts on Native American, minority and low-income populations. 24% of the population of Clark County is considered to be members of minority groups, with Hispanics [11%] and Blacks [9%] comprising most of this group. 35% of the county population falls into the low income category.

The population within one mile each side of I-15 and the Union Pacific Railroad in Clark County is 38% minority, a significantly higher percentage than the county as a whole. Those Native Americans who live on reservations within county borders are also affected since the both living areas are immediately adjacent or straddle I-15 or U.S. 95. This shows that, because of where they live and who they are, a much greater percentage of minority and low income individuals and Native Americans are placed at higher risk than would be expected if the risk distribution were equitable among the population.

This has been addressed by three federal documents that will have significant effects on the *EIS* process. The first, a *Presidential Executive Order on Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, 1994*, pointed out that existing environmental and civil rights statutes provide many opportunities to address environmental hazards in minority and low-income communities. Application of these statutes may be used to prevent such communities from being subject to disproportional high and adverse environmental effects. The Executive Order provided specific directives regarding federal agency responsibilities and strategies, and gave direction for research, data collection and analysis. In addition, the Order created an Interagency Working Group on Environmental Justice to consist of a number of federal agencies, including DOE.

A second document, *Environmental Justice Strategy* [DOE, 1995], considers DOE's approach and plans to comply with federal statutes. The *Strategy* proposes a partnership of federal, state and local governments and other stakeholders to plan and implement mitigation and remediation activities where prevention adverse impacts are unavoidable.

42 While we commend and support this important program, we have seen very little evidence that the plan was used during the preparation of the *Draft EIS*. First, the region of interest included only those individuals who live in close proximity to the NTS, thus eliminating
43 consideration of the high number of minority and low income group members in Clark County. Secondly, the *Strategy* addresses the use of the best possible data and the sharing of this information with stakeholders. If this had been done, the significant affected population
44 of Clark County would have been included in the study.

45 As in other impact areas, we feel that any environmental justice analysis must address cumulative effects, including social amplification and stigma impacts. Social amplification and stigma effects are important, in part, because of the importance of the tourism and gaming industry to Clark County's economy. While adverse impacts to tourism and the economy have the potential of being detrimental to all residents of Clark County, minority and low income populations who rely on the gaming industry for service level employment could be even more adversely affected if the tourist economy is impacted.

The third document, the *U.S. Department of Energy American Indian Policy*, provides guidance to DOE personnel regarding management actions affecting American Indians. This policy pointed out that the DOE recognizes the sovereignty of Indian tribal governments and that the Department will consult with tribal governments to assure that tribal rights and concerns are considered prior to any action that may affect tribes. Specifically, each field office or DOE installation with areas of cultural or religious concerns to American Indians "will consult with them about the potential impact of proposed DOE actions on those resources and will avoid unnecessary interference with traditional religious practices."

46 Expanded use of the NTS has the potential not only to disturb cultural artifacts and make impacts on long-lived cultures but also to adversely affect the health and safety of ethnic minorities. These issues, as defined in *Appendix G, American Indian Comments . .*, must be carefully considered by the DOE.

MUNICIPAL GOVERNMENT 7

MAYOR
JAN LAVERTY JONES
COUNCILMEN
ARNIE ADAMSEN
MATTHEW Q. CALLISTER
MICHAEL J. MCDONALD
GARY REESE
CITY MANAGER
LARRY K. BARTON

CITY of LAS VEGAS

May 3, 1996

Donald R. Elle, Director
Environmental Protection Division
U. S. Department of Energy
Nevada Operations Office
P. O. Box 14459
Las Vegas, NV 89114

Dear Mr. Elle:

The City of Las Vegas wishes to thank the Department of Energy for the opportunity to comment on the draft of the Environmental Impact Statement (EIS) for the Nevada Test Site (NTS) and Off-site Locations in the State of Nevada. This is an important issue which effects local governments directly. Your group, in particular Frank Disanza and Katie Grassmier, worked on transportation issues and truly worked with local governments to try to understand local concerns.

The City of Las Vegas is the largest incorporated city in Nevada with a population of over 360,000 city residents located within a metropolitan population in excess of 1,000,000 when including the cities of North Las Vegas and Henderson and the unincorporated entities located in the valley under the jurisdiction of Clark County. The Las Vegas metropolitan area represents approximately two thirds of the population of the state and produces five eighths of the economic activity of the state.

Southern Nevada is unique in that it contains large areas of open land, most controlled by various federal government agencies, while at the same time containing a population which is more densely urban than Los Angeles. The economy of Southern Nevada is driven by tourism with seven of the ten largest hotels in the world located in the Las Vegas valley. The image of Las Vegas draws visitors from all over the world. As the fan reaction to the baseball strike has shown, image is a very fragile thing. The entities in the Las Vegas valley work very hard at promoting the Las Vegas image.

400 E. STEWART AVENUE • LAS VEGAS, NEVADA 89101-2986
(702) 229-6011 (VOICE) • (702) 386-9108 (TDD)

7009 3810-015-12/95

MUNICIPAL GOVERNMENT 7 (CONTINUED)

Donald R. Elle, 5/3/96

Page 2

1 The most common access to the Nevada Test Site is from Las Vegas by way of United States highway 95. That means that every road shipment of radioactive materials destine for NTS will pass through the heart of Las Vegas, no more than one quarter mile from "Fabulous Fremont Street". No other community in the nation will "see" every shipment, no other community is so dependent on image to maintain prosperity.

2 A release accident is not necessary in order to damage our image. A "fender bender" involving a radioactive load has the potential to produce a headline reading **"Nuclear Accident in Las Vegas"**, inopportune timing could produce the loss of millions of dollars to the Las Vegas economy. Multiple occurrences could be devastating, our job is to protect the residents of Las Vegas from threats to their well being.

The following are items which the City of Las Vegas feels should be detailed in the Nevada Test Site Environmental Impact Statement.

3 1. This should take into account all aspects of the DOE waste system. Southern Nevada is affected by the waste streams generated by the entire DOE complex, and transportation system should not ignore the effects from the potential repository or interim storage of high-level waste. "Everything is connected to everything else", a change in one part of the system effects the whole program.

4 2. DOE should establish a firm routing policy which requires carriers of DOE shipments to follow specific routes. Deviation from these routes should be on an emergency only basis.

5 3. Although Hoover Dam is on a US highway, DOE should eliminate shipments across this structure. From a public perception perspective and from a tourist exposure framework, this routing is not wise. Davis Dam or the I-40 crossing near Needles California are better choices.

6 4. Although outside the formal notification process, DOE should make available real-time information on shipments through the Las Vegas valley.

7 5. Las Vegas makes a formal request for a DOE commitment to maintain a Radiological Assistance Team (RAT) or similar group at NTS for the duration of waste operations at NTS.

8 6. DOE should conduct and fund yearly accident scenario exercises with local governments in the Las Vegas valley to assure that a good working relationship exists between the DOE and local emergency response organizations.

MUNICIPAL GOVERNMENT 7 (CONTINUED)

Donald R. Elle, 5/3/96 **Page 3**

The well being of the citizens of Las Vegas includes health, safety and economic well being, it is not enough do numerical analysis of exposure rates
9 **and dose to population. The very real effects of accidents on a tourist economy must be evaluated. A plan to mitigate these effects must be in place**
10 **if this material is to be shipped through southern Nevada.**

Sincerely,

Peter Cummings
Manager, Administrative Services
City of Las Vegas

PC:SD

MUNICIPAL GOVERNMENT 8

Eureka County
Yucca Mountain Information Office
P.O. Box 714
Eureka, Nevada 89316
Phone (702) 237-5407 FAX (702) 237-5169

May 1, 1996

Donald R. Elle, Director
Environmental Protection Division
U.S. Department of Energy
Nevada Operations Office
P.O. Box 14459
Las Vegas, NV 89114

RE: Comments by Eureka County, Nevada, on the Draft Environmental Impact Statement for the Nevada Test Site

Dear Dr. Elle:

On behalf of Eureka County, Nevada, I am submitting the following comments for the record on the Department of Energy's (DOE) Draft Environmental Impact Statement for the Nevada Test Site.

Eureka County's interests in the Nevada Test Site include the potential transportation impacts from shipments to the site that might use highways within Eureka County as primary or alternate routes. In addition, our experience related to aboveground and underground nuclear weapons testing has shown us that activities at the Nevada Test Site can have a profound and far reaching impact on us. Eureka is an affected unit of local government under Section 116 of the Nuclear Waste Policy Act, and retains an active interest in the interrelationship of Yucca Mountain activities and Nevada Test Site activities.

Preferred Alternative

The DOE has indicated that it is likely to choose portions from each of the four alternatives presented, selecting specific options from the various alternatives. This is confusing and does not provide the public with the kind of information needed to evaluate the alternatives, since DOE has stated that none of them will actually be chosen. Instead, the DOE should present an actual
1 preferred alternative along with other options so that the public can understand what DOE proposes to do.

1

No Action Alternative

2 Alternative 1, to continue current operations, is designated as the "No Action Alternative". This is an inappropriate designation for activities which are being carried out in the absence of a current EIS. In addition, several of the activities described under this alternative do not relate to the defense mission of the NTS, and are activities that belong in the expanded use alternative. Receipt of waste from out-of-state generators should not be part of a "no action" alternative.

Yucca Mountain

3 The draft EIS appears to exclude the portion of NTS designated for the Yucca Mountain project. The EIS should clearly state why this portion has been excluded. After all, a compelling argument for locating a high-level waste repository at Yucca Mountain was its location, in part, on the Test Site. The EIS must acknowledge, throughout, the interdependence and connections that exist and may exist in the future between NTS operations and Yucca Mountain operations. Also the EIS should make full use of the wealth of information generated by the Yucca Mountain project.

Radionuclide Surface Contamination and Source Terms

4 More detailed information is needed on radiological source terms and surface contamination throughout all environmental media at NTS, especially locations where radionuclide levels exceed regulatory standards, including the off-site locations.

Cumulative Impacts

The cumulative impacts analysis is deficient. The potential cumulative impacts from the transportation, treatment, storage and disposal of both radioactive waste and special nuclear materials is not assessed and should be. Of special note are the cumulative impacts from the Yucca Mountain project in combination with proposed NTS activities. To this analysis should be added the cumulative impact of these activities not only on southern Nevada but on the entire state of Nevada.

5 The cumulative impact analysis of Bureau of Land Management reasonably foreseeable future actions does not mention the Central Nevada Communication Sites Proposed Plan Amendment and Environmental Assessment, which recommends that Navy threat emitters be confined to the Dixie Valley area. This analysis is relevant in the overall scheme of federal government activity in Nevada, especially as it relates to the potential future connections between the Navy and the Air Force practice areas over Nevada.

The cumulative impact analysis for local government is confined to southern Nevada counties and communities only. The activities of the Nevada Test Site impact the entire state. Potentially transportation of radioactive materials could occur in northern Nevada counties, yet there is no

analysis of future projects in northern Nevada counties that could contribute to a cumulative impact.

5 cont. The cumulative impact analysis of the U.S. Navy's reasonably foreseeable future actions is deficient. The discussion on pages 6-3 and 6-4 does not address the proposed Diamond MOA and the Navy's plans to expand their practice areas to include nearly all of central Nevada. The section's conclusion, "The sole concern is the proposed withdrawal of land. This potential issue is of a statewide nature and is not directly related to NTS programs, " ignores the many concerns voiced by both residents and local governments that the impacts of Navy activities related to supersonic and low level practice flights are adversely affecting rural Nevada communities.

One common suggestion that we hear is that those flights should be redirected to the Nevada Test Site, and that the Navy, Air Force and Department of Energy should cooperate to ensure that all military practice needs are accommodated without disrupting rural communities. This should be addressed in the EIS.

Military Airspace

The EIS should address the possible use of NTS airspace for practice for both the Air Force and the Navy, working cooperatively. This could be in the expanded use section or alternative use section. In a state dominated by the federal government, it is essential that branches of the federal government work together to minimize the adverse impacts of their activities on the residents of Nevada. This is a prime example of where we should see this type of cooperation, related to the
6 purposes of national defense.

In the Framework for Resource Management Plan, page 4-8, the goal "Coordinate airspace requirements with surrounding land-management agencies and make restricted airspace available for uses compatible with DOE's missions" is a good start. It would be unfortunate if that were determined to mean that DOE could not cooperate with the Navy regarding shared airspace use of the NTS because of this language. It is essential that for this resource management plan, the language be open to the possibility of such cooperation and coordination.

Transportation

7 The EIS fails to sufficiently provide a detailed description of the transportation activities associated with each proposed alternative. Such information is needed to allow all affected parties including State and local governments to assess the on-site and off-site transportation risk and impacts of each alternatives.

Eureka County was a participant in the Nevada Test Site Transportation Advisory Group, Protocol Working Group. The following recommendations, many of them discussed by the Protocol Working Group, should be incorporated into the EIS.

MUNICIPAL GOVERNMENT 8 (CONTINUED)

8 Shipment notification procedures including local jurisdiction notification must be formalized, including designation of a point of contact for each corridor jurisdiction.

9 DOE must notify all communities of potential shipments and provide contact names and numbers. Public notices should be place in the newspapers of record for each community at the start of each shipping campaign. DOE needs to ensure that local emergency response agencies are able to identify low level waste shipments and provide immediate notification for federal and state agencies responsible for responding to or supporting the handling of accidents.

10 There should be regular update meetings, reports and evaluations on past shipments.

11 DOE should develop and maintain a monitoring program which will address concerns of local communities if a problems begins to occur with truck shipments and to resolve issues along transportation routes. This monitoring program would serve to identify additional impacts and mitigation measures as they arise.

12 DOE should provide an annual report to the State of Nevada showing pertinent information such as the total amount of waste shipped and the routes used. The report should identify any problems encountered and actions taken to address them. Any accidents should be described.

13 Shipper/carrier data should be made available to all corridor jurisdictions.

14 DOE should provide responding jurisdictions and agencies with the equipment needed to monitor and respond including two new detection instruments per jurisdiction, in-vehicle radio repeaters, and surplus emergency response equipment.

15 DOE should work with corridor communities to make training opportunities as effective as possible. Communities which are not directly on transportation routes should be provided the opportunity to participate in emergency response training courses offered to corridor communities.

16 DOE should provide financial and technical assistance to ensure that corridor communities have up-to-date evacuation plans in place.

17 DOE must commit in the Record of Decision to a clearly articulated process for routing of low level waste shipments and to a mechanism that binds the shipper to adhering to the identified routing alternative.

18 DOE should provide the State and local jurisdictions with copies of the route and risk analyses for each carrier transporting Class 7 materials.

19 DOE should work with the State and corridor jurisdictions to develop criteria for selection of safe parking areas to be used by carrier vehicles.

MUNICIPAL GOVERNMENT 8 (CONTINUED)

Conclusion

We believe that additional work must be done in a number of areas for this EIS to be adequate. Thank you for considering our comments.

Sincerely,

Sandra L. Green
ACJ

Sandra L. Green
Project Coordinator

cc: Leonard Fiorenzi

MUNICIPAL GOVERNMENT 9

LINCOLN COUNTY
NUCLEAR WASTE PROJECT

P.O. BOX 90
PIOCHE, NV 89043
(702) 962-5497
(702) 962-5497

May 2, 1996

Mr. Donald R. Elle
Environmental Protection Division
U.S. Department of Energy
P.O. Box 14459
Las Vegas, Nevada 89114

RE: Lincoln County Comments to the Draft Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada

Dear Dr. Elle:

On behalf of Lincoln County and the City of Caliente, I am pleased to submit the following comments to the Draft Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada. The County and City participated extensively during scoping of the NTS Sitewide EIS providing both verbal and written comments to the scope of the document. Key issues raised during scoping by the County and City are listed below.

1. A cumulative assessment of on and off-site radiological exposure risks associated with historical, present and future activities at NTS must be included within the EIS.

2. For every proposed or potential activity considered for NTS, an analysis of related direct and indirect environmental, social and economic costs and benefits should be undertaken and contained within the NTS Sitewide EIS.

3. The NTS Sitewide EIS should consider the geographical distribution of historic, present and potential NTS related benefits and risks with particular emphasis upon disequity between local areas within Nevada and among states hosting DOE facilities.

4. The NTS Sitewide EIS should consider implications of past, present and future effects of transporting radioactive materials both into and out of the site.

MUNICIPAL GOVERNMENT 9 (CONTINUED)

5. The NTS Sitewide EIS should include a comprehensive identification and evaluation of options for mitigating impacts documented through the study process.

6. Prior to publishing a final NTS Sitewide EIS, acceptable mitigation measures must have been determined and should be included as a component of any subsequent Record of Decision.

7. Effective measures to more equitably distribute possible future economic benefits of NTS activities to rural communities within Lincoln County and to mitigate other potentially significant impacts, must be identified and evaluated.

8. The potential for NTS land and infrastructure to support private sector industrial activities must be considered.

9. The NTS Sitewide EIS should include an epidemiological baseline for communities surrounding NTS.

10. The potential for NTS to serve as a location for projects carried out in cooperation with the State of Nevada and local governments designed to assist with mitigation of within-state environmental problems while providing important national research and development benefits must be considered. A specific example which should be considered would be use of Area 23 or Area 6 for management of municipal solid wastes generated throughout Nevada coupled with waste-to-energy and recycling research and development activities.

11. Use of the 45,000 acre Aerojet research and development site in Coyote Springs Valley as a possible location for NTS related solar energy demonstration projects should be considered within the EIS.

The comments which follow generally address the extent to which the Draft EIS considers the various issues raised by Lincoln County and the City of Caliente.

1 Through verbal and written comments to the scope of the NTS Sitewide EIS, Lincoln County and the City of Caliente provided ample evidence of the potential for cumulative dose effects from exposure to radiation resulting from historical, present, and potential NTS activities. Important issues of cancer latency and genetic damage from cumulative doses were introduced. Despite these comments, the Draft EIS fails to consider cumulative aspects of dose attributable to historic source terms. The document further fails to consider the cumulative dose from various source items. The statement on line 4 of Page 2-16 of Volume 1, "the risk assessment encompasses risks contributed from past operations ...", is very misleading. The EIS does not consider cumulative risks to receptors of repeated doses from historic, present, and future exposure. In fact, it appears that transportation health risks and other operational health risks are treated in separate appendices, with no consideration of cumulative dose. NEPA guidelines require that the EIS consider cumulative effects.

2 Lincoln County and the City of Caliente are concerned that the Draft EIS does not sufficiently address the potential for historic, on-going, and prospective activities at NTS to result in both favorable and undesirable impacts upon the County and City. To a large extent, potential ramifications of NTS activities upon the County and City are ignored within the EIS. This situation appears to result from the adoption by DOE of an assumption that future patterns of residential settlement by NTS workers will mirror the past (wherein most workers have resided in

2

2 cont. the Las Vegas area and commuted to NTS by way of subsidized federal busing). As the NTS EIS looks to the next several decades, it is inappropriate to only assume that subsidized transportation services will be sustained and that workers will reside primarily in Clark County. Reliance upon this flawed assumption has resulted in the Draft EIS failing to consider alternative worker settlement patterns and resulting impacts upon potentially affected communities.

During scoping, Lincoln County and the City of Caliente provided DOE (through participation in the South-Central Nevada Federal Complex Advisory Board (SNFCAB)) with evidence of the significance of NTS to the economy of the County compared to that of Clark County. Written comments to the scope of the NTS EIS submitted by Lincoln County and the City of Caliente documented the relative degree of importance of NTS to the economy of the County in comparison to Clark County. Data provided by Lincoln County demonstrated that NTS employment represented 4.88 percent of Lincoln County personal income in 1990. This compared to NTS employment contributing just 0.14 percent to personal income within Clark County during 1990.

Despite the loss or gain of NTS employment representing the "most consequence" for Lincoln County relative to Clark County, the NTS EIS does not consider economic or fiscal consequences in Lincoln County. Section 4.3.4 of the Implementation plan for the Nevada Test Site EIS indicated that the EIS would address socioeconomic concerns of the surrounding cities, counties, and the State of Nevada. Section 5.3.4 of the Implementation Plan notes that the environmental consequences section of the NTS EIS will evaluate potential socioeconomic consequences within the region of influence for each alternative. Section 4.1.3 of the NTS EIS defines the region of influence as the area in which the principal direct and secondary socioeconomic effects of site actions are likely to occur and are expected to be of the most consequence for local jurisdictions.

3 The Draft EIS limits consideration of economic and other consequences to Clark and Nye counties. The EIS demonstrates that seemingly large changes in NTS employment in Clark County result in relatively small impacts. Alternatively, a small change in total employment in Lincoln County would result in relatively large and significant impacts to the local economy. By focusing upon economic and fiscal impacts in Clark County, the Draft EIS gives great detail to estimation of insignificant consequences. Had the EIS considered potential economic impacts in Lincoln County, significant change would have been detected. This might be particularly true had the Draft EIS considered the implications of either suspending subsidized busing of employees between Las Vegas and NTS or considered provision of busing through Gate 700 as an option for employees who might then choose to reside in Lincoln County.

In written scoping comments, Lincoln County and the City of Caliente requested that the NTS Sitewide EIS evaluate historical and projected future distribution of risks and benefits of DOE activities to communities surrounding the site. Section 4.3.6 of the EIS Implementation Plan indicated that the EIS would examine "the proportional benefits and risk related detriments incurred by communities surrounding NTS". In addition, Section 4.3.6 of the Implementation Plan noted that the EIS would "begin to evaluate how such impacts could be addressed and mitigated if they are found to occur". Despite these commitments within the Implementation Plan, review of the
4 Draft EIS reveals no consideration by DOE of possible disequitable distributions of NTS related risks and benefits. As a consequence, no identification of possible measures to mitigate such effects is offered in the document. The Draft EIS is woefully inadequate in its treatment of regional distributions of risk and benefit. As a result, the potential for rural communities in Lincoln, Nye, and Esmeralda counties to continue to bear an inordinate measure of risk while accruing relatively

4 cont. little economic benefit from NTS, remains very real.

Verbal and written comments and copies of Lincoln County sponsored transportation risk assessments provided to DOE each substantiated the likelihood that transportation of radioactive wastes through rural areas of Nevada would be more risky than similar transport through rural areas along possible routes in other states. This is largely due to the higher accident rates associated with rural two-lane highways in Nevada. Despite encouragement by Lincoln County to do so, the Draft EIS does not consider the degree of risk in Nevada versus other areas. As a result
5 there is no basis for DOE to conclude that risks might be greater in Nevada. To the extent that within-state risks are greater, efforts should be made to manage risk to bring it in line with that to accrue along routes in other states. DOE must consider relative degrees of risk between states and seek to reduce risk to equitable levels. Options for managing transportation risk should be included within the Draft EIS. Lincoln County and the City of Caliente support transportation mitigation measures identified by the Transportation Protocol Working Group (which developed transportation mitigation proposals in consultation with DOE).

Lincoln County and the City of Caliente are concerned that the Draft EIS generally concludes that potential impacts are either non-existent or insignificant, such that mitigation is not warranted. Due to previously described deficiencies in the EIS analysis of impacts, these conclusions may be in error. In other cases where impacts are identified and mitigation proposed, little evaluation of measure feasibility or commitment to specific implementation is offered. For example, Section 7.11 indicates that emergency response programs will be employed to mitigate
6 impacts of accidents to workers and the public. Section 7.11 also notes that each plan uses resources specifically dedicated to assist the facility in emergency management. Examples given include county emergency command centers, protective clothing and equipment. The Draft EIS does not however, evaluate the availability of these items and/or personnel trained in their proper use within counties along possible transportation routes. As a consequence, there is no guarantee that effective mitigation would occur as envisioned by the Draft EIS. The EIS should evaluate the availability of needed emergency management capabilities along transportation routes and where deficiencies exist, include a commitment to provide needed equipment and training.

The Draft EIS does not apparently consider the potential for privatizing portions of NTS and its facilities. Nor does the document explicitly consider making such facilities available for
7 temporary use by the private sector. Rather the EIS considers only a narrow "government only" suite of mission possibilities. Given likely reductions in federal spending, failure to consider privatization and private uses of NTS appears shortsighted.

During scoping, Lincoln County and the City of Caliente suggested that the NTS Sitewide EIS include an epidemiological baseline for communities surrounding NTS. The availability of this information was deemed necessary to enable monitoring of health effects during the next several decades of NTS operation. The Draft EIS provides no analysis of baseline health information. This is despite recognition within Section 4.1.11 of the document that atmospheric dispersion model calculations predicted exposure to persons living in off-site areas around NTS. Without
8 explicit knowledge of existing health conditions and effects of historical doses to area residents, little if any capability to understand consequences of future exposures to NTS related radioactivity may be possible. The Final EIS and related Record of Decision should include a commitment by DOE to undertake a comprehensive study of and monitor baseline health conditions in communities surrounding NTS.

9 Lincoln County and the City of Caliente, in concert with the South-Central Nevada Federal

MUNICIPAL GOVERNMENT 9 (CONTINUED)

9 cont. Complex Advisory Board, suggested that the EIS consider the potential for NTS to serve as a location for projects carried out in cooperation with the State of Nevada and local governments designed to assist with mitigation of within state environmental problems. Such a use of NTS was also seen as providing important national research and development benefits. A specific example offered by SNFCAB considered use of Area 23 or Area 6 for management of municipal solid wastes generated throughout Nevada coupled with waste-to-energy and recycling research and development activities. The Draft EIS does not mention of waste-to-energy or other novel land uses which would serve to mitigate existing environmental problems within Nevada (apart from those on or related to NTS). The vision for a diversified future at NTS which Lincoln County and the City of Caliente anticipated, appears altogether absent within the EIS. The Final EIS and Record of Decision should include more creative options for future uses of NTS.

Lincoln County and the City of Caliente are pleased to see that DOE has included use of the 45,000 acre Aerojet research and development site in Coyote Springs Valley as a possible location for NTS related solar energy demonstration projects. The Final EIS and Record of Decision should maintain this site as a viable option for solar facilities.

10 Most, if not all, map figures within the Draft EIS illustrating the NTS region, erroneously show an extension of Nye County heading east from NTS into the Desert National Wildlife Refuge. This area should be relabeled as Lincoln County.

11 Page 4-19 of Volume 1 of the Draft EIS suggests that the only future DOE activities that could occur within Area 13 would involve environmental restoration. However, the EIS does not provide any description of environmental restoration activities planned for Area 13. It is therefor not possible to conclude the significance of any potential impacts which might result from future DOE activities within Area 13.

I trust these comments will be of assistance to DOE in preparing the Final EIS and related Record of Decision.

Sincerely,

Jason Pitts
Coordinator

cc: Board of Lincoln County Commissioners
Caliente City Council

5

MUNICIPAL GOVERNMENT 10

NYE COUNTY

May 14, 1996

Donald R. Elle, Director
Environmental Protection Division
Nevada Operations Office/U.S. Department of Energy
P.O. Box 14459
Las Vegas, Nevada 89114

Re: Nye County Comments on the Nevada Test Site Draft Environmental Impact Statement

Dear Dr. Elle:

Nye County has appreciated the opportunity to participate as a cooperating agency in the preparation of the Nevada Test Site (NTS) draft Environmental Impact Statement (DEIS) and regrets that resource constraints limited us from participating more fully. We are pleased to offer the accompanying comments for your consideration. We recognize that the County has not met your May 3rd deadline, but request that you give due consideration to the concerns we raise.

1 Nye County supports all alternatives proposed except Alternative 2, which calls for discontinuing operations. Our preferred alternative is #3 which calls for expanded use. The expanded use alternative, however, needs to be accompanied by a more complete Nye County economic impact discussion.
2 The DEIS socioeconomic impact discussion, in general, offers little insight into NTS' relationship with its host jurisdiction. Nye County aspires to strengthen its collaborative and economic relationship with NTS and requests that the final EIS reflect consideration of this opportunity for both of us. We would be pleased to share our data base, as well as participate in the development of a more detailed strategic plan for the preferred alternative.

3 We remain concerned that the water resources evaluation has been inadequate, appearing to rely on data from 10 to 30 year-old technology, inadequate modeling, and insufficient attention to the hydrology of the region down gradient from NTS – at least so far as we can tell from the DEIS. Amargosa Valley residents need assurances that the quality and quantity of their water resources will be protected for future generations.

COUNTY OF NYE • P.O. BOX 153 • TONOPAH, NEVADA 89049 • (702) 482-8191

Page 2
May 14, 1996
Nevada Test Site Draft EIS

Thank you for your attention to our comments. Please call me at (702) 482-8189 or Phillip Niedzielski-Eichner at (703) 818-2434 if you have any questions.

Very truly yours,

Les W Bradshaw

Les W. Bradshaw
County Manager

Enclosure

cc: Nye County Commissioners
Phillip Niedzielski-Eichner, Governmental Dynamics, Inc.

NEVADA TEST SITE
DRAFT ENVIRONMENTAL IMPACT STATEMENT
Comments from Nye County, the Host Local Government
May 14, 1996

I. COOPERATING AGENCY STATUS

Nye County has appreciated the opportunity to participate early in the development of the Nevada Test Site (NTS) draft Environmental Impact Statement (DEIS) process. While we did not have the resources that we would have liked to devote to the effort, we believe that it is important to the future of the Test Site to foster and encourage positive partnerships.

II. PREFERRED ALTERNATIVE

4 Nye County supports all alternatives but the discontinuation of operationsThe County could support any of the alternatives except for Alternative 2 -- discontinued operations. The preferred alternative is the expanded use alternative or Alternative 3. However, to benefit the region, we believe that expanded use requires strategic planning and a more thorough consideration of impact issues and related mitigation measures.

III. WATER RESOURCES ISSUES

5 It is clear that there are potential adverse impacts on groundwater availability as a result of expanded use of the Test Site. In particular, the Solar Enterprise Zone will be a major demand on groundwater resources. The County seeks better information on any potential off-site impacts.
6 In addition, the County would like to better understand the extent to which development of the Solar Enterprise Zone could preclude or constrain the pursuit of some future ventures at NTS.

A. Dated Data Base

7 The main hydrology-related goal of Nye County is to protect the county's water resources. The information provided in the document with relation to the water resources and use are general and mostly reflect literature search and reviews. There is some brief mention of numerical modeling, but the specific reference is not provided. The numbers that are used to compare different alternatives also appear to have been driven from literature search. In order to provide a thorough review of such a document, all supporting documents and analysis need to be provided by DOE and ample time given for detailed review. Many of the statements made in the document appear to be mere assertion that cannot be substantiated.

Analysis of a complex system such as the ground-water basins of the Nevada Test Site and vicinity requires sophisticated basin analytical tools. The tools available to us today are ground-water flow and solute transport models. We believe several such models exist for the study site,
8 though they may not be properly calibrated. Once calibrated, they should be used to evaluate and compare the various alternatives that are being considered for the DEIS. These models should ultimately be used to optimize the selected alternative. The results of such an analysis being used in this DEIS are not evident.

Although the literature search and results provide valuable insight into the ground-water systems at the site, most of the values reported are based on 10- to 30-year old technology and the
9 assumptions used for various basin may not be consistent. The DEIS estimates that 2.2 million acre-ft of groundwater is held in storage in the upper 100 ft of the saturated zone in Yucca Flat, Frenchman Flat, Mercury and Rock Valley, and Fourtymile Canyon (Scott, et. al. 1971).

B. Water Availability

The DEIS suggests that this water is available for development of water supplies at NTS. For some of the alternatives, NTS requires a little less than 2000 acre-ft/yr. DEIS also estimates that there is 41,400 acre-acre-ft/yr inflow to NTS by under flow and upland recharge. The DEIS
10 estimates that 42,000 acre-ft/yr. is discharged to Ash Meadows and Rock Valley. If these number are correct there is a small deficit in annual mass balance between recharge and discharge, with recharge being slightly less. Thus, in the absence of a plan for replenishment, any withdrawal will be mined. At 2000 acre-ft/yr with 600 acre-ft/yr natural deficit, 130,000 acre-ft will be mined out of the system.

The volume of 130,000 acre-ft is about six percent of the total volume estimated in the DEIS. As it is with any other ground-water basin, the total system does not contribute to the amount of water withdrawn. Therefore, there will be isolated areas that will experience substantial draw
11 down. Such stresses on the aquifer might well result in migration of the existing plumes to non-impacted areas. Furthermore, withdrawal of good quality ground water will eventually result in deterioration of the overall quality of the ground water.

C. Future Public Use

The DEIS states that there are no known public use of the water at the NTS (p. 4-143, lines 28-33). This position does not account for future use of property bordering NTS or future
12 development in the Amargosa Valley. Nye County is already experiencing the pressure of increased water demand from the Las Vegas Valley. NTS and the vicinity will soon become precious water resources areas. The DEIS does not address this reality.

D. Containment Ponds and Sewage Lagoons

The impact of the contaminated containment ponds and sewage lagoons is underestimated. These ponds and lagoons must be lined or drained as soon as possible. The highly permeable
13 nature of the material in which these ponds are constructed promotes rapid percolation of the contaminated water to groundwater system.

IV. SOCIOECONOMIC ISSUES

14 With respect to socioeconomics, the analysis projects no adverse impacts from any of the alternatives, although Alternative 2 would seem to result in adverse impacts. Although the report indicates that no mitigation measures are required, there are some supportive measures proposed
15 that the County endorses pursuing (Volume 1, Part B, p. 7-3, lines 21-25). We urge that the second bullet be modified to reflect a joint *local*, state and federal conference to promote a national and international environmental technology development center.

A. Description of the Affected Environment

16 The analytical methods used in the DEIS do not fully convey the relative importance of the facility to the economic, social and political fabric of Nye County nor the contribution of Nye County to the success of the NTS in meeting its mission. In Chapter 4, the document suggests that the Nye County contribution to the NTS is relatively small, and that the NTS represents a relatively small part of the overall County economy. In Chapter 5, the document suggests that all
17 negative impacts of the alternatives will be minimal and short-term in duration. In both cases, Nye believes that a complete description of the relationship between the County and the NTS will provide a more realistic assessment of the importance of NTS to the Nye County economy.

The document suggests the limited contribution of Nye County to the NTS by the fact that only seven percent of total NTS employees live in Nye County (p. 4-69, line 6). The DEIS suggests
18 the limited role of NTS in Nye County by the assertion that it accounts for only six percent of total employment (by place of residence) in 1994 (p. 4-69, line 13). Neither of these statistics captures the true nature of NTS in Nye County.

19 In quantitative terms, over the past 44 years, the NTS has been consistently the largest employer in the County. The location of the NTS in Nye County has provided the nation with a valuable resource and has, to some extent, limited the County's ability to attract alternative or diversified
20 industries. For example, the Department of Defense's *Special Nevada Report* estimates that, if another economic activity (e.g., mining or grazing) had developed in the area currently reserved for NTS activities, total County employment could be 3% higher, gross regional product could be $180 million higher (in 1990 dollars) and personal income could be $37 million higher.

MUNICIPAL GOVERNMENT 10 (CONTINUED)

21 Also, the facility has resulted in the need for greater levels of public services and facilities, and has to some extent identified Nye County as the nation's nuclear testing ground. For example, in the past, protests at the NTS have increased the need for public safety and judicial services provided by Nye County agencies. Also, protests and general news reporting of NTS activities have focused attention on Nye County as the site of radiation contamination, arguably the most publicly-feared form of environmental hazard.

Rather than protesting or contesting the location of NTS, Nye County residents and officials have willingly accepted their contribution to national defense and research. In part, this is because of the local familiarity with the facility and the relatively high salaries and wages paid for NTS jobs. But familiarity and higher wages do not fully explain the widespread support for the facility by Nye residents who receive no direct or indirect financial benefit from it. In a very real sense, the value of the NTS to the nation is a result not just of its remote location but also from the support it receives from the surrounding communities. In another location, the NTS's mission could be compromised or complicated by local opposition to its presence, or even by less active or less widespread support for its activities. It is widely understood that DOE could not find a willing host for a facility such as NTS in today's environmentally sensitive climate.

B. Local Responsibility for Emergency Management and Response

22 In addition to the on-site provisions for public health and safety described in the DEIS, the document should acknowledge and discuss the responsibilities of local emergency management and emergency response personnel for emergency preparedness, first-on-scene, first response and incident command in off-site incidents. In addition to the training requirements described above, it is important to consider and resolve issues regarding mutual aid, incident command and cleanup responsibilities for any off-site incidents in Nye County.

C. Alternative 2 Impacts

23 In addition to the description in Section 5.2.1.3 of the effects under Alternative 2 of a loss of jobs in the Nye County economy, the DEIS should also discuss the disproportionate impacts of reduced employment opportunities in an environment of declining average salary/wage income and relatively high unemployment in Nye County vis a vis the region and the state.

D. Museum Concept

The proposal to develop a Nuclear Era Museum is an excellent idea that Nye County supports and recommends consideration of locating the facility in the Lathrop Wells area. Nye County has already invested in this idea and has available a facility design, schematic drawings, and a scale model. The County would welcome the opportunity to work in partnership with DOE and private entities to develop this concept further.

MUNICIPAL GOVERNMENT 10 (CONTINUED)

E. Decentralization of Public Finance and Public Services

24 The DEIS describes public finances and public services in terms of historical trends in levels and types of services, and in the costs of providing those services. This description, and the fiscal impacts associated with future actions, should note the current trend toward decentralization of government, and the resulting increase in obligations on local governments. For example, recent statutes and case law require increased supervision of landfill sites by local governments as well as increased standards for local jail facilities. This trend could result in a significant shift of services and expenditure obligations from federal and state government to local governments. Therefore, the projection of future costs of local government services should (at a minimum) acknowledge the trend toward increasing service costs.

F. Cumulative Impact Analysis

25 In Section 6.4, on page 6-14, line 1, it appears that text has been omitted from the first full sentence on the page ("Fiscal impacts to local jurisdictions . . . ").

G. Mitigation Measures

26 The DEIS should acknowledge the special relationship that has existed between the NTS and Nye County over the past four decades, through periods of expansion as well as periods of contraction. In addition, the contribution of the County and its communities to the success of NTS should be acknowledged by formal commitments of the U.S. Department of Energy to certain limited mitigation measures for alternative scenarios of current and future uses of the DOE facilities at NTS.

27 Section 7.3 of the DEIS states that "No adverse impacts are associated with implementation of any alternative for any socioeconomic issue (economic activity, population, housing, public finance, or public service); therefore, no mitigation measures are required." (p. 7-3, lines 17-19) This appears to conflict with the statement in Section 5.2.1.3 that "The loss of employment and personal income and the increase in unemployment associated with Alternative 2 would result in substantial short-term adverse effects to the regional economy; however, economic and natural growth in the region of influence is expected to compensate for these reductions over time." (p.5-102, lines 17-20) The mitigation section should acknowledge this impact, and describe mitigation measures appropriate to the impact.

From a broad perspective, Nye County believes that it is important to maintain the Nevada Test Site as a viable facility and, like many other interested parties, prefers greater emphasis on the expansion of research and development activities. However, it is clear that the Nevada Test Site is viewed as an ideal candidate for the disposal of low-level waste and low-level mixed waste, because of its relative isolation, arid climate, and deep groundwater table.

MUNICIPAL GOVERNMENT 10 (CONTINUED)

Expanded waste management operations at NTS may provide for the public safety at other sites, but would present extra risks and burdens to the County, and, therefore, the County should receive reasonable equity offsets to mitigate the potential impacts. These could include:

28
- Improvements in local health and education delivery systems
- Establishment of a trust fund to protect future generations
- Assistance for local emergency responders
- Preferential hiring of residents for DOE projects
- Directed procurement to host county business
- Training for local workers
- Consolidation of DOE and contractor offices in the host jurisdiction
- Preferential treatment in siting of other federal projects
- Establishment of energy and nuclear waste R&D facilities in the host jurisdiction

29 Also in Section 7.3, the provision for "a joint state and federal conference to promote a national and international environmental technology development center" (p. 7-3, line 23) should include the active participation of local government as well.

VI. TRANSPORTATION

30 With respect to transportation, if roads are expected to deteriorate, perhaps to unacceptable levels, by 2000, waste shipments will engender additional risks. Regardless of the source of the deterioration to the roads, DOE/NV will need to address these issues and contribute to mitigating the deteriorating conditions, particularly if the NTS and Yucca Mountain become prime destinations for waste. 31 Moreover, if NTS becomes the central location for nuclear weapons complex waste, rail access should be constructed.

A. Follow Through From Study to Decision and Implementation

The efforts of DOE/NV to involve stakeholders in meaningful discussion of transportation issues have been very useful (page 2-1 ff). The meetings of the Transportation Protocol Working Group, for example, have generated valuable discussion, resulting in action items for DOE and the stakeholders.

However, two reservations about this process must nevertheless be expressed. First, despite the valuable discussion and the action items for the NTS DEIS process, the substance of some of the stakeholder questions and concerns is not yet resolved, not yet negotiated among decision-makers at DOE and in the state and local communities. Valuable discussion regarding the NTS DEIS process cannot take the place of negotiation to resolve impact concerns and policy issues. Second, due to funding cutbacks, many of the stakeholders who were able to participate in 1995 are not able to participate in 1996. This jeopardizes the continuance of a forum which will be needed as decision about ongoing and future operations at NTS are made and implemented.

MUNICIPAL GOVERNMENT 10 (CONTINUED)

We advocate continued efforts by DOE and stakeholders to maintain an active forum for discussion and resolution of issues as the NTS decision process unfolds.

B. Limitations On Nts Transportation Issues Addressed

The NTS DEIS was undertaken in a policy context which required many topics potentially affecting NTS to be deferred to other agencies and other ongoing assessment processes. For example, the transportation of highly-enriched weapons-usable fissile materials has been addressed in the Defense Program Transportation Risk Assessment (page 1-8), and is being addressed in the Long-Term Storage and Disposition of Weapons Usable Fissile Materials Draft PDEIS (page 1-9). Transportation issues regarding shipments of spent fuel to Yucca Mountain are deferred to the Yucca Mountain DEIS, even though choices regarding Yucca Mountain affect the options and desirabilities regarding transportation to NTS. 32 Issues regarding the possible transportation of spent fuel and high-level nuclear waste across NTS to a centralized storage facility at NTS Area 25 are not considered at all, even though these prospects are as real as many others included in the NTS DEIS alternatives.

33 At minimum, the deferral to other agencies and processes makes the NTS DEIS confusing. It is not clear, for example whether the analysis of transportation risk under Alternative #3 includes potential Stockpile Stewardship responsibilities, shipments involving the Transportation Safeguards Division at DOE/AL.

34 At maximum, despite much good work included in the NTS DEIS, the preparation of an DEIS as a decision-making document may have been premature, since the NTS DEIS cannot consider the full consequences of the alternatives identified, particularly Alternative #3.[1]

35 It is recommended that DOE/NV should update the transportation analysis as decisions emerge from the Stockpile Stewardship, Fissile Materials, Programmatic Waste Management, and HLNW processes, to identify the number, source, routing, mode, and timing of all prospective shipments to NTS.

C. Concerns Not Addressed In Analysis Of Risk Probabilities

Though the study acknowledges that "risk is not the only concern in the transportation of radioactive materials and hazardous waste to the NTS" (page 1-10), it goes to substantial lengths to calculate the risks associated with low-level and mixed waste shipments, and to show that the risk probabilities of vehicle-related fatalities and injuries and incident-free radiation-induced fatalities are low.

1 The transportation analysis of Alternative #3 (Tables C-23 through C-44) is limited to low-level and low-level mixed waste shipments.

1. Risk Perceptions and Potential Impacts

36 The study does not address the "other concerns," either from an analytic or policy perspective. These include risk perceptions and the concern that prolonged large-scale shipment campaigns could affect growth patterns and property values. Even if waste shipment campaigns, in and outside Nevada, are entirely incident-free, this is a major concern. In combination with incidents or accidents it could become a major concern and a political and economic reality. These concerns should be addressed, even in the constrictive DEIS format.

2. Projected Service Levels, Traffic Volumes and Adjacent Populations

37 While we acknowledge the several conservative assumptions used in the calculations of population dose estimates in incident-free transportation (page C-13, 14), we nevertheless question whether the estimates adequately reflect the projected decline in service levels and the projected increase in traffic volumes and population (residents, visitors, and workers) in areas adjacent to relevant segments of I-15, US-95, and US-93.

D. Rail Access To NTS

1. Rail Access Required or Desirable in Another Context

38 The NTS DEIS states that "The only credible alternative to *require* rail access directly to NTS is one in which NTS would be the sole low-level waste disposal site for the DOE complex (Alternative 3)" (page 2-14, emphasis added). The implications of this statement are not made clear. It is the conclusion that Alternative 3 would require the development of rail access for shipment of low-level wastes, regardless of the requirements associated with stockpile stewardship materials, weapons usable fissile materials, high-level defense wastes, and/or spent nuclear fuel? If required, is it DOE's position that rail access would be used for all shipments into Nevada, or only as a supplement or alternative for truck shipments?

2. Contortions in Considering NTS Rail Access

The NTS DEIS is very contorted in its efforts to address rail access options while avoiding policy positions and leaving the initiative for decision and implementation with another agency of DOE, which is dealing with an adjacent site under different funding arrangements. While we have some understanding and empathy for the contortions, they do not take the place of direct negotiation and commitment among parties in a position to make and implement policy decisions.

Draft NTS DEIS
Nye County Comments
5/14/96
Page 8

MUNICIPAL GOVERNMENT 10 (CONTINUED)

3. The Comparison of Costs and Risks of Truck and Rail Modes

While the NTS rail access study compares "the (estimated) costs of shipping by truck, rail, and intermodal modes" (page 2-14), the NTS Transportation Study points to a current evaluation by DOE/ID of the costs and risks associated with alternative modes of spent nuclear fuel transportation, including intermodal and rail options (page 1-6).

39 We believe that the cost and risk basis for decisions between truck, rail, and intermodal transportation options (for spent fuel, low-level and other waste shipments in Nevada) has not been fully considered or presented on an integrated basis. Such an evaluation should be developed as a basis for future use decisions at NTS, including NTS Area 25 and Yucca Mountain.

E. The Barriers To First Responder Training In Rural Communities

40 During the NTS DEIS process, rural communities including Nye County repeatedly expressed the need to provide and maintain first responder and first-on-scene training for fire, law enforcement, and emergency medical responders, emphasizing the barriers for largely-volunteer rural services in accessing this training, and the need for innovative solutions (including funding) involving DOE/NV, DOE/YMSCO and rural service providers. The NTS DEIS limits its response to a statement that "The DOE is working with rural response forces to schedule training that volunteers can attend" (page 2-11), but it does not address the substance of the barriers or the adequacy of its own limited response to deal with the issue. The issue remains and it should be addressed at policy-making levels in DOE/NV, DOE/YMSCO and affected local governments.

VI. DEFENSE PROGRAMS

41 The Conventional Weapons Demilitarization program has the potential of ultimately involving disposition of 3 million tons of weapons/explosives. We would be interested in a more comprehensive assessment of the County impacts of such a program.

VII. FRAMEWORK FOR NTS RESOURCE MANAGEMENT PLAN

Nye County is pleased to note that many of its comments on the preliminary draft framework were incorporated in this version, but we still want to underscore our suggestion regarding a joint planning process. In addition, there is some language regarding the community reuse organization that has been included since the July predecisional draft (our last opportunity for input) which poses some concern. We also want to take the opportunity to comment on how DOE might engage local government and the public in the development of the resource management plan over the next few years.

Draft NTS DEIS
Nye County Comments
5/14/96
Page 9

MUNICIPAL GOVERNMENT 10 (CONTINUED)

On p. 4-8, lines 29-30, the framework notes, "To the extent consistent with its missions, the DOE/NV will cooperate with land-use plans and policies of local governments such as Nye County." We support such cooperation but believe it must go a step further. As we have noted before, Nye County has adopted a comprehensive plan, a transportation plan, a solid waste management plan and an overall economic development plan. Nye County is also in the process of considering regional land use plans and ordinances. To best achieve our respective and mutual goals, we recommend that Nye County and DOE/NV conduct a joint comprehensive planning process.

42 In a few different sections (note especially p. 1-3, lines 6-8; and p. 2-3, lines 24-26), the community reuse organization (CRO) is referred to as "the community's single voice to the DOE/NV for economic development." While Nye County appreciates the potential role of the CRO, we also believe that the CRO, as constituted, cannot serve as a single voice for the "community." Of the approximately 60 members, only one represents Nye County government, the host jurisdiction of the NTS, while Clark County is well represented. The economic development issues and impacts are very different for our two jurisdictions, as you note in the description of the region of influence for the DEIS (Volume 1, Part A, p. 4-69, lines 10-14): "Analysis of economic activity impacts in the region of influence of Clark and Nye counties is accomplished separately for each county."

The differences in size, economies, and contributions would produce a misleading analysis if both were analyzed as one aggregate area. For example, in 1994, the NTS accounted for 1 percent of total Clark County employment, as contrasted with 6 percent of total Nye County employment." Further, on p. 4-74, lines 5-7, the report states: "Rural economies, such as Nye County, however, often leak large portions of both business and residential purchases to larger communities, resulting in economic loss and a set of economic development needs different from those in more urban areas."

43 In the framework document, DOE has solicited input regarding what partnerships might be formed with different entities and how to best involve the public and local government, among others. We offer the following recommendations for public involvement:

- DOE/NV should make regular and direct contact with private landowners within at least a 50-mile radius of the Nevada Test Site to inform them of the process and to solicit their input. Particular attention should be given to the residents of Amargosa Valley, the community closest to the Test Site.
- DOE/NV could test some public information and involvement approaches beyond public meetings, including the use of special NTS tours, newspaper inserts or articles, and schools. The public meetings could benefit from professional facilitators to elicit values.

44 With respect to local and state government participation in the development of the resource management plan, we recommend that an intergovernmental working group be established. At a minimum, the group would be composed of representatives from Nye County, Clark County, Lincoln County, and the State of Nevada, and would have working meetings with DOE/NV on a monthly basis or perhaps more regularly during peak development periods.

45 Specifically, with respect to a partnership with Nye County, we recommend that DOE/NV take the following approach:

- Establish a framework for formal interactions process between Nye County and DOE/NV, comparable to the agreement between the Yucca Mountain Project and Nye County. This process is characterized by regular interaction, senior management involvement, and documentation of discussions. This agreement would cover the wide range of DOE/NV issues, including the development of the resource management plan.
- Regularly interact with Nye County through the intergovernmental working group, but use the formal interactions process to resolve issues unique to Nye County that are not appropriate for or cannot be resolved in the working group.
- With respect to the resource management plan, DOE/NV officials should plan to brief the Nye County Commission at least twice a year, at its regularly scheduled meetings, on the progress and direction of the RMP development.

46 Nye County views the NTS as a unique outdoor laboratory, ideally suited to research, development, and testing (broadly speaking). Nye County's philosophy regarding resources on the NTS is that they be used in a way that supports the missions articulated in Alternatives 1, 3 and 4 to the greatest extent possible. We place high value on most of the resource issues listed in Table 2-1, but the number one resource issue is minimizing risk to the health and safety of workers and the public. (Note that the definition of health and safety on p. 2-2, line 7, should be modified by adding to the end of the sentence: "or the public.") To the degree that it is or becomes consistent with the national security demands of NTS missions, Nye County is interested in exploring the potential commercial value of geological and mineral resources.

This Page Intentionally Left Blank

COMPANY 1

Corporation for Solar Technology and Renewable Resources

Rose McKinney-James
President & CEO

Corporate Officers:
Honorable Richard H. Bryan
Chairman
Peter M. Thomas
Secretary / Treasurer

6863 W. Charleston Blvd.
Las Vegas, Nevada 89117
(702) 869-3610
Fax (702) 869-3614

April 4, 1996

Mr. Donald R. Elle
Director, Environmental Protection Division
U.S. Department of Energy, Nevada Operations Office
P.O. Box 14459
Las Vegas, NV 89114

Dear Mr. Elle:

I have reviewed your draft Environmental Impact Statement for the Nevada Test Site and Off-Site Location in the State of Nevada and attended your recent workshop meeting held in Las Vegas on March 26th. As you know, given DOE interest in solar development it was deemed necessary to include prospective Solar Enterprise Zone (SEZ) sites in the scope of work undertaken in the EIS. In addition to providing comments to your staff on various sections of the draft statement volumes, I thought it might be useful to provide a general description of how the SEZ initiative has matured
1 during the last eighteen months. This information should be considered as you make final adjustments to the EIS documents and move toward publishing the record of decision.

The Corporation for Solar Technology and Renewable Resources (CSTRR) has made significant progress relative to the development of a Solar Enterprise Zone in Southern Nevada. For example, we now have a better vision of the electrical capacity, solar technologies and preferred sites that are likely to be involved in the initial projects.
2 Some of these advancing issues could influence representations that you make in the draft EIS particularly regarding acreage requirements and water usage and their impact upon local plants and animals.

The SEZ is the product of efforts undertaken at the request of US Senators Richard Bryan and Harry Reid to promote and establish a mechanism for the development of renewable resources within the State of Nevada. More specifically, Senator Bryan expressed an interest in the development of solar energy as an alternative use for the Nevada Test Site. With the support of the Department of Energy, a SEZ Task Force comprised of business, community and government leaders convened to outline a strategy for the expansion of the concept. In early 1995, the Corporation for Solar Technology and Renewable Resources was formed. CSTRR is currently funded through a $3 million grant from the Department of Energy. These funds are intended to

COMPANY 1 (CONTINUED)

be used exclusively to support the development of CSTRR and its mission. The grant funds are not intended to be used to support the actual costs of construction.

The SEZ initiative has been undertaken in an effort to encourage and promote private investment in solar energy. Consequently, significant industry and public interest has been expressed in the development of solar power within the zone. It is important
3 to note that the Task Force specifically determined that the Nevada Test Site represents a significant solar resource with the potential to develop more than 100 MW of solar powered energy generation.

The mission of CSTRR is to promote the development of this renewable resource for commercialization. CSTRR is to coordinate and facilitate the assistance of a variety of federal, state and local supports to establish a self-sustaining solar resource within the SEZ. In an effort to move this process forward, CSTRR issued a RFP in mid-1995 to identify potential developers willing to construct solar power projects within the zone. The Corporation hoped to draw developers with sound technologies, financial strength and projects with the strongest potential for commercial success. As a result of the process, 14 proposals were submitted. After a comprehensive review and evaluation of these projects by a selected panel of experts, the proposals were narrowed down to four. The four projects which were selected for initial development represent a variety of technologies and preferred sites within the zone, including both on and off-site locations.
4 Collectively, these four projects represent almost 300 MW of electrical generation. Additionally, each project includes a manufacturing component that provides a tremendous opportunity for economic development for the State of Nevada.

The four projects selected by the CSTRR Board of Directors are summarized in the
5 enclosed project summary. Two of the four proposals indicated a preference to develop their project at the Nevada Test Site. Regardless of their preferred site, it is anticipated that each project will select a site that best meets their technical requirements while minimizing environmental impacts. For example, it is not likely that solar technologies
6 requiring significant wet cooling will be situated at the Test Site or other locations where water supply is a problem. While it may be too early to determine specific impacts, it is anticipated that there will be some environmental disruption from the construction of the
7 power generating facilities in spite of best efforts.

It is anticipated that the actual construction costs will be paid by project participants. Project developers will be eligible to apply for tax exempt bond financing through CSTRR as a result of its corporate non-profit status. It is therefore anticipated that the cost of any environmental mitigation would also be the responsibility of the project developer.

8 Given the significant historical investment that the DOE has made in renewable energy, particularly solar energy sources, there certainly exists the possibility of future DOE involvement in a SEZ/CSTRR project. Currently there are no specific plans or proposed projects which anticipate DOE equity participation at this time.

At present, CSTRR technical staff has scheduled meetings with the four project developers to further negotiate various details of each proposal. This process should be completed in June of 1996. Also, efforts are continuing to establish markets for the

COMPANY 1 (CONTINUED)

power to be generated by the initial projects and the form and conditions of power contracts. Initially, the targeted market is limited to DoD and DOE federal facilities and Native American loads that are presently situated in high rate areas. Additionally, CSTRR anticipates competing for approximately 50 MW of solar power that has been offered through an RFP issued by SMUD.

9 The SEZ/CSTRR long term goal remains to facilitate the construction and operation of up to 1000MW of solar generation in the Southern Nevada zone. At present our most likely scenario suggest that no more than 300MW would be located at any one site among those investigated in your draft document.
10 Considering all factors now apparent, including technical, marketing and environmental issues, the Eldorado Valley site appears to be more suitable for a larger component of generating capacity with smaller generating facilities at some combination of the other sites. This may help you focus your concerns regarding acreage and water requirements at each site.
11 The light industrial manufacturing infrastructure contemplated would most likely be located in Henderson or Boulder City at existing facilities where little or no environmental impact is expected; however, significant employment and economic development should result.

I hope that this provides you with a better understanding of the current status of the SEZ/CSTRR effort. If you have any questions or require further clarification, please feel free to call.

Sincerely,

Rose McKinney-James, President

RMJ/pc
Enclosure

cc: Bob Golden
Earl Hodge

COMPANY 1 (CONTINUED)

CSTRR

CORPORATION FOR SOLAR TECHNOLOGY AND RENEWABLE RESOURCES

AMOCO / ENRON

Technology:	Solarex thin-film photovoltaic modules
Project:	100 MW, long term contracts installed in roughly 10MW increments.
Local Economy:	Will locate manufacturing facility if they receive a 100 MW contract. Open to negotiations for smaller projects.

CUMMINS POWER GENERATION, INC.

Technology:	DISH STIRLING. Solar Thermal, heat is absorbed and used to drive free floating piston.
Project:	1MW, has also amended to include a 50MW second stage project.
Local Economy:	Under the 50MW proposal, a manufacturing facility to fabricate the dish structure and glass mirrors will be located in southern Nevada by 2003.

KENETECH CORPORATION, PHOTOVOLTAICS INTERNATIONAL, SOLAR CELLS, INC

Technology:	Wind blended with 2 (potentially 3) separate photovoltaic technologies.
Project:	100MW's, 40MW's of solar with 60MW's of wind.
Local Economy:	Solar Cells, Inc. to locate manufacturing facility in Southern Nevada. Tentative commitment to manufacture PVI receivers as well.

NEVADA POWER, ENTECH INC., SAIC

Technology:	Photovoltaic Concentrator Technology blended with Nevada Power wholesale power or wind. (Project is being resubmitted.)
Project:	20MW's of solar with variable blended power.
Local Economy:	Will locate concentrator assembly in Southern Nevada. Estimated 200 jobs.

Corporation for Solar Technology and Renewable Resources
6863 West Charleston Boulevard, Las Vegas, Nevada 89117 (702) 869-3610

COMPANY 2

ROM : NV Nuke Wst T F Judy Treichel PHONE NO. : 7022481128 Apr. 09 1996 02:37PM P03

NEVADA NUCLEAR WASTE TASK FORCE, INCORPORATED

Alamo Plaza
4550 W. Oakey Blvd.
Suite 111
Las Vegas, NV 89102
702-248-1127
FAX 702-248-1128
800-227-9809

April 4, 1996

Donald R. Elle, Director
Environmental Protection Division
U. S. Department of Energy
P. O. Box 14459
Las Vegas, NV 89114

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE NEVADA TEST SITE

In this Draft Environmental Impact Statement there are four proposed alternatives, but none is listed as preferred. The introduction of the document states that "... DOE will issue a Record of Decision that explains all factors considered in reaching its decision and specifies which alternative or alternatives are considered to be environmentally preferable." And in the section where the alternatives are described reviewers are told "[t]he use the DOE ultimately selects, however, may not be one of the alternatives in its entirety, but rather a hybrid created by selecting specific options from among the various alternatives."
1 As with several of the EISs now underway, critical public comment on alternatives is of questionable value because DOE's stated intention is to select a "hybrid." To do an effective evaluation of any proposed action, the commenter must have complete and clearly defined details, and know that the action, as stated, is a viable option. To have DOE pick and choose pieces from the various alternatives to create a "hybrid" puts public participants at a serious disadvantage and weakens the effectiveness of their involvement.

2 The Nevada Nuclear Waste Task Force has presented, conducted, and attended many public meetings where nuclear issues are discussed. We have heard repeatedly from public audiences that there is enthusiastic support for solar development at NTS. Some of the alternatives discussed in this document include options for solar development but the sites suggested are not under the control or authority of the DOE. This leaves the impression that DOE's intention to pursue this option is disingenuous.

3 There is also public demand for stabilization and cleanup of contamination at NTS that could potentially risk public health and safety and the environment. Citizens in Nevada and adjoining states are adamant about the need for extensive, effective cleanup. It is the opinion of this commenter that all possible alternatives must include this action, whether in conjunction with other activities or not.

COMPANY 2 (CONTINUED)

FROM : NV Nuke Wst T F Judy Treichel PHONE NO. : 7022481128 Apr. 09 1996 02:37PM P04

4 It is well understood and documented that past activities at the Test Site have resulted in serious damage and continuing risk to neighboring populations. The media has reported from public meetings where many speakers demanded shutdown and cleanup of the site.
5 This should, in fact, be listed as a "no action" alternative. DOE was quoted in those reports as saying that such an option would not be adopted. The term "no action" as applied to the option in the document is a misnomer.

6 This draft, with no preferred alternative, options that are totally unacceptable to DOE itself, and suggested actions that DOE has no authority to carry out is flawed to the extent that it cannot be effectively reviewed. If there is a sincere desire for public participation and insightful review, a new draft should be issued.

7 The EIS process is one of the few opportunities for the public to participate in the formulation of policy decisions that affect current and future populations. When the draft document is flawed, citizen involvement is ineffectual. The result is frustration and declining or further fortified distrust toward the federal agency and its decision - especially in matters where public health and safety are, or should be the highest priority.

Submitted by,

Judy Treichel

Judy Treichel
Executive Director

Company 3

CEDAR STRAT

Silver Canyon Ranch
Hiko, NV 89017
(702) 725-3500

April 16, 1996

Dr. Donald R. Elle
EPA Division, DOE Nevada Operations
P.O. Box 14459
Las Vegas, NV 89114

Dear Dr. Elle,

Following are my comments and questions concerning the *Draft Nevada Test Site Environmental Impact Statement.*

1 In Volume 1, Chapter 4 lines 16 and 17 the draft states: "....*the NTS is probably the geologically best known large area within the United States.*" I am interested in who made such a sweeping statement and on what basis was the statement made. Since access to the geology of the NTS and surrounding Nellis Range has been highly restricted, independent review by the geologic sciences has been precluded. Your people told me that the draft was made by reviewing peer-reviewed papers of the geology of the area. If the geological community is restricted from scrutinizing
2 geological observations and interpretations by federal geologists or geologists under federal contracts, how can there be an impartial, independent review of the geology there? If it is truly the *best known large area* then there should be reports on sequence stratigraphy, balanced structural cross sections, and other state-of-the-art papers available. Since I saw no
3 reference to modern stratigraphic and structural analysis, I suspect they are not available and/or not completed for the Nevada Test Site. If that is true, then you will need to rewrite lines 16 and 17 as: "*the NTS is probably the geologically least known large area within the United States.*

On page 4-100, lines 21 and 22 there is a reference to a generalized stratigraphic column for the area in the vicinity of the NTS. Is there a detailed stratigraphic column available? Who
4 did it? Have the stratigraphic sequences been defined and how do they correlate to other sections in the region? What sequences in the stratigraphic column are part of the regional, Paleozoic carbonate aquifer? I saw no references to regional karst intervals or other porous and permeable sequences in the draft. Is there someone working on the Paleozoic sequence stratigraphy of the NTS as it relates to groundwater aquifers, hydrocarbon reservoirs or ore host rocks? If not, will it be done for the
5 final EIS? How can accurate statements be made about groundwater, hydrocarbon and ore deposits be made if this basic work is not complete? If it is complete, where is it available
6 for independent review? Who did the work? Does the worker(s)

Company 3 (continued)

6 cont. have experience with carbonate sequence stratigraphy in Nevada? Have at least a doctorate degree on sequence stratigraphy? Scored at least 90% on the GRE Exams? Have at least 10 years
7 experience in oil and gas experience? Did they generate surface gamma-ray logs with their stratigraphic sections?

On page 4-100, lines 28 and 29 there is no explanation of how compressional deformation rearranged the positions of the
8 Paleozoic rocks and what the implications of the rearrangement has on groundwater and possible extractive minerals including oil and gas.

No reference was made to how the Mississippian foreland basin sediments vary between structural plates on line 29, page 4-100.
9 Is there detailed measured sections available with tight biostratigraphic control for the Mississippian sediments. Where are these sections available for review?

Is there evidence that the strike-slip faults mentioned on line 2, page 4-103 are related to tear faults during the Mesozoic compression event? What evidence is there suggesting there is no
10 relationship? Has there been a detailed sequence stratigraphic analysis been made to compare and contrast the stratigraphy on both sides of the faults? If not, why not? If so, where is the detailed data available for independent review? Where is there a discussion of how these faults control groundwater flow and
11 hydrocarbon and hydrothermal fluid migration?

On page 4-104, line 2, there is reference that the Eleana
12 formation is thought to be bounded by faults. What kind of faults? What thrust sheet is the Eleana Range and Frenchman Flat
13 in? How can an accurate evaluation be made on the contamination of the groundwater in the regional carbonate aquifer be made if
14 there is no reference to what structural plate is involved in the tests? How can there be a remedy to groundwater contamination if
15 the perched water tables are all that are being tested for regional groundwater contamination while the deep carbonate aquifer is unmonitered?

Figure 4-24, page 4-112 shows no reference to thrust faults in
16 the NTS. Is there a reason why thrust faults have been overlooked? Have the thrust faults been mapped? Has the stratigraphy between hanging wall and footwall plates been
17 compared and correlated? If not, why not? If so, where is the data for independent review?

Where is the data concerning the thermal maturity for oil and gas mentioned on page 4-120. Who did the sampling, analyses, and
18 evaluation? Was he (they) certified petroleum geologists with experience in oil and gas exploration? If not, why not? Line 18
19 states that potential source rocks have low organic carbon and hydrogen indices. Where is this data available? Who generated

COMPANY 3 (CONTINUED)

19 cont. the data. From which structural plate were the samples taken?
From what sequences were the samples taken? What parameters
where used to conclude the low potential for hydrocarbon
resources for the region? Who made the conclusions? Was the
20 person a certified petroleum geologist? Were all tests in the
21 NTS logged by independent certified petroleum geologists? What
experience did personnel have who logged tests? How can the
22 hydrocarbon potential of the region be determined if there has
been no evaluation by independent, experienced, oil exploration
23 personnel? Will an evaluation be made before the final EIS?

I will provide additional questions and comments before May if I have more time.

Sincerely,

Alan K. Chamberlain
President

3

COMPANY 4

KISTLER
AEROSPACE CORPORATION
3834 T Street N.W. • Washington, D.C. 20007 • 202 337.9463 • Fax 202 337-3639

May 2, 1996

Mr. Donald R. Elle
Director
Environmental Protection Division
U.S. Department of Energy
P.O. Box 14459
2753 South Highland Drive
Las Vegas, Nevada 89193-8518

BY FAX AND FEDERAL EXPRESS

Re: Comments on Draft Environmental Impact Statement for Nevada Test Site

Dear Mr. Elle:

Enclosed please find the comments of Kistler Aerospace Corporation, of Kirkland, Washington, on the draft Environmental Impact Statement issued for comment by the U.S. Department of Energy in January 1996.

Thank you for your attention to this matter. Please contact me if you have any questions or comments.

Very truly yours,

Robert L. Meuser
Chief Regulatory Counsel

"Providing Launch Services For Low Earth Orbit Satellites"

Before the
Nevada Operations Office,
U.S. Department of Energy

Comments
on
Draft Environmental Impact Statement

U.S. Department of Energy
Nevada Test Site

Robert L. Meuser
Chief Regulatory Counsel
Kistler Aerospace Corporation
3760 Carillon Point
Kirkland, WA 98033
206-889-2001

May 2, 1996

Comments
on
Draft Environmental Impact Statement

U.S. Department of Energy
Nevada Test Site

Kistler Aerospace Corporation of Kirkland, Washington ("Kistler Aerospace"), files these comments on the Draft Environmental Impact Statement (DEIS) issued by the Nevada Operations Office of the U.S. Department of Energy (NV/DOE) in January 1996.

Kistler Aerospace supports Alternative 3 set forth in the DEIS. Kistler Aerospace respectfully urges NV/DOE to reference the testing and operation of a fully reusable aerospace vehicle by Kistler Aerospace at the Nevada Test Site under Alternative 3, the environmental effects of which are considered in the DEIS.

Section 1. Statement of Interest

Kistler Aerospace has entered into discussions with the NTS Development Corporation of Las Vegas, Nevada ("NTS Development") toward use of the Nevada Test Site for purposes of fabrication, testing, ground support and flight operations of a fully reusable aerospace vehicle. NTS Development has been designated by the Department of Energy as a Community Reuse Organization for the Nevada Test Site.

Kistler Aerospace is participating in a project team chaired by NV/DOE. Members of the project team include NTS Development, the Federal Aviation Administration and the U.S. Air Force. Kistler Aerospace will work closely with local, state and federal officials to develop the Nevada operations center.

The NTS site will allow Kistler Aerospace to deliver satellites to all projected orbits for the telecommunications and other low earth orbit satellite constellations now in development. The Nevada site will permit Kistler to serve its commercial satellite customers conveniently from a U.S. location offering comprehensive logistical support. Kistler Aerospace projects that operations from the Nevada site will increase to roughly two flights per month in 2001-2, and could exceed four flights per month by 2004-5.

Kistler Aerospace and NTS Development also will explore with Kistler's contractors the prospects for locating vehicle fabrication facilities at the Nevada Test Site.

If the K-1 airframe can be fabricated and the K-1 vehicle assembled at the NTS Development site, Kistler's transportation costs and barriers will be reduced substantially.

Kistler Aerospace anticipates that its operations will help to increase employment and diversify the economy in southern Nevada. Kistler expects these economic benefits to flow not only from Kistler activities directly, but also indirectly from Kistler's contractors and customers as they support their Kistler-related activities.

Section 2. Description of Kistler Aerospace's Proposed Activities at the Nevada Test Site

2.1. Kistler Aerospace's operating strategy

Kistler Aerospace intends to operate a space delivery service using a fleet of three K-1 aerospace vehicles consistent with the principles used by commercial air carriers generally and air freight delivery services particularly.

The K-1 will be a two-stage vehicle, comprised of the Launch Assist Platform (LAP) and the Orbital Vehicle (OV). *Each stage* will be *fully reusable* and uses well-characterized technologies. Like modern aircraft, the K-1 will be organized around modular, line-replaceable units (LRUs) for each vehicle system to increase reliability and facilitate maintenance.

K-1 systems and components have been selected to take advantage of technologies that have already proven themselves in aerospace applications. In most cases, the hardware that makes use of these technologies has a documented flight history, and, in many cases, is available off-the-shelf.

2.2. Ground handling, facilities and support

Kistler Aerospace plans to construct its assembly and routine maintenance facility at the launch site. The assembly building will be a simple hanger with room for work on two vehicles and basic amenities. Kistler Aerospace will perform assembly of the K-1 vehicle and its payload, pre-flight check, and routine maintenance at this facility. The assembly facility will provide isolated clean rooms for each of four payloads for check-out prior to launch.

The K-1 will use a mobile strongback, or launcher, for three operational functions. The launcher first will serve as the assembly platform for the K-1 vehicle and its payload. The launcher secondly will convey the K-1 vehicle from the assembly facility to the launch pad, and then erect, fuel and launch the K-1, in approximately four hours. This mobile device is similar in concept to the transporters in use at Russian and Kazakh operational launch sites.

Kistler intends to construct a basic flight facility, including modest buildings, a pad, roads leading to the pad, and a dry well for exhaust. These facilities are expected to require less land area and involve less construction than construction of an airport.

After erection at the pad, the K-1 will be loaded with propellants and pressurants by commercial tank trucks feeding through the launcher. Battery charging voltage will be supplied from the self-contained power supply on the launcher. The fueling will take approximately four hours.

Kistler Aerospace selected Russian RD-120 LOx/kerosene engines because they offered the highest performance and reliability of any of the available engines. The RD-120 has been fired 484 times, accumulating 118,000 seconds of operation time - a substantial amount for a rocket engine. Since its inception, 151 RD-120 engines have been built.

The RD-120 engines use RP-1, a more refined form of kerosene. The low volatility of RP-1 as compared to liquid hydrogen makes for safe and easy fueling operations since spilled or leaked fuel will not spontaneously ignite. Safe fueling procedures for RP-1 are well-established after 30 years of use in Titan and Delta expendable vehicle launches.

2.3. Flight operations

After launch, the first stage, or LAP, will boost the orbital vehicle to approximately 40 km (130,000 ft), an altitude and a velocity sufficient for the OV to fly into orbit. The LAP then will separate, rotate and re-ignite its engine for automatic return to the launch site. Separation along any planned azimuth of flight will occur within the restricted airspace surrounding the Nevada Test Site.

Upon separation from the LAP, the OV will ignite its engines and lift into its orbit. The K-1 will be at least 270,000 feet in altitude along any planned azimuth of flight at the point in flight when the K-1 will cross out of the FAA restricted airspace surrounding the NTS.

The OV will deliver its payload after achieving orbit, and then will remain in orbit until the proper time to fire its single main engine for re-entry. The standard 480 kilometer circular orbit will permit re-entry within 12 twelve hours of launch. The OV then will re-enter the earth's atmosphere, and will return to its launch site in an autonomous precision landing maneuver.

Upon re-entry, the K-1 orbital vehicle will be at least 140,000 feet in altitude when it enters the restricted airspace surrounding the NTS. This relatively steep ballistic re-entry path will enhance the targeting of the K-1 re-entry.

COMPANY 4 (CONTINUED)

The K-1's avionics system is being designed with built in health monitoring capability. This allows the replacement of any unstable component before it fails. In so doing, it enables better maintenance and refurbishment programs, thereby increasing reliability.

In the event of an in-flight engine emergency during boost phase, the K-1 can continue flying to a pre-designated diversion site for a safe landing with its remaining engines. After staging, a fuel dump system enables the OV to jettison its fuel load and reach a pre-designated diversion landing site.

The K-1 will have completely redundant avionics so that the vehicle can tolerate the failure of any part of its navigation and guidance systems and continue the flight. Like an aircraft, the K-1 will carry equipment for monitoring position and velocity compatible with Federal Aviation Administration (FAA) requirements for aircraft.

K-1 avionics consist of proven technology with well-documented flight histories. The inertial measurement unit has a documented Mean Time Between Failure (MTBF) of five years of constant operation. The flight control computer has a documented MTBF of four years in continuous operation.

The final landing sequence for both the LAP and OV will use parachutes and airbags. The K-1's parachute and airbag landing system takes advantage of extensive military development. This heritage insures that the K-1's landing systems will perform as designed, and safely land the LAP and OV in nominal and diversion site landings.

The K-1's landing systems remain intact and operable throughout its flight sequences. A barometric sensor deploys the parachutes and airbags insuring a controlled, intact landing at a pre-designated diversion site in the event of an emergency landing. Both the LAP and OV can be recovered, serviced, and, after determination of the cause of any failure, re-inserted into the fleet.

The operation of any vehicle in navigable airspace is subject to licensing, certification, safety restrictions, and operating restrictions imposed by the Federal Aviation Administration of the U.S. Department of Transportation (FAA). Kistler Aerospace will comply with all applicable FAA requirements in its testing and flight operations.

2.4. Recovery and turnaround

When the LAP and OV land on their airbags, recovery vehicles will be dispatched to retrieve each vehicle from the landing zone. The recovery vehicle will use a hoist to lift the LAP and the OV onto the flat-bed recovery vehicle for transport back to the hangar. Once in the assembly facility, the LAP and OV will be transferred to the launch system, which will re-enter the hangar to begin a new maintenance cycle. If the operating systems of the LAP and the OV prove nominal, the first and second stages will be mated, checked out, integrated with payload, and ready for flight in 3 days.

COMPANY 4 (CONTINUED)

If the LAP or OV are not ready for flight, the modular construction of the K-1 will permit repairs at the assembly hangar by replacement of the inoperable system. Kistler Aerospace will maintain spare replacements for all systems. Maintenance will *not* be performed on system modules at the assembly facility. Rather, malfunctioning system modules will be removed from the K-1, replaced by spares, and returned to the relevant contractor for refurbishment or repairs. The K-1 will use proven technology and minimum number of system modules to assure reliability.

2.5. Test Flights

Kistler Aerospace plans to conduct six or more test flights from its operations center. The first three test flights of the Kistler K-1 will be suborbital and wholly within the confines of the Nevada Test Site and the airspace over it. The next three test flights are planned to be orbital flights, with or without payloads, as described above.

2.6. Manufacture of Airframe

Kistler Aerospace will contract the manufacture of the airframe for the K-1 vehicle. The airframe will consist of composite material. The dimensions of the airframe may restrict transport of the airframe to the flight operations center. As a consequence, Kistler intends to invite the airframe manufacturer to locate a composite material fabrication facility at or near the site of operations.

If Kistler's airframe contractor has an interest, Kistler Aerospace will work with the manufacturer and NTS Development toward locating fabrication facilities at the Nevada Test Site.

Section 3. The DEIS Encompasses Kistler Aerospace's Contemplated Activities at the Nevada Test Site

The DEIS issued by NV/DOE encompasses the environmental effects of Kistler Aerospace's contemplated activities at the Nevada Test Site.

3.1. Kistler Aerospace's Contemplated Activities at the Nevada Test Site

Kistler Aerospace contemplates the following activities at the Nevada Test Site:

- Construction of assembly building, manufacturing facility, flight operations pad and support buildings, and associated infrastructure on NTS land.
- Manufacture (possibly) of composite airframe on NTS land.
- Ground support, including transport, fueling, take-off, landing, and recovery on NTS land.

- Flight operations in NTS airspace.

3.2. The Environmental Effects of these Activities Are Addressed in the DEIS

The environmental effects of Kistler Aerospace's contemplated activities are addressed and evaluated in the DEIS. In evaluating these activities, NV/DOE should focus on the environmental consequences of activities, not on the activities themselves. *See Village of Grand View v. Skinner*, 947 F.2d 651, 657 (2d Cir. 1991)("whether the change will affect the ... environment in a significant manner or to a significant degree not already considered in previous studies").

Kistler Aerospace's contemplated activities fall within the classes and kinds of environmental effects considered in the DEIS, and thus are addressed in the DEIS:

Contemplated Kistler Activity	DEIS Coverage
1. Manufacturing (possible activity)	As part of Alternative 1 (No Action) and Alternative 3 (Expanded Use), land use zoning at the NTS envisions industrial use, including manufacturing. Alternative 3 contemplates pursuit of new private initiatives at the NTS. NV/DOE specifically contemplated a "large, heavy industrial facility" under Alternative 3 (at A.1.3.5).
2. Construction	Construction and maintenance of facilities and infrastructure are contemplated as part of Alternative 1 and Alternative 3.
3. Flight operations	Flight operations of various aircraft and missiles are contemplated as part of Alternative 1 and Alternative 3. The LOx/kerosene fuel to be used by the K-1 aerospace vehicle is comparable in environmental implications to other fuels. Alternative 1 and Alternative 3 contemplate spill testing and other testing of hazardous materials.
4. Ground support	Alternative 1 and Alternative 3 contemplate landing by aircraft, ground impact by weapons, and testing of explosive devices.

COMPANY 4 (CONTINUED)

This conclusion is shared by the Desert Research Institute, which compared Kistler Aerospace's contemplated activities with the DEIS. The Desert Research Institute evaluated the environmental consequences of Kistler's contemplated activities element by element. For each element, the Desert Research Institute concluded that the DEIS evaluated the environmental implications of Kistler's contemplated activities. The Desert Research Institute report is attached as Appendix A.

3.3. Kistler Aerospace's Contemplated Activities Should be Covered in the Site-Wide EIS

Kistler Aerospace's contemplated activities should be addressed in the site-wide environmental impact statement in preparation. The DEIS attempts to address comprehensively future alternatives and uses of the Nevada Test Site. Kistler Aerospace's proposed use of the NTS for aerospace operations is under active discussion and consideration by NV/DOE and by NTS Development, the designated Community Reuse Organization for the Nevada Test Site. Such an activity is interconnected with the comprehensive use of the Nevada Test Site, and should be considered in that context. 40 C.F.R. 1502.4, 1508.25(a)(1); *Village of Grand View v. Skinner*, 947 F.2d 651, 657 (2d Cir. 1991)("'Connected' actions are properly the subject of a single EIS."); Shoshone-Paiute Tribe v. United States, 889 F. Supp. 1297,1308-10 (D.Idaho 1994)(placement of Composite Wing and Idaho Training Range connected and improperly considered under
1 separate EIS processes).

Moreover, as demonstrated above, Kistler Aerospace's contemplated activities are addressed in the DEIS. By regulation, the significance of environmental effects must be considered in the context of existing environmental documents and pre-existing circumstances at the site. 40 C.F.R. 1508.27. *See Village of Grand View v. Skinner*, 947 F.2d 651, 657 (2d Cir. 1991). In the context of the existing uses of the Nevada Test Site, and the alternatives contemplated in the DEIS, Kistler Aerospace's contemplated activities are insignificant as a matter of law.

Section 4. The Draft EIS Should Be Modified to Explicitly Reference Kistler Aerospace's Contemplated Activities

The final environmental impact statement for the Nevada Test Site should explicitly reference Kistler Aerospace's contemplated activities under Alternative 3 (Expanded Uses).

NV/DOE cites as illustrations certain activities under Alternative 3, including a spill test facility and a solar energy power generation facility. Kistler Aerospace urges NV/DOE to add the following reference to the list of examples:

- Testing and operating a fully reusable aerospace vehicle, and constructing ground support and manufacturing facilities to support testing and operations.

In addition, NV/DOE should clarify that the references to projects under Alternative 3 do not limit or circumscribe other projects that could be developed and that fall within the environmental effects addressed in the EIS.

A modification of the draft EIS to reflect or refine alternatives is not only proper, but also fundamental to the process mandated by the National Environmental Procedures Act (NEPA). Federal agencies are directed by regulation to respond to comments filed during the comment period. Permissible responses to comments on a draft EIS include modification of alternatives; development of new alternatives; supplementation, improvement, or modification of the agency's analyses; and factual corrections. 40 C.F.R. 1503.4(a). *Lake Hefner Open Space Alliance v. Dole*, 871 F.2d 943, 947 (10th Cir. 1989).

Section 5. Conclusion

For the foregoing reasons, Kistler Aerospace Corporation supports Alternative 3 of those posed in the Draft Environmental Impact Statement for the Nevada Test Site. Kistler Aerospace respectfully urges the Nevada Operations Office of the Department of Energy to reference specifically the contemplated activities of testing and operation of a fully reusable aerospace vehicle on and in the airspace over the Nevada Test Site, the environmental effects of which fall within those addressed already in the draft EIS.

Respectfully submitted,

Robert L. Meuser
Chief Regulatory Counsel

May 2, 1996

COMPANY 4 (CONTINUED)

Appendix A

COMPANY 4 (CONTINUED)

University and Community College System of Nevada

Water Resources Center

Environmental Implications of Kistler Aerospace Corporation
Nevada Flight Operations
by

Roger L. Jacobson
Research Professor
Water Resources Center
Desert Research Institute

The project as currently configured is to develop a site in Area 26 on the Nevada Test Site (NTS) to manufacture and fly aerospace vehicles into earth orbit. The site will resemble a small manufacturing complex with an associated take-off area. The vehicles will be built on site using light reusable composite materials. The manufacturing operation will meet all applicable OSHA, EPA, DOE and other agency regulations. The vehicles will be fueled by kerosene and liquid oxygen, which will not be stored on site, but brought in when needed. The vehicle will fly back to the NTS and be recovered.

The purpose of this evaluation is to compare the current draft Environmental Impact Statement (EIS) for the NTS and surrounding areas, and the proposed environmental impacts of NTS operations by Kistler Aerospace Corporation. The draft EIS is not constructed to cover all future operations but rather to investigate the impacts of various activities that could be elements in any major project or operation. This document describes the environmental impacts of the Nevada Flight Operations proposed by Kistler Aerospace.

The first major activity that may impact the environment will be the construction of the facilities in Area 26 on the NTS. This activity will be similar to numerous other activities, either completed or planned, on the NTS. The land will be surveyed for cultural resources, which will potentially include three investigations: 1) a historic mining area, 2) structures from past Atomic Energy Commission (AEC) activities, and 3) archaeology. This type of routine activity is discussed in the draft EIS in Volume 1, Part A, Section 4.1.10.

The biological resources are investigated in a similar and routine manner to the Cultural Resources. This survey is also conducted on a routine basis before any land disturbing activity. This is discussed in Volume 1, Part A, Section 4.1.6 of the draft EIS.

Materials and supplies will need to be transported to the site during the construction phase and during operation. This is a very common NTS activity and is discussed in Volume 1, Part A, Section 4.1.2.3. The transport of normal construction material is not discussed in the draft EIS, however Section 4.1.2.3 covers the transport of explosives, fuels, compressed gas, other petroleum products, and numerous types of waste and debris.

P.O. Box 19040
Las Vegas, NV 89132-0040
702 895-0450
Fax 702 895-0427

COMPANY 4 (CONTINUED)

Provisions for manufacturing and/or fabrication are under both Alternative 1 and 3 in Volume 1, Part A, Sections 3.1.1.6 and 3.1.3.6. Small-scale specialized fabrication and assembly have been conducted on the NTS for decades. The Occupational and Public Health and Safety (Section 4.1.11) related to both the manufacturing and launching are covered by federal and state law, DOE orders, and organizational plans and procedures.

The fueling of the aerospace vehicles with kerosene is similar to fueling other types of vehicle on the NTS. This specific activity is so routine that no reference could be found in the draft EIS. The proposed site has a propellant catch basin which should adequately contain any fuel spills or leaks so that the environment will not be impacted. Kistler current plans are to bring fuel on to the NTS when needed and not to store fuel on site. However, at the present time large quantities of fuel are stored on the NTS and the small amount of fuel required by Kistler would have little or no impact.

The vehicle take-off will result in a gaseous plume of combustion products similar to a jet airplane take-off and perhaps dust production depending on the take-off area configuration. This operation is under Volume 1, Part A, Section 4.1.7 in the draft EIS. The NTS is in the Nevada Intrastate Ar Quality Control Region. The ambient air quality at the NTS is not currently monitored for criteria pollutants or hazardous air pollutants, except for radionuclides. Elevated particulate matter may occasionally occur because of local sources of fugitive particulates. All other pollutant are believed to be low, and would be emitted from boilers or incinerators. Assuming that take-offs are a rather rare event the current air shed should not exhibit any notable change in air quality. The current plumes produced at the spill test facility located on Frenchman Flat dissipate and leave no residual air quality issues.

The noise associated with the Nevada Flight operations is generally believed to be within the levels of past NTS activities. These include surface testing of nuclear weapons, high explosive tests, and aircraft operation. This environmental impact is covered in Volume 1, Part A, Section 4.1.8 of the draft EIS. The remoteness of the site generally precludes the noise impacting the general public and NTS workers will have protective equipment, if required. The take-off site is over 20 miles to the nearest small community (Amargosa Valley) and because of the topograph the noise will be reduced. There is currently no data available related to current NTS noise activities. The State of Nevada nor local governments have not established any specific numerical environmental noise standards.

The visual impact of the aerospace vehicle take should be very short and is unlikely to create a permanent impact. This activity is in Volume 1 Part A, Section 4.1.9 of the draft EIS.

The site in Area 26 will need a water supply, either by extending the existing lines or drilling a new well. Both of these activities are common on the NTS and are covered in Volume 1, Part A, Section 4.1.5.2. The water requirements for the Kistler Nevada Flight Operations are unknown but appear to be very modest. It is unlikely that his water use will in anyway stress the aquifers on the NTS.

COMPANY 5

THE RURAL ALLIANCE FOR MILITARY ACCOUNTABILITY

DIRECTOR
Joan Monroe

P.O. Box 60036
Reno, Nevada 89506
Field Operations
Phone/Fax (702) 677-7001
(702) 786-0180

P.O. Box 920
Questa, NM 87556
Central Office
(505) 586-1241
Phone/Fax

Thursday, May 02, 1996

Donald R. Elle, Director
Environmental Protection Division U. S. Department of Energy
P. O. Box 14459
Las Vegas, NV 89114

Dear Mr. Elle,

The following are the Rural Alliance for Military Accountability comments on the Department of Energy's (DOE) Draft Environmental Impact Statement for the Nevada Test Site.

1 Our comments will focus on the cumulative impacts associated with Department of Defense and DOE activities and proposed expansions in the State of Nevada. For example discussions found on page 6-3 to 6-10 do not even closely resemble proposed expansions at Naval Air Station Fallon and Nellis Air Force Base. This section is insufficient for example the DEIS states that " The sole concern is the proposed withdrawal of land..." These findings ignore the long standing concerns of the State of Nevada, the Western Shoshone Nation and rural impacts associated with low-level and supersonic military aircraft activities which are adversely impacting rural Nevada residents.

Presently, over 40% of the skies over Nevada are designated as Special Use Airspace (SUA) for use by the Department of Defense with estimates at 70% with inclusion of Military Training Routes (MTRs). Despite the Pentagon's current control of Nevada's airspace, Naval Air Station Fallon is currently attempting a massive airspace expansion which, if approved, would double their present airspace use in Nevada from 10,200 square miles (15% of the state total) to 21,000 square miles extending eastward to the White Pine Mountains, north to the Ruby Mountains and south into Nye County.

The massive proposal would cover the Duckwater Indian Reservation, the 19th century mining boom town of Eureka, with its collection of nationally historic buildings, the Big Smoky Valley, Round Mountain and portions of the Monitor and Toquima ranges and Toiyabe Mountains. The Currant Mountain, Arc Dome, Alta Toquima and Table Mountain Wilderness Areas would be located beneath the proposed Special Use Airspace. An additional 4 million acres of Nevada would be impacted by military overflights.

As described in the Special Nevada Report the three new Military Operation Areas (MOAs) proposed are:

COMPANY 5 (CONTINUED)

- The Smoky Military Operation Area (MOA) would encompass 3,853 square miles and would be designated down to 200 feet Above Ground Level (AGL) with a ceiling of 18,000 Mean Sea Level (MSL) or above sea level.
- The Duckwater Military Operation Area (MOA) would encompass 4,818 square miles. The Duckwater Military Operation Areas (MOA) would allow for supersonic intercept where military aircraft may break the sound barrier creating sonic booms.
- The Diamond Military Operation Area (MOA) would encompass 3,430 square miles of airspace. The Diamond Military Operation Areas (MOA) would have a floor of 10,000 feet Mean Sea Level (MSL) with a ceiling of 18,000 feet MSL. The Naval proposal includes an exclusion zone of 2,000 feet above ground level in a 3 nautical mile radius centered on the Eureka Airport.
- Expansion of their Supersonic Operations Area (SOA) within the proposed Diamond Military Operation Areas (MOA) by 500 square miles. This airspace in which military pilots can fly at supersonic speeds breaking the sound barrier and causing sonic booms could leave the land beneath an uninhabitable area where impacts will eventually force residents to leave. Nearly all the residents have been bought out by the military in Dixie Valley where NAS Fallon is presently conducting supersonic jet training activities.
- Additional plans by Naval Air Station Fallon include the elimination of the Highway 50 Visual Flight Route (VFR) and attempts to raise the ceiling on all Restricted Airspace within the Fallon Training Range Complex from 18,000 feet MSL to 45,000 feet MSL.

The proposed expansions will pose serious impacts to civil aviation, property values, wildlife, livestock, hunting, recreation, human health, Native American sovereignty and the quality of life for Nevadans living under these operations. Subsonic jet noise produced by military aircraft flying at 100-250 feet is generally above the pain threshold for humans. A jet flying at full power can produce levels as high as 140 decibels.

If the U.S. military has its way, huge chunks of Nevada's public land would be converted to simulated war zones. The Department of Defense has already dedicated 25 million acres of land (the size of the state of Virginia) to the military. Currently, 20% or over 4 million acres of Nevada public lands are currently designated for the sole use of the military. Nevadans have learned that once public lands are withdrawn, the Pentagon in most circumstances exerts preemptive use of the lands. These actions exclude other multiple use opportunities such as mining, grazing, hunting, and recreation.

Currently, Naval Air Station (NAS) Fallon is attempting to garner control of 196,000 acres of public lands in Churchill County as buffer zones for the present NAS Fallon bombing ranges and Electronic Warfare Range. The action was first proposed in 1982, but delayed by lawsuits and public opposition from environmental, ranching, recreational and mining

COMPANY 5 (CONTINUED)

organizations. All military withdrawals over 5,000 acres warrant an Engle Act (43 U.S.C. 155-158) withdrawal and Congressional approval.

As described in the Special Nevada Report NAS Fallon land withdrawal proposals of 364,833 acres:

- The Master Land Withdrawal if approved would grant Naval authority over 189,073 acres of public lands in Churchill County surrounding current Naval Bombing Ranges. The proposal includes 34,023 acres at Bravo 16, located between Fallon and Fernley. The existing B-16 range is already curtailing residential and geothermal development. Private homes are located within one half mile of the range. At Bravo 17, located adjacent to Highway 50 just east of Sand Mountain State Park, 35,895 acres are requested. At Bravo 19, located adjacent to the Walker River Paiute Reservation and Highway 95 a total of 19,073 acres are requested. Additionally, the proposed land withdrawal for the Electronic Warfare Range would add 92,673 acres.

In addition, Naval Air Station Fallon's has requested approximately 7,584 acres to their withdrawal application for the Fallon Range Training Complex of the Naval Air Station, Fallon, Nevada (formerly known as the Master Land Withdrawal).

- The Bravo 17/ Bravo 19 Land Bridge would withdraw 122,600 acres of public land. The Proposed Land Bridge of 312 square miles would allow the firing of surface to air missiles from Bravo 19, adjacent to Highway 50 to Bravo 17 bordered by Highway 95 and the Walker River Paiute Reservation between Fallon and Schurz.

- Included in the new proposal is a new 10 square mile bombing range "Bravo 18" which as proposed would be south of the present Bravo 17 range. The proposed Bravo 18 bombing Range could withdraw an additional 53,160 acres of public lands. This newly proposed bombing range would be used for dropping and firing live ordinance, laser operations, helicopter operations, rocket firing, Smokey Sam firing, and motorized artillery firing.

Furthermore, the US Air Force is proposing the expansion of the Paradise Military Operation Area in northern Nevada as part of the Enhanced Training Range in Idaho. The Air Force is also proposing the expansion of Special Use Airspace at the Utah Test and Training Range in eastern Nevada. These proposed expansion, if approved, would further impact civilian aviation and rural residents.

The new proposals have raised protests from a broad coalition of interested parties including pilots, ranchers, miners, Native Americans, environmentalists and rural residents across Nevada who have joined hands to fight increasing military encroachment as it impacts their resources and quality of life.

2 In conclusion, we believe that the DOD and DOE should consider as a viable alternative the relocation of Special Use Airspace and Military Training Routes to the Nevada Test

COMPANY 5 (CONTINUED)

2 cont. Site to ensure that military training activities do not disrupt rural life styles. This alternative was not addressed in the DEIS. Implemented of this alternative would demonstrate to the public that are branches of the federal government are working as one to accommodate our nation's needs in a cooperative manner.

Thank you for the opportunity to comment on this important matter. Please feel free to contact us if you have any further questions.

Sincerely,

Grace Bukowski

Grace Bukowski

COMPANY 6

CEDAR STRAT
Silver Canyon Ranch
Hiko, NV 89017
(702) 725-3500

April 16, 1996

Dr. Donald R. Elle
EPA Division, DOE Nevada Operations
P.O. Box 14459
Las Vegas, NV 89114

Dear Dr. Elle,

Following are my comments and questions concerning the *Draft Nevada Test Site Environmental Impact Statement.*

1 In Volume 1, Chapter 4 lines 16 and 17 the draft states: "....*the NTS is probably the geologically best known large area within the United States.*" I am interested in who made such a sweeping statement and on what basis was the statement made. Since access to the geology of the NTS and surrounding Nellis Range has been highly restricted, independent review by the geologic sciences has been precluded. Your people told me that the draft was made by reviewing peer-reviewed papers of the geology of the area. If the geological community is restricted from scrutinizing geological observations and interpretations by federal geologists or geologists under federal contracts, how can there be an impartial, independent review of the geology there? If it is truly the *best known large area* then there should be reports on sequence stratigraphy, balanced structural cross sections, and other state-of-the-art papers available. Since I saw no reference to modern stratigraphic and structural analysis, I suspect they are not available and/or not completed for the Nevada Test Site. If that is true, then you will need to rewrite lines 16 and 17 as: "*the NTS is probably the geologically least known large area within the United States.*"

2 On page 4-100, lines 21 and 22 there is a reference to a generalized stratigraphic column for the area near the NTS. Is there a detailed stratigraphic column available? Who did it? Have the stratigraphic sequences been defined and how do they correlate to other sections in the region? What sequences in the stratigraphic column involve the regional, Paleozoic carbonate aquifer? I saw no references to regional karst intervals or other porous and permeable sequences in the draft. Is there someone working on the Paleozoic sequence stratigraphy of the NTS as it relates to groundwater aquifers, hydrocarbon reservoirs or ore host rocks? If not, will it be done for the final EIS? How can accurate statements be made about groundwater, hydrocarbon and ore deposits be made if this basic work is not complete? If it is complete, where is it available for independent review? Who did the work? Does the worker(s) have experience with

COMPANY 6 (CONTINUED)

2 cont. carbonate sequence stratigraphy in Nevada? Does he(they) have at least a doctorate degree on sequence stratigraphy? Did he score at least 90% on the Graduate Records Examination for geology? Does he have at least 10 years experience in oil and gas exploration? Has he generated surface gamma-ray logs for their stratigraphic sections?

3 On page 4-100, lines 28 and 29 there are no explanation of how compression deformation rearranged the positions of the Paleozoic rocks and what the implications of the rearrangement have on groundwater and possible extractive minerals including oil and gas. Nether is there reference made to the Las Vegas shear zone that is probably a tear fault related to thrusting. 4 There is no mention how contaminated groundwater from the Test Site mixes with groundwater in the deep carbonate aquifer and how groundwater movement in the aquifer is controlled by the shear zone. There is no mention of deep monitoring wells to measure the velocity of the tritium plume toward the Las Vegas Basin. As a result, there are no plans for mitigating contamination of groundwater in the Las Vegas Basin. Is the Department of Energy prepared to provide an alternate source of water when the tritium plume reaches the Las Vegas Basin?

5 No reference was made to how the Mississippian foreland basin sediments vary between structural plates on line 29, page 4-100. Are there detailed measured sections available with tight biostratigraphic control for the Mississippian sediments. Where are these sections available for review? How do these section correlate with other sections in the region beyond the Test Site?

6 Is there evidence that the strike-slip faults mentioned on line 2, page 4-103 are related to tear faults during the Mesozoic compression event? What evidence is there suggesting there is no relationship? Has there been a detailed sequence stratigraphic analysis been made to compare and contrast the stratigraphy on both sides of the faults? If not, why not? If so, where is the detailed data available for independent review? Where is there a discussion of how these faults control groundwater flow and hydrocarbon and hydrothermal fluid migration? Where is the detailed geologic mapping to document these faults? If the mapping is not done, will it be done by competent geologists before the final EIS is submitted? If not, why not?

7 On page 4-104, line 2, there is reference that the Eleana formation is thought to be bounded by faults. What kind of faults? What thrust sheet is the Eleana Range and Frenchman Flat in? 8 How can an accurate evaluation be made on the contamination of the groundwater in the regional carbonate aquifer be made if there is no reference to what structural plate is involved in the tests? How can there be a remedy to groundwater contamination if the perched water tables are all that are being tested for regional groundwater contamination while the deep carbonate

COMPANY 6 (CONTINUED)

8 cont. aquifer is unmonitored?

9 Figure 4-24, page 4-112 shows no reference to thrust faults in the NTS. Is there a reason thrust faults have been omitted? Have the thrust faults been mapped? Has the stratigraphy between hanging wall and footwall plates been compared and correlated? If not, why not? If so, where is the data for independent review? Who did the correlations? Is the person competent in sequence stratigraphy and the use of surface gamma-ray logs? If not, how was the person chosen to make the correlations?

10 Where is the data concerning the thermal maturity for oil and gas mentioned on page 4-120. Who did the sampling, analyses, and evaluation? Was he (they) certified petroleum geologists with experience in oil and gas exploration? If not, why was there not a certified petroleum geologist assigned to the evaluation? Line 18 states that potential source rocks have low organic carbon and hydrogen indices. Where is this data available? Who generated the data? From which structural plate were the samples taken? From what sequences were the samples taken? How do these plates and sequences correlate with those beyond the NTS. What parameters where used to conclude the low potential for hydrocarbon resources for the region? Who made the conclusions? Was the person a certified petroleum geologist? Were all wells in the NTS logged by independent certified petroleum geologists? What experience did the personnel have who logged wells have? How can the hydrocarbon potential of the region be found out if there has been no evaluation by independent, experienced, oil exploration personnel? Will an evaluation of the oil and gas potential be made by a professional before the final EIS?

11 During the scoping workshop in Caliente, you mentioned that the EIS is not a comprehensive treatise on the geology of the Test Site. I appreciate that, but a brief review of the geology of the NTS should at least summarize the results of sequence stratigraphic analysis and provide at least a generalized balanced structural cross section. There ought to be at least a reference made to the deep carbonate aquifer since it is the most important groundwater resource in the eastern Great Basin.

12 I have enclosed a copy of a recent paper dealing with sequence stratigraphy of rocks involved in the deep carbonate aquifer of eastern Nevada to be incorporated in the final EIS. The paper is on the Timpahute Range which is the closest continuous geologic transect to the NTS and Nellis accessible to the geologic community. Similar sequence analysis should be done in the NTS and in Nellis to complete the geologic review for the EIS.

3

COMPANY 6 (CONTINUED)

For the "*the geologically best known large area within the United States,*" the geologic part of the draft NTS EIS is inadequate. It should at least provide a summary of the results of millions of dollars of geologic research using modern geologic technology such as sequence stratigraphy and balanced structural cross sections.

Sincerely,

Alan K. Chamberlain
President

cc: Govenor Bob Miller, State of Nevada
Senator Richard Bryan, US Senate
Mary Manning, Las Vegas Sun
Mr. Michael Johnson, Las Vegas Valley Water District
Mr. Carl Johnson, Nevada Nuclear Waste Project Office

4

Volume 3

2C-16

Devonian Sequences and Sequence Boundaries, Timpahute Range, Nevada

ALAN K. CHAMBERLAIN[1]
JOHN E. WARME[2]

[1]CEDAR Strat, Silver Canyon Ranch, Hiko, Nevada 89017

[2]Department of Geology and Geological Engineering
Colorado School of Mines, Golden, Colorado 80401-1887

ABSTRACT

A well-exposed 5000-foot-thick composite stratigraphic section in the Timpahute Range, south-central Nevada, provides a useful reference section for defining Devonian depositional cycles and sequences across the eastern Great Basin. Twenty-one mappable sequences were identified. Each sequence is bounded by discrete surfaces, and is comprised of one or more depositional cycles that exhibit distinctive boundaries and internal characteristics. The section exhibits three major sea-level lowstands that produced regionally and economically significant karst surfaces, and six major sea-level transgressions. Bounding surfaces and internal features were interpreted for their relative sea-level changes and paleoenvironmental significance, and the results were used to create a relative sea-level curve.

A surface gamma-ray profile closely mirrors the sea-level curve. Gamma-ray patterns indicate karst and erosion surfaces, lithofacies and biofacies shifts, and both deepening and shallowing events. Some patterns also suggest lithologic and biostratigraphic transitions that are subtle or undetectable in outcrops. The surface gamma-ray log is valuable for regional correlation of formations, sequences and cycles in other surface and subsurface sections. It is also useful for interpretations of sea-level changes and facies shifts throughout the Devonian section.

Sequences identified in this reference section have been compared to over 50 eastern Great Basin surface and subsurface sections, and they provide a powerful regional correlation tool. Furthermore, these sequences have been used to map complex structures in the Timpahute and adjacent ranges. Some sequence boundaries, such as the karsted Simonson unconformity, provide attractive targets for hydrocarbon exploration in the region.

INTRODUCTION

In this paper, we describe a well-exposed composite section of Devonian rocks in the Timpahute Range, south central Nevada. This reference section can be used to identify and interpret Devonian sequences and cycles across the eastern Great Basin. It lies in the middle and western parts of the greater Timpahute Range, about 120 miles north of Las Vegas (Figs. 1, 2). The Devonian section lies between predominantly carbonate rocks below and a mixture of carbonate and siliciclastic rocks above. It can be correlated to other mountain ranges where much of the Paleozoic section is exposed (Fig. 3).

The Devonian portion of the southwest Mail Summit measured section, referred to in this paper as "TMS", is nearly 5000 feet thick. Table 2 provides formation names of the Paleozoic rocks commonly used in the region. Five formations make up the Devonian TMS section: Sevy Dolomite, Simonson Dolomite, Guilmette Formation, West Range Limestone, and Pilot Formation (Figs. 4, 5). Ages of these formations are approximately of Early, Middle, Late, and very Late Devonian, and Devonian-Mississippian, respectively. Recognition of precise sequence boundaries provides natural boundaries for formations and members. Furthermore, a karst surface at the top of the Simonson Dolomite separates dolostones below from varied lithologies of limestone, dolostone, sandstone, megabreccia and siltstone above. Karsted, coarsely crystalline dolostone below the unconformity is a major hydrocarbon exploration target and probably correlates to the reservoir rocks at the Grant Canyon oil field 55 miles to the north.

Sequences identified in the TMS can be recognized in over 50 eastern Great Basin surface and subsurface sections, and they provide a powerful regional correlation tool (Figs. 1, 6, 7). Diagnostic features and depth indicators listed in Table 3 were used to help identify and group sets of upward-shallowing cycles into sequences in the regional correlations. Figure 6 shows correlations where lithology of individual sequences may vary laterally. Correlation of

in M. W. Longman and M. D. Sonnenfeld, eds., 1996, Paleozoic Systems of the Rocky Mountain Region. Rocky Mountain Section, SEPM (Society for Sedimentary Geology), p. 63-84.

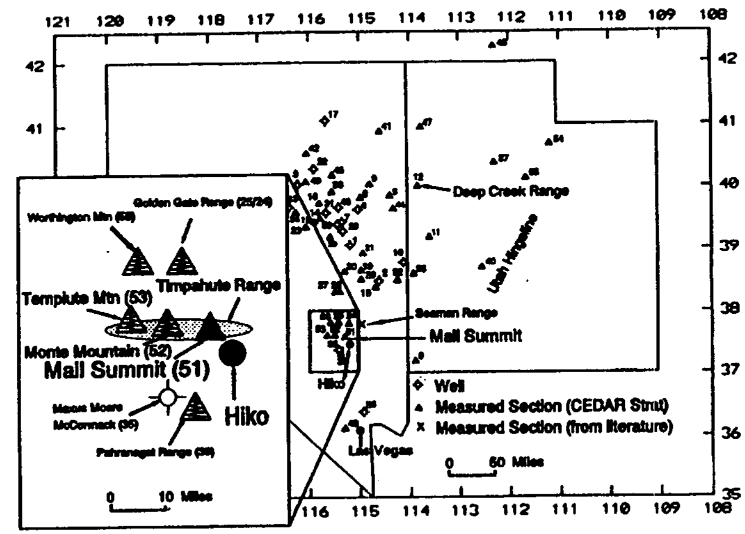


Figure 1. Index map showing parts of Nevada and Utah and location of southwest Mail Summit composite stratigraphic section (TMS) in the greater Timpahute Range near Hiko, about 110 miles north of Las Vegas. Also shown are adjacent (inset) and regional surface and subsurface sections (listed in Table 1) to which Devonian sequences in the southwest Mail Summit reference section were correlated. Dry hole symbols indicate selected study wells that penetrated the Devonian section. The Seaman Range section (X) measured by Hurtubise (1989) is shown. Numbers on the map borders are degrees latitude and longitude. Type sections for the Devonian Sevy, Simonson and Guilmette formations are in the Deep Creek Range (#12 on Table 1), western Utah.

sequences between surface and subsurface sections is shown in Figure 7. In a further application of this work, the first author has used features listed in Table 4 to identify sequences and map complex structures in the Timpahute, Golden Gate, Worthington, Hiko, Seaman, and Pahranagat ranges. Because the region lacks well bores penetrating the Paleozoic section, this reference section may prove useful in helping unravel the nature of complex structures encountered by deep hydrocarbon exploration tests in southern Nevada.

Past Work

Lithostratigraphic terminology used here (Table 2) reflects the most widely used nomenclature for Basin and Range strata (Langenheim and Larson, 1973). Reso (1963) in the Pahranagat Range and Kellogg (1963) in the Egan Range helped define this terminology. In Figure 3, the Devonian stratigraphy of the TMS (section 51, Fig. 1) is compared with the Paleozoic stratigraphy exposed in the Egan (section 20, Fig. 1) and Pahranagat (section 38, Fig. 1) ranges.

Nolan (1935) first applied the names Sevy Dolomite, Simonson Dolomite, and Guilmette Formation to Devonian beds in the Deep Creek Range, western Utah (Fig. 1). Between the very light-gray, slope-forming Sevy Dolomite and the darker gray, ledge-forming Simonson Dolomite is a brown-gray, slope- and ledge-forming interval that includes the Oxyoke Canyon Sandstone Member of the Nevada Formation (Nolan *et al*, 1956) and corresponds to the Oxyoke Interval in this paper. Subdivisions of the Simonson Dolomite were taken from Osmond (1954) and are readily applied throughout much of the Paleozoic platform facies in eastern Nevada and western Utah. Members of formations generally coincide with sequences, and their definition is still being refined.

Reso and Croneis (1959) proposed that the base of a yellow slope-forming bed (Yellow Slope Sequence in this paper), 40 to 90 feet above the highest bed bearing the brachiopod *Stringocephalus*, be the base of the Guilmette

Table 1. Measured sections and wells that were correlated to the southwest Mail Summit (TMS) reference section.

No. Well or Measured Section

1. American Hunter Expl., Blackjack Spring
2. Amoco, Dutch John
3. Amoco, East Henderson
4. Anadarko, Combs Peak
5. Antelope Range
6. Beaver Dam Mountains, Horse Canyon
7. Blair, White Pine
8. Cherry Creek Range, Egan Basin
9. Cherry Creek Range, Goshute Canyon
10. Commodore Resources, Outlaw Fed
11. Confusion Range, Little Mile & 1/2
12. Deep Creek Range
13. Depco, Willow Wash
14. Diamond Range, Newark Mountain
15. Diamond Range, Oxyoke Canyon
16. Diamond Range, Rattlesnake Ridge
17. Diamond Shamrock, Kimbark
18. Dutch John Mountain
19. Egan Range, Ninemile
20. Egan Range, Shingle Pass
21. Egan Range, Water Canyon
22. Exxon, Aspen Unit
23. Fish Creek Range, Bellevue Peak
24. Golden Gate Range, Lower Plate
25. Golden Gate Range, Upper Plate
26. Grace Pet., Arrow Canyon-1
27. Grant Range, Forest Home Lower Plate
28. Grant Range, Forest Home Upper Plate
29. GW, Moorman Ranch
30. Horse Range
31. Keith Walker, Fed
32. Limestone Hills
33. Little Bald Mountain
34. Lone Mountain
35. Maxus Expl., Moore McCormack 6-1
36. North Needles Range
37. Oquirrh Mountains
38. Pahranagat Range, Cutler Reservoir
39. Pancake Range, Green Spring
40. Pavant Range, Dog Valley Peak
41. Pequop Range, Independence Valley
42. Pinion Range, Pine Mountain Klippe
43. Ram, Long Jevity-1
44. Red Hills.
45. Ruby Range, Pearl Peak
46. Samaria Mountain, Idaho
47. Silver Island Mountain, Graham Peak
48. Spring Mountain, Lovell Canyon
49. Sulphur Springs, Telegraph Canyon
50. Tenneco Oil Co, Illipah-1
51. Timpahute Range, Mail Summit
52. Timpahute Range, Monte Mountain
53. Timpahute Range, Tempiute Mountain
54. Uinta Mountains, Hoyt Peak
55. Wasatch Range, Rock Canyon
56. Worthington Mountain

Formation in the Pahranagat Range. Tschanz and Pampeyan (1970) in their regional synthesis, Hurtubise (1989) in the Seaman Range, Ackman (1991) in the Worthington Range, and Estes (1992) in the Pahranagat Range also placed the top of the Simonson Dolomite at the base of the yellow slope-forming bed. In his work in the Pahranagat Range area, Reso (1960) divided the Guilmette into two members above and below the top of a prominent carbonate megabreccia (B2 Sequence in this paper). Hurtubise (1989) divided the Guilmette into two members above and below the top of the yellow slope-forming bed. We have divided the Guilmette Formation into nine mappable sequences (Fox Mountain, Yellow Slope, and Sequences A through G) that correlate with other measured sections and wells of the eastern Great Basin (Fig. 1).

We propose to modify some formation and member boundaries to conform to newly identified sequence boundaries. Sequence boundaries are genetic, focus on significant and identifiable surfaces, and have great potential for regional correlations.

Sequences and Sequence Boundaries

"Sequence" as used in this paper is one or a bundle of depositional cycles bounded by discrete surfaces. Cycles were sequentially numbered from bottom to top in each sequence and are described in detail by Chamberlain (1996). The average thickness of cycles in TMS, excluding the B2 megabreccia, is 22 feet. Each cycle and sequence has a predictable gamma-ray pattern. Sequences in TMS vary from less than 100 feet to more than 500 feet in thickness and generally have characteristics that contrast with adjacent sequences (Table 4). Significant characteristics that help distinguish one sequence from another include mineralogy, texture, bedding, weathering profile, color, fossil content, shallowing- or deepening-upward trends, gamma-ray signature, and other properties that may be unique to one or a few cycles (*e.g.*, cross stratification, condensed intervals, oncolites, cherts, etc.). Some boundary characteristics that separate sequences include karsted surfaces, erosional surfaces, desiccation cracks, paleosols, sharp contacts, transgressive lags, and abrupt deepening events (Fig. 4).

We use widely accepted sequence stratigraphic terms to describe and interpret the Devonian strata in Nevada (*cf.* Baum and Vail, 1988; Weimer, 1992). A sea-level Lowstand Surface of Erosion (LSE) is an unconformity or significant hiatus formed during a relative lowstand of sea level. In carbonate rocks, LSEs are signaled by zones of karst, paleosols, deep cracks, and obvious erosion. A Transgressive Surface of Erosion (TSE) is a hiatus formed by waves and currents crossing the position of the stratigraphic section as sea level rose. It commonly represents little erosion, and may be a sharp surface or rendered vague by bioturbation. A Maximum Flooding Surface (MFS) is formed during sea-level transgression and highstand. In contrast, a Condensed Section (CS) represents beds deposited during a sea-level highstand above the MFS.

COMPANY 6 (CONTINUED)

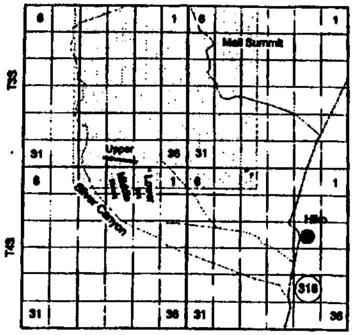


Figure 2. Location of lower, middle and upper segments of the southwest Mail Summit composite stratigraphic section. Access is by gravel road from Highway 318 to Silver Canyon. Arrows point up-section. The Mail Summit topographic 7.5 minute quadrangle is stippled.

LOCATION

In this paper, the southwest Mail Summit measured section (TMS), measured within the southwest Mail Summit 7.5 minute quadrangle, consists of three segments (Fig. 2). All three segments lie within the same structural thrust plate (Chamberlain and Gillespie, 1993). The basal segment of the TMS includes Sevy Dolomite Sequence 3 through the top of the Simonson Dolomite Brown Cliff Sequence. Along strike to the west, the middle segment contains the Simonson Upper Alternating Sequence through the base of Guilmette Sequence D. Measured along a ridgetop one mile north of the other two segments, the base of the upper segment includes Guilmette Sequence B2 to the Mississippian Joana Limestone. Overlap of Sequences B2 and C was made to compare and contrast reef and off-reef features.

METHODS

Measured Sections

A traverse of the least structurally deformed and best exposed section was chosen by constructing a 1:24,000 scale reconnaissance geologic map of the southwest Mail Summit 7.5 minute quadrangle area. Mounted with a clinometer corrected for structural dip, a 5-foot Jacob's Staff was used to measure section thicknesses. Outcrop profile, description, and gamma-ray measurements at 2.5-foot intervals were recorded on audio tape. Outcrop descriptions included cycle boundaries, internal lithologies, colors, textures, fossil content, sedimentary structures, bedding, and other significant information. A numerical value representing facies environments was assigned to each facies while in the field. These data were used to construct a relative water-depth (relative sea-level) curve. Criteria used to make facies assignments are summarized in Table 3.

Surface Gamma-Ray Logs

Surface gamma-ray logs provide a powerful correlation tool in frontier areas (Chamberlain, 1983). Figures 3, 6 and 7 provide examples of surface and subsurface correlations in the greater Timpahute Range. Note that the gamma-ray patterns above Sequence B allow correlation between the sections (Fig. 6), despite changes in lithology.

Gamma-ray measurements were made by holding a scintillometer waist high and recording the counts per second from the digital display (Chamberlain, 1983). The data were transcribed onto a spreadsheet for further data manipulation and preparation for graphic output. A paper printout of the measured section at a large scale (*e.g.*, 1 in. to 10 ft) allowed detailed correlation of the gamma-ray log with the outcrop description. A final printout at smaller scales (*e.g.*, 1 in. to 200 ft) compressed the gamma-ray log and emphasized subtle, but significant, changes that helped to distinguish sequence boundaries (Figs. 5, 6, 7). The gamma-ray log is compressed much more (*e.g.*, 1 in. to 2000 ft) and the lithology is greatly generalized in Figure 3.

A "gamma-ray inflection" is an increase in radiation or excursion to the right on the gamma-ray log and a "gamma-ray deflection" is a decrease in gamma radiation or an excursion to the left. Of the three naturally occurring radioactive elements, potassium and/or thorium in detrital dust is probably the most likely source of gamma radiation in most Devonian rocks of Nevada. Detritus-poor, open-marine carbonates at the base of cycles emit less gamma radiation than detritus-rich, supratidal silty dolostones at the top of cycles. Wilson and Pilatzke (1987) suggested that gamma-ray inflections in time-equivalent beds of the Williston Basin are caused by wind-blown, thorium-rich silt deposited under arid climate conditions. However, the sharp, intense gamma-ray inflections in the Mississippian-Devonian Pilot Formation and in the Mississippian Antler clastic shales and the general increase in radiation upward (Fig. 3) are probably due to uranium concentrated in organic-rich, fine-grained detrital rocks.

DEVONIAN SEQUENCES

Figure 5 summarizes the Devonian sequences identified and described in this paper. Abbreviations in the first column, defined in the legend, show the sequence order. Gamma radiation was recorded and plotted as counts per second, similar to API units in well logs. Major lithologies and surfaces are illustrated in the lithologic column. Facies values assigned in the field (Table 3) were used to plot the

COMPANY 6 (CONTINUED)

relative sea-level curve. Each excursion to the right marks a deepening event at the base of each upward-shallowing cycle. Cycles within each sequence are sequentially numbered from bottom to top (Chamberlain, 1996). The sea-level curve is a mirror-image of the gamma-ray curve (*i.e.*, gamma radiation intensity decreases over rocks deposited during sea-level rises [*e.g.*, at approximately 2000 ft in Fig. 5]). Boundary characteristics that separate sequences are listed in the right-hand column. Generally, features are listed in the order they occur in the section (from bottom to top). The lower part of the Mississippian Joana Limestone is included to complete the TMS.

Shown in Table 3 are the number (relative sea-level depth scale) and characteristics of each facies, as assigned in the field. The depth scale was used to construct the sea-level curve in Figure 5. Interpreted facies are shown in the middle column. Diagnostic features and/or depth indicators in the right-hand column summarize features observed in the TMS sequences, and documented in many other measured sections in the Great Basin (Fig. 1).

Using significant boundary characteristics (LSEs, TSEs, etc.), internal features (lithofacies, biofacies, trends, etc.), and gamma-ray response, we divided the Devonian section into 21 genetic mappable rock sequences. Table 4 provides a convenient reference for the thicknesses, number of cycles, and significant features that distinguish each sequence. These criteria are useful for mapping complex structures in the region and for correlating sequences to other Great Basin surface and subsurface sections. Most of the sequences are composed of bundles of thinner (tens of ft) cycles.

Sequence Boundaries

Karst and desiccation cracks mark relative sea-level Lowstand Surfaces of Erosion (LSEs). Karsted surfaces mark the tops of the following sequences: Coarsely Crystalline and Upper Alternating of the Simonson Dolomite, Fox Mountain, and Sequences B2, B3, and F of the Guilmette Formation (Fig. 5). Desiccation cracks occur at the top of the Fox Mountain Sequence and tops of cycles in Guilmette Sequences D, E and F. Desiccation cracks filled with quartz sandstones also commonly occur at the top of Guilmette G cycles. LSEs, represented by paleosols, occur at the tops of the Fox Mountain and Sequence B3 of the Guilmette.

Transgressive Surfaces of Erosion (TSEs) commonly occur at sequence or cycle bases where carbonate mudstones and/or wackestones with open-shelf fossils abruptly overlie platform, fossil-poor, light-gray, laminated dolostones representing restricted platform carbonates at the top of the underlying shallowing-upward cycle. This type of TSE occurs at the base of each of the following sequences: 1) Simonson Brown Cliff-Forming Sequence, 2) Guilmette Sequences A1, A2, and D, 3) West Range Limestone, and 4) Joana Limestone. TSEs signaling less pronounced deepening events commonly mark internal, thinner (tens of ft) sequences or cycles. TSEs may truncate desiccation crack-bearing, quartz sandstone caps of many upward-shallowing cycles in Sequence G. They also truncate the uppermost cycles in Sequences D and F and may merge with the underlying LSEs. Lag deposits commonly occur just above TSEs such as those at the bases of the Oxyoke Formation, Simonson Lower and Upper Alternating and Brown Cliff Sequences, Guilmette Fox Mountain and Sequences A2, B3, and F, and Pilot Sequence 2. Hummocky cross-stratification occurs just above TSEs marking the base of both Sequences of the Oxyoke Interval and in the lower part of Guilmette Sequence E Cycle 8.

Gamma Radiation

The large-scale trend of background gamma radiation decreases from supratidal Sevy dolostones to open-shelf carbonates of Sequences A2 through B3. Three major, large-scale (100s of ft) upward-deepening sequences, composed of numerous minor upward-shallowing cycles, occur in the basal 2000 feet of the measured section (Fig. 5). Gamma radiation generally decreases upward in each of the large-scale sequences. The Simonson Brown Cliff Sequence occurs at the top of the lowermost large-scale sequence and contains the first occurrence of open-shelf fossils in the TMS. Gamma radiation of the Brown Cliff Forming Sequence is less intense than of the adjacent sequences above or below. The Guilmette Fox Mountain Sequence and Sequence B occur at the top of the other two large-scale sequences in the overlying 1000 feet. As with the Brown Cliff below, open-marine carbonates of the Fox Mountain and Sequence B provide less gamma radiation than adjacent sequences. In the Guilmette, gamma radiation increases from the base of Sequence B to the top of Sequence C. Gamma radiation is less intense than in Sequences C and E and is nearly constant through Sequence D.

Gamma-ray patterns of the upward-shallowing Sequence F and subsequent sequences are inverse to underlying patterns. Instead of gamma radiation increasing from an open-shelf to supratidal environment in each cycle, bases of cycles from Sequences F and upward through the Pilot Sequences, which represent deeper-water and more basinal rocks, produce a stronger gamma response. This increase in gamma radiation at cycle bases is probably due to the greater influx of terrigenous material associated with the incipient Antler Orogeny.

SEQUENCE DESCRIPTIONS AND INTERPRETATIONS

Sevy Dolomite
(980 ft thick at Tempiute Mountain, 3 sequences)

A regional unconformity (Osmond, 1962), the surface between the Silurian Laketown Dolomite and the Devonian Sevy Dolomite, correlates with the base of the second-order Sauk sequence boundary of Wheeler (1942). Generally, a change from cliff-forming, dark gray, chert-

COMPANY 6 (CONTINUED)

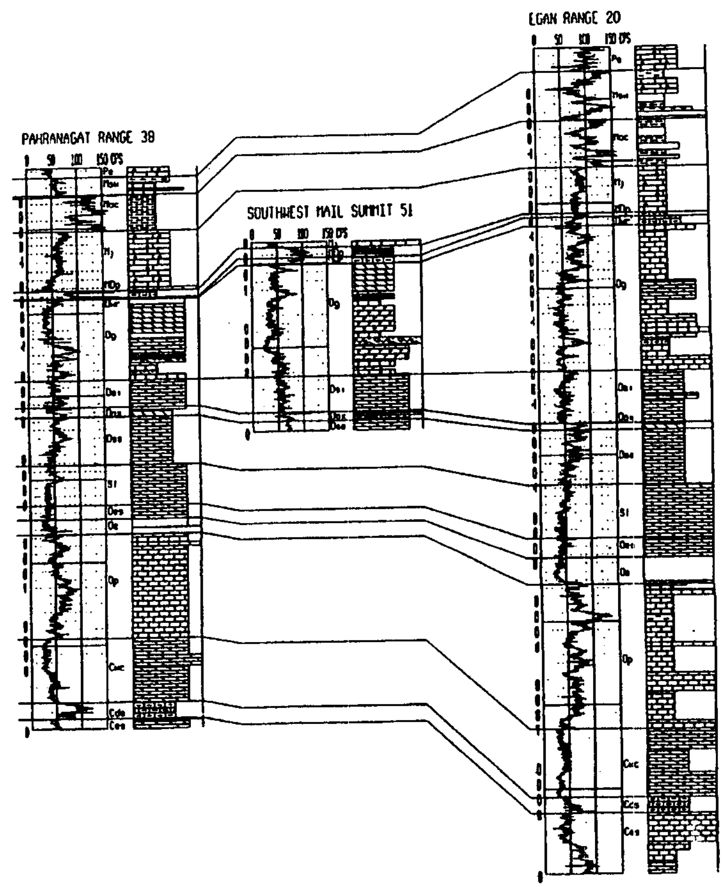


Figure 3. Paleozoic correlation chart that compares the Devonian stratigraphy of the Timpahute Mail Summit (TMS) measured section (section 51, Fig. 1) with the Paleozoic stratigraphy exposed in the Egan (section 20, Fig. 1) and Pahranagat (section 38, Fig. 1) ranges. Table 2 summarizes the Paleozoic nomenclature and formation abbreviations used in this paper. Commonly used symbols are used to illustrate lithology. Vertical scales in feet.

bearing, fossil-rich Silurian dolostones to slope-forming, fossil-poor, laminated, light-gray Devonian dolostones marks the sequence boundary. This boundary may also be subtle and occur on partly covered slopes of light-gray dolostone. Fossils in the Laketown Dolomite suggest deposition in open-shelf conditions, whereas Osmond (1962)

COMPANY 6 (CONTINUED)

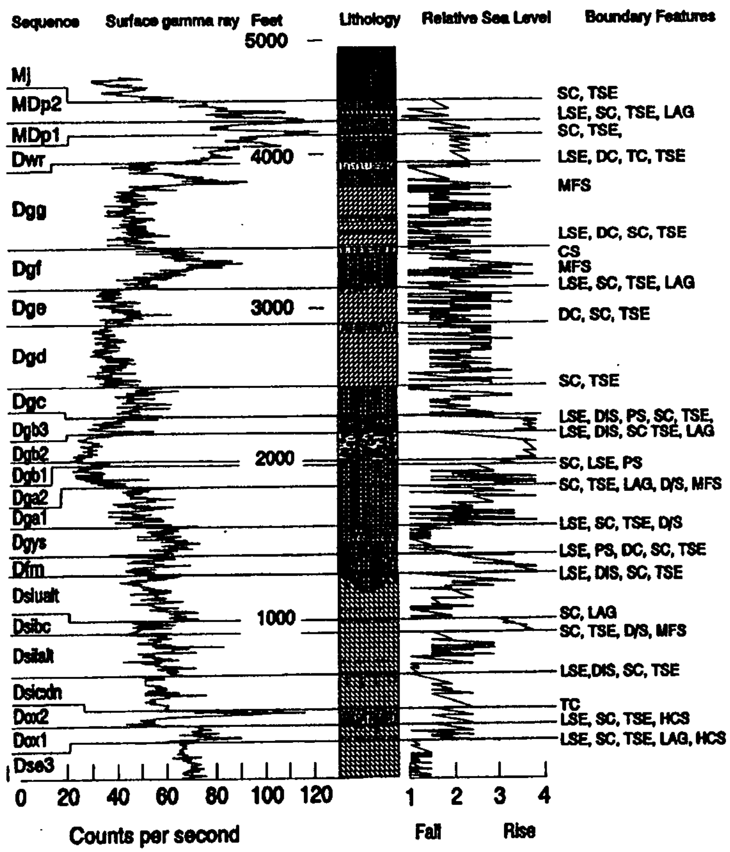


Figure 5. Composite stratigraphic column of southwest Mail Summit section showing sequences, surface gamma-ray log, stratigraphic column, relative sea-level curve, and sequence-boundary features (see legend in Fig. 4 for explanation of abbreviations and lithologic symbols, Table 3 for criteria and values used to construct the relative sea-level curve, and Table 4 for sequence thicknesses, numbers of cycles and significant features).

Simonson: Coarsely Crystalline Sequence (225 ft thick, 4 cycles)

Recrystallization to coarse-grained dolostone has obliterated most primary depositional features in this basal member of the Simonson Dolomite. Solution collapse breccias and drusy cavity fillings occur tens of feet below the top of the sequence, indicating exposure and a major LSB. Intensity of karsting and crystal coarseness increase to the upper boundary (Fig. 5). Composed of subtidal

COMPANY 6 (CONTINUED)

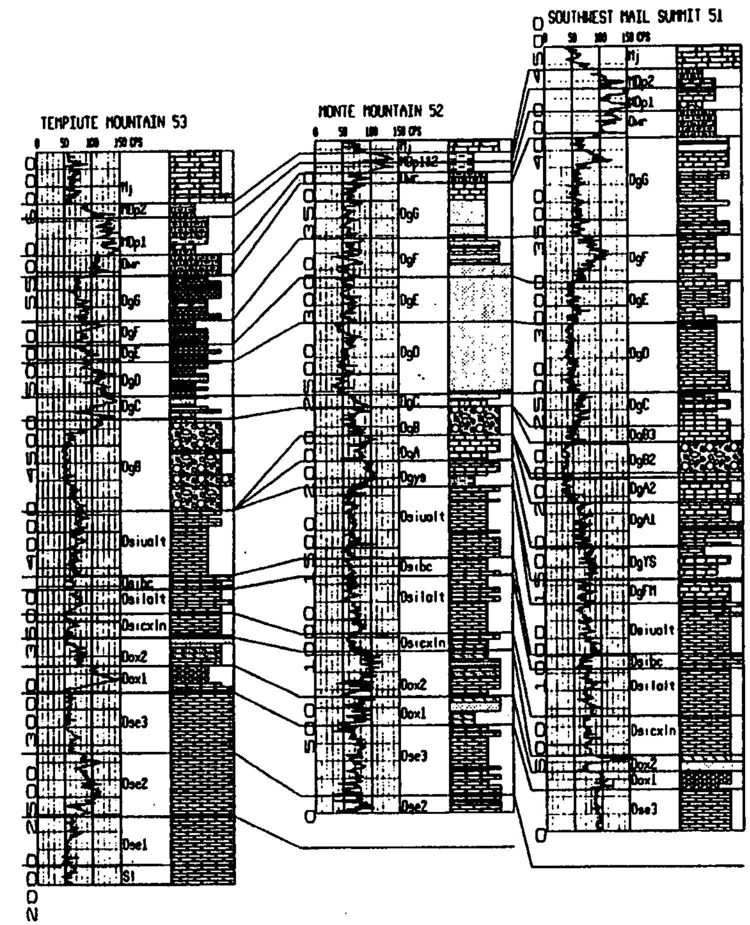


Figure 6. Correlation of three measured sections in the Timpahute Range separated by Mesozoic thrust faults (see inset map on Fig. 1 for location of the measured sections at Mail Summit, Monte Mountain and Tempiute Mountain). Spaces between the columns are proportional to the distances between sections. The datum is the top of Sequence C (DgC). Lithologic symbols are standard. Vertical scales in feet. Note that the megabreccia of Sequence B progressively overlies older rocks westward until it rests on the Simonson unconformity at Tempiute Mountain.

COMPANY 6 (CONTINUED)

Table 2. Paleozoic nomenclature in southeastern Nevada with abbreviations used in Figure 3. The numbers in the colun headers correspond to the section number on Figure 1.

ABBRV	AGE	THIS PAPER 51	KELLOGG (1963) Egan Range 20	RESO (1963) Pahranagat Range 38
Pe	Pennsylvanian	Ely Limestone	Ely Limestone	Bird Spring Formation
Msw	Mississippian	Scotty Wash Sandstone	Scotty Wash Sandstone	White Pine Group. Langenheim and Larson (1973) included Scotty Wash in upper part.
Mc		Chainman Formation	Chainman Shale	
Mj		Joana Limestone	Joana Limestone	Joana Limestone
MDp	Mississippian/ Devonian	Pilot Formation	Upper West Range Formation	Pilot Formation
Dwr	Devonian	West Range Limestone	Lower and Middle West Range Formation	West Range Limestone
Dg		Guilmette Formation	Guilmette Formation	Guilmette Formation
Dsi		Simonson Dolomite	Simonson Dolomite	Simonson Formation
Dox		Oxyoke Interval	sandstone lens (0-25 feet thick near top of Sevy Dolomite	sandstone bed at base of Simonson Formation and calcareous siltstone and chert at top of Sevy Formation.
Dse		Sevy Dolomite	Sevy Dolomite	Sevy Formation
Sl	Silurian	Laketown Dolomite	Laketown Dolomite	Laketown Dolomite
Oes	Ordovician	Ely Springs Dolomite	Fish Haven Dolomite	Ely Springs Dolomite
Oe		Eureka Sandstone	Eureka Sandstone	Eureka Sandstone
Op		Pogonip Formation	Pogonip Group	Pogonip Group
Cwc	Cambrian	Whipple Cave Formation	Whipple Cave Formation	Desert Valley Formation
Cd		Dunderberg Shale	Dunderberg Formation	Dunderberg Shale
Ces		Emigrant Springs Formation	Emigrant Springs Formation	Highland Peak Formation

suggested that the fossil-poor Sevy originated as a primary evaporitic dolostone (supratidal).

Internally, the Sevy contains thin beds of rip-up clasts that mark the bases of minor cycles within the formation. These minor cycles are illustrated as sea-level rises on Figure 5. It is difficult to divide the Sevy into sequences on the outcrop, but a change in gamma-ray character allows division of the section into three sequences. The contact with the underlying Laketown Dolomite and Sequences 1 and 2 are not exposed in the TMS, but are exposed in a section at Tempiute Mountain (Figs. 1, 6, 7) where Sequences 1-3 are 275, 365, and 340 feet thick, respectively. Sequence 2 exhibits a stronger and more erratic gamma-ray pattern than the characteristically smoother pattern observed in the overlying Sequence 3 (Figs. 6, 7). At the TMS, only 240 feet of Sequence 3 is exposed.

Oxyoke Interval (195 ft, 2 sequences)

The Cherty Argillaceous and Sandy Members of the Sevy Dolomite (Osmond, 1962) are similar to Sequences 1 and 2 in this paper. One difference is that the base of Sequence 1 is immediately below a prominent gamma-ray deflection at a flat-pebble conglomerate (at a TSE) and not at the first occurrence of argillaceous dolostone above the conglomerate. Another difference is that the base of Sequence 2 is not always at the base of prominent sandstone beds such as at Tempiute Mountain (Figs. 6, 7). Except for a 60-foot-thick sandstone bed at TMS, background gamma radiation of the Oxyoke Interval is significantly higher than the adjacent strata. The sandstone represents the Oxyoke Canyon Sandstone Member of Nolan *et al* (1956) and commonly produces a local gamma-ray deflection within a regional gamma-ray inflection in sections where the sandstone is present. This characteristic gamma-ray inflection has been correlated to the wells and measured sections shown on Figure 1 (see also Figs. 6, 7).

Oxyoke: Sequence 1 (100 ft thick, 4 cycles)

The lower boundary of Sequence 1 is a merged LSE and TSE that separates the underlying laminated, quartz-free, light-gray Sevy dolostone from the overlying light-yellow-brown, sandy, hummocky cross-stratified, intraclast (flattened rip-up clasts) packstone grading upward to finely crystalline, black chert nodule-bearing, burrowed Oxyoke dolomudstone. In contrast to the supratidal Sevy Dolostone,

COMPANY 6 (CONTINUED)

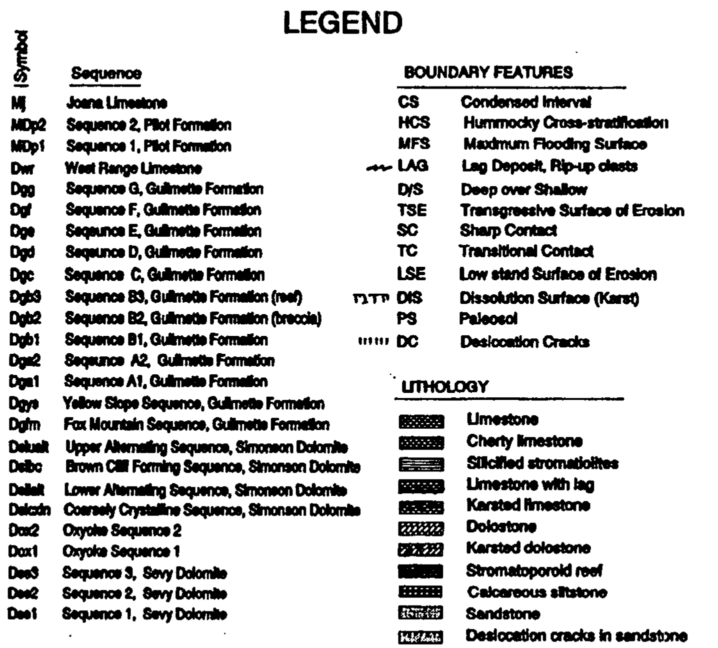


Figure 4. Legend for sequence symbols, sequences, boundary features, and lithologic symbols in Figure 5.

the interpreted depositional environment of the basal Oxyoke is an open shelf above storm-wave base. All four of the Sequence 1 cycles are upward-shallowing and are interpreted as culminating in low intertidal to supratidal environments. A small gamma-ray spike followed by a prominent gamma-ray deflection marks the base of Sequence 1 (Fig. 5).

Oxyoke: Sequence 2 (95 ft thick, 2 cycles)

The base of Sequence 2 in the TMS is the base of a light orange-brown quartz sandstone cliff that creates a regionally recognizable but intermittent stratigraphic unit. Hummocky cross-stratification at the base suggests another deepening event within the Oxyoke Interval. Medium yellow-brown, fine- to medium-grained, crossbedded, dolomite-cemented quartz sandstone comprises the first of the two cycles. Quartz sand content decreases upward and the cycle appears to shallow upward. The second cycle is composed of finely-crystalline, medium dark-gray dolostone that contains upward-thickening sandy beds. Superficially, there appears to be a transition upward from sandy Oxyoke beds to the overlying Coarsely Crystalline Sequence of the Simonson Dolomite. However, a sharp gamma-ray deflection was used to define the boundary between the Oxyoke and the overlying Simonson (Figs. 5, 6, 7).

Simonson Dolomite (860 ft, 4 sequences)

The four sequences of the Simonson coincide with the four members identified by Osmond (1954): Coarsely Crystalline, Lower Alternating, Brown Cliff, and Upper Alternating. Two major karst surfaces, one at the top of the Coarsely Crystalline Sequence and the other at the top of the Upper Alternating Sequence, create significant karst zones that make the Simonson an attractive hydrocarbon exploration target (Figs. 8, 9).

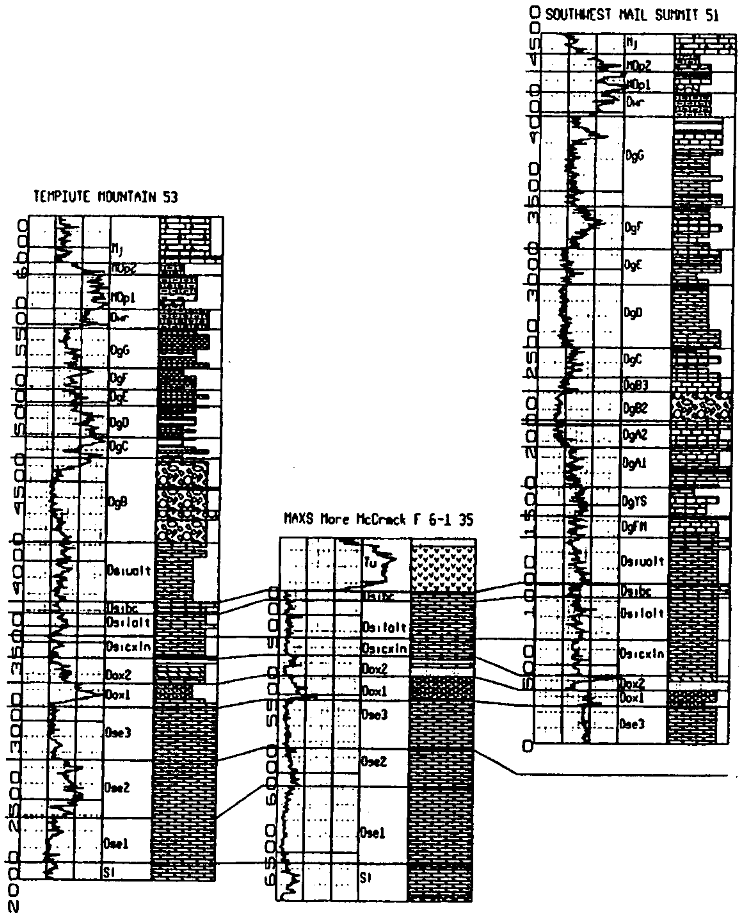


Figure 7. Correlation of TMS (51) and another measured section (53) in the Timpahute Range with the Maxus Moore McCormack Federal 6-1 (35) well (see inset map in Fig. 1 for locations). Standard lithologic symbols are used. Vertical scales in feet. Erosion at the Tertiary unconformity has removed the upper part of the section in the McCormack well. The diagram illustrates how surface gamma-ray logs, calibrated with exposed sequences, can be used to identify sequences in the subsurface. Datum is the karsted surface marking the top of the Simonson, coarsely crystalline sequence.

Table 3. Sequence characteristics used to compile the relative sea-level curve. Facies numbers (relative sea-level values) were assigned while measuring sections in the field and are used to plot the relative sea-level curve in Figure 5. Bold type signifies the most important characteristics. Facies numbers greater than four occur above Sequence B at Templute Mountain (Fig. 6) and do not occur at southwest Mail Summit. Diagnostic features and depth indicators were used to interpret and group strata into facies sets. Assignment of facies numbers is a subjective process that improves with experience.

Facies # (Fig. 5)	Interpreted Facies	Diagnostic Features/Depth Indicators
1	Supratidal	Usually **dolomicrite**, forms recessive slopes, very **light-gray to yellow-gray**, microcrystalline to very finely-crystalline, algal (stromatolitic), ripple, wavy and/or parallel **laminations**, mud-chip breccia, rip-up clasts, windblown **silt** and **scattered quartz grains**, paleokarst, **solution breccias**, vugs, paleosols, terra rosa, **desiccation cracks**, bird's-eyes, **tepee structures**; laminated dolomicrites commonly cap upward-shallowing cycles and exhibits a **higher gamma-ray log signature** than adjacent more seaward strata. The most diagnostic features are the light color, laminations, dolomicrite, desiccation or karst features, silt and scattered quartz grains and high gamma-ray log signature.
1.5	Low Supratidal	Usually **dolomicrite**, forms slightly resistive slopes, darker (**medium- to light- gray**) than 1 but lighter than 2, thin bedded to **weakly-laminated** transitional between supratidal and intertidal strata. It forms the cap on upward-shallowing cycles where erosion has cut out high supratidal strata. It exhibits a slightly higher gamma-ray log signature than intertidal rocks below but slightly lower than supratidal rocks above. The most diagnostics feature are weak laminations, light-gray color, and dolomicrite.
2	Intertidal	Commonly dolomicrite and/or dolomitic lime mudstone, characteristically partly covered intervals, **mottled** light- to very light-gray to medium dark- gray, microcrystalline or very finely crystalline to sucrosic, parallel-ripple and/or low-angle cross-laminations, low angle cross-bedding, channel and tidal flat quartz sandstone, shelly **intraclast lags, rip-up clasts**, vugs, sparse chert. Commonly lies between restricted-shelf and supratidal strata in an upward-shallowing cycle. May form base of upward-shallowing cycle. The gamma-ray log signature is higher than the low intertidal strata below but lower than supratidal strata above. Intraclast lags and mottles are the determining features.
2.5	Low Intertidal	Commonly dolomicrite and/or dolomitic lime mudstone, forms low ledges, dark gray to medium-light gray, brown-gray to medium gray, intraclast mudstone-wackestone, medium bedded, commonly **mottled/burrowed**. May form the base of upward-shallowing cycles but commonly occurs between restricted-shelf and subtidal strata. The gamma-ray log signature is lower than intertidal strata above but higher than restricted-shelf strata below. Relative cycle position and mottles/burrows are the determining factors.
3	Restricted subtidal-shelf	Limestone or dolostone, forms ledges, medium dark- to medium-light gray, ***Amphipora*** wackestone-packstone, **low faunal diversity**, some thin-shelled brachiopods, uncommonly gastropod-rich and rare stromatoporoids. It usually occurs between transgressive basal open-shelf and shallow intertidal strata. The gamma-ray signature may be the lowest value in the cycle, but commonly underlying open-shelf strata exhibit slightly lower radiation. The presence of *Amphipora* and low faunal diversity provide the most diagnostic criteria.
3.5	Partially restricted subtidal-shelf	Limestone or dolomitic limestone, forms prominent ledges, medium light- to dark-gray or light brown-gray, **small rounded stromatoporoids** and/or *Amphipora* packstone-wackestone, burrowed/mottled mudstone, massive to medium bedded, dolomite/limestone, crinoids, rugose corals, grainstones, storm lags. Commonly forms the basal part of upward-shallowing cycles and emits less gamma radiation than adjacent strata. Small rounded stromatoporoids are the most significant criterion.

to supratidal, medium light-gray, highly fractured, vuggy (Fig. 8), coarsely-crystalline dolostone, the first three upward-shallowing cycles exhibit faint crossbedding. Except where obliterated by karst breccia, rip-up clasts and burrows mark the base of the fourth cycle of finely-crystalline dolostone. A slight gamma-ray inflection marks the upper karsted surface of the sequence and correlates to other wells and sections (Fig. 7). Gamma radiation in the sequence is generally low and forms a smooth signature. Within the sequence, gamma radiation of each cycle gradually increases upward, then abruptly decreases at the base of the overlying cycle.

Simonson: Lower Alternating Sequence (265 ft thick, 12 cycles)

A transgressive lag above the merged LSE and TSE marks the base of the Lower Alternating Sequence. Twelve prominent upward-shallowing cycles form the sequence. Each cycle is tens of feet thick and exhibits an alternating light and dark appearance. These cycles contain minor cycles (<10 ft thick). Subtidal, medium-gray to dark-gray, burrowed, medium-crystalline dolostone that commonly contains *Amphipora* makes up the base of the major cycles. They shallow upward to supratidal, light-gray, fossil-poor,

COMPANY 6 (CONTINUED)

Table 3. Continued.

Facies # (Fig. 5)	Interpreted Facies	Diagnostic Features/Depth Indicators
4	Open-shelf	Limestone (rarely dolostone), forms prominent ledges and/or cliffs, dark-medium gray, crinoid, coral (rugose and/or colonial) brachiopod, bryozoan, gastropod mudstone-wackestone-packstone, with bulbous-tabular stromatoporoids, rich faunal diversity, abundant fossil fragments. Hummocky cross-bedding at the base of some cycles. Commonly forms transgressive strata over the base of upward-shallowing cycles and usually exhibits a sharp decrease in gamma radiation. Crinoids, massive to tabular stromatoporoids and rich faunal diversity in limestone form the most important criteria.
4.5	Deep Open-shelf	Limestone, rare early-formed dolomite, forms thin ledges, medium dark gray, nodular lime mudstone, with uncommon crinoid and/or brachiopod fragments, burrowed, with chert stringers, massive to thick bedded. Rarely forms the lower part of shallowing upward cycles. The gamma-ray log pattern is similar to open-shelf carbonates. Crinoids and brachiopods, darker gray limestone than open-shelf strata, and chert stringers provide diagnostic criteria.
5	Shelf Edge	Limestone, forms thin ledges and/or partly covered slopes, medium gray-black, lime mudstone, very thin- to thin-bedded, laminated, chert nodules and lenses, rare fossils, abundant load casts/soft sediment deformation. Rarely forms the base of shallowing upward cycles. Gamma-ray radiation is higher than with open-shelf strata. This and the next three shelf occur almost exclusively in the Guilmette Formation above Sequence B at Templute Mountain. The black color and chert are diagnostic features.
5.5	Upper Slope	Limestone, forms partly covered slopes, dark-gray, no fossils, contains bedded chert. Gamma-ray log signature is relatively high but slightly lower than the more shallow strata above. Rarely preserved between more basinward shelf slope strata and shoreward shelf-edge strata of 5. These and the two positions following are unique to the Templute Mountain section. Dark-gray limestone with bedded chert and lack of fossils are diagnostic features.
6	Slope	Limestone, forms covered slope with sparse prominent ledges, lime mudstone, ribbon limestone with pale-red siltstone partings, convoluted and isoclinal soft sediment deformation, sparse deep-water trace fossils. Where present, it commonly forms the lower part of shallowing-upward cycles. Gamma radiation is relatively low and is similar to the gamma-ray signature over open-shelf strata at the base of shallowing upward cycles. Diagnostic features include thin, ribbon limestone and convolute, soft-sediment deformation.
7	Base of Slope	Sandstone, forms thin ledges and partly covered slopes, light- to dark-gray, fine- to coarse-grained, lithic graywacke, deep-water sandstone (turbidites) and siltstone, interbedded thin-bedded unfossiliferous silty limestone, deep-water trace fossils. Occurs rarely in the Templute Mountain section above Sequence B2 Guilmette Formation. Usually forms the base of upward-shallowing cycles but rarely occurs near the top of a cycle. Gamma-ray log signature is usually lower than overlying shelf-slope strata. Lithic graywacke is the most characteristic feature.

finely-crystalline dolostone, some with tepee structures. Successive cycles become bathymetrically deeper, and become thinner to the middle of the sequence and then thicken to the top (Fig. 5). Gamma radiation increases abruptly at the base of the sequence and gradually decreases upward (Figs. 5, 6, 7). Minor fluctuations superimposed on the upward decrease in gamma radiation roughly track the twelve upward-shallowing cycles, with each cycle marked by a subtle gamma-ray decrease at the base and an increase upward.

Simonson: Brown Cliff Sequence
(85 ft thick, 4 cycles)

A regionally significant undulating surface cuts into the top of the Lower Alternating Sequence and represents a merged LSB and TSB directly overlain by an MFS. Recrystallization has largely masked a transgressive lag in the Brown Cliff Sequence above the erosional surface.

Composed of four upward-shallowing cycles, the overall sequence contains open-shelf corals, stromatoporoids, bryozoans, crinoids and brachiopods and appears to shallow upward. An upward decrease in coral abundance and in stromatoporoid size also suggests upward-shallowing with increasingly restricted circulation. Each cycle is composed of dark-gray, coarse- to medium-crystalline dolostone and contains a distinctive fossil assemblage as follows: Cycle 1—*Amphipora*, corals, brachiopods, crinoids; Cycle 2—thick *Amphipora* beds, abundant brachiopods, corals, crinoids; Cycle 3—large (7 to 12-inch diameter) bulbous stromatoporoids; Cycle 4—small (2 to 4-inch diameter) stromatoporoids.

COMPANY 6 (CONTINUED)

Table 4. Thicknesses, numbers of cycles, and significant features of Devonian sequences in the southwest Mail Summit measured section, Timpahute Range, Nevada.

Seq. Abbrev.	No. of Feet	Cycls	Significant Features
MDp2	115	2	Silicified stromatolites and laminated black chert, slope
MDp1	130	2	Silty limestone capped with fossil bone-bearing sandstone, slope
Dwr	153	4	Silty, burrowed limestone, partly covered slopes
Dgg	567	29	Carbonate cycles capped by thick (>10 feet) quartz sandstone beds
Dgf	267.5	16	Slightly deeper cycles and more limestone than in adjacent sequences
Dge	235	17	Carbonate cycles capped by thin (<10 feet) quartz sandstone beds
Dgd	405.5	23	*Amphipora* dolopackstone, dark-gray ledges and cliffs
Dgc	188	6	Silty limestone with abundant gastropods & burrows, slope
Dgb3	97	2	Stromatotoporoid and coral reef facies, light-gray cliffs
Dgb2	179	1	Graded bed of carbonate breccia, open-marine fauna, brown-gray cliffs
Dgb1	26	2	Abundant corals, stromatoporoids, and *Amphipora*, limestone cliffs
Dga2	145	8	Shallowing-upward cycles that successively deepen upward, predominately limestone, open-marine fauna, ledges and slopes
Dga1	250	12	Shallowing-upward cycles that successively deepen upward, predominately dolomite, open-marine fauna, ledges and slopes
Dgys	182	10	Yellow, silty dolomite, stromatolites, and cycles capped by thin beds of very fine-grained quartz sandstone, ostrocods, forms slopes
Dgfm	135	4	Open shelf fauna, brachiopod *Stringocephalus*, resistant cliffs.
Dsluah	285	12	Shallowing-upward cycles that successively deepen upward giving an alternating dark and light band appearance, karst breccia, ledges
Dslbc	85	4	Open shelf fauna (corals, stromatoporoids), dark brown-gray cliff
Dslfalt	265	12	Alternating intertidal-supratidal or dark and light bands, ledges
Dslcdn	225	4	Coarsely crystalline dolomite capped by karst surface, light-gray to light-gray brown cliffs
Dox2	95	2	Quartz sandstone with hummocky cross-bedding at base, ledge
Dox1	100	4	Burrowed, silty dolomite with flat-pebble conglomerate at base, light-brown slope
Dse3	240+	12+	Light-gray, fine-grained, laminated dolomite, slopes, base concealed
Total	4370+	188+	

The Brown Cliff-Forming Sequence contains more open-shelf fossils and exhibits weaker gamma radiation than any other sequence in the Simonson. A sharp gamma-ray deflection at the base of the sequence is regionally correlative (Figs. 5, 6, 7). Typically, gamma radiation decreases at cycle bases deposited in more open-shelf conditions and increases toward cycle tops deposited in more restricted to supratidal conditions. A slight increase in overall gamma radiation from base to top follows the same pattern of upward-shallowing cycles in other parts of the TMS. Thus, the gamma-ray pattern coupled with fossil distributions suggest that the Brown Cliff-Forming Sequence is an upward-shallowing sequence.

Simonson: Upper Alternating Sequence
(285 ft thick, 12 cycles)

A merged LSB and TSB marks the base of the Upper Alternating Sequence. Thinsections display ghosts of intraclasts near the base of the sequence, suggesting a TSB lag. Above the TSB, there is a pronounced lack of open-shelf fossils, and gamma radiation increases abruptly. The bases of the 12 upward-shallowing cycles in the sequence are composed of brown-gray to dark-gray, fine- to medium-crystalline dolostone. The cycle tops are composed of laminated, light-gray to medium light-gray, finely crystalline dolostone. The base of each successive cycle was deposited in deeper water because the bases become thicker, darker and more fossiliferous (Fig. 5). The base of the uppermost cycle contains open-marine corals, brachiopods, stromatoporoids, and echinoderms (Fig. 5).

Extensive karsting at the top of the Simonson Dolomite marks the most persistent exposure surface of the Great Basin Devonian section. Evidence for karsting includes karst breccia, drusy calcite-lined cavities (Fig. 9), increasing crystal coarseness upward, bleaching, and geopetal structures filled with laminated yellow-gray, silty dolostone. These features may extend several hundred feet below the top of the Simonson.

The basis for originally separating the Simonson Dolomite from the overlying Guilmette Formation at its type locality in the Deep Creek Range, Utah, was the change from sucrosic dolostone to limestone (Nolan, 1935). The dolostone breccia Nolan (1935) described at the base of

COMPANY 6 (CONTINUED)

Figure 8. Shown here is a fractured and vuggy coarsely crystalline dolostone in outcrop from below the karsted surface at the top of the Coarsely Crystalline Sequence in the Simonson. Such dolostones provide an attractive reservoir target for hydrocarbon exploration. Width of view is about 4 feet.

the Guilmette Formation may be related to the karst surface at the top of the Simonson Dolomite, or to a transgressive lag over it. Hurtubise (1989) included the *Stringocephalus*-bearing Fox Mountain Member as the uppermost part of the Simonson. We regard the Fox Mountain as basal Guilmette because 1) the regional exposure surface separates fine-grained, Fox Mountain limestones from underlying coarsely crystalline and karsted Simonson dolostones, and 2) the regional thickness changes of the Fox Mountain (it may be hundreds of feet in some sections and absent in others; Fig. 6). The Fox Mountain appears to rest within incised valleys cut into the Simonson.

A sharp increase in gamma radiation marks the base of the Upper Alternating Sequence. The general decrease in gamma radiation of each succeeding cycle upward supports the upward deepening interpretation made from changes in lithology and biofacies (Figs. 5, 6). Gamma-ray spikes at the tops of internal upward-shallowing cycles may be due to concentrated wind-blown radioactive detritus. A gamma-ray spike at the top of the sequence is probably caused by radioactive debris concentrated along a karst interval.

Guilmette Formation
(2677 ft thick, 9 sequences, 5 subsequences)

Of the five Devonian formations at TMS, the Guilmette Formation is the most lithologically variable. Nine sequences are present (Figs. 5, 6). Above Sequence B at TMS, the section consists mainly of shallow-water, cyclic carbonates that are predominantly dolostone with some limestone and minor sandstone beds higher in the section. Equivalent beds are mainly quartz sandstone at Monte Mountain, and deeper-water, thin-bedded limestone at Tempiute Mountain. Where present, the resistant Fox Mountain forms prominent ledges and cliffs. A good Guilmette marker bed in southern Nevada is the nonresistant Yellow Slope Sequence. Sequence B weathers into massive cliffs whereas Sequence A and the rest of the Guilmette weather into ledges and slopes.

Guilmette: Fox Mountain Sequence
(135 ft thick, 6 cycles)

The transgressive cliff-forming Fox Mountain Sequence of medium- to dark-gray limestone overlies the regional unconformity at the top of the karsted, light brown-gray Simonson Dolomite. We believe that the Fox Mountain was deposited at Mail Summit in a topographic low where marine limestone filled a previous erosional valley on the Simonson. Where the Fox Mountain is missing by erosion, or by nondeposition on adjacent topographic highs as at other measured sections, younger sequences overlie the unconformity (Fig. 6).

A sudden deepening at the base of the Fox Mountain Sequence is illustrated by the relative sea-level curve in

COMPANY 6 (CONTINUED)

Figure 9. Vugs and fractures in this piece of core from a depth of 4486 ft in the Grant Canyon #4 well are probably related to the karst surface at the top of the Simonson Dolomite. Note the oil stain in the vugs.

Figure 4. The sequence is composed of four shallowing-upward cycles with lower parts of open-marine, dark-gray, burrowed, brachiopod, crinoid, echinoderm, gastropod lime wackestones and upper parts of supratidal, medium-gray to light-gray, laminated dolostone. Each of the four cycles successively begins and ends in shallower water. A regional LSE at the top of the Fox Mountain is marked with a pale-red siltstone paleosol, desiccation cracks, and a change from open-marine to restricted-marine fossils. Generally, gamma radiation tracks the relative sea-level curve (Fig. 5, 6). Open-shelf limestones at the bases of the Fox Mountain cycles emit less gamma radiation than their supratidal dolostone tops.

Guilmette: Yellow Slope Sequence
(182 ft thick, 10 cycles)

Easily identified on aerial photographs and in the field as a yellow slope, the supratidal, silty dolostone cycles of the Yellow Slope Sequence mark an abrupt change from open-shelf limestones of the Fox Mountain (Table 4). The relative sea-level curve also illustrates the change (Fig. 5). Medium- to dark-gray, intertidal, calcisphere lime mudstone occurs at the lower part of upward-shallowing cycles. The cycles are capped by pale yellow-brown, supratidal, fossil-poor dolomudstone with desiccation cracks. Generally, cycles at the lower and upper parts of the sequence are thicker and their bases were deposited in deeper water than cycles in the middle of the sequence. Characterized by very dark-gray to black stromatolites, the second cycle in the sequence is easily correlated to most other sections in the region. Thin (<5 ft), yellow-gray, fine-grained quartz sandstone interbeds cap two cycles in the section. They contain the first conspicuous quartz grains above the Oxyoke Interval. The ninth cycle contains intertidal ostracod lime mudstones. Gamma radiation increases sharply at the base of the Yellow Slope Sequence and is high throughout the sequence.

Guilmette: Sequence A
(395 ft thick, 2 subsequences)

Sequence A is divided into two subsequences in the TMS, but the subdivision is not recognized in other sections (Figs. 5, 6). Sequence A1 is predominantly dolostone and Sequence A2 is predominantly limestone (Table 4).

Guilmette: Sequence A1
(250 ft thick, 12 cycles)

A sharp contact separates the ostracod- and calcisphere-bearing Yellow Slope Sequence from the coral-, stromatoporoid-, and brachiopod-bearing Sequence A1 (Table 4). Generally, the lower parts of the sequence cycles are composed of open-shelf, medium dark-gray to medium-gray, burrowed stromatoporoid, coral, brachiopod, *Amphipora* lime wackestone. Supratidal, light-gray, laminated dolomudstones with rip-up clasts cap most of the cycles. Cycles exhibit a general upward-deepening trend from the supratidal Yellow Slope to the open-shelf B2 Sequence and a general decrease in gamma radiation (Fig. 5). A sharp gamma-ray deflection marks the TSE at the base of the sequence. Within the sequence, each cycle begins with a sharp deflection at the limestone base followed by a gradual increase in gamma radiation and dolostone content to the cycle top.

Guilmette: Sequence A2
(145 ft thick, 8 cycles)

A TSE at the base of Sequence A2 separates predominantly dolostone strata containing common open-shelf fossils of Sequence A1 from the overlying predominantly limestone strata characterized by abundant open-shelf fossils (Table 4). A thin (1-2 ft) bed of distinctive B2 carbonate megabreccia occurs 20 feet above the base of the sequence. It may represent a potential surface-of-detachment for the Sequence B2 sedimentary megabreccia, and is designated as Unit D, a diamictite of fluidized bedrock, by Warme and Sandberg (1995, 1996). If it is fully detached,

COMPANY 6 (CONTINUED)

then all of Sequence A2 above this level is a great clast of the megabreccia.

Each upward-shallowing cycle in Sequence A2 shows a more pronounced change from the base to the top than in underlying Guilmette sequences. Generally, the base of each cycle is marked by an open-shelf, medium dark-gray to medium-gray, stromatoporoid, coral, brachiopod lime wackestone to packstone. Seven of the eight cycles are capped with subtidal, laminated, commonly burrowed, light yellow-gray, fossil-poor dolostone. Two cycles are capped by an extensively burrowed, medium-gray lime fossil wackestone of a restricted-shelf environment.

A regionally correlative abrupt gamma-ray deflection occurs at the base of Sequence A2 (Figs. 5, 6). The low gamma radiation is interpreted to be caused by carbonate dilution of wind blown, radioactive detritus deposited in an open-shelf setting. Gamma radiation decreases upward to a distinctive gastropod lime wackestone at the top of Sequence A2, above which it abruptly increases.

Guilmette: Sequence B
(301 ft thick, 3 subsequences)

In the TMS, a distinctive sedimentary megabreccia (B2) splits Sequence B into three subsequences: B1, B2 and B3 (Table 4). Two upward-shallowing cycles below the sedimentary megabreccia comprise subsequence B1, and five cycles above the megabreccia comprise B3. Prominent gamma-ray inflections at the base and top of Sequence B are regionally correlative (Fig. 5, 6). Sequence B emits less gamma radiation (as low as 21 counts per second) than any other sequence in the TMS. Except for the gamma-ray spike between B2 and B3, gamma radiation increases steadily from the base to the top of Sequence B.

Guilmette: Sequence B1
(26 ft thick, 2 cycles)

The base of Sequence B1 is a stromatoporoid wackestone that contrasts with the gastropod lime wackestone at the top of Sequence A2. Based on thinsections, the top of Sequence B1 is 40% dolomitized. Sequence B1 gamma radiation decreases steadily upward to the base of B2.

Guilmette: Sequence B2
(179 ft thick, 1 cycle)

Sequence B2 is a unique rock body that occurs in northwestern Lincoln County. It consists of a single graded bed of sedimentary packstone megabreccia with huge (up to 100s of ft long) clasts at the base and mud at the top (Warme *et al*, 1993). Clasts are typically light-gray to medium light-gray limestone (Fig. 10) in contrast to the commonly dolomitized fine-grain matrix that gives the outcrop a dark-gray appearance (Fig. 11). The base of B2 varies from section to section. It is defined as the first occurrence of megabreccia matrix above upward-shallowing carbonate cycles of Sequence A, but as described above, a thin (1-10 ft) bed of megabreccia, genetically related to B2, occurs tens of feet below B2. At southwest Mail Summit (TMS), this unusual megabreccia bed occurs 20 feet above the base of Sequence A2, or 392 feet below the top of B2. Apparently, the megabreccia was either fluidized at, or injected into, this horizon by the same catastrophic event responsible for the formation of B2 megabreccia.

At Monte Mountain, 10 miles west of the TMS, B2 lies directly on a thin (145 ft) Sequence A. Farther west, at Tempiute Mountain, it cuts down into the top of the Simonson Dolomite (Fig. 6). At TMS, the dark-gray, massive cliffs of Sequence B2 contrast sharply with the cyclic or banded sequences below and the light-gray stromatoporoid reef above (Fig. 11). Fossils present are colonial corals, solitary corals, brachiopods, and abundant stromatoporoids including *Amphipora*. A surface of dissolution marks the upper contact. Warme and Sandberg (1995, 1996) present evidence that the B2 megabreccia is a massive submarine slide triggered by a Late Devonian hypervelocity impact.

A low-intensity and featureless gamma-ray pattern over most of Sequence B2 suggests that the entire sequence was deposited under similar conditions. However, a gamma radiation spike occurs at the top of the sequence and may reflect settling of radioactive dust after the event responsible for the megabreccia.

Guilmette: Sequence B3
(96 ft thick, 5 cycles)

Sequence B3 is a classic lens-shaped, open-shelf, stromatoporoid reef and associated flank beds developed above the B2 megabreccia (Fig. 11). An LSE overlain by a transgressive TSE lag marks the sharp contact with the underlying Sequence B2. At TMS, the B3 reef, a coral-stromatoporoid boundstone, is recrystallized limestone that forms a prominent light-gray cliff above the medium-gray B2 cliffs (Dunn, 1979). Terra rosa and karst pockets characterize the LSE at the top of the reef and on top of the reef flanks (Fig. 5).

An abrupt gamma-ray deflection at the base of B3 marks the base of reefy strata both on the reef in the middle segment of the measured section and on the reef flank in the upper segment of the measured section (Figs. 2, 5, 6). An open-shelf depositional environment is suggested by the blocky, low-intensity, surface gamma-ray log response that becomes stronger upward (Fig. 5). A gamma-ray inflection marks the LSE at the top of the sequence.

Guilmette: Sequence C
(189 ft thick, 6 cycles)

A paleosol on a dissolution surface separates the base of Sequence C, a silty burrowed, gastropod lime wackestone from the underlying Sequence B (Table 4). Except near the top of the sequence, each successive, upward-shallowing cycle in Sequence C begins and ends with rocks deposited

COMPANY 6 (CONTINUED)

Figure 10. Photo of Sequence B2 megabreccia showing light-gray limestone clasts in a dark-gray dolostone matrix. This sequence may provide an exploration target in northwestern Lincoln County because differential erosion has locally removed limestone clasts from the more resistant megabreccia to create a "rock sponge" (e.g., at Hiko Spring near Hiko). Such diagenetic conditions could make Sequence B2 an excellent reservoir rock.

in shallower water. Shallow-water conditions are suggested by fossil-poor, light-gray limestone that increases in abundance in successive cycles. The lower part of most cycles is composed of medium-gray, burrowed limestone. Cycle tops are generally fossil-poor, medium- to light-gray limestone.

An abrupt gamma-ray inflection at the base of Sequence C is conspicuous on measured sections and well logs (Figs. 5, 6). Gamma radiation intensity increases upward from the open-shelf bases to the more restricted-shelf tops of the shallowing-upward cycles. Generally, Sequence C is more silty than adjacent sequences and produces a characteristic gamma-ray inflection recognizable in most sections throughout the region (Figs. 5, 6).

Guilmette: Sequence D
(406 ft thick, 24 cycles)

Amphipora-rich dolowackestone-packstone characterizes Sequence D (Table 4) and suggests deposition in a restricted-shelf lagoon environment (Niebuhr, 1979). A TSE marks the sharp basal contact of this sequence. Above the transgressive lag deposit associated with the TSE is an oncolite-bearing bed. Except for a few minor (10 ft thick or less) limestone intervals and several thin (<5 ft thick) quartz sandstone beds, 90% of Sequence D is an *Amphipora*-rich dolostone that generally shallows upward. Cycles are generally 10 feet thick near the bottom and top of the sequence and 20 feet thick near the middle. Open-shelf, medium-gray, stromatoporoid lime packstone occurs at the base of the lower cycles. In contrast, the bases of the upper cycles are characterized by restricted-shelf lagoon, medium dark-gray to medium brown-gray *Amphipora* dolopackstone. Medium dark-gray, burrowed lime mudstone occurs near the base of many cycles. Dark-gray limestones commonly grade upward to thick beds of dark-gray *Amphipora* dolopackstone. Most cycles are capped by laminated light-gray dolostone. A few cycles are capped by thin (<5 ft) sandstone beds. The light-gray, medium-grained, well-sorted, dolomite-cemented, crossbedded quartz sandstones, some with desiccation cracks, commonly show a prevailing southwest current direction. Other than a few scattered medium-sized quartz grains in the Yellow Slope Sequence, sandstone in cycle 15 near the middle of Sequence D contains the first occurrence of medium-grained quartz above the Oxyoke sandstone.

A prominent gamma-ray deflection marks the base of Sequence D, which lies on the unconformity at the top of Sequence E. Figures 5 and 6 illustrate a slight increase in gamma radiation from the base to near the middle of the sequence. The gamma-ray pattern is generally smooth over the sequence except for local inflections at cycle tops caused by wind-blown radioactive dust.

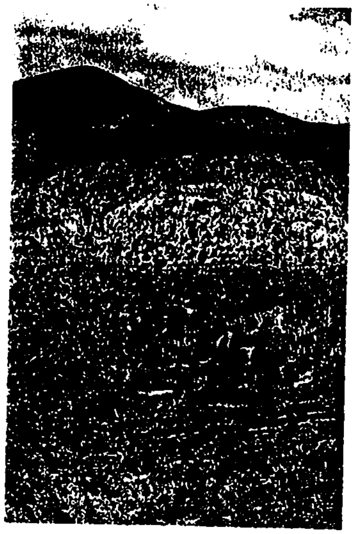


Figure 11. Classic Devonian stromatoporoid reefs characterize Sequence B3. This light-gray lens-shaped limestone reef lies directly on the dark-gray megabreccia of Sequence B2 at TMS. Note the A and B1 carbonate cycles under the dark gray cliffs of B2. Some reefs in the region are tightly cemented limestone (like this one), but many are dolomitized with open pores and vugs. The reefs vary in thickness from less than 100 feet to over 200 feet.

Guilmette: Sequence E
(235 ft thick, 16 cycles)

Whereas Sequence D is predominantly dolostone, Sequence E is a mixture of dolostone, limestone, quartz sandstone and siltstone (Table 4). Denoting another sharp merged LSE and TSE sequence boundary, dolostone at the base of Sequence E directly overlies quartz sandstone-filled desiccation cracks at the top of Sequence D. Upward-shallowing cycles at the base and top of Sequence E are thicker (15-20 ft) than in the middle (10 ft). Four of the cycles (cycles 4, 6, 10, and 13) are capped with thin (2 ft thick) quartz sandstone beds composed of supratidal, fine- to medium-grained, frosted quartz grains associated with desiccation cracks (Table 4). Cycles in the lower part of the sequence are commonly burrowed, in the middle part contain *Amphipora* wackestones-packstones, and in the upper part are burrowed dolomudstone.

A regionally correlatable gamma-ray inflection marks the base of Sequence E (Figs. 5, 6). Cycles within the sequence are marked with a gamma-ray deflection at the base and a gradual gamma radiation increase toward the top. Gamma-ray spikes are common where terrigenous grains are concentrated at the tops of some cycles.

Guilmette: Sequence F
(267 ft thick, 15 cycles)

The sharp basal contact of Sequence F occurs where an LSE truncates the uppermost light-gray, laminated dolostone of Sequence E and merges with a TSE. A lag deposit in medium dark-gray dolostone overlies the TSE. The sequence is predominantly limestone, except for the uppermost 65 feet composed predominantly of dolostone (Table 3). Medium- to medium dark-gray, medium- to thin-bedded, locally *Amphipora*-bearing, lagoonal, burrowed limestones form the base of most cycles. Many cycles are capped by either supratidal, light-gray, laminated dolomudstone with tepee structures or 1 to 2-foot-thick, supratidal, light yellow-gray, fine-grained quartz sandstone beds.

A light-gray fossiliferous lime wackestone deposited in open-marine conditions at the base of cycle 10, above the middle of the sequence, contrasts with the fossil-poor, burrowed limestone typical of other cycles. Each succeeding cycle in Sequence F contains more laminated dolostones that suggest supratidal conditions.

The gamma-ray inflection at the base of Sequence F is regionally correlative (Figs. 5, 6). As observed in other cycles, gamma radiation is generally higher in supratidal rocks and lower in open-shelf rocks. Cycles 9 and 10 provide the highest gamma-ray responses and mark the uppermost occurrences of open-marine fauna in the section including corals, bulbous stromatoporoids, and brachiopods. Detrital material could have been introduced from the incipient Antler Orogeny to the west and may be responsible for the lack of abundant open-marine macrofossils observed between Sequence F cycle 10 and the Mississippian Joana Limestone.

Guilmette: Sequence G
(567 ft thick, 29 cycles)

Sequence G contains the most lithologic variety in the Guilmette Formation and varies greatly in thickness. A regionally correlatable gamma-ray deflection marks the base of Sequence G (Figs. 5, 6). Otherwise, the contact between the light brown-gray dolostone of Sequence F and Sequence G is indistinguishable in the field. Restricted-shelf indicators such as *Amphipora* and gastropods commonly occur at the base of Sequence G cycles. The tops of many cycles are capped with thick (>10 ft) quartz sandstone beds. These units commonly contain desiccation cracks and other supratidal indicators including carbonate mud drapes, stromatolitic laminae, and herringbone cross-laminations (Table 4). Many sandstones exhibit tidal channel, bidirectional

crossbedding. Dolostone predominates in the lower cycles, whereas limestone predominates in the upper ones. Typically, the top of the Guilmette Formation is marked by a prominent sandstone bed.

The abrupt decrease in gamma radiation at the base of the sequence provides a deflection that can be observed regionally, and a correlative gamma-ray spike occurs near the top of the sequence. Gamma radiation in Sequence G is low compared with subjacent and superjacent sequences (Figs. 5, 6). The last occurrence of *Amphipora* in TMS occurs at the base of cycle 25. A gamma-ray spike occurs at the top of the cycle in a silty limestone. The disappearance of *Amphipora* and an increase of radioactive detrital material may have been related to another surge of the Antler Orogeny, similarly corresponding to the increase in gamma radiation in Sequence F, cycles 9 and 10, marking the end of abundant open-shelf fossils in TMS.

West Range Limestone (153 ft thick, 1 sequence)

West Range Limestone
(153 ft thick, 4 cycles)

The basal contact of the West Range Limestone is marked by a transgressive surface covered by deeper-water, lime mudstones. These units overlie the uppermost intertidal-supratidal quartz sandstone bed of Sequence G (Figs. 5, 6). Eroding into recessive, partly-covered slopes and low ledges, the West Range is composed of a light-gray, burrowed lime mudstone that contains few macrofossils. It is commonly mottled or burrowed, silty, argillaceous, and thin-bedded. Cycles are burrowed at the base and laminated at the top (Table 4). A sharp, distinct gamma-ray inflection marks the base of the sequence on surface and subsurface logs (Figs. 5, 6).

Pilot Formation (245 ft thick, 2 sequences)

The poorly exposed Mississippian-Devonian Pilot Formation occurs above the cyclic Devonian carbonates. It is composed of two sequences (Figs. 5, 6). The Mississippian-Devonian boundary lies within the Pilot, probably within Sequence 2. Erosion along a major unconformity cuts out eight conodont zones in the Pilot Formation at Bactrian Mountain, on the north end of the Pahranagat Range (Sandberg and Ziegler, 1973), 7 miles south of TMS. The unconformity may be the sequence boundary between Sequences 1 and 2.

Pilot Formation: Sequence 1
(130 ft thick, 2 cycles)

The base of the Pilot Formation occurs where recessive limestones of the West Range give way to mostly covered intervals bearing fragments of light-gray, silty limestone that produce an increased gamma-ray measurement. The top of the sequence is marked by a thin (5-10 ft), ferruginous, fossil fish plate-bearing quartz sandstone that overlies 10 feet of pale-yellow calcareous siltstone.

Two of the highest gamma-ray spikes in the TMS occur in Pilot Sequence 1 (Figs. 5, 6). The first occurs at the base of cycle 1, and the second occurs near the top of cycle 2 in the ferruginous sandstone. Although thick cover commonly masks the base of the sequence, the contact can be picked on the surface gamma-ray log where there is an abrupt gamma-ray inflection. This is another example of using surface gamma-ray logs to interpret changes in lithology hidden by talus (Chamberlain, 1983).

Pilot Formation: Sequence 2
(115 ft thick, 2 cycles)

The ferruginous quartz sandstone at the top of Sequence 1 is overlain by pale-red cherty siltstone of Sequence 2. Black, laminated, silicified stromatolite beds of cycle 1 are capped by a 2.5-foot-thick bed of bioturbated sandstone (Table 4). The second cycle is a silty limestone that is commonly covered.

The ferruginous sandstone at the top of Sequence 1 produces a gamma-ray peak in contrast to the abrupt gamma-ray deflection at the base of Sequence 2 (Figs. 5, 6). Silicified stromatolites produce another gamma-ray spike at the top of cycle 1. Gamma radiation abruptly decreases at the base of cycle 2, and continues to decrease gradually to the base of the overlying Joana Limestone where there is a distinct gamma-ray deflection at a sharp erosional break.

Mississippian Joana Limestone

The Joana represents a major transgression over the uppermost Pilot Formation Sequence 2 cycle 2. Joana Limestone sequences from the base to the top include: (1) Ledge-forming, silty lime wackestone, (2) prominent cliff-forming crinoid grainstone, (3) prominent cliff-forming crinoid grainstone banded with chert, and (4) cliff-forming crinoid grainstone. The formation is mostly a medium-gray weathered, massively bedded, crinoid packstone.

Though the Joana-Pilot contact is usually covered with overlying Joana talus, there is a pronounced decrease in gamma radiation at the contact to some of the lowest values measured in the TMS (Figs. 5, 6; only the base of the Joana is shown). The gamma-ray deflection at the erosional break is interpreted to be a merged LSE and TSE that separates Pilot slopes from overlying Joana cliffs. Gamma radiation increases upward to the top of the Joana Limestone.

DISCUSSION AND APPLICATIONS

Karst surfaces mark LSEs in the Great Basin Devonian that provide regional exploration targets. Commonly, rocks below major LSEs, such as at the top of the Simonson Dolomite, are highly fractured, vuggy, coarsely crystalline, permeable and porous. LSE sequence boundaries can also be marked by erosional surfaces, paleosols, and desiccation cracks. Deeper-water, finely-crystalline carbonates of the lower part of an overlying sequence could provide effective seals over porous reservoir rocks. Other exploration targets involving karsted sequences include the Simonson Coarsely Crystalline Sequence, Guilmette Fox Mountain Sequence, and Guilmette Sequence B. Potential seals, besides open-marine, finely-crystalline carbonates of the lower part of sequences, include the Yellow Slope Sequence and finely-crystalline, laminated, supratidal carbonates that form the upper parts of many cycles (Fig. 5).

Accurate time-slice paleogeographic reconstructions of Devonian rocks of the Great Basin depend on the quality of sequence identification and correlation. A relative sea-level curve, using boundary characteristics and significant features of sequences, provides a standard to which other measured sections can be compared. In addition, the relative sea-level curve can help interpret both surface and subsurface gamma-ray profiles of the region. Gamma-ray log inflections and deflections closely match excursions of the relative sea-level curve. Gamma-ray inflections and deflections occur either at obvious karsted horizons or at erosional surfaces (LSEs and TSEs) that separate significant changes in lithology and fossil content. They may also occur at specific levels within apparently subtle or transitional lithologic or biostratigraphic shifts.

Karsted surfaces and reef-bearing sequences provide primary targets for petroleum accumulations in the Devonian rocks of Nevada. Prolific oil production at Grant Canyon and Bacon Flats fields in Railroad Valley 55 miles north of TMS is from brecciated, coarsely crystalline dolostone reservoirs that may represent the regional karst surface at the top of the Simonson Dolomite. Specific sequences at TMS probably correlate to Grant Canyon oil field rocks. Stromatolitically laminated dolostone with medium-grained sand from 3961.9 feet in Grant Canyon No. 3 is similar to stromatolitically laminated dolostone with medium-grained quartz sand in the Guilmette Yellow Slope Sequence. Other than the Yellow Slope Sequence, medium-grained quartz in stromatolitically laminated dolostone is rare in the lower Guilmette. Fossils, solution cavities and breccia in the oil-stained core from Grant Canyon No. 1 (4483 ft) are similar to fossils, cavities and karst breccia near the regional Simonson unconformity that underlies the Yellow Slope Sequence (Figs. 5, 6, 9). However, Read and Zogg (1988) ruled out Devonian age solution-collapse brecciation and invoked other mechanisms such as faulting and "steam-blasting" to explain the brecciation.

Devonian Guilmette Sequence B reefs, which are similar in age and composition to the prolific Canadian Devonian reefs, may prove to contain significant volumes of oil in Nevada. Oil is also produced from above the interpreted Oxyoke Interval Sequence 1 TSE at Blackburn Field in Pine Valley (Scott and Chamberlain, 1988). This interval could produce elsewhere in the region. Refined Devonian stratigraphy facilitates structural interpretations of the region—especially complexities caused by Mesozoic compression, and to a lesser extent, Tertiary extension.

ACKNOWLEDGMENTS

Many thanks to the reviewers who made useful suggestions that improved the paper: Mark Longman (consultant), Susan Longacre (Texaco), Bruce Birge (consultant), David Read (consultant), Walt Pusey (Conoco), Kathy Nichols (USGS), and Charles Gillespie (Tide Petroleum). Thanks also to those who helped with field work and made helpful observations: Bruce Birge, Charles Gillespie, Edgar Perez, Brian Ackman, Anna Chamberlain and participants of several field trips to the Timpahute Range area. Special thanks to Yvonne Chamberlain who willingly moved the Chamberlain family to the base of the Timpahute Range and encouraged the first author to finish this work. Data from regional measured sections and stratigraphic studies of wells incorporated into a regional reservoir rock study in 1992 was provided by CEDAR Strat Corporation. Chris Hansen and Greg Cameron did much of the early field work. Bruce Birge and Alan Chamberlain picked the Devonian sequences and correlated them with surface and subsurface sections throughout the eastern Great Basin. This work was supported in part by NSF Grant EAR-906324 awarded to Colorado School of Mines, John E. Warme, Principal Investigator.

REFERENCES

Ackman, B.W., 1991, Stratigraphy of the Guilmette Formation, Worthington Mountains and Schell Creek Range, southeastern Nevada: unpublished Master's thesis, Colorado School of Mines, Golden, Colorado, 207 p.

Baum, G.R., and P.R. Vail, 1988, Sequence stratigraphic concepts applied to Paleogene outcrops, Gulf and Atlantic basins, *in* C.K. Wilgus, B.S. Hastings, C.G.S.C. Kendall, H.W. Posamentier, C.A. Ross, and J.C. van Wagoner, eds., Sea-level changes—an integrated approach: SEPM Special Publication 42, p. 309-328.

Chamberlain, A.K., 1983, Surface gamma-ray logs—a correlation tool for frontier areas: AAPG Bulletin, v. 68, p. 1040-1043.

Chamberlain, A.K., 1996, Devonian stratigraphy of the Timpahute Range, Nevada: unpublished Ph.D. dissertation, Colorado School of Mines, Golden, Colorado, in preparation.

Chamberlain, A.K. and C.W. Gillespie, 1993, Evidence of late Mesozoic thrusting, Timpahute Range, south central Nevada, *in* C.W. Gillespie, ed., Structural and stratigraphic relationships of Devonian reservoir rocks, east central Nevada: 1993 Field Trip Guidebook, Nevada Petroleum Society, Reno, Nevada, p. 139-155.

Dunn, M.J., 1979, Depositional history and paleoecology of an Upper Devonian (Frasnian) bioherm Mount Irish, Nevada: unpublished Master's thesis, State University of New York at Binghamton, 133 p.

Estes, J.E., 1992, Stratigraphy of the Devonian Guilmette Formation, Pahranagat Range, Lincoln County, Nevada: unpublished Master's thesis, Colorado School of Mines, Golden, Colorado, 94 p.

Hurtubise, D.O., 1989, Stratigraphy and structure of the Seaman Range, Nevada, with an emphasis on the Devonian System: unpublished Ph.D. dissertation, Colorado School of Mines, Golden, Colorado, 443 p.

Kellogg, H.E., 1963, Paleozoic stratigraphy of the southern Egan Range, Nevada: Geological Society of America Bulletin, v. 74, p. 685-708.

Langenheim, R.L., Jr., and E.R. Larson, 1973, Correlation of Great Basin stratigraphic units: Nevada Bureau of Mines and Geology, Bulletin 72, 36 p.

Niebuhr, W.W., 1979, Biostratigraphy and paleoecology of the Guilmette Formation (Devonian) of eastern Nevada: unpublished Ph.D. dissertation, University of California, Berkeley, 246 p.

Nolan, T.B., 1935, The Gold Hill mining district, Utah: U.S. Geological Survey Professional Paper 177, 172 p.

Nolan, T.B., C.W. Merriam, and J.S. Williams, 1956, The stratigraphic section in the vicinity of Eureka, Nevada: U.S. Geological Survey Professional Paper 276, 77 p.

Osmond, J.C., 1954, Dolomites in Silurian and Devonian of East-Central Nevada: AAPG Bulletin, v. 38, no. 9, p. 1911-1956.

Osmond, J.C., 1962, Stratigraphy of Devonian Sevy Dolomite in Utah and Nevada: AAPG Bulletin, v. 46, p. 2033-2056.

Read, D.L., and W.D. Zogg, 1988, Description and origin of the Devonian dolomite reservoir, Grant Canyon field, Nye County, Nevada, *in* S.M. Goolsby and M.W. Longman, eds., Occurrence and petrophysical properties of carbonate reservoirs in the Rocky Mountain region, Rocky Mountain Association of Geologists, Denver, p. 229-240.

Reso, A., 1960, The geology of the Pahranagat Range, Lincoln County, Nevada: unpublished Ph.D. dissertation, Rice University, Houston, Texas, 656 p.

Reso, A., 1963, Composite columnar section of exposed Paleozoic and Cenozoic rocks in the Pahranagat Range, Lincoln County, Nevada: Geological Society of America Bulletin, v. 74, p. 901-918.

Reso, A., and C.G. Croneis, 1959, Devonian system in the Pahranagat Range, southeastern Nevada: Geological Society of America Bulletin, v. 70, no. 9, p. 1249-1252.

Sandberg, C.A., and W. Ziegler, 1973, Refinement of standard Upper Devonian conodont zonation based on sections in Nevada and West Germany: Geologica et Palaeontologica, v. 7, p. 97-122.

Scott, C., and A.K. Chamberlain, 1988, Blackburn Field, Nevada: a case history, *in* S.M. Goolsby and M.W. Longman, eds., Occurrence and petrophysical properties of carbonate reservoirs in the Rocky Mountain region: Rocky Mountain Association of Geologists, Denver, p. 241-250.

Tschanz, C.M., and E.H. Pampeyan, 1970, Geology and Mineral Deposits of Lincoln County, Nevada: Nevada Bureau of Mines and Geology Bulletin 73, 188 p.

Warme, J.E., and C.A. Sandberg, 1995, The catastrophic Alamo breccia of southern Nevada: record of Late Devonian extraterrestrial impact: Courier Forschungsinstitut Senckenberg, v. 188, W. Ziegler Commemorative Volume.

Warme, J.E., and C.A. Sandberg, 1996, Alamo megabreccia: Record of a Late Devonian impact in southern Nevada: GSA Today, v. 6, no. 1, p. 1-7.

Warme, J.E., Yarmamoto, A.K. Chamberlain, and B.W. Ackman, 1993, The Alamo event: cataclysmic Devonian megabreccia, southeastern Nevada, *in* C.W. Gillespie, ed., Structural and Stratigraphic Relationships of Devonian Reservoir Rocks, East Central Nevada, 1993 Field Trip Guidebook, Nevada Petroleum Society, Reno, Nevada, p. 157-170.

Weimer, R.J., 1992, Developments in sequence stratigraphy—foreland and cratonic basins: AAPG Bulletin, v. 76, p. 965-982.

Wheeler, H.E., 1942, Post-Sauk and pre-Absaroka Paleozoic stratigraphic patterns in North America: AAPG Bulletin, v. 26, p. 1497-1526.

Wilson, J.L., and R.H. Pilatzke, 1987, Carbonate-evaporite cycles in lower Duperow Formation of the Williston Basin, *in* M.W. Longman, ed., Williston Basin: Anatomy of a cratonic oil province: Rocky Mountain Association of Geologists, p. 119-146.

ORGANIZATION 1

THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
for the NEVADA TEST SITE and
OFF-SITE LOCATIONS IN THE STATE OF NEVADA

Nevada Test Site EIS Hearing Comment Sheet

Meeting Location: University of Nevada, Reno

Meeting Date: 3/19/96

Please Enter Your Name, Organization and Address Below:

Steve Alastuey — *Your Name*
Citizen Alert (board member) & Nevada Outdoor Recreation Association — *Organization*
1077 Riverside Drive #13 — *Street Address*, Reno — *City*, NV — *State*, 89503 — *Zip Code*

Thank you for attending this hearing. Please use this sheet (and attachments if needed) to inform us of your written comments on this EIS.

When commenting, please indicate beside your comment the applicable issue category number from the list below. This will help us to ensure that your comment is considered in the relevant section of the EIS. You may identify additional issue categories as needed.

1. Land Use
2. Transportation
3. Site Support Activities
4. Socioeconomics
5. Geology and Soils
6. Surface Hydrology
7. Groundwater
8. Biological Resources
9. Air Quality
10. Noise
11. Visual Resources
12. Cultural Resources (includes American Indian Perspective)
13. Occupational and Public Health and Safety/Radiation (includes Human Health Risk)
14. Environmental Justice
15. DOE Environmental Policies and Procedures
16. Nuclear Policies
17. Big Explosive Experiment Facility
18. Defense Program
19. Waste Management Program
20. Environmental Restoration Program
21. Nondefense Research and Development Program
22. Work for Others Program
23. Alternative 1 - Continue Current Operations (No Action Alternative)
24. Alternative 2 - Discontinue Operations
25. Alternative 3 - Expanded Use
26. Alternative 4 - Alternate Use of Withdrawn Lands
27. NEPA Process
28. Other

TOPIC NUMBER **COMMENT** *(continue on back if needed)*

1 | (1) Lands should be made safe, free from toxins, for human use/exposure.
2 | 3 | (2) Transportation accident prevention isn't 100% possible/effective. Best present solution is on-site storage (i.e.
(4) NTS should be made safe, and therefore not threatening, to
4 | tourists, outdoor recreationists, residents; the reputation of the
5 | region cannot prosper if people are fearful of contamination.
6 | (5) Soil contact must be safe & non-contaminant.
(6) Precipitation shouldn't be contaminated by contact with toxic
7 | soils; water runoff travels through ravines & streambeds, and carry contaminants over wider area.
(7) Groundwater/aquifers can transport contamination very long
distances through the known rock fissures.
8 | Seismic activity is active, including some occasional earthquakes, which widen existing fissures and create new ones.

Please hand this form in today or mail before May 3, 1996 to:

U.S. Department of Energy
Environmental Impact Statement
P.O. Box 14459
Las Vegas, NV 89195-8066

over →

ORGANIZATION 1 (CONTINUED)

9 | (8) Flora and fauna are incapable of warding off contaminants. Mutations are known to occur from exposure to nuclear toxicity (ie. offspring). Plants transfer contaminants from soil to first-order consumers, and second-order consumers get it from the herbivores, and etc. on the food chain. Nuclear toxins are known to create diseases; ie. leukemia

10 | (9) "Down winders" are victims of radiation who contract illness from airborne contamination. These people (and animals, plants) are known victims.

11 | (10) I never heard of noise except from live explosives which release the radiation.

12 | (11) Visual appeal of the region becomes degraded by the knowledge of its toxicity.

13 | (12) Amer-Indian cultural sites exist; they should be preserved as part of their heritage and viable cultural/social resource.

14 | (13) Health & safety involving any use of the area should be first priority. This encompasses any human use, which is affected by any form of contaminant transportation/exposure.

15 | (14) & (15) Environmental Justice and DOE policies should work together to make all the facts and information readily accessible to all the public. Repressed information is useless to people; partial information is deception because it lacks all data for our evaluation. Justice is having all data to keep us out of trouble, and for a basis to develop safe, practical solutions.

16 | (19) Maximized safety through viable detoxification techniques is essential.

17 | 18 | (20) Same as #(19) — (21) Spend more on sustainable peacetime.

19 | & 20 | (25) Expand use by making it safe to be there. Any recreational, (26) educational, industrial use is precluded by radiation exposure.

21 | (27) live up to highest standards of NEPA; don't cut corners.

ORGANIZATION 2

UNLV

April 18, 1996

Dr. Donald R. Elle, Director
Environmental Protection Division
US Department of Energy
PO Box 14459
Las Vegas, NV 89114

Dear Dr. Elle:

Attached are my comments on the Draft Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (NTS EIS). I am a Nevada Risk Assessment/Management (NRAMP) Technical Team member and therefore have a background relating to many of the issues addressed in the NTS EIS. Specifically, my focus in reviewing the document was on the topic of groundwater contamination.

I have included both general comments and page-specific comments. All comments have corresponding recommendations. I believe the recommendations will make the document a more appropriate communication tool. Many of the comments relate to specific points which I believe need to be addressed in order to produce a final product which is an honest portrayal of the site and potential future use.

Sincerely,

Tod E. Johnson
Environmental Modeling
Nevada Risk Assessment/Management Program

cc: W.B. Andrews
Nevada Test Site Citizen Advisory Board

Harry Reid Center for Environmental Studies
4505 Maryland Parkway • Box 454009 • Las Vegas, Nevada 89154-4009
(702) 895-3382 • Telex 62048164 UNLV/MSM • FAX (702) 895-3094

ORGANIZATION 2 (CONTINUED)

Comments on the <u>Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada</u>, Volume 1, Appendix H, "Human Health Risks and Safety Impacts Study" and Selected Groundwater-Related Sections in Other the NTS EIS Volumes.

April 1996

Tod Johnson, Environmental Modeling
Nevada Risk Assessment/Management Program
Harry Reid Center for Environmental Studies
Box 454009
4505 Maryland Parkway
Las Vegas, NV 89154-4009

<u>GENERAL COMMENTS:</u>

G-1:

1 **Problem**: One of the Land Use Alternatives listed in the EIS involves turning back some of the land (70%) to public lands inventory. As such, the evaluation of the risks to the public should have included estimation of risk at the potential new boundaries. Vol. 1, 3-27 states that return of the land would be evaluated, but only to the US Bureau of Land Management (BLM) for public use (not directly to the public, the State, Nye County or to the sovereign nations). Because it would be available for public use, even under the control of the BLM, many exposure scenarios impacting the public should have been considered.

2 **Recommendation:** The exposure scenarios should include the ingestion of drinking water by casual/recreational public visitors to the area and include worker risk scenarios consistent with relatively remote locations (i.e. partial residence time on the site).

G-2:

3 **Problem**: Modeling shows that contaminants from underground testing are likely off the NTS and CNTA, and likely will be off the Shoal Site in the future. This understanding is not reflected in the document.

4 Also, because site characterization is quite limited, the risk results are quite uncertain. This understanding is not reflected in the EIS. The predicted concentrations, locations, duration and potential hazards must be included because no intervention is described.

5 **Recommendation 1:** The Draft NTS should be revised to remove conflicting sections and misleading statements which imply the underground contamination is not leaving the site.

6 **Recommendation 2:** The document should also be revised to include honest, clear discussion of the uncertainties.

ORGANIZATION 2 (CONTINUED)

7 **Recommendation 3:** Because of the large uncertainties inherent in the modeling, the worst-case analyses should be presented, not the least-conservative.

==

PAGE-SPECIFIC COMMENTS:

<u>Draft NTS EIS Summary</u>

S-1 EIS Summary, Page S-19, lines 11-13:

8 **Problem:** The text states that groundwater models suggest there will be no migration out of the NTS boundaries. That statement is in conflict with modeling from other sources (Daniels et al., 1993, Andricevic et al., 1994). Modeling in those sources indicated migration was possible, and estimate the risks related to the transport. The risk values correspond to tritium concentrations greater than detection limit (1 pCi/L) and greater than background (approx. 10 pCi/L).

9 Also, some of the locations for which modeling was conducted (NTS EIS Human Health Risk and Safety Impacts Study, Vol. 1, Appen. A, page 2-17, lines 11-14) do not have corresponding results listed in the EIS. Therefore, one cannot test the "no migration off site" statement for those locations.

10 **Recommendation:** Delete the "no migration" expected statement. Say instead that modeling does indicate migration off the site sometime in the future.

S-2 EIS Summary, Page S-19, lines 15-18:

11 **Problem:** The text implies that groundwater contamination will never be a problem simply because no contamination has been detected in off site monitoring wells. That is a poor argument for several reasons. First, the contamination could move off site in narrow plumes and miss the monitoring wells. Second, the contamination may be moving toward the wells, but not have reached it yet. Third, the modeling report for the area (Chapman et al., 1995) indicates contamination will likely move off the site sometime in the future. If the conservative estimate in the report is used (which includes limits of uncertainty in some of the parameters), a concentration of 720,000 pCi/L could occur at the boundary.

12 **Recommendation:** Add text to indicate that the groundwater modeling indicates movement off the site could occur sometime in the future.

S-3 EIS Summary, Page S-19, lines 20-27:

13 **Problem:** The text implies no contamination has left or will leave the CNTA from underground sources. This does not match the conclusion from results presented in the NTS EIS Human Health Risks and Safety Impacts Study (Vol. 1, Appen. A, page 2-17, lines 22-26). The specific discussion of the CNTA modeling describes concentrations as high as 1.2×10^8 pCi/L at the boundary. There is no existing well at the location, but the text in the Summary is written in such a way as to imply there is no release beyond the site boundary. It states that "transport could already be occurring",

ORGANIZATION 2 (CONTINUED)

13 cont. which does not clearly communicate the relevant detail that contamination has likely already left the site.

14 **Recommendation:** Modify text to include the statement: "Ground water modeling has indicated contamination has likely left the site boundary, but has not been identified in any existing well."

<u>Volume 1, Appendix H, "Human Health Risks and Safety Impacts Study"</u>

S-4 Page ES-2, Lines 4-7:

15 **Problem:** The sentence states that tritium is never expected to exceed measurable concentrations at the site boundaries of the NTS and Shoal. However, on page 5-1, the report states the detection limit is 1 pCi/L. On the same page (5-1), the report states an estimate of 280 pCi/L at the boundary some time in the future. Therefore, tritium <u>is</u> expected to leave the NTS and Project Shoal boundaries in measurable concentrations in the future.

16 **Recommendation:** The text on page ES-2 should be corrected to state that contaminants are expected leave the site boundaries at every site (not just the CNTA).

S-5 Page 2-17, lines 15-16:

17 **Problem:** The information describing the method of calculation of the NTS tritium source is poorly described in the EIS and may be incorrect. The text indicates the concentrations used for model inputs came from direct measurements from shot cavities. This does not appear to be the case. NRAMP has a version of the results and code from the program listed in the EIS. The description listed does not indicate the values came direct measurement. Rather, the actual method used appears to combine classified information regarding cavity volume with averages of recently declassified tritium estimates. The assumption appears to be that the tritium is, on average, distributed within a volume of water approximately equal to the sum of the shot cavities. The merits of the assumption can be debated, but only if the method is described to the public in the EIS document. I believe the public should not be led to think the data came from site-specific measurements (which may or may not exist, but which do not appear to have been used in the calculation of results).

18 **Recommendation 1:** Briefly describe the method used to calculate the concentrations, so the public is more clear about the uncertainties of the estimate. (The method used to calculate the concentrations is not classified.)

19 **Recommendation 2:** Briefly list which shot(s) was (were) chosen for the modeling. Was the shot closest to the boundary-of-concern used? Or was one that was considered by the DOE to be representative in yield and location used?

ORGANIZATION 2 (CONTINUED)

S-6 Page 2-17, lines 11-14:
20 **Problem**: The EIS states the MC_TRANS code was used to simulate the movement of tritium from test locations on Pahute Mesa and Yucca Flat to downstream locations within the NTS, to the towns of Beatty and Lathrop Wells, and to the boundary of the NTS south of Mercury, Nevada. Where are the results for the locations within the NTS boundaries? Where are the results for the towns of Beatty and Lathrop Wells? It seems that the only result listed is for a distant, unlikely location.

21 **Recommendation**: The results of the other locations should be presented for completeness and honesty (the locations listed could have higher risk values than the single NTS location listed in the EIS).

S-7 Page 2-17, lines 11-14:
22 **Problem**: Not all of the relevant risk calculations have been presented. A risk estimate was conducted for the NTS using the Solute Flux method, the same as was used for Project Shoal and the CNTA. The study (Daniels et al., 1993 and Andricevic et al., 1994) estimated the risk at the boundary near Pahute Mesa and at the nearest accessible environment, the Oasis Valley, which is 19 km downgradient. The risks were estimated to be as high as 2×10^{-2} at the boundary and 1.4×10^{-6} at the Oasis Valley. Those risks are significant relative to a de minimus level and are quite high relative to the value used in the EIS (1.5×10^{-11} at the boundary near Mercury).

23 **Recommendation**: Include the Oasis Valley in list of locations that have completed calculations. (The high estimate of risk at the boundary does not need to be included in this EIS, because it appears to be US Air Force-controlled property adjacent to the NTS at that point, and is therefore still under administrative control for the near-future. And the EIS is not considering US Air Force property to be available for public access in the scope of the EIS.)

S-8 Page 2-17, lines 16 and 17:
24 **Problem**: Regarding the risk calculations for the NTS boundaries, the equations listed in Attachment A may or may not be the equations used to calculate the values, but are incomplete if the groundwater flow and contaminant transport parameters are not available for review. (The document describing the results has apparently not been made available to the public or evaluating groups such as NRAMP.) Therefore, the equations listed in Attachment A are of limited value.

25 **Recommendation 1**: Release the document containing the data and results for the MC_TRANS modeling. (The transport calculations are not likely classified, nor is the model treatment of the source term.)
26 The equations do not appear to have been used for the offsite locations (Shoal and CNTA).

27 **Recommendation 2**: If Recommendation 1 cannot be followed because the modeling report is not finished, then the EIS results should be listed as interim results.

ORGANIZATION 2 (CONTINUED)

28 **Recommendation 3**: If Recommendation 2 cannot be followed, do not cite the equations likely used -- the public cannot test their application or relevance.

S-9 Page 2-17, lines 23-29:
29 **Problem**: The equations (or even summation of the method) used for calculating the risks at the off-site locations (within the Solute Flux method) are not listed in the EIS document. An approach using an age-specific intake distribution, time-dependent tritium concentrations, and age-dependent health effects was used.

30 **Recommendation**: The method should be <u>described</u> (briefly) or is should not be used to calculate the values.
31 If the risk calculation method within the Solute Flux method) is not to be used, the more simple equations listed in back of the EIS would have to be used, causing new results.

S-10 Page 5-1, Lines 15-18:
32 **Problem**: The risk assessment for scenarios involving ingestion of water are said to be identical for each alternative. As stated in comment G-1, above, Land Use Alternative 4 involves turning back some of the land (70%) to public lands inventory. Therefore, the land uses are not sufficiently similar to do only one water ingestion scenario that would be applicable to all.

33 **Recommendation**: The evaluation of the risks to the public should be corrected to include estimation of risk at the potential new boundaries for Alternative 4.

S-11 Page 5-2, Table 5-1:
Problem: The report lists a table of health risks to individuals, summarizing work from several different reports.

34 **Recommendation**: Looking at the original texts, the risks included in EIS work were the <u>minimum</u> of a variety of scenarios listed in the original texts. The values in the original text include reasonable (according to the authors of the texts) inclusion of uncertainty. Uncertainties which were in the original texts include uncertainties in the mean velocity of the groundwater and greater areal variation in hydraulic conductivity. In some of the cases, the risk including the higher uncertainties is still de minimus (less than 10^{-6}). In other cases, such as Project Shoal, the risks increase from a de minimus level to levels that have, for other sites, been considered significant. I recommend changing Table 5-1 to include the more conservative values listed in my attached table.

S-12 Page 5-2, Table 5-1:
35 **Problem**: The report lists a table of health risks to individuals, summarizing work from several different reports. A risk estimate was conducted for the NTS using the Solute Flux method, the same as was used for Project Shoal and the CNTA. The study (Daniels et al., 1993 and Andricevic et al., 1994) estimated the risk at the boundary near Pahute Mesa and at the nearest accessible environment, the Oasis Valley, which

ORGANIZATION 2 (CONTINUED)

35 cont. is 19 km downgradient. The risks were estimated to be as high as 2×10^{-2} at the boundary and 1.4×10^{-5} at the Oasis Valley. Those risks are significant relative to a de minimus level and are quite high relative to the value used in the EIS (1.5×10^{-11} at the boundary near Mercury).

36 **Recommendation:** Include the value for the risk to residents near the Oasis Valley in Table 5-1. (The high estimate of risk at the boundary does not need to be included in this EIS, because it appears to be US Air Force-controlled property adjacent to the NTS at that point, and is therefore still under administrative control for the near-future. And the EIS is not considering US Air Force property to be available for public access in the scope of the EIS.)

S-13 Page 5-3, lines 8-9:

37 **Problem:** Regarding concentrations and arrival times listed in the EIS text for Project Shoal, the values increase when uncertainty (listed in the source document, Chapman et al., 1995) is included. For the Project Shoal Area, if listed uncertainties are included, the peak tritium concentrations in the groundwater could be as high as 720,000 pCi/L, arriving 71 years after the test. The number cited in the EIS is 280 pCi/L at 206 years.

38 **Recommendation:** Correct the text to include the values resulting from the higher levels of uncertainty.

S-14 Page 5-1, lines 25-26:

39 **Problem:** The evaluation of the risk calculations of the NTS boundary near Mercury is more difficult to conduct than for the offsites (Shoal and CNTA), because the report referenced for the results is apparently not publicly available. NRAMP has a version of the results and code from the program listed in the EIS, but the calculation included in the EIS is not given in the documentation available to NRAMP. From initial calculations conducted by NRAMP, it is unlikely that there is substantial risk at the boundary near Mercury. However, other boundary locations may be more appropriate to list in the EIS. For instance, the boundary near Pahute Mesa has shot locations much closer to the boundary and has hydraulic gradients which could move the contaminants past the boundary. A risk estimate was conducted for the NTS using the Solute Flux method, the same as was used for Project Shoal and the CNTA. The study (Daniels et al., 1993 and Andricevic et al., 1994) estimated the risk at the boundary near Pahute Mesa and at the nearest accessible environment, the Oasis Valley, which is 19 km downgradient. The risks were estimated to be as high as 2×10^{-2} at the boundary and 1.4×10^{-5} at the Oasis Valley. Those risks are significant relative to a de minimus level and are quite high relative to the value used in the EIS (1.5×10^{-11} at the boundary near Mercury).

40 **Recommendation 1:** Provide more of the framework for the parameters and calculations used to produce the Mercury boundary number.

41 **Recommendation 2:** Include the Pahute Mesa to Oasis Valley results in discussion.

ORGANIZATION 2 (CONTINUED)

<u>REFERENCES</u>

Andricevic, R., Daniels, J.I. and Jacobson, R.L.. 1994. "Radionuclide migration using a travel time transport approach and its application in risk analysis." <u>J. of Hydrology</u>, Vol. 163, pp. 125-145.

Daniels, J.I., Andricevic, R. Anspaugh, L.R. and Jacobson, R.L. 1993. "Risk-based screening analysis of ground water contaminated by radionuclides introduced at the Nevada Test Site (NTS)." Tech. Rep. UCRL-ID-112789, Lawrence Livermore National Laboratory, Livermore, CA.

ORGANIZATION 2 (CONTINUED)

Table referred to in Comment 34

Table 1. Considering Limits of Uncertainties in Original Documents

Test Location	Receptor Location	Arrival Time of Peak Concentration (yr)	Dose (rem)	Radiation LCF	Radiation Detriment
Yucca Flat	Mercury	* (EIS: 100)	* (EIS: 3.0×10^{-8})	* (EIS: 1.5×10^{-11})	* (EIS: 7.0×10^{-12})
Project Shoal Area	Eastern Boundary	**71** (EIS: 206)	**4** (EIS: 1.6×10^{-3})	**2×10^{-3}** (EIS: 8.0×10^{-7})	**9.2×10^{-4}** (EIS: 3.7×10^{-7})
Project Shoal Area	Nearest Public Well	** (EIS: 278)	**0.08** (EIS: 2.0×10^{-7})	**4×10^{-5}** (EIS: 1.0×10^{-10})	**1.8×10^{-5}** (EIS: 4.6×10^{-11})
Central Nevada Test Area	Central Nevada Test Area Boundary	**8** (EIS: 15)	**11** (EIS: 8.0)	**5.3×10^{-3}** (EIS: 4.0×10^{-3})	**2.4×10^{-3}** (EIS: 1.8×10^{-3})
Central Nevada Test Area	Nearest Public Well	**117** (EIS: 410)	**6×10^{-7}** (EIS: 1.8×10^{-20})	**3.2×10^{-10}** (EIS: 9.0×10^{-24})	**1.5×10^{-10}** (EIS: 4.1×10^{-24})

* Original documentation not available
** Not listed in original document

8

ORGANIZATION 3

UNLV

April 17, 1996

Dr. Donald R. Elle, Director
Environmental Protection Division
US Department of Energy
PO Box 14459
Las Vegas, NV 89114

Dear Dr. Elle:

I am submitting comments prepared by the Nevada Risk Assessment / Management Program (NRAMP) on the Waste Management Programmatic Environmental Impact Statement (DOE/EIS-0200-D) for your consideration in the NTS Environmental Impact Statement (DOE/EIS 0243). The majority of the comments ask for clarification of the scope and impacts related to the transportation of radioactive waste. It is appropriate that both documents address theses issues in a consistent manner.

1 Major discrepancies between current Nevada Test Site and other programmatic environmental documents related to the shipment and disposal of Low Level Waste (LLW) contribute to an incoherent set of federal proposals for public comment.
2 The total number of predicted health effects and the percentage due to radiation effects are potentially significant in other documents.

Specific preferences for the alternatives described in the NTS-EIS could not be developed based on the lack of consistent information. It is apparent, however, that the high cost of development of LLW disposal and treatment facilities at distributed locations and the relatively low costs of transportation will likely result in an increased need and use of Nevada for
3 the disposal of LLW. Increased use of rail transportation could significantly reduce both risk and cost for all alternatives except there is no offsite transportation.

Detailed comments are enclosed.

Sincerely,

Bill Andrews

W.B. Andrews

RECEIVED APR 2 5 1996

Harry Reid Center for Environmental Studies
4505 Maryland Parkway • Box 454009 • Las Vegas, Nevada 89154-4009
(702) 895-3382 • Telex 62048164 UNLV/MSM • FAX (702) 895-3094

Comments on the Nevada Test Site Environmental Impact Statement, Appendix I, Transportation Study (DOE/EIS 0243)

April 1996

Public interest is high for transportation issues. The DOE Nevada Operations Office, noted this interest in their efforts to work with members of the public, elected officials, American Indian tribal governments and private issue advocacy groups in the development of a technical report on transportation impacts associated with the Nevada Test Site Environmental Impact Statement (DOE 1995a). These groups expressed concern about continued and possible expansion of transportation of low level radioactive waste by truck on public highways in the Las Vegas valley. In response to these concerns, the DOE addressed the possible use of alternative truck routes, construction of rail access to the NTS and intermodal truck/rail shipments to the site.

<u>Technical Adequacy of the NTS-EIS Document</u>

This review included a comparison the NTS-EIS to other current DOE environmental documents and an evaluation of risk management opportunities related to transportation of radioactive wastes. **Discrepancies identified in current environmental documents related to**
4 **the shipment and disposal of Low Level Waste (LLW) contribute to an incoherent proposal from the DOE-EM program for public comment.** A comprehensive response to the NTS-EIS is not possible without resolution of these discrepancies.

The NTS-EIS transportation study (DOE 1995a) describes shipping volumes for Low Level Waste (LLW) importation for the next ten years. The EIS land use case of "continue current operations" shows radioactive shipments from 12 offsite locations at a rate of 678 shipments per year. The EIS case of "expanded use" shows radioactive shipments coming for the next 10 years from 29 offsite locations with an average annual volume of 3946 shipments per year.

The Waste Management Programmatic EIS (DOE 1995c) was released in September 1995. The PEIS describes alternative strategies and impacts for the management of wastes from ongoing and past DOE operations that are anticipated to be shipped to and from various
5 treatment and disposal sites over a 20 year period. Wastes from site remediation are excluded from the assessment. Implementation of a centralized storage/disposal option at the NTS for LLW, LLMW and HLW would result in the maximum number of waste shipments. A combined total of 295,000 truck shipments and more than 106,000 rail shipments could occur under this alternative.

THE NTS-EIS CONTAINS MAJOR DISCREPANCIES IN THE NUMBER OF POTENTIAL SHIPMENTS OF LLW COMPARED TO WM-PEIS ESTIMATES

Waste shipment numbers in Table 1 were summarized from the WM-PEIS. They are

ORGANIZATION 3 (CONTINUED)

reported on an annual basis to allow comparison to the NTS-EIS. Shipping volumes in Table 1 are up to 3 times higher than volumes reported in the NTS-EIS.

5 cont.

<u>Table 1. Annual Shipments from the Waste Management PEIS for Nevada Storage Options</u>

Waste Form	No Action	Decentralized	Regionalized	Centralized
Low Level Mixed Waste	No Shipments	5	1 - 482	0.5/year out, Ship to Hanford
Low Level Waste	3498	0	0 - 2945	0 - 12,400
Transuranic Waste	0, Store Onsite	4.5 / yr out Ship to WIPP	4 / yr out Ship to WIPP	4 / yr out Ship to WIPP
High Level Waste	Not Included in PEIS	Not Included in PEIS	Not Included in PEIS	Not Included in PEIS

6 **ENVIRONMENTAL RESTORATION WASTES ARE NOT INCLUDED IN THE WM-PEIS IMPACTS AND COULD RESULT IN MUCH HIGHER WASTE VOLUMES FOR DISPOSAL AT THE NEVADA TEST SITE**

The *Baseline Environmental Management Report (BEMR)* (DOE 1995b) was used in the WM-PEIS as the basis of a sensitivity study for waste shipment volumes. Results of an WM-PEIS sensitivity study (appendix B) indicated that disposal volumes could be up to 60% higher than those shown in Table 1 based on the WM-PEIS assumption that only 5% of the LLW available from site restoration would be transported to an offsite location for disposal. The reasonableness of these results could not be determined since the basis for the shipping volume estimate is based on an unpublished draft of the BEMR. The impacts of increased LLW volumes was not estimated in Appendix B.

7 **RISK LEVELS REPORTED IN THE NTS-EIS AND THE WM-PEIS ARE NOT CONSISTENT. THE WM-PEIS RESULTS ARE MUCH MORE SIGNIFICANT AND HAVE A HIGH FRACTION OF RADIOLOGICAL HEALTH EFFECTS**

Risk results are provided in the two EISs. The NTS-EIS risks for Nevada are summarized in table 2. The NTS-EIS reported relatively low total risks and the percentage of health effects
8 due to the radiological nature of the cargo are a small percentage of the total risk. Results of the WM-PEIS evaluation of LLW risks are shown in Table 3. No Nevada-specific results were included in the WM-PEIS for the transportation of wastes. The total number of predicted health effects and the percentage of health effects due to radiation are potentially significant.

ORGANIZATION 3 (CONTINUED)

Table 2 - Offsite Population Transportation Risks from the NTS-EIS for 10 years - Low Level Waste & Safe Secure Trailers

	Deaths (Latent & Mechanical)	Injuries (Mechanical)	Cargo - Related (latent cancers)	Cargo Percentage of Total
Alternative 1 - Present Operations	2	27	0.002	0.1
Alternative 2 - Discontinue Operations	minimal	minimal	minimal	n/a
Alternative 3 - Expanded Use	7	97	0.06	0.8
Safe Secure Trailers (30 shipments)	n/a	n/a	Incident Free-0.000016 Accidents - 0.000007	n/a

n/a - not available

8 cont.

Criteria That Should be Considered in Selecting Preferred Alternatives and Making Final Decisions

Relative to LLW treatment, transportation and disposal, it is apparent from the results of the NTS-EIS that transportation is the dominant source of public risk and that treatment and disposal are dominant for worker risks. It is also apparent that development of disposal facilities is expensive relative to transportation. This presents decision makers with the dilemma of trading off dollar savings for potential increases in public and worker risks.

Preferences for Alternatives Evaluated for LLW

Specific preferences for the alternatives described in the NTS-EIS could not be developed because of the lack of consistent information in the three environmental documents. It is apparent, however, that the high cost of development of LLW disposal and treatment facilities at distributed locations and the relatively low costs of transportation will likely result in an increased need and use of Nevada and/or other sites for the disposal of LLW. Public review of revisions to the NTS-EIS that reconcile the previous comments on waste volumes and risk along with additional opportunities for public education on the overall DOE-EM program would increase public understanding and comment.

ORGANIZATION 3 (CONTINUED)

Table 3. Cancer and Non-cancer Health Effects (HE) for LLW Disposal

	Treat. Worker Mech. HE	Treat. Worker Cancer HE	Percent Treat. Worker Cancer HE	Disposal Worker Mech. HE	Disposal Worker Cancer HE	Percent Disposal Worker Cancer HE	Truck Cancer HE	Truck Mech. HE	Percent Truck Cancer HE	Rail Mech. HE	Rail Cancer HE	Percent Rail Cancer HE
No Action	3	1	25	4	3	43	5	12	29	0.6	1	37
Decentralized	2	1	33	6	2	25	<1	<1	n/a	<1	<1	n/a
Regionalized 1	2	1	33	6	2	25	<1	1	0	<1	<1	n/a
Regionalized 2	5	1	17	4	2	33	<1	1	0	<1	<1	n/a
Regionalized 3	2	1	33	5	2	29	2	3	40	<1	<1	n/a
Regionalized 4	5	1	17	4	2	33	2	3	40	<1	<1	n/a
Regionalized 5	5	1	17	4	2	33	2	4	33	<1	<1	n/a
Regionalized 6	3	1	25	6	2	25	3	10	23	0.6	0.6	50
Regionalized 7	3	1	25	6	2	25	4	10	28	0.6	0.6	50
Centralized 1	3	1	25	1	3	75	16	37	30	1.7	2.3	42
Centralized 2	3	1	25	1	3	75	15	37	29	1.7	2.3	42
Centralized 3	5	1	67	1	2	67	15	35	30	1.6	2.3	41
Centralized 4	5	1	67	1	2	67	14	37	27	1.7	2.3	42
Centralized 5	4	2	33	1	2	67	15	37	29	1.7	2.3	42

Data Compiled from Tables 5.3-1 and E-16, WM-PEIS

ORGANIZATION 3 (CONTINUED)

9 **Increased use of rail transportation could significantly reduce both risk and cost for all alternatives except in the case where there is no offsite transportation.** Table 4 summarizes information from the WM-PEIS. The WM-PEIS indicates a slightly higher cost for the "no action" case if rail transportation would be used for all sites. All other cases show cost reductions ranging from $30 million to $2 billion. Risks would be significantly reduced for all alternatives except where transportation is not used. These reductions range from 8% to 80% of the total system risk.

10 **If rail transportation were used, risks of all the alternatives for LLW disposal would be comparable in terms of their total predicted health effects.** It is, of course, a very crude estimate to sum risks of the public, workers, and future generations, but when the total risk magnitudes are similar, discussions about the acceptance of risk could have a different tone than the current situation where the motoring public and roadside residents would experience the greatest portion of total risk in order to achieve relatively modest reductions in future risks to communities that are near DOE facilities.

11 **Rail transportation could reduce concerns about the EM activities in Nevada.** Currently truck shipments travel primarily over Hoover Dam, through the largest cities in Nevada and then to the NTS due to routing restrictions imposed by current US Department of Transportation regulations. Rail shipments could allow greater DOE discretion in the development of alternative routes that could avoid these areas because there are currently no rail routing regulations and intermodal transfer points could be chosen that would better meet local needs.

References

DOE 1995a, *Nevada Test Site Environmental Impact Statement, Appendix I, Transportation Study*, DOE/EIS 0243, DRAFT, United States Department of Energy, 1000 Independence Avenue, Washington, DC 20585, January 1996

DOE 1995b, *The 1995 Baseline Environmental Management Report, Estimating the Cold War Mortgage*, DOE/EM-0232, US Department of Energy, Washington DC, March 1995

DOE 1995c, *Waste Management Programmatic Environmental Impact Statement*, DRAFT, United States Department of Energy, 1000 Independence Avenue, Washington, DC 20585, September 1995.

ORGANIZATION 3 (CONTINUED)

Table 4. Risk and Cost Impacts of Using Rail for LLW Transportation

Alternative	Total Fatalities System (Truck)	Total Fatalities System (Rail)	Risk Reduction (Use Rail)	Risk Reduction Percent (Rail)	(Billions of 1994 Dollars) Total (Inc. Truck Costs)	Rail Savings	Total (Inc. Rail Costs)
No Action	28	12.6	15.4	55%	17.9	-0.07	17.97
Decentralized	11	11	0	0%	16.3	0.03	16.27
Regionalized 1	12	11	1	8%	16.2	0.04	16.16
Regionalized 2	14	12	2	14%	20	0.04	19.96
Regionalized 3	15	10	5	33%	14.7	0.16	14.54
Regionalized 4	17	12	5	29%	19.7	0.15	19.55
Regionalized 5	18	12	6	33%	19.6	0.26	19.34
Regionalized 6	25	13.2	11.8	47%	12.7	0.48	12.22
Regionalized 7	26	13.2	12.8	49%	13.6	0.49	13.11
Centralized 1	61	12	49	80%	11.9	2.02	9.88
Centralized 2	60	12	48	80%	11.8	1.82	9.98
Centralized 3	59	12.9	46.1	78%	17.9	1.91	15.99
Centralized 4	60	13	47	78%	17.8	1.72	16.08
Centralized 5	61	13	48	78%	14.9	2.02	12.88

Data Compiled from Tables 5.3-1, 5.3-2, and E-16, WM-PEIS

ORGANIZATION 4

UNLV

April 18, 1996

Dr. Donald R. Elle, Director
Environmental Protection Division
U.S. Department of Energy
P.O. Box 14459
Las Vegas, NV 89114

Dear Dr. Elle:

I am submitting comments for your consideration on the Nevada Test Site Environmental Impact Statement (NTS EIS). I am a member of the Nevada Risk Assessment/Management Program (NRAMP) Technical Team at the Harry Reid Center for Environmental Studies, UNLV. The majority of my comments attempt to clarify technical discrepancies rather than dwell on philosophical approaches to improving the NTS EIS methodologies.

In addition, I am also submitting several comments based on a letter to the NRAMP Principal Investigator, Mr. William B. Andrews, from Mr. David B. Leclaire, the Deputy Assistant Secretary for Program Support, Defense Programs. In this letter (which is attached), Mr. Leclaire recommends that I look at specific areas of the NTS EIS for interesting information regarding the radiological source term. For the record, I did not find any new information in these sections of the NTS EIS and my doctoral thesis (which was completed and successfully defended in January, 1995) did not include any aspect of thermonuclear weaponry, but rather experimental investigations of fusion reactor engineering safety issues.

Itemized comments are attached in the order they come up in the NTS EIS. There is no priority given to earlier comments than later comments. I feel my comments are rarely contentious and are meant to highlight potentially significant technical or perceptional problems with the NTS EIS.

Sincerely,

Anthony E. Hechanova

Anthony E. Hechanova, Ph.D.
Nuclear Engineering

cc: Earle Dixon (CAB)
David B. Leclaire (DOE)
William B. Andrews (NRAMP)

Harry Reid Center for Environmental Studies
4505 Maryland Parkway • Box 454009 • Las Vegas, Nevada 89154-4009
(702) 895-3382 • Telex 62048164 UNLV/MSM • FAX (702) 895-3094

ORGANIZATION 4 (CONTINUED)

Itemized Comments on Human Health Risks and Safety Impacts Study in the NTS EIS (Vol. 1, App. H) with Additional Comments in Response to Mr. David B. Leclaire's Letter (attached)

by Anthony E. Hechanova, Ph.D.
Nuclear Engineering
Harry Reid Center for Environmental Studies
University of Nevada, Las Vegas
tel: (702) 895-1457
April 16, 1996

	Number	Location	Comment
1	1	v 1, p 4-8, li 1-22	***Problem:*** Table 4-1 is not properly referenced.
			Recommendation: Cite the references from which values are given in Table 4-1. For example, as regards to the Surficial Soils, I am familiar with Radionuclide Inventory and Distribution Program (RDIP) reports and figured those would be the appropriate references from the References Section 4.8 starting on page 4-318. But I am not as fortunate to know the NTS EIS references for the various "Disposal" sources or Deep Underground Tests on lines 13-22.
2	2	v 1, p 4-8, li 1-22	***Problem:*** Table 4-1 is not complete.
3			***Recommendation:*** Modify Table 4-1 Column 4. Column 4 should at least reflect the elements of all nine major radionuclides: Americium, Cesium, Cobalt, Europium, Plutonium, and Strontium, although McArthur and Mead (RDIP Report #3, 1987) also measured several other radionuclides in the surficial soils.
4	3	v 1, p 4-106, li 15-16	***Problem:*** Nowhere in McArthur's (1991) report is the inventory at Sedan Crater explicitly estimated as 328 Ci. In fact, in Area 10, the total inventory from the nine major radionuclides is 304 Ci with 12 Ci more found at Sedan from other manmade radionuclides.
			Recommendation: Simply remove this sentence since it is not important to the argument or adjust the statement to reflect accurate information.
5	4	v 1, p 4-110, li 29-32	***Problem:*** Tritium decay is incorrectly calculated from 18,570 Ci to 3,200 Ci after 5 years.

1

Recommendation: Consider the following correction: tritium has a 12.3-year half-life and would decrease to 75.4 percent of its original amount after 5 years. Thus, 18,570 Ci of tritium decay to 14,000 Ci after 5 years.

6 | 5 | v 1, p 4-110, li 29 to v 1, p 4-111, li 7 | *Problem:* The interpretation of the work by Borg *et al.* (1976) is inappropriate considering the current knowledge of nuclear testing conducted by the United States. The numbers published by Borg *et al.* (1976, p 100-102) which are used in these lines of the NTS EIS are the result (*i.e.*, activation and fission products) of a fission yield except for the tritium component. Although activation of trace lithium in the NTS ground would be the major contributor of tritium from a fission detonation, the authors were aware that a significant amount of tritium would be produced from a thermonuclear device because it is one of the primary fuels in the core. In other words, tritium is no longer the result of trace amounts of lithium in the ground from a fission detonation, but rather, tritium is purposefully produced in mass in the core of a thermonuclear device to provide the fuel for fusion reactions. For
7 this reason, the NTS EIS and Borg *et al.* (1976) are essentially comparing apples and oranges when they simply add a tritium component to a fission yield.

Recommendation: When considering the Radiological Source Term, one should be very careful to estimate the fission and fusion contributions separately since the physics involved are very
8 different. The primary purpose of the Borg *et al.* (1976) document was to analyze contaminant migration and I do not believe that their results were intended to be applied to the characterization of a thermonuclear device as the NTS EIS has applied their work. This is best evidenced by quoting from the Borg *et al.* (1976) document and putting to light the rigor of their tritium "calculations:"

"The amount of tritium deposited below or near the water table at NTS through June 30, 1975, can be crudely estimated. It is about 10 kg at Pahute Mesa and about 3 kg at Yucca Flat. The amount at Frenchman Flat is negligible. These values are for the 78 tests detonated below the water table or with a cavity radius below the water table. These estimates are probably accurate to within a factor of 2 or 3 but should not be construed as a definitive catalog of tritium deposited at NTS." (Borg *et al.*, 1976, p 103)

Therefore, I suggest removing line 27 (p 4-110) through line 7 (p 4-111) in which this rather obfuscated and possibly incorrect treatment of the Radiological Source Term is exemplified, and end

the section with the non-contentious statement of the preceding line: "The source term includes numerous isotopes that are both short-lived and long-lived."

9 | 6 | v 1, p 4-111, li 1-7 | *Problem:* The basis of the total underground radioactivity of 300 million curies (including a reference citation) has not been clarified. Thus, it is not clear in this paragraph which considerations are connected to the work of Borg *et al.* (1976): the estimate itself or the uncertainty in the estimate. In either case, the previous comment still applies: the Borg *et al.* (1976) work alone is not
10 appropriate to determine parameters of the total underground radiological source term, especially tritium.

11 *Recommendation:* The basis (*e.g.*, methodology and calculations) of the 300 million curies should be made available to the public and open scientific community for review. This would mean releasing an unclassified version of the reference. I invoke the words of a truly eminent scientist to aid in the argument against classification. The following are excerpts from Better a Shield Than a Sword, by Edward Teller (1987).

"Today, secrecy has become a terrible destructive force in our society. My postwar efforts to reverse the process have not affected its devastating spread. I am unhappy that I had anything to do with its beginnings.

Science thrives on openness. Researchers should, and often must, share their findings.

Security regulations have helped drive a wedge between our universities and our military research and development effort.

Under present rules, research done in our national laboratories cannot be fully shared with civilian industries. When we fail to expose people to problems they could help solve, we remain unaware of the loss. We now have millions of classified technical documents. We also have falling productivity. Rapid progress cannot be reconciled with central control and secrecy. The limitations we impose on ourselves by restricting information are far greater than any advantage others could gain by copying our ideas.

In addition, by tainting science with secrecy, an unfortunate public attitude is perpetuated: Science is nobody's business but the scientists'. Today, science and technology are part of the life-support system of the world. Encouraging the development of a scientifically literate public is of primary importance to everyone's well-being.

Secrecy is not compatible with science, but it is even less compatible with democratic procedure. Two hundred years ago James Madison said, "A popular government without popular information, or the means of acquiring it, is but a prologue to a farce or a tragedy, or perhaps both."

ORGANIZATION 4 (CONTINUED)

The term *credibility gap* is a modest description of our monstrous current problem."

12 The credibility of the NTS EIS radiological source term is at issue not only due to the secretive nature of its conception but also considering possible inappropriate use of methodologies in a referenced work (Borg, *et al.*, 1976) that is available to the public.

13 7 v 1, p 4-159, li 13 ***Problem:*** The data in Table 4-27 is not referenced. However, the data is identical to data released by M. Pankratz of Los Alamos National Laboratory in a memo dated June 23, 1995. The methods used to estimate the data refers to a classified report: LA-CP-94-0222, "Total Radionuclide Inventory Associated with Underground Tests Conducted at the Nevada Test Site," 1955 1992 (U), September 26, 1994 (SRD), authors not given.

14 ***Recommendation:*** Please reference the document from which data in Table 4-27 is taken. If it is in fact the one cited above, which I strongly suspect it is, then the numbers are not for 1995, but for Jan. 1, 1994. This would make a 5 percent difference in the tritium level and affect the levels reported in the following sentence (line 15) for inventories since most of the radioactivity is from tritium.

15 8 v 1, p 4-159, li 20-21 ***Problem:*** I do not agree with the statement that "Most investigators have concluded that much of the radioactivity released during an underground detonation remains in the melt glass in the original cavity. . . ." This is not a true statement since 90 percent of the radioactivity listed in Table 4-27 is tritium which most investigators would conclude becomes part of tritiated water and only a small fraction would remain in the melt glass.

Recommendation: Re-write the sentence to exclude tritium as follows: "Most investigators have concluded that radionuclides other than tritium released during an underground detonation predominantly remain in the melt glass in the original cavity. . . ."

16 9 v 1, p 4-162, li 27 ***Problem:*** The Hydrologic Resources Management Program details refer to "DOE (1995)" which does not fit with any of the references in the Reference Section 4.8.

17 ***Recommendation:*** Clarify which DOE (1995) report is being referenced or add the reference if it is actually missing.

18 10 v 1, p 4-164, li 2-23 ***Problem:*** The superscripts in Table 4-28 are incorrect (*e.g.*, "Lazer Dyes" and "Soda Ash") or incomplete.

ORGANIZATION 4 (CONTINUED)

Recommendation: Change superscript of "Soda Ash" from "d" to "c" since Soda Ash contains theophylline, ethylenediamine, and carbonic acid disodium salt. Change the superscript of "Lazer Dyes" from "c" to "b" since Bryant and Fabryka-Martin (1991) note them as part of some detector packages. Bryant and Fabryka-Martin (1991) note that Thulium is a radiochemical detector and less than 100 grams is typically used, thus, it should have the superscript "a" added.

19 11 v 1, p 4-164, li 2-23 ***Problem:*** Bryant and Fabryka-Martin (1991) mention Thallium as a possible Rack and Canister material which is also listed as a Hazardous Material in their Appendix.

Recommendation: Add Thallium to Column 2 of Table 4-28.

20 12 v 1, Ap H, p ES-2, li 4-7 ***Problem:*** This sentence of the Executive Summary claims that the "migration of tritium-contaminated groundwater from test locations within the NTS or at the Project Shoal Area is never expected to result in tritium concentrations at the site boundaries that are detectable using present-day analytical equipment" which does not agree with the content of the NTS EIS.

<u>Project Shoal:</u> In the NTS EIS (v 1, Ap H, p 5-3, li 2-4), it is stated that at "the eastern boundary of the Project Shoal Area, tritium in groundwater is predicted to reach a maximum concentration of about 280 pCi/L in about 206 years." 280 pCi/L is above background levels for tritium and is easily detectable.

Recommendation: Correct the sentence to accurately reflect the contents of the document or re-write this section completely to include the worst case scenarios from DOE publications (see Comment 27, below):

21 13 v 1, Ap H, p ES-2, li 10-15 ***Problem:*** The NTS EIS does not quote the worst case scenarios as reported in their reference (Pohlmann *et al.*, 1995) which considers the uncertainties in key transport parameters

Recommendation: Re-write this section using values from Pohlmann *et al.* (1995) worst case scenario (see Comment 27, below).

22 14 v 1, Ap H, p 1-1, li 15-18 ***Problem:*** The term "evaluation of the potential environmental impacts associated with the various alternative uses of the NTS" is not qualified to the 10-year time frame of the NTS EIS.

ORGANIZATION 4 (CONTINUED)

Recommendation: Since tritium migration could be a compliance problem after the 10-year time frame (see Comments 28 and 33, below), this statement under the "Purpose" heading of the document should accurately convey the narrow scope of the evaluation. I suggest re-writing this part of the sentence as follows: "evaluation of the potential environmental impacts, over the next 10 years, associated with the various alternative uses of the NTS. . . ."

23 | 15 | v 1, Ap H, p 1-1, li 15-18

Problem: The NTS EIS does not evaluate all of the various alternative uses of the NTS, *e.g.*, public exposure in released-land scenarios (Alternative 4) which would most likely contain the highest risk scenarios to members of the public.

Recommendation: Re-write the sentence to accurately convey that only the more likely alternatives in which members of the public do not have access to NTS land in the next 10 years are being evaluated as follows: "It is the intent that this EIS serve as a support tool for policy makers and stakeholders by providing an evaluation of the potential environmental impacts, over the next 10 years, associated with the more likely alternative uses of the NTS and its resources that are being considered by the DOE." I feel that this re-write truly captures the intent of the DOE in writing the NTS EIS.

24 | 16 | v 1, Ap H, p 1-7, li 3-5

Problem: The lead sentence of this section of the document again misses the important nuances mentioned in the preceding two comments.

Recommendation: Re-write the lead sentence as follows: "The purpose of this report is to provide an assessment of the human health and safety impacts, over the next 10 years, associated with program activities performed under the more likely alternatives being considered in the NTS EIS."

25 | 17 | v 1, Ap H, p 2-1, li 11-16

Problem: This lead line under "General Risk Assessment Concepts" is incomplete. A general risk assessment has the following components:

SOURCE->TRANSPORT->EXPOSURE->DOSE->RISK

The component of "exposure" is missing from the general concept of risk assessment.

Recommendation: Re-write the lead line to include "exposure:"

ORGANIZATION 4 (CONTINUED)

"Risk assessment is a multidisciplinary subject requiring the identification of events (scenarios) with the potential for a failure that could lead to an undesirable outcome. A general risk assessment contains the following five components: the prediction of the source contaminants subject to release and their concentrations; the description of environmental transport; the determination of exposure pathways to assault the body; the calculation of internal and external dose; and the extrapolation of this dose to human health effects."

26 | 18 | v 1, Ap H, p 2-3

Problem: The purpose of Section 2.1.2.1 entitled "Radioactive Decay and Fission" is not clear. I understand and agree with the importance of explaining radioactive decay. However, mentioning
27
fission with regard to nuclear electric power production is inappropriate for the NTS. In addition, if the goal of this section is
28
to explain nuclear reactions such as fission to the public, then an equally important (if not more important) reaction relevant to Radiological Effects is the fusion reaction.

Recommendation: Rename Section 2.1.2.1 "Nuclear Reactions: Radioactive Decay, Fission, and Fusion" and insert the following paragraph at page 2-3, line 22:

"Fusion is the process whereby two light nuclei, *e.g.*, a deuteron and a triton (nuclei of heavy hydrogen isotopes), collide and fuse together to form one heavier nucleus and one lighter nucleus. In the process, mass is lost and converted to energy. This nuclear reaction is the process which actually energizes the sun. The amount of energy released per pound of heavy hydrogen fusion is about four times as much as the amount of energy
29
released per pound of uranium or plutonium fission. The large yield (greater than 100 kilotons) nuclear tests conducted at the NTS are
30
probably based on the fusion reaction. Because tritium (a radioactive isotope) is produced in the core of the device as a fuel for the detonation, there is predicted to be large amounts of tritium left in the cavity of the large yield tests."

31 | 19 | v 1, Ap H, p 2-14, li 29

Problem: Collective dose is report in units of rem.

Recommendation: Change the two occurrences of "rem" to "person-rem."

32 | 20 | v 1, Ap H, p 2-16, li 24 and p 2-17, li 11

Problem: The GeoTrans (1995, a and b) references are not in the Public Reading Facility on Losee Road in N. Las Vegas, NV, as of April 17, 1996. Mary Ellen Giampaoli of the DOE has contended that the references are there. But I had this re-checked by Cynthia

ORGANIZATION 4 (CONTINUED)

Ashley (personal communication, April 17, 1996), the facility librarian, and she has confirmed that the GeoTrans (1995, a and b) references are not at the Public Reading Facility. Latomya Glass of the DOE Public Affairs Office (personal communication, April 17, 1996) is contacting GeoTrans, Inc. to resolve this problem.

Recommendation: Please provide copies of the GeoTrans (1995, a and b) references to the Harry Reid Center for Environmental Studies at UNLV as well as have them available to the public in the Public Reading Facility.

33 | 21 | v 1, Ap H, p 2-16, li 30-31

Problem: Daniels *et al.* (1993) is cited but does not appear in the References on page 7-1. Daniels *et al.* (1993) did very important work that is applicable to the NTS EIS (see Comment 28, below) and possibly more applicable than GeoTrans (1995a).

Recommendation: Add the Daniels *et al.* (1993) information to the References section on page 7-1.

34 | 22 | v 1, Ap H, p 2-17, li 14-16

Problem: Tritium concentrations are reported in this sentence without citing the source.

Recommendation: Cite the source of the 1×10^9 pCi/L tritium concentration.

35 | 23 | v 1, Ap H, p 2-17, li 14-16

Problem: Tritium concentrations are assumed to be 1×10^9 pCi/L based on unreferenced measurements (see comment above). However, measured data from the Cambric event (Hoffman, 1977) give a measured tritium concentration of 6.1×10^9 pCi/L at the edge of the cavity. Cambric was a very small 0.75 kTon event. I find it hard to believe that the NTS EIS assumption of 1×10^9 pCi/L tritium concentration is representative of any NTS underground shot.

Recommendation: Do not assume the tritium concentration at test locations will be 1×10^9 pCi/L since I doubt that it will be scientifically justifiable.

36 | 24 | v 1, Ap H, p 2-17, li 16-17

Problem: Calculated risks to the hypothetical member of the public at the boundary of the NTS are results of modeling which used the disputed (see above comment) 1×10^9 pCi/L tritium concentration.

Recommendation: Refer to Daniels *et al.* (1993) for public risks, see Comment 28, below.

8

ORGANIZATION 4 (CONTINUED)

37, 38 | 25 | v 1, Ap H, p 4-2, li 26-27

Problem: To state *a priori* that consumption of tritium-contaminated drinking water does not have impacts within the 10-year time frame of the NTS EIS is precarious, especially in this circumstance. Although later in the document Table 5-1 indicates that the nearest peak tritium concentration occurs at the boundary of the Central Nevada Test Area in 15 years. A look at the reference by Pohlmann *et al.* (1995), who performed the calculations, reveals that their scenario considering the highest uncertainty (*i.e.*, worst case) would occur in only 8 years.

Recommendation: Remove the following sentence from the NTS EIS because it is not factual and requires knowledge of the results of calculations which, in one instance, may not agree with the statement: "Scenario GW1 is a future scenario that does not have impacts within the 10-year time frame of this EIS."

39 | 26 | v 1, Ap H, p 5-1, li 16-17

Problem: Same as above comment regarding assumption of no impact from tritium-contamination in 10-years.

Recommendation: The content of the paragraph will not be lost by removing the following sentence: "These impacts to the public are not expected to occur within the 10-year timeframe addressed in the scope of the NTS EIS."

40 | 27 | v 1, Ap H, p 5-1 to 5-2

Problem: Table 5-1 does not reflect the worst case scenarios in the off-site references (*i.e.*, Shoal (Chapman *et al.*, 1995) and CNTA (Pohlmann *et al.*, 1995)) in which high variances and uncertainties are assumed. These values should be used to, at the very least, give the upper range of possibilities or could stand alone as the worst case scenarios.

Recommendation: Replace the off-site values in Table 5-1 with the values in the following table (note: NTS EIS values (in parenthesis) are also given below the recommended changes which are in boldface print):

9

ORGANIZATION 4 (CONTINUED)

Test Location	Receptor Location	Arrival Time of Peak Conc. (year)	Dose (rem)	Radiation LCF	Radiation Detriment
Project Shoal Area	Eastern Boundary	**71** (206)	**4** (1.6×10^{-3})	**2×10^{-3}** (8.0×10^{-7})	**1×10^{-3}** (3.7×10^{-7})
Project Shoal Area	Nearest public well	**None Listed** (278)	**0.08** (2.0×10^{-7})	**4×10^{-5}** (1.0×10^{-10})	**2×10^{-5}** (4.6×10^{-11})
Central Nevada Test Area	CNTA Boundary	**8** (15)	**11** (8.0)	**5×10^{-3}** (4.0×10^{-3})	**2×10^{-3}** (1.8×10^{-3})
Central Nevada Test Area	Nearest public well	**117** (410)	**6×10^{-7}** (1.8×10^{-20})	**3×10^{-10}** (9.0×10^{-24})	**1×10^{-10}** (4.1×10^{-24})

41 ***Recommendation:*** I also recommend reporting the risk values with only one significant figure to emphasize that order of magnitude is the most reliance that can be placed on their determination.

28 v 1, Ap. H, p 5-1, li 23-27

42 ***Problem:*** The migration of tritium-contaminated groundwater from Yucca Flat to Mercury does not even closely approximate the maximum health risks to a public individual from underground testing within the NTS boundaries. Since the reference which contains the calculations is currently not available in the Public Reading Facility (see Comment 20, above), I could not determine the reason other federal reports were neglected such as the LLNL report by Daniels, J. I., editor, *et al.*, "Pilot Study Risk Assessment for Selected Problems at the Nevada Test Site," UCRL-LR-113891, Lawrence Livermore National Laboratory, June, 1993, which estimates the dose at the boundary of Area 20 to a member of the public drinking the tritium-contaminated water as 14 rem (not only is this dose nine orders of magnitude different from the NTS EIS values, but it is also above compliance levels). In addition, the dose to the nearest residential community, Oasis Valley, had a dose of 0.008 rem. This value is still five orders of magnitude higher than the NTS EIS dose at Mercury although probably within safe standards.

Recommendation: Use federally sponsored studies containing worst case scenarios of tritium-contamination to members of the public. These scenarios (*e.g.*, Pahute Mesa to Oasis Valley) are probably not those analyzing migration from Yucca Flat to the boundary near Mercury, NV, as given in the NTS EIS.

ORGANIZATION 4 (CONTINUED)

29 v 1, Ap H, p 5-1, li 25-29

43 ***Problem:*** The EPA's Clean Drinking Water Act sets the level of tritium in "clean" water at 20,000 pCi/L. In addition, tritium exists in the NTS groundwater due to natural causes at levels which are easily detectable (on the order of 10s of pCi/L). Thus, to give risk numbers for a clearly *de minimus* tritium concentration (the value is actually never given in the NTS EIS but is inferred to be less than 1 pCi/L) leads to insignificant risks such as 1.5×10^{-11}. This risk value assumes a Linear, No-Threshold Dose-Response Curve which is not uniformly accepted in the scientific community. For example, since insufficient epidemiological data exists to say anything about health risk at doses below 5 rem/yr or lifetime dose below 10 rem, some subscribe to a threshold limit. Currently, a range of risks which include the likely possibility of zero adverse health effects is proposed by the Health Physics Society.

44 ***Recommendation:*** If the Yucca Flats to Mercury scenario is chosen to estimate risk to members of the public, it could be dismissed as below some screening level, even if that screening level is 0.0001 of the EPA's "clean" water standard.

30 v 1, Ap H, p 5-3, li 3-8

45 ***Problem:*** A tritium concentration of 280 pCi/L is still below the screening level I propose.

Recommendation: If such a low concentration is to be considered, it should at least give a range for risk which includes the likely possibility of zero adverse health effects.

46 31 v 1, Ap H, p 5-3, li 8-12

Problem: The NTS EIS is again considering tritium concentrations below 1 pCi/L.

Recommendation: Same as Comment 29, above.

47 32 v 1, Ap H, p 5-3, li 17-22

Problem: The NTS EIS is again considering tritium concentrations below 1 pCi/L.

Recommendation: Same as Comment 29, above.

33 v 1, Ap H, p 5-3, li 29-31

48 ***Problem:*** Radioactive decay should be properly considered to give the calculation scientific validity. This is important because the tritium concentration (120 million pCi/L) in this case is significant and well above compliance standards even when decay is considered.

ORGANIZATION 4 (CONTINUED)

Recommendation: Adjust the concentration and risk values to include radioactive decay.

49 | 34 | v 1, Ap H, p 5-4, li 31-33 | *Problem:* The worker population radiation dose is considered over a 10-year period although workers actually could work up to around 40 years.

50 | *Recommendation:* Age effects and nuances in calculating committed dose should justify looking at the workers' lifetime dose, not just a 10-year block. Consider radiation exposure over the entire work period of the population (as the 50-years for the Maximum Reasonably Foreseeable Accident scenario in the NTS EIS, volume 1, appendix H, page 5-8, line 7), not simply over the 10-year scope of the NTS EIS.

51 | 35 | v 1, Ap H, p 5-5, li 15-17 | *Problem:* The worker population radiation dose is considered over 10-year period although workers actually could work up to around 40 years.

Recommendation: Same as Comment 34, above.

52 | 36 | v 1, Ap H, p 5-5, li 29-31 | *Problem:* The worker population radiation dose is considered over a 10-year period although workers actually could work up to around 40 years.

Recommendation: Same as Comment 34, above.

53 | 37 | v 1, Ap H, p 5-6, li 28-30 | *Problem:* The worker population radiation dose is considered over a 10-year period although workers actually could work up to around 40 years.

Recommendation: Same as Comment 34, above.

38 | v 1, Ap H, p 5-8, li 6 | *Problem:* A total lifetime dose of 281 rem is large and within the scope of the acute 10 rem on which the National Research Council's BEIR V (1990) and the International Commission on Radiological Protection (1991) base the risk slope factor used in the NTS EIS.

54 | I believe the Dose-rate effectiveness factors for radiation at low dose rates (Φ_c and Φ_4 on page B-3) were inappropriately invoked in these instances.

Recommendation: Check the calculations and do not use the Dose-rate effectiveness factors for radiation at low dose rates which effectively increases the risks by a factor of 2.

ORGANIZATION 4 (CONTINUED)

55 | 39 | v 1, Ap H, p 6-1, li 21-22 | *Problem:* The concept of probability is misstated. A probability of 1.0 means that it will definitely happen. A probability of 0.5 means that there is a 50-50 chance of occurrence. A probability between 0.5 and 1.0 I would consider "likely." It is not true to infer that a probability of less than 1.0 is "unlikely."

Recommendation: Remove the concept of probability by deleting the following sentence: "In other words, for each NTS EIS alternative, the probability that a single radiation-induced or chemical-induced health effect will occur in the worker population is less than 1.0." And simply state that "it is unlikely that any workers will contract fatal cancer or other detrimental health effects as a result of exposure to radiation. . . ."

56 | 40 | v 1, Ap H, p 6-1, li 30-32 | *Problem:* The statement that "subsurface migration of tritium in groundwater is not expected to result in measurable tritium concentrations at existing public wells at any time in the future," was contested in Comments 12 and 28, above.

Recommendation: Resolve the issue which may mean changing the conclusion in this statement.

57 | 41 | v 1, Ap H, p B-3, li 14-15 | *Problem:* I believe the Dose-rate effectiveness factor for radiation latent cancer fatality at low dose rates is incorrectly quoted as 2.5. ICRP (1991, p 112) "has decided to recommend that for radiation protection purposes the value 2 be used for the DDREF" (Dose and Dose Rate Effectiveness Factor for low LET radiation). The factor of 2 is also found in the Federal Register (page 23363, 1991).

Recommendation: I believe the incorrect factor was never actually used in calculations, but this should be double-checked as well as the factor for radiation detriment (Φ_d) which I could not find in ICRP (1991).

58 | 42 | v 1, Ap H, p C-21, li 1-11 | *Problem:* Table C-34 reports insignificant and meaningless values. The public has no comprehension for these values and the doses for such risk are well under safe limits.

59 | *Recommendation:* Place values for concentration and dose next to safe and EPA clean standards to give the public an intuitive feel for the insignificance of these risks.

ORGANIZATION 4 (CONTINUED)

References

BEIR V, Biological Effects of Ionizing Radiations, No. 5. "Health Effects of Exposure to Low Levels of Ionizing Radiation," U.S. National Research Council, 1990.

Borg, I. Y., R. Stone, H. B. Levy, and L. D. Ramspott, "Information Pertinent to the Migration of Radionuclides in Ground Water at the Nevada Test Site, Part 1: Review and Analysis of Existing Information," Lawrence Livermore National Laboratory, UCRL-52078 Part 1, May 25, 1976.

Bryant, E. A., and J. Fabryka-Martin, "Survey of Hazardous Material Used in Nuclear Testing," LA-12014-MS, Los Alamos National Laboratory, Los Alamos, NM, 1991.

Chapman, J., K. Pohlmann, and R. Andricevic, "Exposure Assessment of Groundwater Transport of Tritium from the Shoal Site," DOE/NV/11508-01, UC-703, DRI Pub. 45132, April, 1995.

Daniels, J. I., editor, et al. (1993), "Pilot Study Risk Assessment for Selected Problems at the Nevada Test Site," UCRL-LR-113891, Lawrence Livermore National Laboratory, June, 1993.

Federal Register, Rules and Regulations, "Nuclear Regulatory Commission," Vol. 56, No. 98, May 21, 1991.

GeoTrans, Inc., "A Stochastic Advective-Dispersive Transport Code for a Multiple Constituents in Dual Porosity Geological Media," prepared for NTS, 3705-491, April 20, 1995a.

GeoTrans, Inc., "A Fracture/Porous Media Model of Tritium Transport in the Underground Weapons Testing Areas, Nevada Test Site," prepared for U. S. DOE, Nevada Operations Office, August, 1995b.

Hoffman, D. C., "A Field Study of Radionuclide Migration," Los Alamos Scientific Laboratory, 1977 (assumed).

International Committee on Radiological Protection, "1990 Recommendations of the International Commission on Radiological Protection," Publication 60, Pergamon Press, 1991.

McArthur, R. D., "Radionuclides in Surface Soil at the Nevada Test Site," Desert Research Institute, Pub. #45077, August, 1991.

McArthur, R. D., and S. W. Mead, "Nevada Test Site Radionuclide Inventory and Distribution Program: Report #3. Areas 3, 7, 8, 9, and 10, Desert Research Institute, Pub. #45056, 1987.

Pankratz, M., memo to Janet Williedated June 23, 1995, "Selected NTS Underground Inventory Data," from a classified document: LA-CP-94-0222, "Total Radionuclide Inventory Associated with Underground Tests Conducted at the Nevada Test Site," 1955 1992 (U), September 26, 1994 (SRD), authors not given.

Pohlmann, K., J. Chapman, and R. Andricevic, "Exposure Assessment of Groundwater Transport of Tritium from the Central Nevada Test Area," DOE/NV/11508-02, UC-703, DRI Pub. No. 45133, April, 1995.

Teller, E., Better a Shield Than a Sword Perspectives on Defense and Technology, The Free Press, Macmillan, Inc., New York, NY, 1987.

ORGANIZATION 4 (CONTINUED)

Apr-10-96 03:33P DP34 NEPA Office G Palmer 202 586 0282

Department of Energy
Washington, DC 20585

APR . 1996

Mr. W. B. Andrews
Harry Reid Center for Environmental Studies
4505 Maryland Parkway
Box 454009
Las Vegas, Nevada 89154-4009

Dear Mr. Andrews:

When you met with Acting Under Secretary Grumbly and me on April 3, 1996, you discussed an issue with regard to the Environmental Impact Statement (EIS) for the Nevada Test Site (NTS) and Off-site Locations in the State of Nevada, which is being prepared by the Office of Defense Programs (DP) with the cooperation of several other Department of Energy (DOE) offices. Because DP is the lead office for the EIS, I told Mr. Grumbly that I would respond to your comments regarding the calculation of the soil burden of radiation that resulted from the underground nuclear tests conducted at the Nevada Test Site.

You commented that Mr. Anthony Hechanova had not been able to get enough information from the DOE to confirm the results of work on a doctoral thesis. We contacted personnel of the Nevada Operations Office, but have not been able to verify who has been contacted by Mr. Hechanova.

With regard to an evaluation of the calculations by DOE, we have not conducted an evaluation, as no one we contacted at the Nevada Operations Office has seen the model which led to the calculations nor the calculated results.

DOE's current analysis regarding the radiologic inventory is in the draft EIS, which has been with the public since February 2, 1996. Specific references of interest to you would be: pages 4-3 thru 4-9, paragraph 4.1.1, Land Use; pages 4-100 thru 4-111, para. 4.1.4.2, Geology; and pages 4-159 thru 4-163, RADIOLOGIC SOURCES IN GROUNDWATER.

I am aware of your organization's work with studies for the transportation of low level waste for the EIS. We would like to pursue the issues you raised to ensure that the EIS is as accurate as possible. We are reviewing and incorporating comments and questions from the public until May 3, 1996, but to date we have no

Printed with soy ink on recycled paper

ORGANIZATION 4 (CONTINUED)

Apr-10-96 03:34P DP34 NEPA Office G Palmer 202 586 0282 P.03

record of having received comments from you or Mr. Hechanova. ~~Please contact~~ Dr. Donald R. Elle, the Program Manager for the NTS EIS, at 702-295-5844 to further discuss the issues you raised.

Sincerely,

David B. Leclaire
Deputy Assistant Secretary
for Program Support
Defense Programs

cc: T. Grumbly, US
Mary Manning, Las Vegas Sun

ORGANIZATION 5

COMMUNITY ADVISORY BOARD (CAB)

FOR

NEVADA TEST SITE (NTS) PROGRAMS

COMMENT DOCUMENT

FOR THE

NTS DRAFT ENVIRONMENTAL IMPACT STATEMENT

COMMUNITY ADVISORY BOARD

FOR NEVADA TEST SITE PROGRAMS
ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT

May 1, 1996

Dr. Donald Elle, Director
Environmental Protection Division
U.S. Department of Energy
Nevada Operations Office
P.O. Box 14459
Las Vegas, Nevada 89114

Subject: **NEVADA TEST SITE COMMUNITY ADVISORY BOARD (CAB) COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR THE NEVADA TEST SITE (NTS), AND OFF-SITE LOCATIONS IN THE STATE OF NEVADA**

Dear Dr. Elle:

The Community Advisory Board (CAB) for Nevada Test Site Programs was organized to provide input to the Department of Energy (DOE) on issues of importance to those communities and public potentially affected by present and future activities at the NTS and related areas in Nevada. Although the CAB has been tasked with providing input to a number of key DOE documents and processes, perhaps our most significant task to date has been the review and analysis of the ***Draft Environmental Impact Statement (EIS) for the Nevada Test Site (NTS), and Off-Site Locations in the State of Nevada.***

The CAB, therefore, considers the review of the NTS EIS as one of its more important responsibilities. The future role of the NTS and off-sites, discussed in the EIS, are of considerable importance to Nevadans, particularly those in the southern part of the state.

Although CAB members were selected to provide a representative range of citizen viewpoints to the DOE's activities at the NTS, members recognize that we cannot speak for the entire community. To further broaden our understanding of the public's issues on this program, therefore, many CAB participants actively solicited input from other citizen groups or individuals. While we're hopeful that these interactions with others enhance our understanding of community concerns, DOE must also consider carefully other citizens viewpoints.

In addition to our comments, we have also included a discussion of the process that the CAB employed in the review of the document. We're hopeful that this may be of benefit to other Site Specific Advisory Boards and review groups that are participating in similar review activities.

1050 EAST FLAMINGO, SUITE 347 LAS VEGAS, NEVADA 89119

Dr. Donald Elle
May 1, 1996
Page 2

Official review comments were not provided by CAB for two volumes of the EIS. The CAB, for example, relied on comments from Native American groups for Appendix G of the EIS (American Indian Comments for the Nevada Test Site Environmental Impact Statement), Mr. Richard Arnold, CAB member, coordinated the development of the Native American comments found in Appendix G of the EIS.

Likewise, the CAB did not review Appendix H (Human Health and Safety Impacts Study). In Appendix A, the CAB has attached comments from representatives of the Nevada Risk Assessment Management Program (NRAMP). NRAMP members have also submitted these comments independently.

The CAB members are optimistic that DOE will consider carefully the comments, conclusions and recommendations of the CAB. We are concerned, however, that the relatively brief time available between the release of the *Final* EIS, and the publication of the *Record of Decision (ROD)* will not provide sufficient time for DOE to adequately consider and resolve a number of substantive issues. The final ROD should reaffirm a commitment by DOE to continue to work with interested parties until these issues and any others are resolved.

The Community Advisory Board for the Nevada Test Site Programs has appreciated the many interactions that we've had with DOE staff on this extremely important document. The staff that we've dealt with have demonstrated a strong commitment to understand and resolve community concerns. They are to be commended. We look forward to further exchanges in the future.

We look forward to the timely written response to our comments.

Sincerely,

Dale Schutte

Dale Schutte, Chairperson
Community Advisory Board for
Nevada Test Site Programs

Attachment

cc: CAB Members
Ex officio Members
Earle Dixon, UNLV/HRC
Kevin Rohrer, DOE/AMEM
Administrative record

TABLE OF CONTENTS

THE COMMUNITY ADVISORY BOARD FOR NEVADA TEST SITE PROGRAMS ENVIRONMENTAL IMPACT STATEMENT REVIEW PROCESS

Background

The CAB has recognized that the review of the Nevada Test Site (NTS) Environmental Impact Statement (EIS) is one of our most important tasks. The review of an EIS within a public comment period, usually 90 days, however, can be a formidable task.

With voluntary groups such as the Community Advisory Board (CAB) for Nevada Test Site Programs, the review process becomes even more difficult. Besides the rather substantial time required to review a document of this size and complexity, the approval of a final, official statement from the CAB must also clear a number of procedural hurdles. For example, final approval must occur at a noticed meeting with, appropriately, the opportunity for comment by individuals and organizations. To ensure that all CAB members, and others, have the ability to provide informed input to the EIS it also requires the preparation of a draft response document in advance of the final review meeting.

To meet these demands a process was developed, described in subsequent sections, to facilitate a relatively comprehensive review of the EIS.

Definition of Key Program Topics

It was apparent that, because of the size of the EIS document, and the amount of time available for the review of the document, comments from the CAB would, as much as possible, be limited to major issues. Members, however, were encouraged to provide as much detailed comment as possible.

To assist in structuring the review process, key program areas within the NTS EIS were identified, assigned, and reviewed for specific comment. These were determined to be:

1. The four Alternatives presented *(No Action, Expanded Use,* etc.)
2. The five elements evaluated within each alternative *(Defense programs, waste management, environmental restoration, non-defense R & D, work for others)*
3. Other topics covered under separate EIS documents (Native Americans, Health and Safety, Transportation, and Resource Management were included as part of the EIS review).

The Review Process

The process developed was as follows:

1) The EIS Subcommittee, which was organized to evaluate other Environmental Assessments (EA), and EIS's, distributed the workload.

   A. Subcommittees, usually comprising three or four members, were organized to review each of the Alternatives presented in the EIS.
   B. Others reviewed each of the independent documents.
      1. The CAB's Transportation Subcommittee reviewed the *Transportation Study.*
      2. Native American groups evaluated the adequacy of the American Indian document.
      3. A companion study group examined the Health and Safety study.
      4. The EIS subcommittee reviewed the *Framework for Resource Management.*
   C. A common format was developed for the review of the Alternatives.
      1. A matrix was formulated to organize the response of the group.
      2. A comment matrix format was developed so that specific comments could be listed to facilitate review by DOE.

2) The review was completed by the individual groups and synthesized by the EIS Subcommittee.
   A. Several Board members took the initiative of obtaining comments from other citizens or citizen groups.
   B. Opportunity for public input was provided at CAB monthly meetings, and at other DOE public EIS meetings held in several locations in Nevada and one in Utah.

3) Several other CAB committee meetings were held to further refine the final review.

4) The CAB officially approved the document at its May 1, 1996 monthly meeting prior to the end of the Draft NTS EIS comment period (May 3, 1996).

Lessons Learned

In performing the review a number of lessons were learned that can guide the CAB's future actions in evaluating documents. These may be of use to other groups conducting similar reviews. The comments could possibly provide some insight to the DOE in assisting communities in their review efforts.

1) Because of the relatively brief period for public comment, it is important that all available resources be employed, and innovative solutions be considered. This will require assistance from the local DOE office.

2) The DOE should release draft review documents as early as possible. The ability to review the proposed *Transportation Study,* was especially useful for the NTS CAB. In addition to providing more review time, it also provides a greater opportunity for interaction with the DOE staff.

3) A CAB should take advantage of the expertise of other organizations. "Networking" the review with other committees and advisory groups can assist in building the committee's knowledge on issues, as well as ensure substantive review by "experts" on individual topics.

4) Informal meetings should be held with the DOE staff who produce specific studies. The DOE should provide a list of these individuals and make them available upon request. In addition to the potential for a better comprehension of a topical area, informal meetings also provide an early opportunity for the DOE to gain a direct awareness of a citizen or community's viewpoint.

5) The judgements and other assumptions underlying some of the decisions offered should be questioned if necessary. While this seems fairly self-evident the public is often intimidated by "experts." Make sure the experts clearly explain their information and reasons. The intent of an EIS is to develop a document that will provide the average citizen with understable information about issues, which can be used to develop recommendations for choices of action on those issues. With respect to the DOE in preparing a technical review for incorporation in a EIS, try to reflect on whether the information presented will be understandble to the average citizen.

6) Do not assume that all of the issues need to be resolved in the EIS. While it is important that substantive issues be defined during the comment period, the EIS is the first step in toward the resolution of many key issues. The Record of Decision should note those issues requiring further work.

7) Utilize as many of an advisory board's members as possible. Organize board members to review smaller sections of the single large document and then consolidate sections into one collective review document.

8) Complete the review within the allotted time frame. While the federal government often grants extension of time to allow for additional input into NEPA documents, they are generally not required to do so. Complete the review within the allotted time span.

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments – ALTERNATIVE ONE: CONTINUE CURRENT OPERATIONS

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
1	1	pg 3-2, line 26-27	If DOE/NV activities are to continue in the same manner & degree as they have in the past 3-5 years, how will the underground testing program take into consideration & operate with respect to current world political conditions ?
2	2	pg 3-3, line 20-22	If under the second scenario the President directs DOE to conduct underground testing, what is the minimum amount of weapons grade plutonium that needs to be stored at the NTS to adequately conduct testing operations ?
3	3	pg 3-3, line 20-22	If under the second scenario the President directs DOE to conduct underground testing, what is the criteria for determining whether the device is to be detonated at or below the regional static water table elevation ?
4	4	pg 3-3, line 20-22	Should underground testing of a nuclear device at or below the regional static water table elevation be required under the second scenario, how does DOE plan to minimize the possible contamination of the regional aquifer ?
5	5	pg 3-4, line 9-10	If special tests or experiments with special nuclear materials are to be done, is the Tonopah Test Range a candidate for this type of testing, and how will stakeholders be informed & included in the planning to minimize risk ?
6	6	pg 3-3, line 19	Does the destruction of damaged nuclear weapons mean that the weapon will be destroyed by detonation ?
7	7	pg 2-9 thru 2-11	The Greater Confinement Disposal (GCD) program described under the Waste Management program has not been presented to the CAB. When will the CAB receive a presentation on the GCD program?
8	8	pg 2-10, line 11-16	In 1981 DOE adopted the concept of greater confinement burial of high specific activity-low level waste. What document describes the analysis & adoption of this concept, and can the CAB get a copy of this document ?
9	9	pg 2-11, line 11-12	There are 13 greater confinement boreholes already located in Area 5 RWMS, and approximately 1,000 more of these boreholes are needed to dispose of greater than Class C waste in the complex. Is this true and explain ?
10	10	pg 2-10, line 11-16	If NRC requires that Greater-than-Class-C waste be disposed of in a deep geological repository unless disposal elsewhere is approved, shouldn't the proposed Yucca Mtn repository be the place to dispose of this waste type?
11	11	pg 2-10, line 21-23	The definition of greater-than-class C low-level waste for the DOE means it was not commercially generated. When will the DOE educate stakeholders as to the different classes & hazards (ABCs) of low-level waste ?
12	12	pg 2-12, line 22-25	The prioritization of ER activities will gather & consider factors in Table 2-1. How does the DOE plan to demonstrate & convince stakeholders that their concerns will be included & influence the ER prioritization process?

4/9/96: summarized by ECDixon, CAB Technical Advisor

ALTERNATIVE 1: page 1

ORGANIZATION 5 (CONTINUED)

ALTERNATIVE ONE COMMENTS

COMMUNITY ADVISORY BOARD
CAB
NEVADA TEST SITE PROGRAMS

NTS COMMUNITY ADVISORY BOARD COMMENTS ON THE NTS DRAFT EIS, 5/1/96.

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments – ALTERNATIVE ONE: CONTINUE CURRENT OPERATIONS

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
13	13	pg 3-5, line 13-16	DNA ER activities are funded separately from the DOE/NV ER program. What is the funding status of DNA ER activities & what is their schedule for prioritization and cleanup over the 10 year time frame of the NTS EIS ?
14	14	pg 2-22, line 1-2	Is the Area 5 RWMS performance assessment report still on schedule for publication by July 1996 or earlier ? Will the CAB be given a presentation & a copy of the report ?
15	15	pg 2-22, line 16-17	The performance assessment of Area 3 RWMS is ongoing & scheduled for a draft report in September 1997. Will the CAB be given a presentation & a copy of the draft report ?
16	16	pg 3-8, Fig. 3-1	What is the difference between the NTS Boundary Line & the NTS Area Boundary Line ?
17	17	pg 3-8, Fig. 3-1	What is the origin & justification for designating parts or all of the NTS as "Reserved Zone" ?
18	18	pg 8-1, Table 8-3	How does the DOE conclude that environmental impacts under Alternative 1 would be minimal ? Please define minimal land use impact, especially if storage & disposal operations continue ?
19	19	pg 8-32, Table 8-3	Do the approximated volumes of low-level & mixed-waste waste volumes represent the volume of waste to be disposed of at the NTS ? How many shipments of waste does the approximated volumes equal ?
20	20	pg 8-32, Table 8-3	Approximated waste volumes given under Alternative 1 appear to conflict with waste volumes cited elsewhere in the NTS EIS document. Could the summary data be checked for agreement with data cited elsewhere in the text ?
21	21	pg 3-4, line 14-17	Does the description under 3.1.1.2 Waste Management Program mean that DOE ER activities nationwide will continue to generate increasing volumes of waste destined for management and disposal at the NTS ?
22	22	pg 3-40, Table 3-5	Alternative 1: what is meant by, " Because of the location of the sites analyzed, and because similar land uses generally would be located on the borders of the sites, surrounding land uses would not be affected by this alternative " ?
23	23	pg 3-42, Table 3-5	Alternative 1: How does the employment at the NTS relate to the unemployment, personal income, population in 2005, and housing demand in southern Nevada ?
24	24	pg 3-43, Table 3-5	Alternative 1: Please explain how total effects from continuing groundwater withdrawals are expected to be minor. Is it possible to extract more water than the Yucca Flat Basin can yield & what would be the impact ?

4/9/96: summarized by ECDixon, CAB Technical Advisor

ALTERNATIVE 1: page 2

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments – ALTERNATIVE ONE: CONTINUE CURRENT OPERATIONS

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
25	25	pg 3-43, Table 3-5	Alternative 1: What is the environmental impact from a large surface flow event (25, 50, or 100 year flood) at one of the Radioactive Waste Management Sites & how will this impact be mitigated ?
26	26	pg 3-44, Table 3-5	Alternative 1: What is meant by, "...and the region would continue its present attainment designation for all criteria pollutants." ? What about additions to areas in the Las Vegas Valley that have reached non-attainment ?
27	27	pg 3-45, Table 3-5	Alternative 1: Are the environmental impacts to American Indian cultural resources significant or not , and why ? Is Table 3-5 designed to give the reader a view point that cultural resources impacts are not significant ?
28	28	pg 3-46, Table 3-46	Alternative 1: Are the probabilities given for health effects from exposure to tritiated groundwater & an explosion at the Device Assembly Facility real ? Where are these probability calculations explained in the text of the EIS ?
29	29	pg 5-10, Table 5.1-2	Do the average daily traffic (ADT) values noted include vehicles transporting nuclear waste ?
30	30	pg 5-17, Table 5.1-5	Please explain the discrepancy between the number of generator shipments from the 13 sites in the table with the number of inbound shipments from off-site generators for the next 10 years (6,801) on page 5-12, line 14 ?
31	31	pg 5-39 , lins 25-26	Is there off-site monitoring down gradient in the watershed from where the Area 5 RWMS is located (Muddy River area) ?
32	32	pg 5-40, line 21	Where would the 50,000 cubic meters of mixed waste from the 100 DNA sites be stored and disposed ?

4/9/96: summarized by ECDixon, CAB Technical Advisor

ALTERNATIVE 1: page 3

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments – ALTERNATIVE TWO: DISCONTINUE CURRENT OPERATIONS

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
33	1	A-29, line 29-30	What is the projected volume of greater than Class C waste that the EIS mentions here ?
34	2	A-29, line 29-30	With reference to the volume of greater than Class C waste mentioned above, where is the location & source of this waste ?

4/9/96: summarized by ECDixon, CAB Technical Advisor

ALTERNATIVE 2: page 1

ORGANIZATION 5 (CONTINUED)

ALTERNATIVE TWO COMMENTS

COMMUNITY ADVISORY BOARD
CAB
NEVADA TEST SITE PROGRAMS

NTS COMMUNITY ADVISORY BOARD COMMENTS ON THE NTS DRAFT EIS, 5/1/96.

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments -- ALTERNATIVE THREE: EXPANDED USE

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
35	1	pg 3-16, line 5-7	Why are Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley included for evaluation of an expanded Solar Enterprise Zone and part of the NTS EIS ?
36	2	pg 3-45, Table 3-5	Alternative 3: With respect to cultural resources, will Native Americans continue to be involved with survey of sites & monitoring to protect sites from degradation and vandalism, especially when areas are to be disturbed for construction or testing?
37	3	pg S-8, Table S-1	It is very difficult for the reader to compare the 5 major program activities with respect to land use without an estimate of the land area impacted under each activity. Why not give the reader a summary of land use areas in units of the English system ?
38	4	pg S-34, Table S-3	Why does Alternative 3 biological resources impact description not provide the complete impact to natural habitat from the four technologies proposed for the Solar Enterprise Zone ? Please provide bioimpact for each technology.
39	5	pg S-34, Table S-3	What will be the impact to groundwater resources at & down gradient of the NTS if the Solar Enterprise Zone where to be located at the NTS & withdraw 5,550 acre-feet of groundwater ? Will contaminents from underground testing start to move ?
40	6	pg S-34, Table S-3	How will the impacts from ER activities on biological resources be mitigated when most of the additional 3,060 acres could be desert tortise habitat ?
41	7	pg S-34, Table S-3	How many acres of natural habitat would be disturbed or lost for each type of proposed technology for the Solar Enterprise Zone ?
42	8	pg S-31, Table S-3	Why can't airspace over parts of the NTS and Nellis Range Complex be partially delisted so that private & commercial flights can fly shorter, safer routes between destinations ?
43	9	pg S-33, Table S-3	Why hasn't a Soil Conservation Service survey been done at the NTS to determine which soils & locations can sensibly handle increased traffic and disturbances ?
44	10	pg S-35, Table S-3	Why is the government securing all the visual or viewsheds to lockup the mountain tops to the exclusion of other current & potential future uses in the area northeast of the NTS ?
45	11	pg S-34, Table S-3	If the Solar Enterprise Zone where to be located at the NTS & withdraw 5,550 acre-feet of groundwater, will contaminants from underground testing start to move, to what extent, and in what time frame ?

4/9/96: summarized by ECDixon, CAB Technical Advisor

ALTERNATIVE 3: page 1

ORGANIZATION 5 (CONTINUED)

ALTERNATIVE

THREE

COMMENTS

NTS COMMUNITY ADVISORY BOARD COMMENTS ON THE NTS DRAFT EIS, 5/1/96.

ORGANIZATION 5 (CONTINUED)

ALTERNATIVE FOUR COMMENTS

NTS COMMUNITY ADVISORY BOARD COMMENTS ON THE NTS DRAFT EIS, 5/1/96.

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments -- ALTERNATIVE THREE: EXPANDED USE

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
46	12	Figure 3-4	If Alternative 3 were to be implemented, what is there to prevent the return to the public of lands in area 18, 29, & 30 as shown in Figure 3-4 & cited under Alternative 4 ?
47	13		What are the limiting factors for land uses at the NTS created by groundwater consumption at the site ?
48	14		The possibility of future uses of the NTS holds promise for economic development, however, stakeholders are concerned about activities that would introduce new contamination, impact resources, & further degrade the environment. In terms of the actual process of cleaning up NTS land for potential turn back to the public for alternative use, what would be the steps to take NTS lands from a defense activity status to an industrial zone status and could these steps be illustrated with some type of flow chart so that stakeholders understand the process & bureaucracy of trying to cleanup & return lands to the public for an alternative use ?

4/9/96: summarized by ECDixon, CAB Technical Advisor

ALTERNATIVE 3: page 2

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments – ALTERNATIVE FOUR: ALTERNATE USE OF WITHDRAWN LANDS

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
49	1		What is the estimated size of the land to be set aside for the Solar Enterprise Zone ?
50	2		What is the level of existing contamination and subsequent remediation that would have to be performed in order to establish a Solar Enterprise Zone ?
51	3		What type of technology will be used to clean up the land for the Solar Enterprise Zone ?
52	4		To what health risk standard will the land proposed for the Solar Enterprise Zone have to be cleaned up to ?
53	5		What is the estimated cost and time frame for the clean-up, turn back of lands, and construction of a Solar Enterprise Zone ?
54	6		What would be an estimated operating cost for a Solar Enterprise Zone at the NTS ?
55	7		Under the Work for Others Program, how busy would the airspace over the NTS become and what type of aircraft would be flying over the NTS airspace ?
56	8		Would commerical and general aircraft be able to utilize the NTS airspace under the Work for Others Program at the NTS ?
57	9	pg 5-219, line 5	What is the difference between commercial aviation use and general aviation use ?
58	10		What is the current technology being used at the NTS to monitor/control aircraft flights to the site ?
59	11		What upgrades will be necessary to the existing NTS airfield in order to handle enhanced utilization of the facility under the Work for Others Program ? Will more staff also be needed to support more aircraft traffic ?
60	12		What is the estimated operating cost necessary to monitor/control increased air traffic at the NTS airfield ?
61	13		What types of containment casks and vehicle types will be utilized to transport Transuranic/Mixed Transuranic Waste to the WIPP facility in New Mexico ?

4/9/96: summarized by ECDixon, CAB Technical Advisor

ALTERNATIVE 4: page 1

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments – ALTERNATIVE FOUR: ALTERNATE USE OF WITHDRAWN LANDS

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
62	14		What types of containment devices and vehicles will be utilized to transport Low-Level Liquid Waste from their source of generation to a liquid waste treatment facility.
63	15		In the ER program for Nevada, what types of shipping containers and vehicles will be used to transport contaminated soil and materials to the NTS for disposal ?
64	16		Under the Nondefense Research & Development Program & Work for Others Program, please identify the infrastructure upgrade that will be necessary in order to handle the influx of daily trips to and within the NTS ?
65	17		What will be the cost to upgrade the NTS infrastructure in order to handle increased traffic from the Nondefense Research & Development Program & Work for Others Program ?
66	18		Under the Defense Program & Work for Others Program, employment loses would occur at the NTS. How does the DOE plan to assist displaced workers directly and indirectly affected by these programs ?
67	19		Under the ER Program affecting geology & soils, what is the time table for cleaning up sites, the area of the sites, & what will be the clean-up level for the sites ?
68	20		Under the Waste Management Program, what are the safety features designed into the RWMS & when will the Performance Assessment report be completed & copied to the CAB ?
69	21		Under the Waste Management Program, what are DOE's future plans for the safe disposal & final disposition of high explosives in Area 11 ? Are any other areas at the NTS stated for high explosives disposal ?
70	22		After an area is cleaned-up under the ER Program, what is the estimated time for natural plant communities to reestablish themselves at the remediated sites ?
71	23		Under the Nondefense Research & Development Program, how does DOE plan to minimize destruction of the environment around & beneath the proposed Solar Enterprise Zone ?
72	24		Under Alternative 4 activities, will there be any impact to the air quality in & around the NTS ?
73	25		Under Alternative 4 activities, what will be the off-site noise level impacts based on the increase of NTS activities ?

4/9/96: summarized by ECDixon, CAB Technical Advisor

ALTERNATIVE 4: page 2

ORGANIZATION 5 (CONTINUED)

GENERAL COMMENTS

COMMUNITY ADVISORY BOARD
CAB
NEVADA TEST SITE PROGRAMS

NTS COMMUNITY ADVISORY BOARD COMMENTS ON THE NTS DRAFT EIS, 5/1/96.

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments – ALTERNATIVE FOUR: ALTERNATE USE OF WITHDRAWN LANDS

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
74	26		Under the Nondefense Research & Development Program, what are DOE's plan for managing the Solar Enterprise Zone if the zone is located off the NTS at Eldorado Valley, Dry Lake, or Coyote Springs ?
75	27		Will DOE assume all liabilities that would negatively affect the surrounding property values, due to visible obstruction of views & eyesores to the landscapes if the Solar Enterprise Zone is located off of the NTS ?

4/9/96: summarized by ECDixon, CAB Technical Advisor

ALTERNATIVE 4: page 3

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments –GENERAL COMMENTS

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
76	1		Please explain why there is a lack of inter-relationship between the EIS for regular programs and the Yucca Mountain, and Nellis Range Complex projects ?
77	2		Why doesn't the EIS consider or discuss the cumulative impacts of all types of NTS wastes and cleanups?
78	3		How will DOE set priorities on how to manage the NTS with relation to plant and animal population already existing at the NTS?
79	4		What are DOE's priorities in dealing with the NTS?
80	5		Why does the EIS say only NTS in Nye County? Maps in the NTS EIS clearly show Area 13 half in Lincoln County and Area 51, and its "view sheds" in Lincoln County?
81	6		Why isn't the topic of natural resources, in relation to economic, recreational, or social benefits broached?
82	7		How does the DOE consider the goals of the RMP should be established to reach appropriate scales?
83	8		Does the DOE agree that monitoring by stakeholders as a crucial step to predict impacts and find suitable land uses?
84	9	pgs -4-3, sec. 4.2	Why doesn't the DOE provide maps of the facility and other infrastructure features during the comment period? These maps should be available during the comment period, not after.
85	10	sec. 4.5, pgs 4-5	How are future water needs planned for at the NTS?
86	11		Why did the DOE place the "Reader's Guide" in the back of the summary booklet? Does't the DOE want people to be able to find what they are interested in quickly?
87	12		When will the DOE decide on a preferred alternative? Will this be a part of the final EIS? Will the public have an opportunity to collaborate on the final EIS/with the PA?
88	13		Why is the NTS EIS only investigating a 10 year period?

4/9/96: summarized by ECDixon, CAB Technical Advisor

GENERAL: page 1

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments –GENERAL COMMENTS

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
89	14		Why wasn't there much of an analysis of the Tonopah Test Range, Project Shoal Area, and the Central Nevada Test Area?
90	15	pgs 4-9	Did the DOE note that the Nevada Legislature approved the withdrawl of the land for these purposes?
91	16		Why is the engineering notation too common throughout the report?
92	17	pg 4-61	Since the estimated shipment amounts are available in the Transportation Study, why aren't they included to make it more unstandable to the public?
93	18	pgs 4-128, fig. 4-31	Does this indicate that there is contamination off-site? Why aren't the refernce points with respect to the Tonopah Test Range clear?
94	19	pg 3-29	Why are Yucca Mountain construction, operation, and closure beyond the scope of the EIS?
95	20	pgs 3-29	If the MRS expires how would the DOE handle na Interim Storage Facility, as is being proposed by Congress? How would the EIS handle contingencies?
96	21	pgs 3-36	Has the extent of his contamination been mapped? In the fourth paragraph it states "no measurable tritium resulting from the nuclear testing in the area under the control of the USAF or DOE ", what is measurable?
97	22	pgs 3-37	Has the migration of pollutants from Area 3 waste emplaced in subsidence craters been monitored?
98	23	pgs 3-38	Area is adjacent to Clark County and water supplies for Moapa Paiutes and others. Have potential off-site impacts to these areas been taken into consideration?
99	24	pg 4-4	Is this baseline, complete, or was there sole reliance on the 1977 EIS?
100	25	pgs 4-43	301,000 m3 of waste is noted in Area 3, what is the breakdown of the waste?
101	26		Long term monitoring and security is mentioned often, but why is there no mention of a funding mechanism to pay for this long term monitoring program ?

4/9/96: summarized by ECDixon, CAB Technical Advisor

GENERAL: page 2

ORGANIZATION 5 (CONTINUED)

RESOURCE MANAGEMENT PLAN COMMENTS

COMMUNITY ADVISORY BOARD
CAB
NEVADA TEST SITE PROGRAMS

NTS COMMUNITY ADVISORY BOARD COMMENTS ON THE NTS DRAFT EIS, 5/1/96.

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments –GENERAL COMMENTS

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
102	27		Funding is generally year to year and subject to change at the whim of congress. So why can't the government set up an endowment fund (from generator fees or other sources) to ensure that the requirement for long term monitoring and security is met ?
103	28		There is no mention in the NTS EIS, but is colloial movement of radioactivity in water and soils a possible problem in the future ? And how will this type of transport mechanism be mitigated ?
104	29	S-26, line 30-33 & S-27, line 1-9	Hasn't tritium already been detected outside the northwest NTS boundary corner of NTS (Pahute Mesa)? Mr. Doug Duncan stated such at the NTS Community Advisory Board July 1995 meeting ? Please explain.
105	30		Why does the DOE exclude the Yucca Mountain EIS impacts from the NTS EIS ? Shouldn't there be an integrated approach to evaluating all potential impacts from all potential sources in all DOE programs ?
106	31		The comments of the Nevada Risk Assessment Management Program (NRAMP) to the NTS EIS have raised concerns among stakeholders about technical inaccuracies cited in the EIS document. Technical accuracy
			is extremely important in a NEPA type document since it will be relied upon to make policy & program decisions. How will the DOE support their Record of Decision about NTS activities if technical inaccuracies are determined to be significant ?

4/9/96: summarized by ECDixon, CAB Technical Advisor

GENERAL: page 3

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments -- RESOURCE MANAGEMENT PLAN

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
107	1		What is the DOE doing to instill trust in the public ?
108	2		Does the DOE plan to manage the NTS as an environmental showcase ?
109	3		Does the DOE realize that there may be more potential risks with moving contamination, than with leaving it where it is ?
			Does the DOE take a case by case look at each new cleanup operation or cleanup endeavor ? If yes, what are the steps ? If no, why ?
110	4		Is the DOE trying to make more appropriate and compatible goals for the resources at the NTS ?
111	5		Why are the infecture maps missing? Doesn't the DOE realize that this would avoid costly delays and duplicatons ?
112	6		Why is the DOE exempt from state water laws ?
113	7		What is the DOE's definition of "primary mission activities", and it's explanation on how the NTS's future plans fit into this "mission" ? Be specific.
114	8		Does the DOE acknowledge the nuclear testing that sent radiation over Southern Nevada and Southern Utah as adversely affecting the health of residents there ?
115	9		Does the DOE wish to strike a balance between protecting natural resources and allowing existing activities to continue, as well as new uses established ?
116	10		Is the DOE looking at the rest of the NTS to see where plants and animals are now and making plans to maintain these population levels ?
117	11		Does the DOE plan to manage for biodiversity, yet allow plans for future economic development and expansions ?
118	12		Is the DOE going make sure the ecosystem management is not just used as a tool for DOE, DOD, and contractors to keep their jobs ?
119	13		Will the DOE put a practical meaning the tem "how clean is clean" ?

4/9/96: summarized by ECDixon, CAB Technical Advisor

RMP: page 1

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments -- RESOURCE MANAGEMENT PLAN

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
120	14		Does the DOE have a plan to make sure future plans do not worsen the site ? If yes, be specific and explain. If no, why ?
121	15	pg 2-2, Table 2-1	Has a Soil Conservation Service soil survey been done on the NTS ? And if not, why hasn't a survey been done ?
122	16		What is the definition of subsurface water ? How deep is the water and what is the DOE's perception of interconnections of the water basins ?
123	17	pg 2-3, step 3	Why isn't the CAB mentioned as "other interested parties" ?
124	18	pgs 3-4, 3-5	Is there halogeton (sp. *Glomeratus*) on the NTS ?
125	19	pg 3-6, sec. 3.2.5	Why aren't natural resources that are used for economic, recreational or social benefits mentioned ?
126	20		Has the DOE established RMP goals on an appropriate scale ?
127	21		Does the DOE agree that public monitoring is a crucial step to predict impacts and find suitable land uses ?
128	22		Why aren't maps identifying facility and other infrastructure features available ? Shouldn't the maps have been available during the comment period ?
129	23		How do future plans fit into the DOE's "primary mission activities" ?
130	24		How are future water needs of the NTS planned for ?
131	25	sec. 4.11	Does the DOE realize that socioeconomic boundries do not lie totally within the Nye County boarders ? Does the DOE consider Lincoln County ?
	26		
	27		
	28		
	29		

4/9/96: summarized by ECDixon, CAB Technical Advisor

RMP: page 2

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments –TRANSPORTATION

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
132	1	Volume 1, Appendix I	Transportation & all of its issues are of vital concern to rural Nevadans, especially those in Lincoln County which is under consideration for both truck traffic, heavy haul route, or rail shipments.
133	2	pg 2-3, Table 2-1, line 15	Why was a meeting for Lincoln County stakeholders on transportation issues held in Las Vegas at UNLV ? Other affected communities held meetings in their respective communities.
134	3	pg 3-10, line 30	Waste Definitions: This is a place where definitions are provided for comparison & clarity in the EIS. Why is there no comparison for clarity regarding the interrelationship between waste programs/destinations for NTS, Yucca Mtn, & Nellis Range Complex?
135	4	pg 3-14 thru 3-23	If Yucca Mountain becomes the repository for the nation's high level waste, how will that decision affect the potential routes of low level waste into & through all of southern Nevada ?
136	5	C-137 to C-150	With respect to expanded use truck routes & traffic fatality risks, is it safer to route waste around populated areas even though major transportation routes go through heavily populated areas ? Will routing avoid populated areas ?
137	6	pg D-4, line 28-32 & pg D-5, line 4-7	Why is there not an integrated approach between the Yucca Mountain EIS & the NTS EIS ? The NTS EIS can no longer defer to the Yucca Mtn EIS for the integration of transportation issues. The NTS EIS will have to do a its own transportation study that is independent of Yucca Mtn & is able to stand on its own: TRUE or FALSE and please explain ?
138	7	pg F-2, line 30-34	The route described from Crestline to Sheep Springs to Buckboard Draw and to Condor Canyon: does this route make good geographical sense because these places do not line up ?
139	8		Can the DOE explain how the Final NTS EIS & the Record of Decision will discuss the issue of transportation ?
140	9		Why doesn't the DOE take a more "active" role in the transportation decisions ? This is in reference to the specification of routes, criteria & approvals required for deviation from routings & carrier responsibilities.
141	10		Does the DOE feel that the "fast track" pace of the Record of Decision (ROD) gives adequate time for the public to discuss the routing of waste issue & will the ROD emphasize a need for continued dialogue between DOE & the public ?

4/9/96: summarized by ECDixon, CAB Technical Advisor

TRANSPORTATION:page 1

ORGANIZATION 5 (CONTINUED)

TRANSPORTATION COMMENTS

COMMUNITY ADVISORY BOARD CAB NEVADA TEST SITE PROGRAMS

NTS COMMUNITY ADVISORY BOARD COMMENTS ON THE NTS DRAFT EIS, 5/1/96.

ORGANIZATION 5 (CONTINUED)

APPENDIX A.

ORIGINAL COMMENT INFORMATION

NTS COMMUNITY ADVISORY BOARD COMMENTS ON THE NTS DRAFT EIS, 5/1/96.

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments --TRANSPORTATION

	CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
142	11		Does the DOE, local governments, & the state need to work together to define a methodology & criteria for nuclear waste shipments ?
143	12		How did the DOE select the routing alternatives for Nevada ? Routes seem to be weighed more towards the urban areas where rapid growth already affects highways that may be unsuitable for increased traffic flow.
144	13		How will the DOE consider the transportation of low level waste with respect to high level waste if interim storage becomes a reality for Area 25 at the NTS ?
145	14		Given the number of sites that plan to ship waste to the NTS for disposal based on information given in the WMPEIS, does the DOE accurately know how many shipments of waste are actually slated for the NTS ?
146	15		Areas on the Nellis Range adjacent to Area 51 are being considered for shipments of nuclear waste with respect to the Yucca Mountain program. Since this area is classified & has an active training mission, is this route an option for the NTS EM program ?
	16		
	17		
	18		
	19		
	20		
	21		
	22		
	23		

4/9/96: summarized by ECDixon, CAB Technical Advisor

TRANSPORTATION:page 2

ORGANIZATION 5 (CONTINUED)

These comments were incorporated in previous Organization 5 responses.

Memorandum

To: CAB EIS Subcommittee

From: Alternative 1 Committee

Date: April 4, 1996

Subject: Preliminary NTS EIS Comments

The Alternative 1 Committee (Diane Cravotta, Connie Simkins, Joanne Stockhill, and Jim Henderson) and Earle Dixon did not formally meet to develop comments. Diane and Earle did meet on 4/3/96 from 2:30-4:30 pm to discuss the development of EIS comments using the spreadsheet format. Connie gave some written comments for Alternative 1 to be included in the committee's work. Diane talked with Joanne about her comments and these are also included. Jim Henderson relinquished his responsibility to comment since he was an author of the EIS.

PRELIMINARY COMMENTS

A1.1 Defense: under scenario one, the EIS states that underground testing activities would continue as they were 3-5 years ago. Readiness to test under this alternative should be planned with consideration of current, world political conditions that have changed over the past 3-5 years.

A1.2 Defense: (occupational & public health & safety) If under scenario two the President directs the DOE to resume underground testing, the amount of nuclear bomb material (weapons grade plutonium) stored at the NTS should be minimized.

A1.3 Defense: If under scenario two the President directs the DOE to resume underground testing, there should be no testing of nuclear weapons at or below the water table.

A1.4 Defense: (occupational & public health & safety) page 3-4, sentences 9-10, if special nuclear materials testing is to be done at the Tonopah Test Range, then stakeholders must be informed and included in the planning to ensure containment and minimize impacts to the public..

ORGANIZATION 5 (CONTINUED)

A1.5 Geology/Soils: seismic motion, disturbance, and contamination negatively impact the environment during underground test activities of the Defense Program.

A1.6 Defense: under the first scenario, the destruction of damaged nuclear weapons should be clarified so that stakeholders do not think that damaged weapons may be destroyed by detonation at the NTS.

A1.7 Waste Management: the Greater Confinement Disposal pilot program should be presented to stakeholders and the implications for greater than class C waste to be managed at the NTS.

A1.8 Waste Management: stakeholders need to be educated about the different classes of LLW especially greater than class C waste as part of any public involvement plan for waste management.

A1.9 Environmental Restoration: the prioritization of CAUs should agressively involve stakeholders in the process.

A3.10 Environmental Restoration: stakeholders should be presented with the plan and calendar of events for the cleanup of DNA CAUs.

A1.11 Cultural Resources: Native American consultation and involvement with EM programs at the NTS should continue on a regular basis.

ORGANIZATION 5 (CONTINUED)

Memorandum

To: CAB EIS Subcommittee

From: Connie Simkins

Date: April 3, 1996

Subject: NTS EIS Comments on Alternative 3

Connie Simkins comments for Alternate 3

Affected Environments

Land Use and Airspace

We believe that the airspace should be partially delisted so that private and commercial flights can fly shorter, safer routes passing over NTS and Nellis Range Complex. This is a coming thing with FAA to un-restrict flight paths to give pilots freedom to chose own routes, elevations to use short cuts and avoid storms.

Transportation and Waste Management

Each program should be interconnected or integrated. Each shipment and truck affects each other program such as NTS ongoing activities trucks and Yucca Mountain activities and Nellis Range complex trucks all affect the same environment and should be considered a part of the whole picture.

Socioeconomics

Put man as top priority, employment, technology and scientific research. Do not destroy any plant life now present but do not manage for an environmental showcase that excludes man's top priority.

Geology and Soils

Prepare a detailed soil survey such as is done by Soil Conservation Service which will reveal which soils and locations can sensibly handle increased traffic and disturbances.

Survey Hydrology and Groundwater

Make top priority for available water to economic development and research and technology.

Connie Simkins NTS EIS Preliminary Comments, 4/3/96

1

ORGANIZATION 5 (CONTINUED)

NTS Community Advisory Board Draft NTS EIS Comments – ALTERNATIVE TWO: DISCONTINUE CURRENT OPERATIONS

CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
1	A-29 line 29130	WHAT IS THE PROJECTED VOLUME OF GREATER THAN CLASS C WASTE MENTIONED HERE?
2	A-29 line 29130	(>CLASS C) WHERE IS THIS WASTE COMMING FROM AND WHAT
3		IS ITS HIGH SPECIFIC ACTIVITY LEVEL?
4		LONG TERM MONITORING AND SECURITY IS MENTIONED OFTEN
5	GENERAL	BUT THERE IS NO MENTIONING OF FUNDING TO PAY FOR THIS. FUNDING IS GENERALLY YEAR TO YEAR AND
6		SUBJECT TO CHANGE AT THE WHIM OF CONGRESS. WHY CAN'T THE GOVERNMENT SET UP AN ENDOWMENT FUND
7		(FROM GENERATOR FEES OR OTHER SOURCES) TO INSURE THAT THE REQUIREMENT FOR LONG TERM MONITORING & SECURITY IS MET?
8		
9		THERE IS NO MENTION in The EIS, but is Colloidal movement of RADIOACTIVITY IN WATER AND SOILS
10		A possible problem in the FUTURE?
11	S-26 line 30-33	HASN'T TRITIUM ALREADY BEEN DETECTED OUTSIDE THE NORTHWEST CORNER OF NTS?
12	S-27 line 1-9	NTS Boundary

CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
13		WHY DOES THE DOE EXCLUDE THE YUCCA MOUNTAIN EIS IMPACTS FROM THE NTS EIS?
14		
15		

4/8/96: summarized by ECDixon, CAB Technical Advisor

ALTERNATIVE 2: page 1

ORGANIZATION 5 (CONTINUED)

Page 2 of Connie Simkins comments for Alternative 3:

Biological Resources
Again protect what is presently in healthy condition at NTS, do not manage for an environmental showcase. Use reason and prudence in priorities.

Air Quality and Climate
Continue to monitor and adjust on a case-by-case basis viewing man and new technology as top priority.

Noise
Expanded uses will contain more noise levels, probably not to an unacceptable level, just an increase in what is there today. This expansion of noise levels is acceptable as monitored and adjusted site specific.

Visual Resources
Do not obtain visual or viewsheds to lockup the mountain tops to the exclusion of other current and potential future uses. Locking up viewsheds should not be done.

Cultural Resources
Restrict collections and studies by students and researchers unless specific and managed by Native American tribes consensus.

Occupational and Public health and safety
Maintain current programs for monitoring air and water and soil movements and changes. Keep in effect training and common sense to guard everyone's safety while learning how to more effectively use what we know to be safe at NTS

Bill - call me if you have any questions. Thanks.

ORGANIZATION 5 (CONTINUED)

Memorandum

To: CAB EIS Subcommittee

From: Alternative 3 Committee

Date: March 26, 1996

Subject: Preliminary NTS EIS Comments

The Alternative 3 Committee (Bill V., Richard N., Chris B., & Frank T.) and Earle Dixon met on 3/25/96 from 3-5 pm to discuss their part of the EIS document. The committee input was generated from Bill, Richard, and Earle. Chris left at 4 pm and Frank Tussing was not informed of meeting but was out of town. Chris said he would provide input later. A call is in to Frank to get his input.

PRELIMINARY COMMENTS

A3.1 Visual Resources: the solar program would have the greatest, negative impact on this part of the environment. Based on impact to the visual resource, it is preferable to locate the solar program at the NTS.

A3.2 Cultural Resources: all activities under Alternative 3 appear to impact Native American cultural resources in some manner. Native American people should be involved and consulted in programs of major land disturbance so they can monitor their sites and manage the protection of their heritage as much as possible.

A3.3 Land Use: a cumulative comparison table of the five major program categories and their calculated land use areas and affected environment areas is needed for the reader to understand the land use impacts of Alternative 3.

A3.4 Land Use: the solar program if located at the NTS offers the greatest, negative impact on this part of the environment because of the loss of natural habitat. Location of the solar program at the NTS is the least advantageous of the proposed sites. Location of the solar program in a dry lake bed will have less of an impact on existing land use and existing natural habitat.

ORGANIZATION 5 (CONTINUED)

FROM : Panasonic FAX SYSTEM PHONE NO. : Apr. 25 1996 11:33AM P2

NTS Community Advisory Board Draft NTS EIS Comments -- ALTERNATIVE THREE: EXPANDED USE

CAB comment #	Location and/or line no. in EIS doc.	NTS CAB COMMENT
1	pg 3-16, line 5-7	Why are Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley included for evaluation of an expanded Solar Enterprise Zone and part of the NTS EIS ?
2	pg 3-45, Table 3-5	Alternative 3: With respect to cultural resources, will Native Americans continue to be involved with survey of sites & monitoring to protect sites from degradation and vandalism ? Will they be consulted whenever and development areas are about to be disturbed for construction or testing? ✓
3	pg S-8, Table S-1	It is very difficult for the reader to compare the five major program activities with respect to land use without an estimate of the land use area impacted under each activity. Why was the reader not given a summary of land use areas ? Why can't all units be in the English system with metric following in parens — It's too much to expect the general public to [illegible] but [illegible] they are familiar with and understand.
4	pg S-34, Table S-3	Why does Alternative 3 biological resources impact description not provide the complete impact to natural habitat from the four technologies proposed for the Solar Enterprise Zone ? Please provide bioimpact for each technology.
5	pg S-34, Table S-3	What will be the impact to groundwater resources at & down gradient of the NTS if the Solar Enterprise Zone where to be located at the NTS & withdraw 5,550 acre-feet of groundwater ? Will contaminants from underground testing start to move and if so to what extent (concentration) and how far (distance) and in what time frame ✓
6	pg S-34, Table S-3	How will the impacts from ER activities on biological resources be mitigated when most of the additional 3,060 acres could be desert tortoise habitat ?
7	pg S-34, Table S-3	How many acres of natural habitat would be disturbed or lost for each type of proposed technology for the Solar Enterprise Zone ?
8	pg S-31, Table S-3	Why can't airspace over parts of the NTS and Nellis Range Complex be partially delisted so that private & commercial flights can fly shorter, safer routes between destinations ?
9	pg S-33, Table S-3	Why hasn't a Soil Conservation Service survey been done at the NTS to determine which soils & locations can sensibly handle increased traffic and disturbances ?
10	pg S-35, Table S-3	Why is the government securing all the visual or viewsheds to lockup the mountain tops to the exclusion of other current & potential future uses in the area northeast of the NTS ?
11		IF THIS ALT. IS IMPLEMENTED WHAT IS THERE TO PREVENT THE RETURN TO THE PUBLIC OF THE FOLLOWING AREAS: 18, 29 & 30 AS SHOWN IN FIG 3-4 AND CITED IN ALT. #4 FOR FUTURE USES ✓
12		

4/8/96: summarized by ECDixon, CAB Technical Advisor — ALTERNATIVE 3: page 1

WHAT ARE LIMITING FACTORS CREATED BY WATER CONSUMPTION? ✓

ORGANIZATION 5 (CONTINUED)

A3.5 Geology/Soils: seismic motion, disturbance, and contamination negatively impact the environment during underground test activities of the Defense Program. The solar program would also disturb a significant amount of the soils at the NTS.

A3.6 Surface Hydrology/Groundwater: the estimated water supply demands of the solar program if located at the NTS would negatively impact the groundwater system which is inadequate to meet the program needs. Large volume groundwater pumpage at the NTS over a long period of time also creates concern about flow paths and transport of contaminants.

A3.7 Biological Resources: impacts to this environment are observed in the ER program and the solar program. The ER program would disturb approximately 7,200 acres of habitat during cleanup and then make it available for some future land use. The solar program would disturb 2,400 acres of habitat and the land would not be available for any other use except solar.

A3.8 Transportation: under Alternative 3 the existing NTS roads can handle the increase in traffic. Non-NTS roads with an F class rating, particularly the Hoover Dam route are the least preferred route for waste shipments to the NTS.

A3.9 Socioeconomic: Alternative 3 has the greatest positive, socioeconomic impact and the most potential for socioeconomic return to the community of the four alternatives.

A3.10 Hybrid Alternative Recommendation: the activities proposed under Alternative 3 should include an area that is restored and made available for potential turn back to the public. This area would encompass Areas 18, 30, and 29 in Figure 3-4, page 3-24 which would be included in Figure 3-3, page 3-18.

ALTERNATIVE 3 COMMITTEE Preliminary Comments, 3/25/96.

2

ORGANIZATION 5 (CONTINUED)

To: CAB EIS Subcommittee

From: Alternative 4 Committee

Date April 19, 1996

Subject: 2nd Preliminary NTS EIS Comments

2nd Preliminary Comments

A4.1 Land Use/Airspace:

* Under the Nondefense Research & Development Program, Land areas previously designated as nuclear test zones and nuclear and high explosive test zones would be designated as Nondefense Research and Development Program testing zones. If the new Solar Enterprise Zone activities are to occur at the NTS, the following questions will apply:

1. Identify the estimated size of land to be set-aside for the SEZ.

2. Identify the level of contamination to the proposed land site(s):
   - Type of contaminated materials
   - Depth of subsurface contamination

3. Identify the specific technology and equipment that will be used to cleanup the proposed site(s).

4. Identify the level of "how clean is clean" will the proposed site(s) be for the construction and operation of the SEZ.

5. Identify the estimated time-frame & cost for the following:
   - Cleanup of the proposed site(s)
   - Construction and development of the SEZ
   - Annual operational cost of the SEZ

* Under the Work for Others Program, the restricted airspace that overlies the NTS would be relinquished and would be available for commercial and general aviation use.

1. Identify the average number of flights per week, associated with the Defense Program and the Work for Others Program, that utilize the airspace over the NTS and the surrounding communities for the fiscal years 94',95' and 96'.
   - Identify the size of aircrafts; Class of aircrafts: And type of aircrafts, associated with the Defense Program and Work for Others Program

2. Identify the estimated number of commercial and general aircraft that are anticipated to occupy the airspace over the NTS and the surrounding communities on a weekly basis.
   - Identify the size of aircraft(s); Class of aircraft(s); And types of aircraft that will be permitted to occupy the airspace over the NTS and land at the NTS.

ORGANIZATION 5 (CONTINUED)

3. Per Volume 1, Chapters 1-9, Part B, page 5-219, line 5: describe the difference between commercial aviation use and general aviation use.

4. Identify the current technology being used at the NTS to monitor/control aircraft occupying airspace and landing at the NTS.
   Also, identify the category of flight controllers and the number of flight controllers and support staff at the NTS.

5. Identify the anticipated enhancements to the current technologies that will be needed at the NTS to monitor/control future aircraft occupying airspace and landing at the NTS. Also, identify the anticipated number of flight controllers and support staff required for the new influx of aircrafts.

6. Identify the estimated annual cost to monitor/control aircraft occupying airspace and landing at the NTS.

A4.2 Transportation/Waste Management:

* Under the Waste Management Program, identify the types of containment casks and the type of vehicles that will be used to transport Transuranic Waste/Mixed Transuranic Waste off-site to the WIPPs facility.
Also, identify the types of containment apparatus and type of vehicles that will be used to transport Low-Level Liquid Waste/Mixed Liquid Waste from their source of generation to the Liquid Waste Treatment Facilities.

* Under the Environmental Restoration Program, identify the types of containment apparatus and type of vehicles that will be used to transport contaminated soils and materials to storage and disposal facilities at the NTS.

* Under the Nondefense Research & Development Program, it is anticipated that a substantial increase in traffic will occur at the NTS.

1. Identify the proposed infrastructure development and enhancements that will be needed in order to handle the major influx of daily trips within the NTS.
   Also, identify the associated cost relative to the infrastructure development.

* Under the Work for Others Program, it is anticipated that a substantial increase in traffic will occur at the NTS.

1. Identify the proposed infrastructue development and enhancement work that will be needed in order to handle the major influx of daily trips at the NTS.

ORGANIZATION 5 (CONTINUED)

A4.3 <u>Socioeconomics:</u>

* Under the Defense Program and the Work for Others Program employment loses would occur affecting both direct and secondary jobs.

1. Identify DOE's contingency plans for picking up those displaced workers in an effort to reduce and /or eliminate the unemployment rate.

A4.4 <u>Geology & Soils:</u>

* Under the Environmental Restoration Program, the activities are anticipated to result in adverse impacts to geologic media, processes and/or resources. Based on the Defense Program, Waste Management Program, and Work for Others Program, the geology & soils would be negatively impacted if environmental restoration activities were not forthcoming quickly to avoid any increase in soil erosion and contaminated dust from infiltrating the surrounding areas.

1. Identify the areas or locations that will be selected for environmental restoration.
2. Identify the sq. miles that will be cleaned up and restored.
3. Identify the time-table, estimated start/completion dates, for cleaning up and restoring each area or location.
4. Describe the technology and equipment that will be used for site(s) clean up.
5. Identify the level of how clean is clean for each location.

A4.5 <u>Surface Hydrology & Groundwater:</u>

* Under the Waste Management Program, identify the safety features emplaced to prevent the storage and processing of Low_Level and/or Mixed Liquid Waste from migrating into the groundwater.

A4.6 <u>Biological Resources:</u>

* Under the Waste Management Program identify DOE's near future plans, for the development of new methods for the safe and environmentally sound disposition of high explosives in area 11 and other possible areas at the NTS.

* Under the Environment Restoration Program, identify the process to be used and the length of time it would take for DOE to revegetate an area after the cleanup is complete.

ORGANIZATION 5 (CONTINUED)

* Under the Nondefense Research & Development Program, identify DOE's precautionary steps to minimize the destruction of the ecosystem within the proposed Solar Enterprise Zone.

A4.7 <u>Air Quality & Climate:</u>

* Under the five programs, identify to what level the air quality will be affected.

A4.8 <u>Noise:</u>

* Under the five programs,identify the off-site noise level based on the increase of NTS activities.

A4.9 <u>Visual Resources:</u>

* Under the Nondefense Research & Development Program, identify DOE's plans for managing the SEZ, if the zone is located off-site at either Eldorada Valley, Dry Lake, or Coyote Springs.

Will DOE assume all liabilities that would negatively affect the surrounding property values, due to visible obstruction of views and eyesores to the landscapes.

ORGANIZATION 5 (CONTINUED)

Connie Simkins comments on Volume 2 Framework for Resource Management Plan
January 1996 draft EIS for NTS
March 1, 1996

There is a public perception that there is no difference between the Air Force, Department of Energy, Bechtel, or BLM. They are all thought of a "government". All of these have maintained a certain level of secrecy in their operations about what was being done at NTS. Perfect example is Area 51. Much of the public opinion comes from the treatment of the persons who contracted cancers because of the above ground nuclear testing that sent radiation over Lincoln County adversely affecting the health of residents here.

We were told the test were "safe" yet we still have people dieing of radiation related reasons. People who were employed on areas of the test site were kicked off, miners, hunters, ranchers, casual uses completely stopped. We were told in the beginning that the restrictions would last only as long as the military needed the area from training for World War II. Well we all know how long ago that was over and the military and DOE still have control over the NTS area, plus they are extending that control to include the "view shed" concepts in many areas.

I think we must be most careful in setting priorities on how to manage NTS. There should be a direct balance between protecting the natural resources on NTS and allowing the existing activities to continue and new uses to be established. Man should have first priority, technology development and related economic development should be emphasized.

Do not manage for an environmental showcase. Take a look at where the plant and animals species are now and how healthy these populations are. Alternative 1 says the Pahute Mesa and Yucca Flat areas will continue to be used for "weapons readiness" tests. Ok then look at the rest of the NTS and see where the sensitive plants and animals are now and make plans so these populations will maintain healthy levels, not expanded, not eliminated, - a true balance as nature intended it.

It is OK to manage for biodiversity but put a sense of reality into the plans to allow future economic development and expansions. Make sure ecosystem management is not just a tool for DOE, Bechtel, DOE to save their jobs. A lot of paperwork, studies, reviews, plans, and shuffling can go into a complicated ecosystem management. Put common sense into it. Make it real. We must put in a practical sensible function of "how clean is clean". Make sure future plans don't make things worse by trying to clean something up and move it, rather than dealing with it safely on site. Take things on a site by site and case by case basis, rather than painting the whole NTS operations by a broad brush that must be "ecosystem" managed to the detriment and elimination of jobs and chances to develop new ideas to help people.

ORGANIZATION 5 (CONTINUED)

Page 2-3 Table 2-1 Resource Issues

Under Land category - has a USDA Soil Conservation Service soil survey been done on NTS? This information would apply here if available.
Water category - what is definition of subsurface water - how deep - what is DOE perception of interconnection of basins of water?
Page 2-3 Step 3 management actions
Include the CAB on lines 24 and 26 as "other interested parties".
Section 3.2 characteristics of environment
pages 3-4 and 3-5 tell us that no species have been destroyed to date as a result of operations at NTS and no plant species are endermic (prevalent in or peculiar to an area) at NTS. This supports my earlier suggestion to manage the area on a site by site specific basis. Look at what is there, mange to keep it while allowing current and future uses to flourish. Is there halogens at NTS?

Page 3-6 section 3.2.5. use of natural resources at NTS
It says not mush of the natural resources are used for economic, recreational or social benefits. This is because people have not been allowed on NTS.

RMP goals should be established at appropriate scales. Agree we should develop compatibility goals for resources of greatest importance and most likely to be affected - man - business - status quo priorities. Agree monitoring is crucial step to predict impacts and find suitable land uses.

Question: Page 4-3 section 4.2 site support activities. When will the maps identifying facility and other infrastructure features be available?

Question: Section 4.5 Water page 4-5 Why is DOE exempt from State water law. Define what the primary mission activities are? How do future plans fit into the DOE "primary mission activities" ? How are future water need planned for?

Section 4.10 Airspace - With the ban of nuclear tests both above and below ground, I see no need to maintain restriction over NTS. Yes, I support restriction during times of active training at Bombing Range. This is necessary and desirable. But let the pilots, private and commercial fly over NTS. The big lid of secrecy is off now. Travel times and expenses would be greatly enhances if pilots did not have to detour around NTS.

Section 4.11 Socioeconomic page 4-8. NTS is not located entirely within Nye County. Area 13 straddles the Nye Lincoln line and Area 51 is in Lincoln County, plus all the "viewsheds" taken out of public land status recently are in Lincoln County. This is a use solely connected to NTS and lies in Lincoln County.

Connie Simkins - comments about Management Framework Plan for NTS EIS
March 15, 1996

DOE must build the people's trust in government. The general public sees DOE, NTS contractor, BLM, Air Force, all as "government" and not to be trusted. I attended the NTS EIS public comment meeting in St. George, Utah on March 5, 1996. Eleven people offered public comments, ten were distrustful of DOE. One resident offered the suggestion DOE build a new freeway from Atlantic to Pacific that skirted around all major population centers, specifically avoiding Virgin River gorge, and routed across Lincoln County to NTS for transportation of all kinds of wastes and operations at NTS.

Put together plans that views man as top priority, technology development, economic development. Maintain NTS for what is there now. Do not manage for a environmentally clean showcase. Some cases it cases more problems and health risks to move the contamination than to cover it over where it is now. Put common sense into all dictions on biodiversity. Take a case by case look at each new operation or cleanup endeavor.

Make appropriate and compatible goals for resources at NTS, again putting Man at the top of the list, followed by business and maintaining the status quo.

The MFP is missing the infrastructure maps. Imperative that information be included on what is there now to avoid costly delay and duplications.

Why is DOE exempt from state water law. I recommend we get a definition of "primary mission activities", and an explanation on how NTS future plans fit into this "mission". Be specific.

Airspace - new technology being introduced that will allow pilots to fly where they want to maximize weather conditions and flight times. I realize ongoing training at NTS and Nellis range must continue. Develop a system that identifies for pilots when operations are not going on so commercial and private flights can take advantage of the shortcuts over top of NTS.

Transportation - develop a specific contract for every shipment going into NTS, routes, stops, liabilities, insurances, responsibilities, and accountabilities.

ORGANIZATION 5 (CONTINUED)

Memorandum

To: CAB EIS Subcommittee

From: Connie Simkins

Date: April 3, 1996

Subject: Preliminary NTS EIS Comments on Transportation

---

1. Transportation is the number one issue of concern for rural Nevada.

2. There is no inter-relationship between the ongoing EISs: NTS EIS, Yucca Mountain Project (YMP), and Nellis Range Complex (NRC) EIS. The outcome of the Record of Decision and implementation of the NTS EIS alternatives will affect the other EISs. It is important to relate to other EISs affecting the NTS and the surrounding lands.

3. The strong political influence from the Clark County population will influence the routing and corresponding risk factors for transportation such that waste will be routed outside of the Las Vegas Valley on its way to the NTS. The rural areas of Nevada do not have the political clout to affect the routing of waste through the state.

3. The backroad into the northeast corner of the NTS should be further improved by paving to benefit travel conditions, time, and safety for workers and the communities.

4. The transportation study with respect to the NTS EIS can not be deferred to the YMP transportation study. The NTS EIS has to include the cumulative impact from the NTS, YMP, and NAFR transportation issues. There has to be an integrated approach to all transportation issues in and around the NTS.

5. Rail access study described on pages F-2 and F-3 is erroneous. The proposed route for rail from Crestline to Sheep to Panaca to Condor Canyon does not make geographical sense.

6. The transportation study should make sure it includes the study and numbers of Lincoln County residents that commute to the NTS by the backroad (Gate 700). The study should also not forget Nye County residents that commute to the NTS.

ORGANIZATION 5 (CONTINUED)

Page 2 of Connie Simkins comments on transportation in NTS EIS:

7. Develop a specific contract for each waste shipment to the NTS that identifies, routes, stops, liabilities, insurances, responsibilities, and accountabilities.

8. Alternative 1 does not reevaluate the current weapons testing requirements of the nation as they are today. The alternative proposal may be out of sync with today's conditions.

Connie Simkins NTS EIS Transportation Preliminary Comments,4/3/96.

2

ORGANIZATION 5 (CONTINUED)

CLARK CO. NUC WASTE TEL:702-455-5190 Apr 08'96 7:20 No.002

05 April 96

To: CAB EIS Subcommittee
From: Dennis Bechtel, Member
Transportation Subcommittee

Subj: NTS EIS TRANSPORTATION STUDY

These are a synthesis of comments on the Transportation Study for the NTS EIS. Connie, Richard and I talked several weeks ago, and Connie provided a comprehensive review of the document. I have also included some discussion-only comments from the Transportation Protocol group (discussion only because this group will meet on April 11th and the recommendations thus have not been finalized).

1. Transportation is the perhaps the most important issue to Nevada associated with the EIS. Both rural and urban Nevadans have concerns about the numbers of shipments, the routes being taken, and the potential risk to the health and safety of the public.

2. DOE is to be commended for considering the transportation issue in conjunction with the EIS. Its obviously difficult to isolate decisions of routing, risk, emergency preparedness, and others with the on-going or proposed alternatives at the NTS

3. It is uncertain how the Final EIS and the Record of Decision will discuss the issue of transportation. The Final EIS, however, needs to discuss how transportation decisions will be made, how they will be treated in the Record of Decision, and similar.

4. DOE should take an "active" role in transportation decisions. DOE should utilize the "contract carrier" option and by contract specify routes, criteria and approvals required for deviation from routings and carrier responsibilities. DOE has had a good recent record in transporting waste with respect to minimizing accidents. With the probable increase in the number of shipments, however, DOE needs to have greater control over the carriers.

5. Routing issues will be considered carefully by the public. Given the proposed schedule for the release of the Record of Decision appears to be "fast track" it is important that sufficient time be given to deliberating this issue. The ROD, therefore, needs to state that DOE should continue to work with the local governments until transporation issues such as routing are resolved.

6. DOE and the local governments (the State should also be involved) should work together to define a methodology and criteria for nuclear waste shipments. Important considerations are population density, potential for accident, presence of sensitive areas (e.g. human and environmental) and similar.

ORGANIZATION 5 (CONTINUED)

CLARK CO. NUC WASTE TEL:702-455-5190 Apr 08'96 7:20 No.002 P.03

7. DOE should specifically address the need for enhanced emergency response capabilities especially in rural areas. DOE needs to be sensitive to the needs of rural areas especially those that rely on volunteers.

8. DOE needs to explain how the routing alternatives were selected for Nevada. The routes seem to be weighted more towards the urban areas. With the rapid growth in Clark County its difficult to understand the rationale for assuming that routings that include Hoover Dam, the "Spaghetti Bowl" (notably with the current long-term construction being initiated), and roads such as Craig and Rancho, which are experiencing substantial residential development, are reasonable transportation options.

9. The NTS EIS needs to consider potential transportation impacts (cumulative affects) from the Yucca Mountain program. As you're aware, Congress is considering the use of Area 25 for the interim storage of civilian nuclear waste perhaps as early as 1998. This will have a potentially great cumulative impact on the LLW shipments being considered in this campaign.

10. With respect to other sites considering the NTS for the storage, treatment or disposal of nuclear waste, it is uncertain, especially with respect to those in the Waste Managment Program, how many shipments of waste are actually slated for the NTS.

11. There is need to correct the erroneous geographical information found on F-2 and F-3. This information should be corrected with the assistance of local representatives.

12. Areas on the Nellis Range adjacent to "Area 51" are being considered for shipments of nuclear waste with respect to the Yucca Mountain program. With the realization that this is a "classified" area, and has an active training mission, is this an option for the transport of the waste in the EM program? The document needs to speak to this since the issue is on the table, and at least in one DOE document, this has been mentioned as a potential option, if it is constructed, for the transport of all shipments.

ORGANIZATION 5 (CONTINUED)

APPENDIX B.

NEVADA RISK ASSESSMENT MANAGEMENT PROGRAM (NRAMP) COMMENTS

COMMUNITY ADVISORY BOARD

CAB

NEVADA TEST SITE PROGRAMS

NTS COMMUNITY ADVISORY BOARD COMMENTS ON THE NTS DRAFT EIS, 5/1/96.

ORGANIZATION 5 (CONTINUED)

UNLV

April 29, 1996

To: Earle Dixon, Technical Advisor to the Community Advisory Board

Bill

From: Bill Andrews, PI, Nevada Risk Assessment/Management Program

Subject: NRAMP Comments on the NTS-EIS Risk Assessment

As per the request of the CAB at their March meeting, I have enclosed comments from Tod Johnson, Tony Hechanova and myself of the NRAMP team. Tony made a presentation to the CAB at your April 13, 1996 meeting in Amargosa Valley Nevada to summarize his and Tod's comments. The handout from the CAB presentation may also be useful in compiling a summary statement from the CAB. My comments are similar to those made by the NRAMP on the Waste Management Programmatic Environmental Impact Statement.

Please understand that these comments come from individual NRAMP technical team members with the perspective of our own risk assessment objectives and a review of extensive data sets related to the NTS. These comments do not reflect a project position as they have not been approved by the NRAMP working group. Given the pressure of completing our Preliminary Risk Assessment, we do not plan to make a presentation on the NTS-EIS to the working group. As was previously agreed, the CAB will submit these comments as their own and are free to use them is developing recommendations to the DOE for modifications to the NTS-EIS.

We would be pleased to respond to any additional specific requests that you have.

Harry Reid Center for Environmental Studies
4505 Maryland Parkway • Box 454009 • Las Vegas, Nevada 89154-4009
(702) 895-3382 • Telex 62048164 UNLV/MSM • FAX (702) 895-3094

ORGANIZATION 5 (CONTINUED)

These comments were incorporated in previous Organization 5 responses.

UNLV

April 17, 1996

Dr. Donald R. Elle, Director
Environmental Protection Division
US Department of Energy
PO Box 14459
Las Vegas, NV 89114

Dear Dr. Elle:

I am submitting comments prepared by the Nevada Risk Assessment / Management Program (NRAMP) on the Waste Management Programmatic Environmental Impact Statement (DOE/EIS-0200-D) for your consideration in the NTS Environmental Impact Statement (DOE/EIS 0243). The majority of the comments ask for clarification of the scope and impacts related to the transportation of radioactive waste. It is appropriate that both documents address theses issues in a consistent manner.

Major discrepancies between current Nevada Test Site and other programmatic environmental documents related to the shipment and disposal of Low Level Waste (LLW) contribute to an incoherent set of federal proposals for public comment. The total number of predicted health effects and the percentage due to radiation effects are potentially significant in other documents.

Specific preferences for the alternatives described in the NTS-EIS could not be developed based on the lack of consistent information. It is apparent, however, that the high cost of development of LLW disposal and treatment facilities at distributed locations and the relatively low costs of transportation will likely result in an increased need and use of Nevada for the disposal of LLW. Increased use of rail transportation could significantly reduce both risk and cost for all alternatives except there is no offsite transportation.

Detailed comments are enclosed.

Sincerely,

Bill Andrews

W.B. Andrews

Harry Reid Center for Environmental Studies
4505 Maryland Parkway • Box 454009 • Las Vegas, Nevada 89154-4009
(702) 895-3382 • Telex 62048164 UNLV/MSM • FAX (702) 895-3094

Comments on the Nevada Test Site Environmental Impact Statement, Appendix I, Transportation Study (DOE/EIS 0243)

April 1996

Public interest is high for transportation issues. The DOE Nevada Operations Office, noted this interest in their efforts to work with members of the public, elected officials, American Indian tribal governments and private issue advocacy groups in the development of a technical report on transportation impacts associated with the Nevada Test Site Environmental Impact Statement (DOE 1995a). These groups expressed concern about continued and possible expansion of transportation of low level radioactive waste by truck on public highways in the Las Vegas valley. In response to these concerns, the DOE addressed the possible use of alternative truck routes, construction of rail access to the NTS and intermodal truck/rail shipments to the site.

Technical Adequacy of the NTS-EIS Document

This review included a comparison the NTS-EIS to other current DOE environmental documents and an evaluation of risk management opportunities related to transportation of radioactive wastes. **Discrepancies identified in current environmental documents related to the shipment and disposal of Low Level Waste (LLW) contribute to an incoherent proposal from the DOE-EM program for public comment.** A comprehensive response to the NTS-EIS is not possible without resolution of these discrepancies.

The NTS-EIS transportation study (DOE 1995a) describes shipping volumes for Low Level Waste (LLW) importation for the next ten years. The EIS land use case of "continue current operations" shows radioactive shipments from 12 offsite locations at a rate of 678 shipments per year. The EIS case of "expanded use" shows radioactive shipments coming for the next 10 years from 29 offsite locations with an average annual volume of 3946 shipments per year.

The Waste Management Programmatic EIS (DOE 1995c) was released in September 1995. The PEIS describes alternative strategies and impacts for the management of wastes from ongoing and past DOE operations that are anticipated to be shipped to and from various treatment and disposal sites over a 20 year period. Wastes from site remediation are excluded from the assessment. Implementation of a centralized storage/disposal option at the NTS for LLW, LLMW and HLW would result in the maximum number of waste shipments. A combined total of 295,000 truck shipments and more than 106,000 rail shipments could occur under this alternative.

THE NTS-EIS CONTAINS MAJOR DISCREPANCIES IN THE NUMBER OF POTENTIAL SHIPMENTS OF LLW COMPARED TO WM-PEIS ESTIMATES

Waste shipment numbers in Table 1 were summarized from the WM-PEIS. They are

ORGANIZATION 5 (CONTINUED)

reported on an annual basis to allow comparison to the NTS-EIS. Shipping volumes in Table 1 are up to 3 times higher than volumes reported in the NTS-EIS.

Table 1. Annual Shipments from the Waste Management PEIS for Nevada Storage Options

Waste Form	No Action	Decentralized	Regionalized	Centralized
Low Level Mixed Waste	No Shipments	5	1 - 482	0.5/year out, Ship to Hanford
Low Level Waste	3498	0	0 - 2945	0 - 12,400
Transuranic Waste	0, Store Onsite	4.5 / yr out Ship to WIPP	4 / yr out Ship to WIPP	4 / yr out Ship to WIPP
High Level Waste	Not Included in PEIS	Not Included in PEIS	Not Included in PEIS	Not Included in PEIS

ENVIRONMENTAL RESTORATION WASTES ARE NOT INCLUDED IN THE WM-PEIS IMPACTS AND COULD RESULT IN MUCH HIGHER WASTE VOLUMES FOR DISPOSAL AT THE NEVADA TEST SITE

The *Baseline Environmental Management Report (BEMR)* (DOE 1995b) was used in the WM-PEIS as the basis of a sensitivity study for waste shipment volumes. Results of an WM-PEIS sensitivity study (appendix B) indicated that disposal volumes could be up to 60% higher than those shown in Table 1 based on the WM-PEIS assumption that only 5% of the LLW available from site restoration would be transported to an offsite location for disposal. The reasonableness of these results could not be determined since the basis for the shipping volume estimate is based on an unpublished draft of the BEMR. The impacts of increased LLW volumes was not estimated in Appendix B.

RISK LEVELS REPORTED IN THE NTS-EIS AND THE WM-PEIS ARE NOT CONSISTENT. THE WM-PEIS RESULTS ARE MUCH MORE SIGNIFICANT AND HAVE A HIGH FRACTION OF RADIOLOGICAL HEALTH EFFECTS

Risk results are provided in the two EISs. The NTS-EIS risks for Nevada are summarized in table 2. The NTS-EIS reported relatively low total risks and the percentage of health effects due to the radiological nature of the cargo are a small percentage of the total risk. Results of the WM-PEIS evaluation of LLW risks are shown in Table 3. No Nevada-specific results were included in the WM-PEIS for the transportation of wastes. The total number of predicted health effects and the percentage of health effects due to radiation are potentially significant.

ORGANIZATION 5 (CONTINUED)

Table 2 - Offsite Population Transportation Risks from the NTS-EIS for 10 years - Low Level Waste & Safe Secure Trailers

	Deaths (Latent & Mechanical)	Injuries (Mechanical)	Cargo - Related (latent cancers)	Cargo Percentage of Total
Alternative 1 - Present Operations	2	27	0.002	0.1
Alternative 2 - Discontinue Operations	minimal	minimal	minimal	n/a
Alternative 3 - Expanded Use	7	97	0.06	0.8
Safe Secure Trailers (30 shipments)	n/a	n/a	Incident Free- 0.000016 Accidents - 0.000007	n/a

n/a - not available

Criteria That Should be Considered in Selecting Preferred Alternatives and Making Final Decisions

Relative to LLW treatment, transportation and disposal, it is apparent from the results of the NTS-EIS that transportation is the dominant source of public risk and that treatment and disposal are dominant for worker risks. It is also apparent that development of disposal facilities is expensive relative to transportation. This presents decision makers with the dilemma of trading off dollar savings for potential increases in public and worker risks.

Preferences for Alternatives Evaluated for LLW

Specific preferences for the alternatives described in the NTS-EIS could not be developed because of the lack of consistent information in the three environmental documents. It is apparent, however, that the high cost of development of LLW disposal and treatment facilities at distributed locations and the relatively low costs of transportation will likely result in an increased need and use of Nevada and/or other sites for the disposal of LLW. Public review of revisions to the NTS-EIS that reconcile the previous comments on waste volumes and risk along with additional opportunities for public education on the overall DOE-EM program would increase public understanding and comment.

W. B. Andrews Comments on the NTS-EIS, April 1996 3

ORGANIZATION 5 (CONTINUED)

Table 3. Cancer and Non-cancer Health Effects (HE) for LLW Disposal

	Treat. Worker Mech. HE	Treat. Worker Cancer HE	Percent Treat. Worker Cancer HE	Disposal Worker Mech. HE	Disposal Worker Cancer HE	Percent Disposal Worker Cancer HE	Truck Cancer HE	Truck Mech. HE	Percent Truck Cancer HE	Rail Mech. HE	Rail Cancer HE	Percent Rail Cancer HE
No Action	3	1	25	4	3	43	5	12	29	0.6	1	37
Decentralized	2	1	33	6	2	25	<1	<1	n/a	<1	<1	n/a
Regionalized 1	2	1	33	6	2	25	<1	1	0	<1	<1	n/a
Regionalized 2	5	1	17	4	2	33	<1	1	0	<1	<1	n/a
Regionalized 3	2	1	33	5	2	29	2	3	40	<1	<1	n/a
Regionalized 4	5	1	17	4	2	33	2	3	40	<1	<1	n/a
Regionalized 5	5	1	17	4	2	33	2	4	33	<1	<1	n/a
Regionalized 6	3	1	25	6	2	25	3	10	23	0.6	0.6	50
Regionalized 7	3	1	25	6	2	25	4	10	28	0.6	0.6	50
Centralized 1	3	1	25	1	3	75	16	37	30	1.7	2.3	42
Centralized 2	3	1	25	1	3	75	15	37	29	1.7	2.3	42
Centralized 3	5	1	67	1	2	67	15	35	30	1.6	2.3	41
Centralized 4	5	1	67	1	2	67	14	37	27	1.7	2.3	42
Centralized 5	4	2	33	1	2	67	15	37	29	1.7	2.3	42

Data Compiled from Tables 5.3-1 and E-16, WM-PEIS

W. B. Andrews Comments on the NTS-EIS, April 1996 4

ORGANIZATION 5 (CONTINUED)

Increased use of rail transportation could significantly reduce both risk and cost for all alternatives except in the case where there is no offsite transportation. Table 4 summarizes information from the WM-PEIS. The WM-PEIS indicates a slightly higher cost for the "no action" case if rail transportation would be used for all sites. All other cases show cost reductions ranging from $30 million to $2 billion. Risks would be significantly reduced for all alternatives except where transportation is not used. These reductions range from 8% to 80% of the total system risk.

If rail transportation were used, risks of all the alternatives for LLW disposal would be comparable in terms of their total predicted health effects. It is, of course, a very crude estimate to sum risks of the public, workers, and future generations, but when the total risk magnitudes are similar, discussions about the acceptance of risk could have a different tone than the current situation where the motoring public and roadside residents would experience the greatest portion of total risk in order to achieve relatively modest reductions in future risks to communities that are near DOE facilities.

Rail transportation could reduce concerns about the EM activities in Nevada. Currently truck shipments travel primarily over Hoover Dam, through the largest cities in Nevada and then to the NTS due to routing restrictions imposed by current US Department of Transportation regulations. Rail shipments could allow greater DOE discretion in the development of alternative routes that could avoid these areas because there are currently no rail routing regulations and intermodal transfer points could be chosen that would better meet local needs.

References

DOE 1995a, *Nevada Test Site Environmental Impact Statement, Appendix I, Transportation Study*, DOE/EIS 0243, DRAFT, United States Department of Energy, 1000 Independence Avenue, Washington, DC 20585, January 1996

DOE 1995b, *The 1995 Baseline Environmental Management Report, Estimating the Cold War Mortgage*, DOE/EM-0232, US Department of Energy, Washington DC, March 1995

DOE 1995c, *Waste Management Programmatic Environmental Impact Statement*, DRAFT, United States Department of Energy, 1000 Independence Avenue, Washington, DC 20585, September 1995.

ORGANIZATION 5 (CONTINUED)

Table 4. Risk and Cost Impacts of Using Rail for LLW Transportation

Alternative	Total Fatalities System (Truck)	Total Fatalities System (Rail)	Risk Reduction (Use Rail)	Risk Reduction Percent (Rail)	(Billions of 1994 Dollars) Total (Inc. Truck Costs)	Rail Savings	Total (Inc. Rail Costs)
No Action	28	12.6	15.4	55%	17.9	-0.07	17.97
Decentralized	11	11	0	0%	16.3	0.03	16.27
Regionalized 1	12	11	1	8%	16.2	0.04	16.16
Regionalized 2	14	12	2	14%	20	0.04	19.96
Regionalized 3	15	10	5	33%	14.7	0.16	14.54
Regionalized 4	17	12	5	29%	19.7	0.15	19.55
Regionalized 5	18	12	6	33%	19.6	0.26	19.34
Regionalized 6	25	13.2	11.8	47%	12.7	0.48	12.22
Regionalized 7	26	13.2	12.8	49%	13.6	0.49	13.11
Centralized 1	61	12	49	80%	11.9	2.02	9.88
Centralized 2	60	12	48	80%	11.8	1.82	9.98
Centralized 3	59	12.9	46.1	78%	17.9	1.91	15.99
Centralized 4	60	13	47	78%	17.8	1.72	16.08
Centralized 5	61	13	48	78%	14.9	2.02	12.88

Data Compiled from Tables 5.3-1, 5.3-2, and E-16, WM-PEIS

UNLV

April 18, 1996

Dr. Donald R. Elle, Director
Environmental Protection Division
U.S. Department of Energy
P.O. Box 14459
Las Vegas, NV 89114

Dear Dr. Elle:

I am submitting comments for your consideration on the Nevada Test Site Environmental Impact Statement (NTS EIS). I am a member of the Nevada Risk Assessment/Management Program (NRAMP) Technical Team at the Harry Reid Center for Environmental Studies, UNLV. The majority of my comments attempt to clarify technical discrepancies rather than dwell on philosophical approaches to improving the NTS EIS methodologies.

In addition, I am also submitting several comments based on a letter to the NRAMP Principal Investigator, Mr. William B. Andrews, from Mr. David B. Leclaire, the Deputy Assistant Secretary for Program Support, Defense Programs. In this letter (which is attached), Mr. Leclaire recommends that I look at specific areas of the NTS EIS for interesting information regarding the radiological source term. For the record, I did not find any new information in these sections of the NTS EIS and my doctoral thesis (which was completed and successfully defended in January, 1995) did not include any aspect of thermonuclear weaponry, but rather experimental investigations of fusion reactor engineering safety issues.

Itemized comments are attached in the order they come up in the NTS EIS. There is no priority given to earlier comments than later comments. I feel my comments are rarely contentious and are meant to highlight potentially significant technical or perceptional problems with the NTS EIS.

Sincerely,

Anthony E. Hechanova

Anthony E. Hechanova, Ph.D.
Nuclear Engineering

cc: Earle Dixon (CAB)
David B. Leclaire (DOE)
William B. Andrews (NRAMP)

Harry Reid Center for Environmental Studies
4505 Maryland Parkway • Box 454009 • Las Vegas, Nevada 89154-4009
(702) 895-3382 • Telex 62048164 UNLV/MSM • FAX (702) 895-3094

ORGANIZATION 5 (CONTINUED)

Itemized Comments on Human Health Risks and Safety Impacts Study in the NTS EIS (Vol. 1, App. H) with Additional Comments in Response to Mr. David B. Leclaire's Letter (attached)

by Anthony E. Hechanova, Ph.D.
Nuclear Engineering
Harry Reid Center for Environmental Studies
University of Nevada, Las Vegas
tel: (702) 895-1457
April 16, 1996

Number	Location	Comment
1	v 1, p 4-8, li 1-22	***Problem:*** Table 4-1 is not properly referenced. ***Recommendation:*** Cite the references from which values are given in Table 4-1. For example, as regards to the Surficial Soils, I am familiar with Radionuclide Inventory and Distribution Program (RDIP) reports and figured those would be the appropriate references from the References Section 4.8 starting on page 4-318. But I am not as fortunate to know the NTS EIS references for the various "Disposal" sources or Deep Underground Tests on lines 13-22.
2	v 1, p 4-8, li 1-22	***Problem:*** Table 4-1 is not complete. ***Recommendation:*** Modify Table 4-1 Column 4. Column 4 should at least reflect the elements of all nine major radionuclides: Americium, Cesium, Cobalt, Europium, Plutonium, and Strontium, although McArthur and Mead (RDIP Report #3, 1987) also measured several other radionuclides in the surficial soils.
3	v 1, p 4-106, li 15-16	***Problem:*** Nowhere in McArthur's (1991) report is the inventory at Sedan Crater explicitly estimated as 328 Ci. In fact, in Area 10, the total inventory from the nine major radionuclides is 304 Ci with 12 Ci more found at Sedan from other manmade radionuclides. ***Recommendation:*** Simply remove this sentence since it is not important to the argument or adjust the statement to reflect accurate information.
4	v 1, p 4-110, li 29-32	***Problem:*** Tritium decay is incorrectly calculated from 18,570 Ci to 3,200 Ci after 5 years.

Recommendation: Consider the following correction: tritium has a 12.3-year half-life and would decrease to 75.4 percent of its original amount after 5 years. Thus, 18,570 Ci of tritium decay to 14,000 Ci after 5 years.

5 v 1, p 4-110, li 29 to v 1, p 4-111, li 7

Problem: The interpretation of the work by Borg *et al.* (1976) is inappropriate considering the current knowledge of nuclear testing conducted by the United States. The numbers published by Borg *et al.* (1976, p 100-102) which are used in these lines of the NTS EIS are the result (*i.e.*, activation and fission products) of a fission yield except for the tritium component. Although activation of trace lithium in the NTS ground would be the major contributor of tritium from a fission detonation, the authors were aware that a significant amount of tritium would be produced from a thermonuclear device because it is one of the primary fuels in the core. In other words, tritium is no longer the result of trace amounts of lithium in the ground from a fission detonation, but rather, tritium is purposefully produced in mass in the core of a thermonuclear device to provide the fuel for fusion reactions. For this reason, the NTS EIS and Borg *et al.* (1976) are essentially comparing apples and oranges when they simply add a tritium component to a fission yield.

Recommendation: When considering the Radiological Source Term, one should be very careful to estimate the fission and fusion contributions separately since the physics involved are very different. The primary purpose of the Borg *et al.* (1976) document was to analyze contaminant migration and I do not believe that their results were intended to be applied to the characterization of a thermonuclear device as the NTS EIS has applied their work. This is best evidenced by quoting from the Borg *et al.* (1976) document and putting to light the rigor of their tritium "calculations:"

"The amount of tritium deposited below or near the water table at NTS through June 30, 1975, can be crudely estimated. It is about 10 kg at Pahute Mesa and about 3 kg at Yucca Flat. The amount at Frenchman Flat is negligible. These values are for the 78 tests detonated below the water table or with a cavity radius below the water table. These estimates are probably accurate to within a factor of 2 or 3 but should not be construed as a definitive catalog of tritium deposited at NTS." (Borg *et al.*, 1976, p 103)

Therefore, I suggest removing line 27 (p 4-110) through line 7 (p 4-111) in which this rather obfuscated and possibly incorrect treatment of the Radiological Source Term is exemplified, and end

the section with the non-contentious statement of the preceding line: "The source term includes numerous isotopes that are both short-lived and long-fived."

6 v 1, p 4-111, li 1-7

Problem: The basis of the total underground radioactivity of 300 million curies (including a reference citation) has not been clarified. Thus, it is not clear in this paragraph which considerations are connected to the work of Borg *et al.* (1976): the estimate itself or the uncertainty in the estimate. In either case, the previous comment still applies: the Borg *et al.* (1976) work alone is not appropriate to determine parameters of the total underground radiological source term, especially tritium.

Recommendation: The basis (*e.g.*, methodology and calculations) of the 300 million curies should be made available to the public and open scientific community for review. This would mean releasing an unclassified version of the reference. I invoke the words of a truly eminent scientist to aid in the argument against classification. The following are excerpts from Better a Shield Than a Sword, by Edward Teller (1987).

"Today, secrecy has become a terrible destructive force in our society. My postwar efforts to reverse the process have not affected its devastating spread. I am unhappy that I had anything to do with its beginnings.

Science thrives on openness. Researchers should, and often must, share their findings.

Security regulations have helped drive a wedge between our universities and our military research and development effort.

Under present rules, research done in our national laboratories cannot be fully shared with civilian industries. When we fail to expose people to problems they could help solve, we remain unaware of the loss. We now have millions of classified technical documents. We also have falling productivity. Rapid progress cannot be reconciled with central control and secrecy. The limitations we impose on ourselves by restricting information are far greater than any advantage others could gain by copying our ideas.

In addition, by tainting science with secrecy, an unfortunate public attitude is perpetuated: Science is nobody's business but the scientists'. Today, science and technology are part of the life-support system of the world. Encouraging the development of a scientifically literate public is of primary importance to everyone's well-being.

Secrecy is not compatible with science, but it is even less compatible with democratic procedure. Two hundred years ago James Madison said, "A popular government without popular information, or the means of acquiring it, is but a prologue to a farce or a tragedy, or perhaps both."

The term *credibility gap* is a modest description of our monstrous current problem."

The credibility of the NTS EIS radiological source term is at issue not only due to the secretive nature of its conception but also considering possible inappropriate use of methodologies in a referenced work (Borg, *et al.*, 1976) that is available to the public.

7	v 1, p 4-159, li 13	*Problem:* The data in Table 4-27 is not referenced. However, the data is identical to data released by M. Pankratz of Los Alamos National Laboratory in a memo dated June 23, 1995. The methods used to estimate the data refers to a classified report: LA-CP-94-0222, "Total Radionuclide Inventory Associated with Underground Tests Conducted at the Nevada Test Site," 1955 1992 (U), September 26, 1994 (SRD), authors not given. *Recommendation:* Please reference the document from which data in Table 4-27 is taken. If it is in fact the one cited above, which I strongly suspect it is, then the numbers are not for 1995, but for Jan. 1, 1994. This would make a 5 percent difference in the tritium level and affect the levels reported in the following sentence (line 15) for inventories since most of the radioactivity is from tritium.
8	v 1, p 4-159, li 20-21	*Problem:* I do not agree with the statement that "Most investigators have concluded that much of the radioactivity released during an underground detonation remains in the melt glass in the original cavity. . . ." This is not a true statement since 90 percent of the radioactivity listed in Table 4-27 is tritium which most investigators would conclude becomes part of tritiated water and only a small fraction would remain in the melt glass. *Recommendation:* Re-write the sentence to exclude tritium as follows: "Most investigators have concluded that radionuclides other than tritium released during an underground detonation predominantly remain in the melt glass in the original cavity. . . ."
9	v 1, p 4-162, li 27	*Problem:* The Hydrologic Resources Management Program details refer to "DOE (1995)" which does not fit with any of the references in the Reference Section 4.8. *Recommendation:* Clarify which DOE (1995) report is being referenced or add the reference if it is actually missing.
10	v 1, p 4-164, li 2-23	*Problem:* The superscripts in Table 4-28 are incorrect (*e.g.*, "Lazer Dyes" and "Soda Ash") or incomplete.

Recommendation: Change superscript of "Soda Ash" from "d" to "c" since Soda Ash contains theophylline, ethylenediamine, and carbonic acid disodium salt. Change the superscript of "Lazer Dyes" from "c" to "b" since Bryant and Fabryka-Martin (1991) note them as part of some detector packages. Bryant and Fabryka-Martin (1991) note that Thulium is a radiochemical detector and less than 100 grams is typically used, thus, it should have the superscript "a" added.

11	v 1, p 4-164, li 2-23	*Problem:* Bryant and Fabryka-Martin (1991) mention Thallium as a possible Rack and Canister material which is also listed as a Hazardous Material in their Appendix. *Recommendation:* Add Thallium to Column 2 of Table 4-28.
12	v 1, Ap H, p ES-2, li 4-7	*Problem:* This sentence of the Executive Summary claims that the "migration of tritium-contaminated groundwater from test locations within the NTS or at the Project Shoal Area is never expected to result in tritium concentrations at the site boundaries that are detectable using present-day analytical equipment" which does not agree with the content of the NTS EIS. <u>Project Shoal:</u> In the NTS EIS (v 1, Ap H, p 5-3, li 2-4), it is stated that at "the eastern boundary of the Project Shoal Area, tritium in groundwater is predicted to reach a maximum concentration of about 280 pCi/L in about 206 years." 280 pCi/L is above background levels for tritium and is easily detectable. *Recommendation:* Correct the sentence to accurately reflect the contents of the document or re-write this section completely to include the worst case scenarios from DOE publications (see Comment 27, below):
13	v 1, Ap H, p ES-2, li 10-15	*Problem:* The NTS EIS does not quote the worst case scenarios as reported in their reference (Pohlmann *et al.*, 1995) which considers the uncertainties in key transport parameters. *Recommendation:* Re-write this section using values from Pohlmann *et al.* (1995) worst case scenario (see Comment 27, below).
14	v 1, Ap H, p 1-1, li 15-18	*Problem:* The term "evaluation of the potential environmental impacts associated with the various alternative uses of the NTS" is not qualified to the 10-year time frame of the NTS EIS.

ORGANIZATION 5 (CONTINUED)

Recommendation: Since tritium migration could be a compliance problem after the 10-year time frame (see Comments 28 and 33, below), this statement under the "Purpose" heading of the document should accurately convey the narrow scope of the evaluation. I suggest re-writing this part of the sentence as follows: "evaluation of the potential environmental impacts, over the next 10 years, associated with the various alternative uses of the NTS. . . ."

15 v 1, Ap H, p 1-1, li 15-18

Problem: The NTS EIS does not evaluate all of the various alternative uses of the NTS, *e.g.*, public exposure in released-land scenarios (Alternative 4) which would most likely contain the highest risk scenarios to members of the public.

Recommendation: Re-write the sentence to accurately convey that only the more likely alternatives in which members of the public do not have access to NTS land in the next 10 years are being evaluated as follows: "It is the intent that this EIS serve as a support tool for policy makers and stakeholders by providing an evaluation of the potential environmental impacts, over the next 10 years, associated with the more likely alternative uses of the NTS and its resources that are being considered by the DOE." I feel that this re-write truly captures the intent of the DOE in writing the NTS EIS.

16 v 1, Ap H, p 1-7, li 3-5

Problem: The lead sentence of this section of the document again misses the important nuances mentioned in the preceding two comments.

Recommendation: Re-write the lead sentence as follows: "The purpose of this report is to provide an assessment of the human health and safety impacts, over the next 10 years, associated with program activities performed under the more likely alternatives being considered in the NTS EIS."

17 v 1, Ap H, p 2-1, li 11-16

Problem: This lead line under "General Risk Assessment Concepts" is incomplete. A general risk assessment has the following components:

SOURCE->TRANSPORT->EXPOSURE->DOSE->RISK

The component of "exposure" is missing from the general concept of risk assessment.

Recommendation: Re-write the lead line to include "exposure:"

ORGANIZATION 5 (CONTINUED)

"Risk assessment is a multidisciplinary subject requiring the identification of events (scenarios) with the potential for a failure that could lead to an undesirable outcome. A general risk assessment contains the following five components: the prediction of the source contaminants subject to release and their concentrations; the description of environmental transport; the determination of exposure pathways to assault the body; the calculation of internal and external dose; and the extrapolation of this dose to human health effects."

18 v 1, Ap H, p 2-3

Problem: The purpose of Section 2.1.2.1 entitled "Radioactive Decay and Fission" is not clear. I understand and agree with the importance of explaining radioactive decay. However, mentioning fission with regard to nuclear electric power production is inappropriate for the NTS. In addition, if the goal of this section is to explain nuclear reactions such as fission to the public, then an equally important (if not more important) reaction relevant to Radiological Effects is the fusion reaction.

Recommendation: Rename Section 2.1.2.1 "Nuclear Reactions: Radioactive Decay, Fission, and Fusion" and insert the following paragraph at page 2-3, line 22:

"Fusion is the process whereby two light nuclei, *e.g.*, a deuteron and a triton (nuclei of heavy hydrogen isotopes), collide and fuse together to form one heavier nucleus and one lighter nucleus. In the process, mass is lost and converted to energy. This nuclear reaction is the process which actually energizes the sun. The amount of energy released per pound of heavy hydrogen fusion is about four times as much as the amount of energy released per pound of uranium or plutonium fission. The large yield (greater than 100 kilotons) nuclear tests conducted at the NTS are probably based on the fusion reaction. Because tritium (a radioactive isotope) is produced in the core of the device as a fuel for the detonation, there is predicted to be large amounts of tritium left in the cavity of the large yield tests."

19 v 1, Ap H, p 2-14, li 29

Problem: Collective dose is report in units of rem.

Recommendation: Change the two occurrences of "rem" to "person-rem."

20 v 1, Ap H, p 2-16, li 24 and p 2-17, li 11

Problem: The GeoTrans (1995, a and b) references are not in the Public Reading Facility on Losee Road in N. Las Vegas, NV, as of April 17, 1996. Mary Ellen Giampaoli of the DOE has contended that the references are there. But I had this re-checked by Cynthia

ORGANIZATION 5 (CONTINUED)

		Ashley (personal communication, April 17, 1996), the facility librarian, and she has confirmed that the GeoTrans (1995, a and b) references are not at the Public Reading Facility. Latomya Glass of the DOE Public Affairs Office (personal communication, April 17, 1996) is contacting GeoTrans, Inc. to resolve this problem. ***Recommendation:*** Please provide copies of the GeoTrans (1995, a and b) references to the Harry Reid Center for Environmental Studies at UNLV as well as have them available to the public in the Public Reading Facility.
21	v 1, Ap H, p 2-16, li 30-31	***Problem:*** Daniels *et al.* (1993) is cited but does not appear in the References on page 7-1. Daniels *et al.* (1993) did very important work that is applicable to the NTS EIS (see Comment 28, below) and possibly more applicable than GeoTrans (1995a). ***Recommendation:*** Add the Daniels *et al.* (1993) information to the References section on page 7-1.
22	v 1, Ap H, p 2-17, li 14-16	***Problem:*** Tritium concentrations are reported in this sentence without citing the source. ***Recommendation:*** Cite the source of the 1×10^9 pCi/L tritium concentration.
23	v 1, Ap H, p 2-17, li 14-16	***Problem:*** Tritium concentrations are assumed to be 1×10^9 pCi/L based on unreferenced measurements (see comment above). However, measured data from the Cambric event (Hoffman, 1977) give a measured tritium concentration of 6.1×10^9 pCi/L at the edge of the cavity. Cambric was a very small 0.75 kTon event. I find it hard to believe that the NTS EIS assumption of 1×10^9 pCi/L tritium concentration is representative of any NTS underground shot. ***Recommendation:*** Do not assume the tritium concentration at test locations will be 1×10^9 pCi/L since I doubt that it will be scientifically justifiable.
24	v 1, Ap H, p 2-17, li 16-17	***Problem:*** Calculated risks to the hypothetical member of the public at the boundary of the NTS are results of modeling which used the disputed (see above comment) 1×10^9 pCi/L tritium concentration. ***Recommendation:*** Refer to Daniels *et al.* (1993) for public risks, see Comment 28, below.

ORGANIZATION 5 (CONTINUED)

25	v 1, Ap H, p 4-2, li 26-27	***Problem:*** To state *a priori* that consumption of tritium-contaminated drinking water does not have impacts within the 10-year time frame of the NTS EIS is precarious, especially in this circumstance. Although later in the document Table 5-1 indicates that the nearest peak tritium concentration occurs at the boundary of the Central Nevada Test Area in 15 years. A look at the reference by Pohlmann *et al.* (1995), who performed the calculations, reveals that their scenario considering the highest uncertainty (*i.e.*, worst case) would occur in only 8 years. ***Recommendation:*** Remove the following sentence from the NTS EIS because it is not factual and requires knowledge of the results of calculations which, in one instance, may not agree with the statement: "Scenario GW1 is a future scenario that does not have impacts within the 10-year time frame of this EIS."
26	v 1, Ap H, p 5-1, li 16-17	***Problem:*** Same as above comment regarding assumption of no impact from tritium-contamination in 10-years. ***Recommendation:*** The content of the paragraph will not be lost by removing the following sentence: "These impacts to the public are not expected to occur within the 10-year timeframe addressed in the scope of the NTS EIS."
27	v 1, Ap H, p 5-1 to 5-2	***Problem:*** Table 5-1 does not reflect the worst case scenarios in the off-site references (*i.e.*, Shoal (Chapman *et al.*, 1995) and CNTA (Pohlmann *et al.*,1995)) in which high variances and uncertainties are assumed. These values should be used to, at the very least, give the upper range of possibilities or could stand alone as the worst case scenarios. ***Recommendation:*** Replace the off-site values in Table 5-1 with the values in the following table (note: NTS EIS values (in parenthesis) are also given below the recommended changes which are in boldface print):

Test Location	Receptor Location	Arrival Time of Peak Conc. (year)	Dose (rem)	Radiation LCF	Radiation Detriment
Project Shoal Area	Eastern Boundary	71 (206)	4 (1.6×10^{-3})	**2×10^{-3}** (8.0×10^{-7})	**1×10^{-3}** (3.7×10^{-7})
Project Shoal Area	Nearest public well	None Listed (278)	0.08 (2.0×10^{-7})	**4×10^{-5}** (1.0×10^{-10})	**2×10^{-5}** (4.6×10^{-11})
Central Nevada Test Area	CNTA Boundary	8 (15)	11 (8.0)	**5×10^{-3}** (4.0×10^{-3})	**2×10^{-3}** (1.8×10^{-3})
Central Nevada Test Area	Nearest public well	117 (410)	**6×10^{-7}** (1.8×10^{-20})	**3×10^{-10}** (9.0×10^{-24})	**1×10^{-10}** (4.1×10^{-24})

Recommendation: I also recommend reporting the risk values with only one significant figure to emphasize that order of magnitude is the most reliance that can be placed on their determination.

28 v 1, Ap. H, p 5-1, li 23-27

Problem: The migration of tritium-contaminated groundwater from Yucca Flat to Mercury does not even closely approximate the maximum health risks to a public individual from underground testing within the NTS boundaries. Since the reference which contains the calculations is currently not available in the Public Reading Facility (see Comment 20, above), I could not determine the reason other federal reports were neglected such as the LLNL report by Daniels, J. I., editor, *et al.*, "Pilot Study Risk Assessment for Selected Problems at the Nevada Test Site," UCRL-LR-113891, Lawrence Livermore National Laboratory, June, 1993, which estimates the dose at the boundary of Area 20 to a member of the public drinking the tritium-contaminated water as 14 rem (not only is this dose nine orders of magnitude different from the NTS EIS values, but it is also above compliance levels). In addition, the dose to the nearest residential community, Oasis Valley, had a dose of 0.008 rem. This value is still five orders of magnitude higher than the NTS EIS dose at Mercury although probably within safe standards.

Recommendation: Use federally sponsored studies containing worst case scenarios of tritium-contamination to members of the public. These scenarios (*e.g.*, Pahute Mesa to Oasis Valley) are probably not those analyzing migration from Yucca Flat to the boundary near Mercury, NV, as given in the NTS EIS.

ORGANIZATION 5 (CONTINUED)

29 v 1, Ap H, p 5-1, li 25-29

Problem: The EPA's Clean Drinking Water Act sets the level of tritium in "clean" water at 20,000 pCi/L. In addition, tritium exists in the NTS groundwater due to natural causes at levels which are easily detectable (on the order of 10s of pCi/L). Thus, to give risk numbers for a clearly *de minimus* tritium concentration (the value is actually never given in the NTS EIS but is inferred to be less than 1 pCi/L) leads to insignificant risks such as 1.5×10^{-11}. This risk value assumes a Linear, No-Threshold Dose-Response Curve which is not uniformly accepted in the scientific community. For example, since insufficient epidemiological data exists to say anything about health risk at doses below 5 rem/yr or lifetime dose below 10 rem, some subscribe to a threshold limit. Currently, a range of risks which include the likely possibility of zero adverse health effects is proposed by the Health Physics Society.

Recommendation: If the Yucca Flats to Mercury scenario is chosen to estimate risk to members of the public, it could be dismissed as below some screening level, even if that screening level is 0.0001 of the EPA's "clean" water standard.

30 v 1, Ap H, p 5-3, li 3-8

Problem: A tritium concentration of 280 pCi/L is still below the screening level I propose.

Recommendation: If such a low concentration is to be considered, it should at least give a range for risk which includes the likely possibility of zero adverse health effects.

31 v 1, Ap H, p 5-3, li 8-12

Problem: The NTS EIS is again considering tritium concentrations below 1 pCi/L.

Recommendation: Same as Comment 29, above.

32 v 1, Ap H, p 5-3, li 17-22

Problem: The NTS EIS is again considering tritium concentrations below 1 pCi/L.

Recommendation: Same as Comment 29, above.

33 v 1, Ap H, p 5-3, li 29-31

Problem: Radioactive decay should be properly considered to give the calculation scientific validity. This is important because the tritium concentration (120 million pCi/L) in this case is significant and well above compliance standards even when decay is considered.

ORGANIZATION 5 (CONTINUED)

		Recommendation: Adjust the concentration and risk values to include radioactive decay.
34	v 1, Ap H, p 5-4, li 31-33	*Problem:* The worker population radiation dose is considered over a 10-year period although workers actually could work up to around 40 years. *Recommendation:* Age effects and nuances in calculating committed dose should justify looking at the workers' lifetime dose, not just a 10-year block. Consider radiation exposure over the entire work period of the population (as the 50-years for the Maximum Reasonably Foreseeable Accident scenario in the NTS EIS, volume 1, appendix H, page 5-8, line 7), not simply over the 10-year scope of the NTS EIS.
35	v 1, Ap H, p 5-5, li 15-17	*Problem:* The worker population radiation dose is considered over 10-year period although workers actually could work up to around 40 years. *Recommendation:* Same as Comment 34, above.
36	v 1, Ap H, p 5-5, li 29-31	*Problem:* The worker population radiation dose is considered over a 10-year period although workers actually could work up to around 40 years. *Recommendation:* Same as Comment 34, above.
37	v 1, Ap H, p 5-6, li 28-30	*Problem:* The worker population radiation dose is considered over a 10-year period although workers actually could work up to around 40 years. *Recommendation:* Same as Comment 34, above.
38	v 1, Ap H, p 5-8, li 6	*Problem:* A total lifetime dose of 281 rem is large and within the scope of the acute 10 rem on which the National Research Council's BEIR V (1990) and the International Commission on Radiological Protection (1991) base the risk slope factor used in the NTS EIS. I believe the Dose-rate effectiveness factors for radiation at low dose rates (Φ_e and Φ_d on page B-3) were inappropriately invoked in these instances. *Recommendation:* Check the calculations and do not use the Dose-rate effectiveness factors for radiation at low dose rates which effectively increases the risks by a factor of 2.

ORGANIZATION 5 (CONTINUED)

39	v 1, Ap H, p 6-1, li 21-22	*Problem:* The concept of probability is misstated. A probability of 1.0 means that it will definitely happen. A probability of 0.5 means that there is a 50-50 chance of occurrence. A probability between 0.5 and 1.0 I would consider "likely." It is not true to infer that a probability of less than 1.0 is "unlikely." *Recommendation:* Remove the concept of probability by deleting the following sentence: "In other words, for each NTS EIS alternative, the probability that a single radiation-induced or chemical-induced health effect will occur in the worker population is less than 1.0." And simply state that "it is unlikely that any workers will contract fatal cancer or other detrimental health effects as a result of exposure to radiation. . . ."
40	v 1, Ap H, p 6-1, li 30-32	*Problem:* The statement that "subsurface migration of tritium in groundwater is not expected to result in measurable tritium concentrations at existing public wells at any time in the future," was contested in Comments 12 and 28, above. *Recommendation:* Resolve the issue which may mean changing the conclusion in this statement.
41	v 1, Ap H, p B-3, li 14-15	*Problem:* I believe the Dose-rate effectiveness factor for radiation latent cancer fatality at low dose rates is incorrectly quoted as 2.5. ICRP (1991, p 112) "has decided to recommend that for radiation protection purposes the value 2 be used for the DDREF." (Dose and Dose Rate Effectiveness Factor for low LET radiation). The factor of 2 is also found in the Federal Register (page 23363, 1991). *Recommendation:* I believe the incorrect factor was never actually used in calculations, but this should be double-checked as well as the factor for radiation detriment (Φ_d) which I could not find in ICRP (1991).
42	v 1, Ap H, p C-21, li 1-11	*Problem:* Table C-34 reports insignificant and meaningless values. The public has no comprehension for these values and the doses for such risk are well under safe limits. *Recommendation:* Place values for concentration and dose next to safe and EPA clean standards to give the public an intuitive feel for the insignificance of these risks.

References

BEIR V, Biological Effects of Ionizing Radiations, No. 5. "Health Effects of Exposure to Low Levels of Ionizing Radiation," U.S. National Research Council, 1990.

Borg, I. Y., R. Stone, H. B. Levy, and L. D. Ramspott, "Information Pertinent to the Migration of Radionuclides in Ground Water at the Nevada Test Site, Part 1: Review and Analysis of Existing Information," Lawrence Livermore National Laboratory, UCRL-52078 Part 1, May 25, 1976.

Bryant, E. A., and J. Fabryka-Martin, "Survey of Hazardous Material Used in Nuclear Testing," LA-12014-MS, Los Alamos National Laboratory, Los Alamos, NM, 1991.

Chapman, J., K. Pohlmann, and R. Andricevic, "Exposure Assessment of Groundwater Transport of Tritium from the Shoal Site," DOE/NV/11508-01, UC-703, DRI Pub. 45132, April, 1995.

Daniels, J. I., editor, et al. (1993), "Pilot Study Risk Assessment for Selected Problems at the Nevada Test Site," UCRL-LR-113891, Lawrence Livermore National Laboratory, June, 1993.

Federal Register, Rules and Regulations, "Nuclear Regulatory Commission," Vol. 56, No. 98, May 21, 1991.

GeoTrans, Inc., "A Stochastic Advective-Dispersive Transport Code for a Multiple Constituents in Dual Porosity Geological Media," prepared for NTS, 3705-491, April 20, 1995a.

GeoTrans, Inc., "A Fracture/Porous Media Model of Tritium Transport in the Underground Weapons Testing Areas, Nevada Test Site," prepared for U. S. DOE, Nevada Operations Office, August, 1995b.

Hoffman, D. C., "A Field Study of Radionuclide Migration," Los Alamos Scientific Laboratory, 1977 (assumed).

International Committee on Radiological Protection, "1990 Recommendations of the International Commission on Radiological Protection," Publication 60, Pergamon Press, 1991.

McArthur, R. D., "Radionuclides in Surface Soil at the Nevada Test Site," Desert Research Institute, Pub. #45077, August, 1991.

McArthur, R. D., and S. W. Mead, "Nevada Test Site Radionuclide Inventory and Distribution Program: Report #3. Areas 3, 7, 8, 9, and 10, Desert Research Institute, Pub. #45056, 1987.

Pankratz, M., memo to Janet Williedated June 23, 1995, "Selected NTS Underground Inventory Data," from a classified document: LA-CP-94-0222, "Total Radionuclide Inventory Associated with Underground Tests Conducted at the Nevada Test Site," 1955 1992 (U), September 26, 1994 (SRD), authors not given.

Pohlmann, K., J. Chapman, and R. Andricevic, "Exposure Assessment of Groundwater Transport of Tritium from the Central Nevada Test Area," DOE/NV/11508-02, UC-703, DRI Pub. No. 45133, April, 1995.

Teller, E., Better a Shield Than a Sword Perspectives on Defense and Technology, The Free Press, Macmillan, Inc., New York, NY, 1987.

ORGANIZATION 5 (CONTINUED)

Apr-10-96 03:33P DP34 NEPA Office G Palmer 202 586 0282

Department of Energy
Washington, DC 20585

APR . 3 1996

Mr. W. B. Andrews
Harry Reid Center for Environmental Studies
4505 Maryland Parkway
Box 454009
Las Vegas, Nevada 89154-4009

Dear Mr. Andrews:

When you met with Acting Under Secretary Grumbly and me on April 3, 1996, you discussed an issue with regard to the Environmental Impact Statement (EIS) for the Nevada Test Site (NTS) and Off-site Locations in the State of Nevada, which is being prepared by the Office of Defense Programs (DP) with the cooperation of several other Department of Energy (DOE) offices. Because DP is the lead office for the EIS, I told Mr. Grumbly that I would respond to your comments regarding the calculation of the soil burden of radiation that resulted from the underground nuclear tests conducted at the Nevada Test Site.

You commented that Mr. Anthony Hechanova had not been able to get enough information from the DOE to confirm the results of work on a doctoral thesis. We contacted personnel of the Nevada Operations Office, but have not been able to verify who has been contacted by Mr. Hechanova.

With regard to an evaluation of the calculations by DOE, we have not conducted an evaluation, as no one we contacted at the Nevada Operations Office has seen the model which led to the calculations nor the calculated results.

DOE's current analysis regarding the radiologic inventory is in the draft EIS, which has been with the public since February 2, 1996. Specific references of interest to you would be: pages 4-3 thru 4-9, paragraph 4.1.1, Land Use; pages 4-100 thru 4-111, para. 4.1.4.2, Geology; and pages 4-159 thru 4-163, RADIOLOGIC SOURCES IN GROUNDWATER.

I am aware of your organization's work with studies for the transportation of low level waste for the EIS. We would like to pursue the issues you raised to ensure that the EIS is as accurate as possible. We are reviewing and incorporating comments and questions from the public until May 3, 1996, but to date we have no

Apr-10-96 03:34P DP34 NEPA Office G Palmer 202 586 0282 P.03

record of having received comments from you or Mr. Hechanova. ~~Please contact~~ Dr. Donald R. Elle, the Program Manager for the NTS EIS, at 702-295-5844 to further discuss the issues you raised.

Sincerely,

David B. Leclaire
Deputy Assistant Secretary
for Program Support
Defense Programs

cc: T. Grumbly, US
Mary Manning, Las Vegas Sun

ORGANIZATION 5 (CONTINUED)

UNLV

April 18, 1996

Dr. Donald R. Elle, Director
Environmental Protection Division
US Department of Energy
PO Box 14459
Las Vegas, NV 89114

Dear Dr. Elle:

Attached are my comments on the Draft Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (NTS EIS). I am a Nevada Risk Assessment/Management (NRAMP) Technical Team member and therefore have a background relating to many of the issues addressed in the NTS EIS. Specifically, my focus in reviewing the document was on the topic of groundwater contamination.

I have included both general comments and page-specific comments. All comments have corresponding recommendations. I believe the recommendations will make the document a more appropriate communication tool. Many of the comments relate to specific points which I believe need to be addressed in order to produce a final product which is an honest portrayal of the site and potential future use.

Sincerely,

Tod E. Johnson
Environmental Modeling
Nevada Risk Assessment/Management Program

cc: W.B. Andrews
Nevada Test Site Citizen Advisory Board

Harry Reid Center for Environmental Studies
4505 Maryland Parkway • Box 454009 • Las Vegas, Nevada 89154-4009
(702) 895-3382 • Telex 62048164 UNLV/MSM • FAX (702) 895-3094

ORGANIZATION 5 (CONTINUED)

Comments on the Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada, Volume 1, Appendix H, "Human Health Risks and Safety Impacts Study" and Selected Groundwater-Related Sections in Other the NTS EIS Volumes.

April 1996

Tod Johnson, Environmental Modeling
Nevada Risk Assessment/Management Program
Harry Reid Center for Environmental Studies
Box 454009
4505 Maryland Parkway
Las Vegas, NV 89154-4009

GENERAL COMMENTS:

G-1:
Problem: One of the Land Use Alternatives listed in the EIS involves turning back some of the land (70%) to public lands inventory. As such, the evaluation of the risks to the public should have included estimation of risk at the potential new boundaries. Vol. 1, 3-27 states that return of the land would be evaluated, but only to the US Bureau of Land Management (BLM) for public use (not directly to the public, the State, Nye County or to the sovereign nations). Because it would be available for public use, even under the control of the BLM, many exposure scenarios impacting the public should have been considered.

> **Recommendation:** The exposure scenarios should include the ingestion of drinking water by casual/recreational public visitors to the area and include worker risk scenarios consistent with relatively remote locations (i.e. partial residence time on the site).

G-2:
Problem: Modeling shows that contaminants from underground testing are likely off the NTS and CNTA, and likely will be off the Shoal Site in the future. This understanding is not reflected in the document. Also, because site characterization is quite limited, the risk results are quite uncertain. This understanding is not reflected in the EIS. The predicted concentrations, locations, duration and potential hazards must be included because no intervention is described.

> **Recommendation 1:** The Draft NTS should be revised to remove conflicting sections and misleading statements which imply the underground contamination is not leaving the site.

> **Recommendation 2:** The document should also be revised to include honest, clear discussion of the uncertainties.

ORGANIZATION 5 (CONTINUED)

> **Recommendation 3:** Because of the large uncertainties inherent in the modeling, the worst-case analyses should be presented, not the least-conservative.

==

PAGE-SPECIFIC COMMENTS:

Draft NTS EIS Summary

S-1 EIS Summary, Page S-19, lines 11-13:
Problem: The text states that groundwater models suggest there will be no migration out of the NTS boundaries. That statement is in conflict with modeling from other sources (Daniels et al., 1993, Andricevic et al., 1994). Modeling in those sources indicated migration was possible, and estimate the risks related to the transport. The risk values correspond to tritium concentrations greater than detection limit (1 pCi/L) and greater than background (approx. 10 pCi/L). Also, some of the locations for which modeling was conducted (NTS EIS Human Health Risk and Safety Impacts Study, Vol. 1, Appen. A, page 2-17, lines 11-14) do not have corresponding results listed in the EIS. Therefore, one cannot test the "no migration off site" statement for those locations.

> **Recommendation:** Delete the "no migration" expected statement. Say instead that modeling does indicate migration off the site sometime in the future.

S-2 EIS Summary, Page S-19, lines 15-18:
Problem: The text implies that groundwater contamination will never be a problem simply because no contamination has been detected in off site monitoring wells. That is a poor argument for several reasons. First, the contamination could move off site in narrow plumes and miss the monitoring wells. Second, the contamination may be moving toward the wells, but not have reached it yet. Third, the modeling report for the area (Chapman et al., 1995) indicates contamination will likely move off the site sometime in the future. If the conservative estimate in the report is used (which includes limits of uncertainty in some of the parameters), a concentration of 720,000 pCi/L could occur at the boundary.

> **Recommendation:** Add text to indicate that the groundwater modeling indicates movement off the site could occur sometime in the future.

S-3 EIS Summary, Page S-19, lines 20-27:
Problem: The text implies no contamination has left or will leave the CNTA from underground sources. This does not match the conclusion from results presented in the NTS EIS Human Health Risks and Safety Impacts Study (Vol. 1, Appen. A, page 2-17, lines 22-26). The specific discussion of the CNTA modeling describes concentrations as high as 1.2×10^8 pCi/L at the boundary. There is no existing well at the location, but the text in the Summary is written in such a way as to imply there is no release beyond the site boundary. It states that "transport could already be occurring",

ORGANIZATION 5 (CONTINUED)

which does not clearly communicate the relevant detail that contamination has likely already left the site.

> **Recommendation:** Modify text to include the statement: "Ground water modeling has indicated contamination has likely left the site boundary, but has not been identified in any existing well."

<u>Volume 1, Appendix H, "Human Health Risks and Safety Impacts Study"</u>

S-4 Page ES-2, Lines 4-7:
Problem: The sentence states that tritium is never expected to exceed measurable concentrations at the site boundaries of the NTS and Shoal. However, on page 5-1, the report states the detection limit is 1 pCi/L. On the same page (5-1), the report states an estimate of 280 pCi/L at the boundary some time in the future. Therefore, tritium <u>is</u> expected to leave the NTS and Project Shoal boundaries in measurable concentrations in the future.

> **Recommendation:** The text on page ES-2 should be corrected to state that contaminants are expected leave the site boundaries at every site (not just the CNTA).

S-5 Page 2-17, lines 15-16:
Problem: The information describing the method of calculation of the NTS tritium source is poorly described in the EIS and may be incorrect. The text indicates the concentrations used for model inputs came from direct measurements from shot cavities. This does not appear to be the case. NRAMP has a version of the results and code from the program listed in the EIS. The description listed does not indicate the values came direct measurement. Rather, the actual method used appears to combine classified information regarding cavity volume with averages of recently declassified tritium estimates. The assumption appears to be that the tritium is, on average, distributed within a volume of water approximately equal to the sum of the shot cavities. The merits of the assumption can be debated, but only if the method is described to the public in the EIS document. I believe the public should not be led to think the data came from site-specific measurements (which may or may not exist, but which do not appear to have been used in the calculation of results).

> **Recommendation 1:** Briefly describe the method used to calculate the concentrations, so the public is more clear about the uncertainties of the estimate. (The method used to calculate the concentrations is not classified.)
>
> **Recommendation 2:** Briefly list which shot(s) was (were) chosen for the modeling. Was the shot closest to the boundary-of-concern used? Or was one that was considered by the DOE to be representative in yield and location used?

ORGANIZATION 5 (CONTINUED)

S-6 Page 2-17, lines 11-14:
Problem: The EIS states the MC_TRANS code was used to simulate the movement of tritium from test locations on Pahute Mesa and Yucca Flat to downstream locations within the NTS, to the towns of Beatty and Lathrop Wells, and to the boundary of the NTS south of Mercury, Nevada. Where are the results for the locations within the NTS boundaries? Where are the results for the towns of Beatty and Lathrop Wells? It seems that the only result listed is for a distant, unlikely location.

> **Recommendation:** The results of the other locations should be presented for completeness and honesty (the locations listed could have higher risk values than the single NTS location listed in the EIS).

S-7 Page 2-17, lines 11-14:
Problem: Not all of the relevant risk calculations have been presented. A risk estimate was conducted for the NTS using the Solute Flux method, the same as was used for Project Shoal and the CNTA. The study (Daniels et al., 1993 and Andricavic et al., 1994) estimated the risk at the boundary near Pahute Mesa and at the nearest accessible environment, the Oasis Valley, which is 19 km downgradient. The risks were estimated to be as high as 2×10^{-2} at the boundary and 1.4×10^{-6} at the Oasis Valley. Those risks are significant relative to a de minimus level and are quite high relative to the value used in the EIS (1.5×10^{-11} at the boundary near Mercury).

> **Recommendation:** Include the Oasis Valley in list of locations that have completed calculations. (The high estimate of risk at the boundary does not need to be included in this EIS, because it appears to be US Air Force-controlled property adjacent to the NTS at that point, and is therefore still under administrative control for the near-future. And the EIS is not considering US Air Force property to be available for public access in the scope of the EIS.)

S-8 Page 2-17, lines 16 and 17:
Problem: Regarding the risk calculations for the NTS boundaries, the equations listed in Attachment A may or may not be the equations used to calculate the values, but are incomplete if the groundwater flow and contaminant transport parameters are not available for review. (The document describing the results has apparently not been made available to the public or evaluating groups such as NRAMP.) Therefore, the equations listed in Attachment A are of limited value.

> **Recommendation 1:** Release the document containing the data and results for the MC_TRANS modeling. (The transport calculations are not likely classified, nor is the model treatment of the source term.) The equations do not appear to have been used for the offsite locations (Shoal and CNTA).
>
> **Recommendation 2:** If Recommendation 1 cannot be followed because the modeling report is not finished, then the EIS results should be listed as interim results.

ORGANIZATION 5 (CONTINUED)

Recommendation 3: If Recommendation 2 cannot be followed, do not cite the equations likely used – the public cannot test their application or relevance.

S-9 Page 2-17, lines 23-29:
Problem: The equations (or even summation of the method) used for calculating the risks at the off-site locations (within the Solute Flux method) are not listed in the EIS document. An approach using an age-specific intake distribution, time-dependent tritium concentrations, and age-dependent health effects was used.

Recommendation: The method should be described (briefly) or is should not be used to calculate the values. If the risk calculation method within the Solute Flux method) is not to be used, the more simple equations listed in back of the EIS would have to be used, causing new results.

S-10 Page 5-1, Lines 15-16:
Problem: The risk assessment for scenarios involving ingestion of water are said to be identical for each alternative. As stated in comment G-1, above, Land Use Alternative 4 involves turning back some of the land (70%) to public lands inventory. Therefore, the land uses are not sufficiently similar to do only one water ingestion scenario that would be applicable to all.

Recommendation: The evaluation of the risks to the public should be corrected to include estimation of risk at the potential new boundaries for Alternative 4.

S-11 Page 5-2, Table 5-1:
Problem: The report lists a table of health risks to individuals, summarizing work from several different reports.

Recommendation: Looking at the original texts, the risks included in EIS work were the minimum of a variety of scenarios listed in the original texts. The values in the original text include reasonable (according to the authors of the texts) inclusion of uncertainty. Uncertainties which were in the original texts include uncertainties in the mean velocity of the groundwater and greater areal variation in hydraulic conductivity. In some of the cases, the risk including the higher uncertainties is still de minimus (less than 10^{-6}). In other cases, such as Project Shoal, the risks increase from a de minimus level to levels that have, for other sites, been considered significant. I recommend changing Table 5-1 to include the more conservative values listed in my attached table.

S-12 Page 5-2, Table 5-1:
Problem: The report lists a table of health risks to individuals, summarizing work from several different reports. A risk estimate was conducted for the NTS using the Solute Flux method, the same as was used for Project Shoal and the CNTA. The study (Daniels et al., 1993 and Andricevic et al., 1994) estimated the risk at the boundary near Pahute Mesa and at the nearest accessible environment, the Oasis Valley, which

ORGANIZATION 5 (CONTINUED)

is 19 km downgradient. The risks were estimated to be as high as 2×10^{-2} at the boundary and 1.4×10^{-5} at the Oasis Valley. Those risks are significant relative to a de minimus level and are quite high relative to the value used in the EIS (1.5×10^{-11} at the boundary near Mercury).

Recommendation: Include the value for the risk to residents near the Oasis Valley in Table 5-1. (The high estimate of risk at the boundary does not need to be included in this EIS, because it appears to be US Air Force-controlled property adjacent to the NTS at that point, and is therefore still under administrative control for the near-future. And the EIS is not considering US Air Force property to be available for public access in the scope of the EIS.)

S-13 Page 5-3, lines 8-9:
Problem: Regarding concentrations and arrival times listed in the EIS text for Project Shoal, the values increase when uncertainty (listed in the source document, Chapman et al., 1995) is included. For the Project Shoal Area, if listed uncertainties are included, the peak tritium concentrations in the groundwater could be as high as 720,000 pCi/L, arriving 71 years after the test. The number cited in the EIS is 280 pCi/L at 206 years.

Recommendation: Correct the text to include the values resulting from the higher levels of uncertainty.

S-14 Page 5-1, lines 25-26:
Problem: The evaluation of the risk calculations of the NTS boundary near Mercury is more difficult to conduct than for the offsites (Shoal and CNTA), because the report referenced for the results is apparently not publicly available. NRAMP has a version of the results and code from the program listed in the EIS, but the calculation included in the EIS is not given in the documentation available to NRAMP. From initial calculations conducted by NRAMP, it is unlikely that there is substantial risk at the boundary near Mercury. However, other boundary locations may be more appropriate to list in the EIS. For instance, the boundary near Pahute Mesa has shot locations much closer to the boundary and has hydraulic gradients which could move the contaminants past the boundary. A risk estimate was conducted for the NTS using the Solute Flux method, the same as was used for Project Shoal and the CNTA. The study (Daniels et al., 1993 and Andricevic et al., 1994) estimated the risk at the boundary near Pahute Mesa and at the nearest accessible environment, the Oasis Valley, which is 19 km downgradient. The risks were estimated to be as high as 2×10^{-2} at the boundary and 1.4×10^{-5} at the Oasis Valley. Those risks are significant relative to a de minimus level and are quite high relative to the value used in the EIS (1.5×10^{-11} at the boundary near Mercury).

Recommendation 1: Provide more of the framework for the parameters and calculations used to produce the Mercury boundary number.

Recommendation 2: Include the Pahute Mesa to Oasis Valley results in discussion.

ORGANIZATION 5 (CONTINUED)

REFERENCES

Andricevic, R., Daniels, J.I. and Jacobson, R.L.. 1994. "Radionuclide migration using a travel time transport approach and its application in risk analysis." J. of Hydrology. Vol. 163, pp. 125-145.

Daniels, J.I., Andricevic, R. Anspaugh, L.R. and Jacobson, R.L. 1993. "Risk-based screening analysis of ground water contaminated by radionuclides introduced at the Nevada Test Site (NTS)." Tech. Rep. UCRL-ID-112789, Lawrence Livermore National Laboratory, Livermore, CA.

7

ORGANIZATION 5 (CONTINUED)

Table 1. Considering Limits of Uncertainties in Original Documents

Test Location	Receptor Location	Arrival Time of Peak Concentration (yr)	Dose (rem)	Radiation LCF	Radiation Detriment
Yucca Flat	Mercury	* (EIS: 100)	* (EIS: 3.0 x 10^{-6})	* (EIS: 1.5 x 10^{-11})	* (EIS: 7.0 x 10^{-12})
Project Shoal Area	Eastern Boundary	**71** (EIS: 206)	**4** (EIS: 1.6 x 10^{-3})	**2 x 10^{-3}** (EIS: 8.0 x 10^{-7})	**9.2 x 10^{-4}** (EIS: 3.7 x 10^{-7})
Project Shoal Area	Nearest Public Well	** (EIS: 278)	**0.08** (EIS: 2.0 x 10^{-7})	**4 x 10^{-5}** (EIS: 1.0 x 10^{-10})	**1.8 x 10^{-5}** (EIS: 4.6 x 10^{-11})
Central Nevada Test Area	Central Nevada Test Area Boundary	**8** (EIS: 15)	**11** (EIS: 8.0)	**5.3 x 10^{-3}** (EIS: 4.0 x 10^{-3})	**2.4 x 10^{-3}** (EIS: 1.8 x 10^{-3})
Central Nevada Test Area	Nearest Public Well	**117** (EIS: 410)	**6 x 10^{-7}** (EIS: 1.8 x 10^{-20})	**3.2 x 10^{-10}** (EIS: 9.0 x 10^{-24})	**1.5 x 10^{-10}** (EIS: 4.1 x 10^{-24})

* Original documentation not available
** Not listed in original document

8

ORGANIZATION 6

NTS DEVELOPMENT CORPORATION

April 24, 1996

Donald R. Elle, Director
Environmental Protection Division
U.S. Department of Energy Nevada
P. O. Box 14459
Las Vegas, NV 89114

Dear Mr. Elle:

As the DOE-designated Community Reuse Organization for the Test Site, NTS Development Corporation's (NTSDC) mission is to increase economic activity at the Test Site which will benefit both the public and private sectors. To achieve this, the non-profit, community-based organization is working closely with the Department of Energy and its management and operations contractor to create opportunities for commercial development at the site. The goal is twofold: 1) to protect the long-term interests of the community by enhancing future options for the work force, and 2) to maximize utilization of government resources and facilities which have been affected by budget reductions.

The commercial development referenced above could include business relocations to the Test Site to take advantage of excess federal facilities, equipment and expertise. Other enterprises might construct new facilities at the Test Site because they require the Test Site's unique space advantages for the testing and manufacturing of new technologies and products.

At this time it is impossible to predict the exact nature of all of the commercial ventures which could occur at the site. However, the testing, development, and manufacturing of new rocket designs and vehicle safety devices are two industries already being considered. Mining, commercial tours, and an enterprise which would utilize the spill test facility are others.

Regardless of the various potential scenarios, NTSDC's work will be directly affected by many of the resource management decisions which could result from the draft January 1996 Environmental Impact Statement being proposed at this time. We're attaching our comments for your review.

Thank you for this opportunity.

Sincerely,

Tim Carlson, President

2340 Paseo Del Prado, Suite D-108, Las Vegas, Nevada 89102
Telephone (702) 257-7900 Fax (702) 257-7999

ORGANIZATION 6 (CONTINUED)

<u>NTS DEVELOPMENT CORPORATION</u>

The attached comments are offered in response to the draft Nevada Test Site Environmental Impact Statement, dated January 1996.

<u>EXPANDED USE OF THE NEVADA TEST SITE:</u> "NONDEFENSE RESEARCH AND DEVELOPMENT"

A. REQUEST RESTRICTIVE LANGUAGE BE MODIFIED

Within the above category, restrictive EIS language used to describe potential projects may create barriers to the community's efforts to develop expanded opportunities at the Test Site. If so, the language would limit DOE's desire to maximize utilization of Test Site resources to stimulate the regional economy. It would also limit the NTS Development Corporation's ability to facilitate business ventures for the commercial application of current and future technologies.

1 We request DOE modify the EIS references to potential projects wherever that language is so narrowly constructed that it could preclude all but a single or very few possibilities.

Examples of restrictive references:

> In the description of Alternative 3, Expanded Use (Vol. 1, Chapter 3, pages 15-16), the language describing new initiative possibilities is as follows:
>
> "New initiatives would include constructing and operating a solar-energy production facility and siting an alternative vehicle fuels demonstration project at the NTS. Alternative 3 would also permit the public and private institutions to use the NTS for the purpose of developing new environmental remediation technologies in conjunction with ongoing Environmental Restoration Program activities.
>
> ...abundant data...supports the choice of the NTS as a viable and attractive location for measuring the success or failure of new technologies for remediation of radioactively contaminated areas....The Nondefense Research and Development Program operations and activities at the NTS that would be pursued under Alternative 3 are as follows:
>
> -- Expanding activities at the Spill Test Facility in Area 5
> -- Developing and testing new remediation technology
> -- Developing and constructing a solar-energy power-generation facility."

By itemizing what new initiatives would be included under Alternative 3, and by specifying that public or private "institutions" pursuing only one kind of technology development (environmental remediation technology) would be "permitted" under this Alternative, the EIS may be drastically circumscribing the development potential. The implication is that other initiatives could not be included and business ventures sponsored by non-institutions would not be permitted under Alternative 3.

This implication, if unintended, could be changed simply by adding words which indicate the itemized activities are being used as examples of the types of activities which could be included under Alternative 3. The reference to "institutions" could be changed to "entities", and the reference to environmental remediation technology could be clarified as intended only as an example of various types of technology development which would be permitted at the Test Site. Expressions like "could include but not be limited to," and "such as" would make it clear that the EIS was not intended to preclude consideration of a wide variety of initiatives.

2

ORGANIZATION 6 (CONTINUED)

B. IS THE OMISSION OF MINING AS AN EXAMPLE OF EXPANDED USE AN OVERSIGHT?

2 UNDER ALTERNATIVE 4, the nondefense research and development program activities referenced are limited to those which were mentioned in Alternative 3. Mining was not mentioned as a possibility in Alternative 3. Is this omission intended to preclude mining as one of the alternate uses of NTS land?

3 Also, although Alternative 4 discusses the possibility that some NTS lands could be relinquished to the U.S. Bureau of Land Management, the potential uses of these relinquished lands are listed as public education and recreation. Mining is again not mentioned as a potential use. Are public education and recreation being used only as examples, thereby allowing consideration of mining as a potential use? Or, is mining precluded because it is not mentioned?

Figure 3-4, Volume 1, Chapter 3, page 24, identifies the potential Turn Back Area (land which could be relinquished to the BLM) and the accompanying narrative references the area as designated for potential public education, recreation, and use. Would mining be a possibility under the "and use?"

4 If mining is being considered or anticipated as a potential use, why is there no provision in the EIS for opening the potential turn back area for exploration? This would have to come first, to determine the probability of the kinds and quantities of minerals in the area.

C. SUPPORT ALTERNATIVE 3

In reference to the Summary Comparison of Environmental Impacts of the Alternatives (Volume 1, Chapter 3, Table 3-5), NTS Development Corporation supports Alternative 3. It is the only one which projects a positive influence on the socioeconomics of the region.

3

ORGANIZATION 7

Campaign for Nevada's Future

May 3, 1996

Dr. Don Elle
Nevada Operations
Department of Energy
P.O. Box 14459
Las Vegas, NV 89114

Dear Dr. Elle,

This letter is a transmittal of the comments of Campaign for Nevada's Future on the Draft Environmental Impact Statement (DEIS) for the Nevada Test Site.

- The DEIS's numerous technical deficiencies need to be corrected prior to a Final EIS being issued.

1 Specifically on page 4-110 the decay of tritium is far slower than the figures suggest. Calculated according to generally accepted half-life of 12.3 years, there should be approximately 80% curies of the original tritium concentration left after five years. The document suggests that only 21% was remaining. Has any empirical data been collected to support the estimate in the document? If so,
2 have groundwater transport studies been done in this area to determine how far and in which direction the missing tritium has migrated?

3 On page 5-59 the document reports on a tritium contaminated groundwater transport scenario which is focused on radiation released at Yucca Flat. Paiute Mesa is far closer to inhabited areas offsite than Yucca Flat. The scenario in the document should focus on the closest possible exposed population, not one of the furthest. Specifically, the report, *"Risk-based screening analysis of ground water contaminated by radionuclides introduced at the Nevada Test Site,"* by Daniels et al from LLNL and DRI suggest that radioactively contaminated water will migrate to Oasis Valley.

4 In addition, the Final EIS should seek to model the effects of groundwater pumping which were observed at the tunnel complex in the last several years of nuclear testing. The monitoring of groundwater discharge from the tunnels complexes showed clear spikes from one to two days after each test. It appears that the seismic pulses from the detonations were pushing contaminants along the flow paths at greater volumes than normal groundwater flow. This suggests that more aggressive monitoring around test cavities in tuffaceous rocks may be prudent, as the contaminants may have migrated further than steady state flow models suggest.

ORGANIZATION 7 (CONTINUED)

5 • All data regarding contamination should be declassified. The public has a right to know about potential hazards. The examples cited above are sufficient to show that the EIS will be suspect unless the public can verify for themselves the conclusions in the document through independent analysis of the data.

6 • CNF urges the DOE to determine a preferred alternative which:

a) Supports solar energy on the NTS
b) accelerates environmental restoration
c) limits waste management activities to the waste already on-site, and that which will be generated through on-site ER.
d) closes all parts of the NTS dedicated to building weapons of mass destruction, including but not limited to nuclear weapons.
e) turns back uncontaminated lands to the Western Shoshone and Paiute Tribes among whose members are the descendants of the indigenous population.

7 CNF believes that a six month comment period is more appropriate for a document of the size and complexity of the DEIS and suggests the DOE extend the comment period appropriately.
8 We may submit additional comments in the future, and would like them considered with the same weight as the enclosed and our hearing testimony.

Sincerely yours,

Chris Brown
Director

PO Box 60391 Las Vegas NV 89160

ORGANIZATION 8

5-03-1996 5:06PM FROM NRDC WASHINGTON 202 783 5917 P.2

Natural Resources Defense Council
NRDC

1350 New York Ave., N.W.
Washington, DC 20005
202 783-7800
Fax 202 783-5917

Comments of the

Natural Resources Defense Council

on the

Draft Environmental Impact Statement

for the Nevada Test Site

Barbara A. Finamore
Attorney for NRDC

Christopher E. Paine
Senior Research Associate

100% Post-Consumer Recycled

40 West 20th Street
New York, New York 10011
212 727-2700
Fax 212 727-1773

71 Stevenson Street
San Francisco, CA 94105
415 777-0220
Fax 415 495-[illegible]

6310 San Vicente Blvd., Suite 250
Los Angeles, CA 90048
213 934-6900
Fax 213 934-1210

5-03-1996 5:06PM FROM NRDC WASHINGTON 202 783 5917 P.3

Natural Resources Defense Council

1350 New York Ave., N.W.
Washington, DC 20005
202 783-7800
Fax 202 783-5917

May 3, 1996

Donald R. Elle
Director
Environmental Protection Division
U.S. Department of Energy
Post Office Box 14459
Las Vegas, Nevada 89114

Fax: (702) 295-1264

Dear Mr. Elle:

The Natural Resources Defense Council, Inc. ("NRDC") submits the following comments on the Department of Energy ("DOE" or the "Department) Draft Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (the "Draft EIS" or "sitewide EIS").

Recognizing the need to evaluate the environmental risks and impacts of the DOE nuclear weapons complex on a comprehensive and ongoing basis, the Department's National Environmental Protection Act ("NEPA") implementing regulations require DOE to prepare sitewide environmental impact statements for certain large, multiple-facility DOE sites, and to evaluate these EISs at least every five years to determine whether supplementation or a new EIS is required. 10 C.F.R. § 1021.330. Since publication of the last sitewide EIS for the Nevada Test Site ("NTS") in 1977, tremendous changes have occurred with respect to U.S. national security policies for nuclear deterrence, arms control and nuclear proliferation. These changes have called into question the very purpose and need for the NTS once its primary mission, that of conducting underground nuclear weapons tests, was suspended by moratorium beginning in 1992, pending completion of negotiations on a permanent comprehensive test ban treaty expected to be completed this year.

100% Post-Consumer Recycled

40 West 20th Street
New York, New York 10011
212 727-2700
Fax 212 727-1773

71 Stevenson Street
San Francisco, CA 94105
415 777-0220
Fax 415 495-5996

6310 San Vicente Blvd., Suite 250
Los Angeles, CA 90048
213 934-6900
Fax 213 934-1210

ORGANIZATION 8 (CONTINUED)

5-03-1996 5:07PM FROM NRDC WASHINGTON 202 783 5917 P.4

Donald Elle
May 3, 1996
Page 2

The Draft EIS should be viewed as a meaningful opportunity for the Department to explore alternative uses of the Site in keeping with the nation's post-Cold War objectives.● The Draft EIS does take advantage of this opportunity in many respects, evaluating such alternatives as the demonstration and testing of new environmental remediation technologies. Yet apparently under the guise of "continuing current operations" and behind a veil of secrecy that it has already deliberately lifted, the Department has shielded from public review and comment a proposal for major Federal action posing significant environmental and nonproliferation risks: that of conducting subcritical nuclear experiments at NTS.

On October 27, 1996, DOE issued a press release announcing a decision by the Secretary to conduct a series of subcritical high-explosive experiments with nuclear materials at the Nevada Test Site (Attachment 1). The Secretary characterized this decision as "redirecting the work at Nevada to support a 'zero yield' Comprehensive Test Ban Treaty" (emphasis added). The press release and associated fact sheets (Attachment 2) emphasized the differences between previous underground nuclear tests and the subcritical experiments with respect to their purpose, location, configurations, and results. The subcritical experiments would be conducted at the LYNER ("Low Yield Nuclear Explosive Research") site at NTS, at a new tunnel complex, the mining of which commenced in March 1993. Id. No subcritical tests have apparently ever been conducted at that location, although a high explosive experiment using no nuclear materials took place there in March 1995 in preparation for the subcritical experiments.

Although DOE explained that the actual configurations of the explosive devices to be used are classified, since they relate to nuclear weapons technology, it described the experiments in detail and stressed the transparency of its operations. Among other things, DOE stated that the news media will be allowed to visit the LYNER complex one to two

5-03-1996 5:08PM FROM NRDC WASHINGTON 202 783 5917 P.5

Donald Elle
May 3, 1996
Page 3

weeks prior to the experiment to view preparations, and will be permitted at the Test Site when the experiments are conducted (Attachment 2). DOE has produced detailed unclassified descriptions, including diagrams of the LYNER complex, the experimental package and the experimental layout. (See, e.g., Attachment 3). DOE has also expressly considered the option of allowing foreign governmental access to the LYNER complex in connection with these tests. Id.

Further details of the tests were also provided to a concerned citizen in November, 1995, who noted in a letter to NRDC:

> *Previous tests of this sort were conducted 20 to 30 meters below the ground surface at the NTS and at Los Alamos, resulting in unsolvable contamination problems. During the 1950s, some so-called "safety" test[s] were conducted on the surface, at and near the NTS, resulting in wide-spread Pu-239 contamination surrounding the test locations. Plans, to deal with these contamination problems, are still being debated.*

(Attachment 4). Although the new subcritical nuclear weapons experiments would be conducted approximately 970 feet deep, DOE admitted that the experiments could still result in a release of radioactive and toxic materials into the environment, but described elaborate safeguards that it plans to implement in order to reduce the risk to the health and safety of the public and Test Site workers (Attachments 1-3).

In its October press release, DOE announced that the first two subcritical experiments were planned for mid-June and mid-September 1996, and that four additional experiments were planned for Fiscal Year 1997. More recently, however, DOE has reportedly decided to postpone the start of these experiments, apparently pending the completion of the Stockpile Stewardship and Management PEIS.

ORGANIZATION 8 (CONTINUED)

996 5:09PM FROM NRDC WASHINGTON 202 783 5917 P.6

Donald Elle
May 3, 1996
Page 4

The Secretary's announcement of planned subcritical nuclear weapons experiments at NTS occurred several months before DOE published the Draft NTS environmental impact statement. Yet we have found only passing reference to these experiments in the multi-volume Draft EIS, and can only speculate as to DOE's reasons for failing to include a detailed analysis. Apart from simple oversight, possible justifications appear to include the following: (1) these subcritical experiments are part of the "continued current operations" at NTS and therefore merit no detailed analysis, particularly of purpose, need or alternatives; (2) any discussion or analysis of such experiments belongs in a classified appendix to the Draft EIS rather than the unclassified body of the text; (3) the subcritical nuclear weapons experiments are an independent "interim action" under NEPA that may proceed before completion of the NTS EIS (or the programmatic EIS on Stockpile Stewardship and Management ("SSM")) on the basis of the 1977 sitewide EIS; or (4) the subcritical nuclear weapons experiments have been or will be discussed adequately in the programmatic SSM EIS.

As discussed below, none of these arguments provides a legally supportable basis for DOE's failure to include a detailed analysis of the subcritical experiments in the Draft EIS, using available unclassified information. Specifically, these arguments do not justify DOE's failure to evaluate in the Draft EIS the purpose and need for these experiments and their potentially significant impacts, particular with respect to U.S. nuclear nonproliferation goals. Nor do they excuse DOE's failure to rigorously explore and objectively evaluate all reasonable alternatives to these experiments in either the Draft EIS or, more appropriately, the draft programmatic EIS for the Stockpile Stewardship and Management Program.[1] Since both documents are so inadequate in these respects as to

[1] NRDC herein incorporates by reference its related comments on the Draft Programmatic Environmental Impact Statement on the Stockpile Stewardship and Management Program, which will be submitted to DOE on or before May 7, 1996.

preclude meaningful analysis, DOE must prepare and circulate revised draft EISs that analyze the subcritical nuclear weapons experiments in accordance with the requirements of NEPA. Any decision by DOE to proceed with these experiments before it has fulfilled these NEPA obligations would be in violation of law.

1

A. Subcritical Nuclear Experiments Are Not "Continued Current Operations" or the "No Action Alternative" at the Test Site, But Rather a Proposal for Major Federal Action with Significant Impacts

The Draft NTS EIS categorizes all projects and activities at NTS into one of five categories: Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. In its description of the Defense Program, DOE includes the following: "Other aspects of the program include treaty compliant and permitted conventional high-explosive tests, dynamic experiments and hydrodynamic testing." Draft EIS at S-4.

For each of the program areas, the Draft EIS analyzes four alternatives: "(1) Continue Current Operations (No Action Alternative), (2) Discontinue Operations, (3) Expanded Use, and (4) Alternate Use of Withdrawn Lands." Draft EIS at S-5. Under the Continue Current Operations/No Action Alternative, DOE assumes that NTS activities will continue in the same manner and degree as they have within the past 3 to 5 years. Id. at 3.2. Amazingly enough, DOE includes under the Continue Current Operations/No Action Alternative the possibility that the President will either revoke the moratorium or
2 invoke the "supreme national interest" clause of a test ban treaty and direct DOE to conduct one or more nuclear weapons tests! Id. at 3-3. It is difficult to imagine how such drastic action could be construed as either business as usual or no action.

No less surprisingly, DOE also specifically includes subcritical nuclear weapons experiments in its description of the Continue Current Operations/No Action Alternative: Virtually the only description of these tests in the Draft EIS is contained in the following sentence:

> Subcritical experiments, a subset of dynamic experiments and hydrodynamic tests, conducted with special nuclear materials would be conducted only where containment is assured.

Draft EIS at 3-3. The only other reference to subcritical nuclear experiments we could find in the Draft EIS is buried within an extensive description of non-nuclear hydrodynamic tests and dynamic experiments:

> Dynamic experiments and hydrodynamic tests may include the use of special nuclear material; however, those that are to be conducted are designed to remain subcritical; i.e., no self-sustaining fission chain reaction will occur. ...Subcritical experiments and tests performed at the Lyner Complex may contain special nuclear materials.

Draft EIS at A-11. The Draft EIS discusses the potential environmental impacts of all "Continue Current Operations/No Action" alternatives, including resumption of nuclear weapons testing, as one combined activity. DOE concluded that these impacts would be small because it compared them to the extensive contamination and other environmental impacts that have already occurred as a result of previous testing operations. Draft EIS at 3-36. No attempt was made to address the impacts of the subcritical tests, weigh them against any benefits of proceeding with such tests, or evaluate alternatives. Nor can we
3 find the detailed descriptions of the subcritical tests that were provided following the announcement of testing last fall.

ORGANIZATION 8 (CONTINUED)

Donald Elle
May 3, 1996
Page 7

3 cont. Despite DOE's classification scheme, it is clear that subcritical nuclear experiments are neither a continuation of current operations nor a "no action alternative." DOE agrees that the "emphasis of the U.S. nuclear weapons program has shifted dramatically over the past few years from developing and producing new weapons to dismantlement and maintenance of a smaller enduring stockpile." Draft SSM EIS at 1-1. No nuclear testing of any kind has taken place at NTS since 1992, and subcritical nuclear

4 experiments have not yet begun. Nuclear testing resulting in criticality is expresaly prohibited by the President's August 11, 1995 announcement that the U.S. is seeking a "zero-yield" comprehensive test ban treaty. In fact it is not yet clear what categories of subcritical tests will be permitted under the final version of that treaty.

5 Subcritical experiments are not simply a subset of non-nuclear hydrodynamic tests and dynamic experiments. The possibility exists that flaws in experimental design or implementation of the subcritical experiments could accidentally lead to criticality. In contrast, non-nuclear tests and experiments cannot result in radioactive releases or criticality, are not currently prohibited by moratorium, and are not the subject of heated negotiations in connection with the proposed Comprehensive Test Ban Treaty.

To lump subcritical nuclear experiments together with non-nuclear tests would ignore the fact that conducting subcritical nuclear experiments would represent a major change in the status quo at the Nevada Test Site. The DOE Assistant Secretary for Nuclear Programs recognized this fact when he sought express approval from Secretary O'Leary to conduct subcritical nuclear experiments:

> Many nuclear weapon-related high explosive experiments are conducted each year at the laboratories and the Nevada Test Site without requiring your specific approval. Also,

ORGANIZATION 8 (CONTINUED)

Donald Elle
May 3, 1996
Page 8

5 cont.

> contained dynamic experiments using fissile material are conducted at the laboratories without your specific approval. However, because of the planned use of fissile material in experiments at the Nevada Test Site, and the recent announcement of the President to seek a "zero" yield Comprehensive Test Ban Treaty, your approval of these experiments, in principle, is requested.

Memorandum for the Secretary from Victor H. Reis, Assistant Secretary for Nuclear Programs: ACTION: Approval, in Principle, of Subcritical High Explosive Experiments with Special Nuclear Material at the Nevada Test Site (October 17, 1996) (Attachment 5). In announcing the subcritical nuclear tests, Secretary O'Leary also recognized the change in NTS programs represented by these new activities "The actions I have taken today ...[are] redirecting the work at Nevada to support a 'zero yield' Comprehensive Test Ban Treaty. (Attachment 1) (emphasis added).

6 Rather than "continued operations" or "no action," the request for approval of a program of subcritical nuclear experiments represents a proposal for major Federal action with significant environmental effects, and therefore requires detailed EIS analysis. The Council on Environmental Quality ("CEQ") NEPA regulations, which are binding on DOE, define "proposal" as "exist[ing] at that stage in the development of an action when an agency subject to the Act has a goal and is actively preparing to make a decision on one or more alternative means of accomplishing that goal and the effects can be meaningfully evaluated." 40 C.F.R. § 1508.23. A proposal may exist in fact as well as by agency declaration that one exists. Id. The fact that the Secretary originally approved such experiments prior to the completion of sitewide and programmatic EISs does not relegate these tests to the category of "ongoing activities," particularly when the Secretary has reportedly decided to postpone the experiments until completion of such reviews.

ORGANIZATION 8 (CONTINUED)

5-03-1996 5:13PM FROM NRDC WASHINGTON 202 783 5917 P.11

Donald Elle
May 3, 1996
Page 9

6 cont.

The CEQ Regulations define "major Federal action" to include "actions with effects that may be major....Major reinforces but does not have a meaning independent of significantly." 40 C.F.R. § 1508.18. The CEQ Regulations contain an extensive definition of the term "significantly," which includes consideration of, among other things:

> The degree to which the proposed action affects public health and safety;
>
> The degree to which the effects on the quality of the human environment are likely to be highly controversial;
>
> The degree to which the possible effects on the human environment are highly unlikely or involve uncertain or unknown risks; and
>
> The degree to which the action may establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration;

40 C.F.R. § 1508.27. Courts have held that the presence of even one of these factors would be sufficient to render the impacts significant. Agencies are required to consider all significant environmental effects even if they were not identified in the scoping process. Oregon Natural Resources Council v. Marsh, 52 F.3d 1485 (9th Cir. 1995). Moreover, agencies must consider not only ecological impacts but also economic, cultural, social and other related impacts, whether direct, indirect or cumulative. 40 C.F.R. § 1508.8.

In this case, subcritical nuclear experiments meet a number of the above tests for determining significance. The experiments pose a risk of accidental releases of radiological and toxic materials that could have a significant effect on public health and

ORGANIZATION 8 (CONTINUED)

5-03-1996 5:27PM FROM NRDC WASHINGTON 202 783 5917 P.2

Donald Elle
May 3, 1996
Page 10

6 cont.

safety. The experiments themselves, particularly their potential impact on a comprehensive test ban treaty, could prove highly controversial. Both the environmental and nonproliferation risks of these technologies are highly uncertain and involve unique and unknown risks. Launching a program of subcritical experiments may establish a precedence for future similar actions in the U.S. and abroad.

After DOE announced its plans for subcritical nuclear experiments, NRDC twice wrote to the Department expressing its doubts about the need for and validity of such tests, and describing significant concerns about the negative impacts of such tests on test ban treaty negotiations and other U.S. nonproliferation efforts. These letters are included as Attachments 6 and 7 and incorporated herein as comments on the Draft NTS EIS.

B. DOE Should Not Relegate Discussion and Analysis of the Subcritical Nuclear Experiments to a Classified EIS Appendix

7

Shortly after its perfunctory mention of subcritical nuclear experiments, the Draft EIS states: "Further Lyner Complex details will be addressed in a classified appendix to the NTS EIS." Draft EIS at A-12. It is unclear whether this classified appendix includes any further discussion of the planned subcritical experiments. Even if it does, however, in light of the amount of information about the experiments that has already been made available, such a completely classified discussion would not satisfy the purpose and goals of NEPA, and would violate DOE's classification guidelines and the spirit of Secretary O'Leary's "Openness Initiative."

The disclosure of information under NEPA is governed by the provisions of the Freedom of Information Act, 5 U.S.C. § 522 (1976) ("FOIA"),which is expressly incorporated by reference into NEPA. See 42 U.S.C. § 4332(2)(c). Exemption 1 of

5-03-1996 5:27PM FROM NRDC WASHINGTON 202 783 5917 P.3

Donald Elle
May 3, 1996
Page 11

FOIA in turn allows nondisclosure of materials which are "(A) specifically authorized under criteria established by an Executive order to be kept secret in the interest of national defense or foreign policy and (B) are in fact properly classified pursuant to such Executive order." 5 U.S.C. § 552(b)(1) (1976). DOE NEPA regulations reflect this regime as follows:

> (a) Notwithstanding other sections of this part, DOE shall not disclose classified, confidential or other information that DOE would not disclose pursuant to the Freedom of Information Act and DOE's regulations implementing the FOIA, except as provided by 40 C.F.R. § 1506.6(f) (citations omitted).
>
> (b) To the fullest extent possible, DOE shall segregate any information that is exempt from disclosure requirements into an appendix to allow public review of the remainder of a NEPA document.

7 cont.

10 C.F.R. § 1021.340 (a) and (b) (emphasis added). To the extent that DOE has decided to relegate any detailed discussion of subcritical nuclear experiments to a classified appendix, it is not violating the purpose and spirit of NEPA and FOIA to provide maximum access consistent with the needs of national security. First, as discussed above, DOE has already provided considerably more information to the public about the planned experiments than appears in the unclassified portion of the EIS. Second, DOE has repeatedly emphasized that the tests will be conducted in a open, transparent manner, and has even considered the possibility of opening them to representatives of foreign governments. Any subsequent decision that information already released to the public must now be considered classified expressly contravenes DOE's announced policy of openness.

ORGANIZATION 8 (CONTINUED)

5-03-1996 5:28PM FROM NRDC WASHINGTON 202 783 5917 P.4

Donald Elle
May 3, 1996
Page 12

7 cont.

Courts have held repeatedly that the limited exceptions to FOIA must be construed narrowly because disclosure, not secrecy, is the dominant objective of the Act. See, e.g., Fisher v. U.S. Dept. of Justice, 772 F. Supp. 7 (D.D.C. 1991), aff'd. 968 F.2d 92 (D.C.Cir. 1992). The situation here is very different from that in the Supreme Court case of Weinberger v. Catholic Action of Hawaii/Peace Education Project, 450 U.S. 1039 (1981), where the Navy could not even admit or deny the existence of a proposal to store nuclear weapons without revealing classified information. To the contrary, as described above, DOE held a press conference to announce the experiments, revealed the planned dates and details of the tests, and plans to allow the news media to be present at the test site when the tests are conducted.

In such cases, courts have held that nonexempt portions of a document must be disclosed unless they are "inextricably intertwined" with the exempt portions such that excision of exempt information would impose significant costs on an agency and produce an edited document with little informational value. Neufeld v. Internal Revenue Service, 646 F.2d 661 (D.C. Cir. 1981). It is hard to imagine how DOE's classified appendix would meet this test. In particular, it is difficult to see how a discussion of alternatives to the planned action, which has been described as the "heart of the environmental impact statement" (40 C.F.R. § 1502.14), cannot be included in the unclassified portion of the NTS EIS.

C. Subcritical Nuclear Experiments Cannot Meet the Test for Interim Actions That May Proceed Before Completion of the Sitewide and Programmatic EISs

8

DOE cannot make a reasonable argument that the subcritical nuclear experiments can proceed as interim actions on the basis of an adequate existing EIS before completion of the sitewide and programmatic EISs. The CEQ Regulations provide:

ORGANIZATION 8 (CONTINUED)

5-03-1996 5:29PM FROM NRDC WASHINGTON 202 783 5917 P.5

Donald Elle
May 3, 1996
Page 13

> While work on a required program environmental impact statement is in progress and the action is not covered by an existing program statement, agencies shall not undertake in the interim any major Federal action covered by the program which may significantly affect the quality of the human environment unless such action (1) is justified independently of the program; (2) is itself accompanied by an adequate environmental impact statement; and (3) will not prejudice the ultimate decision on the program. Interim action prejudices the ultimate decision on a program when it tends to determine subsequent development or limit alternatives.

8 cont. 40 C.F.R. § 1506.1(c). The subcritical experiments cannot meet any of these three requirements for permissible interim actions. First, the experiments are by DOE's own definition an integral part of the Stockpile Stewardship and Management program, which now also constitutes a major part of the mission of the Test Site. The experiments have no independent justification outside of the programs described in the programmatic SSM EIS and the NTS EIS, and should not proceed until such reviews are complete. Second, the subcritical experiments have never been analyzed in an adequate environmental impact statement. Since these particular type of experiments have never been performed under the proposed conditions, previous EISs could only have discussed actual weapons tests and/or nonnuclear tests. As discussed above, however, DOE has gone to great lengths to distinguish the planned subcritical experiments from previous nuclear weapons tests, and non-nuclear tests are clearly distinguishable as well. Finally, interim action on the planned subcritical nuclear experiments would tend to determine subsequent development or limit alternatives, particularly after scarce agency resources have been allocated to test preparation at NTS. For these reasons, DOE cannot proceed with the subcritical nuclear experiments prior to an adequate NEPA review in the sitewide EIS and/or the programmatic EIS on Stockpile Stewardship and Management.

ORGANIZATION 8 (CONTINUED)

5-03-1996 5:30PM FROM NRDC WASHINGTON 202 783 5917 P.6

Donald Elle
May 3, 1996
Page 14

D. The Draft Programmatic EIS on Stockpile Stewardship and Management Does Not Provide an Adequate NEPA Review of the Planned Subcritical Experiments

9 DOE cannot justify a failure to consider the planned subcritical nuclear tests and explore all reasonable alternatives based on an argument that the Programmatic EIS on Stockpile Stewardship and Management provides an adequate review of these issues. Courts have held that where a programmatic EIS contains an adequate discussion of impacts and alternatives to a particular project, a subsequent project-specific EIS analysis is not always necessary. Yet in this case the programmatic EIS also fails completely to discuss any aspects of the planned subcritical experiments. NRDC's comments on the Stockpile Stewardship and Management Programmatic EIS explain why a thorough discussion of purpose, need and alternatives to the subcritical tests belongs most appropriately in the Programmatic SSM EIS, although it could also be included in the sitewide EIS. At this point, however, both documents completely fail to consider whether such tests should proceed at all in light of their environmental and nonproliferation risks, and if so, whether it would be more appropriate and feasible to conduct at them at one of the DOE weapons laboratories.

E. In Light of the Inadequacies in Both the Programmatic and Sitewide EISs, DOE Must Prepare and Circulate Revised Draft EISs To Analyze Subcritical Nuclear Experiments

10 The CEQ Regulations provide: "If a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion." 40 C.F.R. § 1502.9(a). In this case, both the draft NTS and the draft SSM PEIS provide no analysis at all of the planned subcritical nuclear experiments.

ORGANIZATION 8 (CONTINUED)

5-03-1996 5:31PM FROM NRDC WASHINGTON 202 783 5917 P.7

Donald Elle
May 3, 1996
Page 15

10 cont. NRDC hereby requests that DOE prepare and circulate a revised Draft NTS EIS in order to discuss impacts and alternatives to these experiments in a meaningful manner. NRDC makes a similar request with respect to the SSM PEIS in its comments on the draft of that document. Any decision by DOE to proceed with these experiments before it has fulfilled its NEPA obligations in this manner would inconsistent with the purpose and spirit of NEPA and in violation of law.

We thank DOE for the opportunity to provide these written comments, and look forward to your response.

Sincerely,

Barbara A. Finamore, Esq.
Attorney for NRDC

Christopher E. Paine
Senior Research Associate

ORGANIZATION 9

CITIZEN ALERT

POB 1681
Las Vegas, NV
89126
(702) 796-5662
FAX 796-4886

POB 5339
Reno, NV 89513
(702) 827-4200
FAX 827-4299

May 3, 1996

Dr. Donald Elle, Director
Environmental Protection Division
U.S. Department of Energy
Nevada Operations Office
PO Box 14459
Las Vegas, NV 89114

RE: Comments on the Draft Environmental Impact Statement for the Nevada Test Site

Dear Dr. Elle:

1 Enclosed you will find comments in regards to the NTS-DEIS, compiled by Rick Nielsen, on behalf of Citizen Alert. Much to our dismay, the size of the document(s), and other DOE documents currently being circulated for public comment which potentially impact the NTS, has limited our responses and comments. We therefore reccomend that the comment period be extended for at least thirty more days, and preferably forty-five. Thorough review of these documents, and others, requires a considerable amount of time and resources. Unfortunately, small public non-profit organizations are usually limited in both.

Below are some general comments on the DEIS.

<u>Time line for current DOE EIS documents</u>

2 Citizen Alert is concerned about the apparent "fast track" time line of the NTS-DEIS with regard to the inter-relation and integration of decisions and timeliness with all other on-going EIS's being undertaken by the DOE. Do these documents and the decisions made, accurately interact with decisions made with regard to future uses of the NTS in the NTS/DEIS? Is the NEPA review as thorough as it should be in light of the uncertainties

Full citizen participation for democratic decisions on issues that affect our lives. Non-Profit tax deductible.

2 cont. arising from other, as of yet, unmade decisions. Are decisions going to be made concurrently, or are decisions made in this document going to predetermine decisions made in the other documents, or is there no bearing whatsoever on any of these decisions. For example, if decisions are pending in other EIS's, that could potentially bring plutonium to the NTS, the impacts of that decision should be comprehensively analyzed, not just mentioned, in the DEIS/NTS document.

<u>No Action Alternative</u>

3 Under the list of alternatives, the no action alternative, under which DOE would continue most-all of its current operations, is in conflict with the original land withdrawal order. The ongoing waste management activities, a source of considerable waste importation into Nevada, are thus also in conflict with the land withdrawal. If the NTS is to continue its current operations under any alternatives, or expand its use, this issue must be addressed in the Final EIS.

4 The DEIS also contains major discrepancies in the amounts of waste/waste shipments between the NTS-DEIS and the WM-PEIS, which has also omitted future waste generated from site remediations. There also appears to be differences in waste volumes within the NTS-DEIS itself. This, in itself, leads one to question the thoroughness, if not just the accuracy of the DEIS.

5 Similarly, the DOE concludes, somehow, that environmental impacts under Continue Current Operations would be minimal. Citizen Alert disagrees that environmental impacts from current operations can be considered, in any way, minimal.

<u>Discontinue Operations</u>

6 By all means, close it down with our blessings. However, under no circumstances should the DOE be allowed to maintain control of the entire site. Those areas that require additional monitoring should be transferred to State control, with the Federal government providing budget assistance for ongoing up-keep. The State, should they so choose, could then decide to return the land to public use or return the portions still usable, to the rightful owners, the Western Shoshones.

<u>Expanded Use</u>

As it is currently structured, this alternative represents the old adage, "You've got to take the bad with the good." Too many expensive and

potentially damaging activities are thrown in this alternative along with some potentially good projects and activities. Specifically, the acceleration of defense and waste management activities, which we believe to be counter to the will and consensus of the general public. Likewise, there may be benefits from the expanded activities in environmental restoration and solar energy. However, taken together, these activities don't seem to be compatible.

7 Citizen Alert is also concerned about potential new missions, projects, or activities that may end-up at the NTS which have not been identified yet. This is specifically in regard to the NTS Development Corporation and their charter to pump ecomonic life into, or out of, the unique resources of the NTS. While the utilization of the the NTS, for ecomonic and technology development is an admirable goal, we are concerned that the timing and approval of these new activities has the potential to introduce additional contamination and environmental consequences, with little or no opportunity for public input.

8 Regarding another aspect of proposed future use, operation of the LYNER facility, we feel it is covered too vaguely in the EIS. Perhaps it is better described in Appendix J. However, since that is a classified supplement, we question how sincere DOE is in asking for public participation in the NEPA process given the inclusion of classified supplements. The public cannot adequately evaluate something that is not available for their review. The "classified" nature of Appendix J, may also hinder international non-proliferation efforts by creating a perception that, in fact, the purpose of the sub-critical tests are to facilitate the design and production of new nuclear weapons. This also has the potential to negatively impact such issues as transparency .

<u>Hybrid Alternative</u>

Citizen Alert recognizes the possibility that a fifth alternative, as described on page S-5, lines 24 and 25, as a hybrid mix of all of the alternatives, may provide the best combination of recommendations for future uses of the NTS. Provided that adequate consideration is given to public and other stakeholder input put forth during the comment period. For example, Citizen Alert would support an alternative that continued or accelerated environmental restoration activities, implemented renewable energy programs, returned to public domain certain portions of the NTS.

Framework for Resource Management Plan
Citizen Alert welcomes the inclusion of the "Framework for Resource Management Plan," and see this document as a valuable tool in future decision making. However, to be truly effective, we suggest that this document needs to be completed prior to any selected alternatives or proposed projects. Likewise, it would seem logical that a transportation plan be a major component of any decision being made about alternative selections, prior to, or at least concurrently, with those decisions. This, however, appears to be the complete opposite of the DOE approach. 9

With regards to economic development, the RMP specifically makes mention of soliciting input from stakeholder groups such as the Community Reuse Organization, now called the Nevada Test Site Development Corporation, and operating on a $5 million grant from the DOE. Citizen Alert questions whether it is appropriate for a organization being funded by the DOE to be making recommendations to establish RMP goals that can impact future resource management decisions and activities at NTS, especially when that organization has a vested economic interest. This is wholly inadequate. We recommend that any private venture, or private-public partnership which proposes to use the NTS as its operating site, be considered as a federal activity, and where appropriate, a major action, open to review under NEPA for environmental impacts. This will allow sufficient public input and involvement in decision about these activities. The alternative would be to provide grants to other "stakeholder" groups, such as Citizen Alert, in return for their contribution to establishing resource management goals. 10

Finally, with regard to legislation pending in both the House and the Senate which would effectively create "interim storage," of high-level nuclear waste, and begin a unprecedented transportation campaign of waste shipments, Citizen Alert asks in what manner and what format, if not the NTS EIS, will the impacts of these activities be evaluated? These activities would be independent from the permanent geologic repository, and as such would not be covered under the presently "shelved" Yucca Mountain EIS. The fact that the decision hasn't been finalized is no different than the situation arising from other pending decisions in ongoing DOE programmatic EIS's, which are evaluated, to some extent, in this document. 11

Groundwater
While it has not been substantiated by Citizen Alert, it has been pointed out by one of our supporters that through the numerous volumes of the DEIS, several conflicting statements are made with regards to groundwater flow, characteristics, migration and contamination. We will continue to follow-up on this and file an addendum to our comments as to the accuracy of the individuals claims, as soon as we can.

Thank you for the opportunity to present these comments and we look forward to the opportunity to additional review and submitting additional comments.

ORGANIZATION 10

SIERRA CLUB - *Toiyabe Chapter*

Southern Nevada Group
P.O. Box 19777, Las Vegas, Nevada 89132

SIERRA CLUB OF SOUTHERN NEVADA COMMENT ON THE D.O.E. DRAFT EIS FOR THE NEVADA TEST SITE

On Feb. 1, 1995 at the CAB meeting for the Nevada Test Site Programs, Mr. Elle responded to a question from CAB member Connie Simkins about a complete shutdown of all NTS activities, as proposed in Alternative 2 of the Draft EIS. Mr. Elle replied, according to the published minutes of this meeting, that "there were a lot of public comments saying the DOE should be looking at shutdown as an option." On March 6, 1996, at a St. George, Utah public meeting to discuss the Draft EIS, Mr. Elle, as
1 quoted by the Las Vegas SUN newspaper, said that "the DOE is reluctant to consider outright closure."

The Sierra Club of Southern Nevada objects to the disingenuous suggestive inclusion in the Draft EIS of an alternative use for the NTS which the DOE has no intention of considering for inclusion in the final Record of Decision. This constitutes an intentional deceitful obfuscation of the issue being considered and renders questionable the integrity of this Draft EIS.

On January 24, 1996 CAB Board Members were asked to prioritize activities relating to the NTS. Of the 12 categories considered, transportation received the third highest priority by the CAB Board Members. Transportation received the highest (12) level of risk in the final priority list, however TRANSPORTATION (and, also, Technology Development) WERE ULTIMATELY DELETED from this Budget Workshop Priority List. At the March 26, 1996 DOE Public Meeting at Cashman in Las Vegas, Mr. Elle replied to a transportation question that 400 more shipments of nuclear waste material would pass through Las Vegas to the NTS during the remainder of 1996. This irresponsible routing of nuclear waste shipments through a densely populated urban area was justified by the disclaimer that such shipments are carried by common carrier trucking companies which are free to choose whatever routing they deem most advantageous and that such routes are not subject to DOE oversight.

The Sierra Club of Southern Nevada objects to the transportation of nuclear waste along routes which do not MINIMIZE the possibility of human exposure in the event of an accident. DOE guidelines for transportation routing of nuclear waste shipments to the NTS are so lax that they
2 **can only be considered negligent. The safe transportation of this extremely hazardous material should be considered a matter of the highest priority. Leaving route selection to common carrier dispatchers is an unacceptable component of this Draft EIS.**

ADDITIONAL CRITICISM OF THE DRAFT EIS IS FURTHER DIRECTED AT THE SUBJECT OF TRANSPORTATION OF NUCLEAR WASTE TO THE NTS. Specifically it is directed at the LACK OF INTEGRATION of the analysis of the cumulative effects of transporting these nuclear
3 **materials to the NTS, and also to the Yucca Mountain and Nellis Range complexes. These programs should be integrated and should have been included in this Draft EIS. This truck transport of nuclear waste into the same general geographic area affects the same environment and should be considered part of the same whole picture.**

4 **THE AFOREMENTIONED COMMENTS ARE ALSO DIRECTED TO ANY PLAN(S) FOR TRANSPORTATION OF NUCLEAR WASTE TO THESE AREAS BY RAILROADS.**

ORGANIZATION 10 (CONTINUED)

5 The DOE has included in the Draft EIS several properties over which it has no authority, and which have never been associated with the NTS. Solar generation at the NTS would be an excellent use of some of the NTS area, however including Coyote Spring Valley, Dry Lake Valley, and Eldorado Valley in this Draft EIS for the NTS again confuses and obfuscates the purpose of this Draft EIS.

The DOE has not specifically indicated what alternative is the preferred DOE alternative. This is an excellent example of the time tested political strategy of using a changing or vague, or "moving target" goal to confuse critics attempting to understand a matter of policy.

6 **The Sierra Club of Southern Nevada objects to this Draft EIS because it has been inflated to confuse the reader by inclusion of significant amounts of irrelevant data on sites over which the DOE has no jurisdiction, and, also, the omission of critical information as to the DOE priority in selection of a preferred alternative which would allow meaningful public comment on this document.**

Pending in the U.S. Congress is legislation pertaining to the use of the NTS for interim storage of High Level Nuclear Waste from nuclear power plants.

7 **The Sierra Club of Southern Nevada objects to the enormous omission by the DOE of not addressing the subject of the proposed interim storage of High Level Nuclear Waste at the NTS.**

SUBJECT: Greater than Class C Nuclear Waste. As defined in vol. 1, chapt. 2, page 2-9, this material "exceeds U.S. Nuclear Regulatory Commission concentration limits for Class-C low-level waste." On the next page, 2-10, it states that "the term "similar to greater than Class-C low level waste" indicates that this waste ... was DOE generated." Also mentioned on lines 11-16 is the "concept of greater confinement for wastes that are not appropriate for near-surface disposal because of their radioactive exposure levels."

The Sierra Club of Southern Nevada objects to the very vague categorization of a large quantity of nuclear waste that has a very high level of radioactivity as simply "greater than Class-C" or "similar to greater-than-Class-C." This term closely associates this material with Low Level
8 **Waste, when, in truth, it my be equally as radioactive as a spent fuel rod, but from a different source. This is deceitful categorization of nuclear materials to allow the shift into the low level category of large quantities of highly radioactive materials based solely on the origin of the material and not on the radioactive toxicity of the waste.**

That the DOE has intentions to drill many, many bore holes to store this type of material at the NTS and has chosen to minimize these plans is a gross material omission of facts from this Draft EIS and renders this document absolutely incomplete. Stakeholders need to be educated about
9 **the different classes of LLW, especially "greater-than-Class-C" waste as part of any public involvement plan for waste management at the NTS, including deep bore hole storage necessitated by the high level of radioactive toxicity of a great quantity of this waste.**

ORGANIZATION 10 (CONTINUED)

The DOE has, at the direction of Secretary O'Leary, attempted to meet a time deadline of 15 months for the completion of this Draft EIS.

10 **The Sierra Club of Southern Nevada objects to the "fast track" approach which the DOE has implemented in the preparation, release, and review process for this Draft EIS. Just because Secretary O'Leary has directed that this draft be completed quickly does not mean that this is an adequate amount of time to complete the necessary two-way public dialogue on an issue of this importance.**

11 **Because of the serious nature of the omissions, the distracting inclusion of irrelevant data, the vague defining of the future DOE mission for the NTS, and the denial by the DOE of its relationship to adjacent DOE sites, the Sierra Club of Southern Nevada believes that this Draft EIS is fatally flawed and that it should be reissued in a much more forthcoming and user friendly form that will allow and encourage a more accurate exchange of information between the stakeholders and the DOE.**

Prepared by Fred E. Dexter, Jr.,
Member of the Sierra Club - Toiyabe Chapter,
Southern Nevada, Conservation Committee

Fred E. Dexter, Jr. 4/30/96
Fred E. Dexter, Jr.

Authorized by Randy Harness,
Member Board of Directors,
Conservation Committee Chairperson,
Sierra Club - Toiyabe Chapter,
Southern Nevada,

Randy Harness
Randy Harness

ORGANIZATION 11

TO: Donald R. Elle
U.S. Department of Energy
Nevada Operations Office

FROM: ALT 2 Subcommittee

DATE: April 6, 1996

SUBJ: ALT 2 ISSUES & COMMENTS

The Alternative 2 (closing the Test Site) has many positive impacts for the Nevada Stakeholders.

These positive impacts are

P1. There would be no further importation of nuclear waste & materials into the state of Nevada, and of course no more long term storage and/or disposal of this imported waste.

P2. All the transportation problems associated with bringing the nuclear waste into Nevada would be solved.

P3. The stigma of being a nuclear waste dump would gradually fade from being an issue.

P4. There would be no further degradation to the environment.

Unfortunately there are several negative impacts from closing the test site that will override the positives impacts for the stakeholders of Nevada.

These negative impacts are (national rather than local)

N1. The national defense mission of the Depart. of Defense would be extremely negatively impacted, unfortunately as history has shown. We have to have a strong national defense mission. There are still nations & regions that would destroy us if they could (no names though) NTS is the only place we have to test nuclear and other devices if we ever have to again. It would be almost impossible to site another location nowadays. We have only a temporary nuclear test ban at present, and even this is not honored by all nations.

N2. The Dept. Of Energy's overall mission would be seriously negatively impacted in order to clean-up other DOE sites around the country the DOE needs a storage place for all the low-level waste. NTS is planned to be one of the major disposal sites for low-level waste in the DOE complex, if not the major disposal site. This is also probably true for high-level waste, spent fuel, and maybe greater than class C waste.

ORGANIZATION 11 (CONTINUED)

N3. On a local level there would be a loss of jobs and other economic benefits if NTS is closed. (Although this represents less than 1% of Las Vegas economy).

N4. There would be no clean up or environmental restoration of existing contamination.

Summary
From a strictly local point of view it would be beneficial to close the Nevada Test Site, but from an overall national view point the Nevada Test Site should not be closed.

Other comments on EIS in general

1. No matter what option is chosen we are leaving behind a legacy and a source of serious contamination for our children and their descendants.

1 — 2. There is no guaranteed source of funding for the future monitoring and security that will be needed for 100's of years to safeguard the public from contamination that has occurred in the past and maybe added to in the future.

3. Nevada is getting the short end of the stick. We are targeted for a lot of waste, but not very many positive programs. The positive programs go elsewhere. The waste comes here. We want equity.

2 — 4. There's not much information of what and how much greater than class C radioactive waste may come to NTS-RED FLAG. This needs to be checked out.

5. No mention in EIS. But is colloidal movement of radioactive material a possible future problem.

3 — 6. The policy of totally separate EIS's for NTS, Yucca Mountain, etc, is wrong. The cumulative problems of transportation, radiation exposure, socioeconomic, cultural aspects, etc., need to be addressed for the directly impacted local resident stakeholders.

4 — 7. The socioeconomical impacts on Pahrump have not been adequately addressed in the EIS. Historically only a small percentage of NTS employees have resided in Pahrump. But due to the very high growth rate that has occurred, and continues to grow, in the last couple of years. This would probably change, whereas Pahrump lacked many features like major grocery markets, fast food stores, gasoline stations, middle class housing subdivisions, etc. These facilities have now been built and/or are being built right now. This will make it much more likely that future employees will make there home in Pahrump because it is closer to

ORGANIZATION 11 (CONTINUED)

4 cont. — NTS and out of the congested and higher cost housing areas of Las Vegas. The population figures used in the EIS do not reflect the growth that has occurred in Pahrump. Therefore alternative three could have a serious impact on our schools, police dept, land fills and other infrastructure. If we get more residents as a result of a large increase in employment at NTS under alt. 3.

B:\CABunsit daleis.com

Dale Schutte

Dale Schutte

ORGANIZATION 12

1 OF 1
5-2-96

TO- MR. DONALD ELLE, DIRECTOR
DEPT. OF ENERGY

FR- CITIZENS FOR RADIATION FREE ENVIRONMENT

RE- ENVIRONMENTAL IMPACT STATEMENT/NEVADA TEST SITE

WE ARE VERY CONCERNED THAT THE FASTEST GROWING COMMUNITY IN THE U.S. TODAY- LAS VEGAS- WILL BE PLAGUED WITH ALL OF THE HAZARDS CONNECTED TO THE NEVADA TEST SITE SITUATION.

IT IS INSANE TO CONTINUE SUCH POTENTIALLY DANGEROUS ACTIVITIES SO CLOSE TO SUCH A METROPOLIS AS LAS VEGAS.

I SPOKE WITH THE FORMER UNDER-SECRETARY OF ENERGY (BUSH ADMINISTRATION) DR. HUGO POMREHN (NOW PRESIDENT OF ATG (AMERICAN TECHNOLOGIES GROUP)- AND HE SAID THAT THEIR 'BASER' WILL (IN 3-4 YEARS) COMPLETELY & SAFELY 'DE-FUSE'/NEUTRALIZE ANY UNSPENT PLUTONIUM FUEL....

IN THE MEANTIME THE ENVIRONMENTAL IMPACT STATEMENT NEEDS TO BE REDONE FOR THE FOLLOWING REASONS:

1 | 1. Inclusion in the draft of irrelevant properties which confuse the issue;
2 | 2. Omission of important data on the DOE response to interim storage proposals;
3 | 3. Inadequate evaluation of transportation routes and common carrier oversight;
4 | 4. The "fast-track" preparation of this draft has created a poor quality document.

Sincerely
Michael Ravis
PRES., CRFE

(702) 645 0562

Dr. Morton [illegible]
Dr. [illegible] Bernott
Dr. Ronald Greenwald

This Page Intentionally Left Blank

Private Citizen 1

March 5, 1996

Department of Energy
Public Hearing of the proposed Nevada Nuclear Waste Depository.
Dixie College Cox Auditorium
St. George, Utah 84770

Re: A safe highway route around St. George, Utah for nuclear waste shipments on Interstate 66.

To Whom it may concern,

The attached map of the USA shows the proposed Interstate highway routes for shipping nuclear waste to the Southern Nevada proposed Nuclear Waste Depository, as printed in the Salt Lake Tribune. More than ½ of all North American nuclear waste is to be shipped through the center of Cedar City and St. George, Utah ! Interstate 15 is overcrowded in these cities and there is a high rate of heavy truck and semi-truck wrecks, especially in the Virgin River Gorge portion of I-15.

The State of Nevada and Las Vegas City is planning to build a new railroad system to divert the rail shipments of nuclear waste completely around and North of the Las Vegas region, to diminish the possibility of shipping 'incidents'. The proposed highway shipments of nuclear waste can be completely diverted around St. George City, Washington County, and Southern Utah on the newly proposed **INTERSTATE 66** and **SOUTHERN CORRIDOR HIGHWAY** and delivered to the Nevada Test Site on **INTERSTATE 66**.

INTERSTATE 66 is the proposed 21st Century, 6-lane, high-speed freeway to cross the trans-continental United States from coast to coast and not to cross any metropolitan areas. This new **INTERSTATE 66** will be built on the "Spine Concept", with traffic connecting to the mainline of the freeway with connector freeways from the metropolitan areas.

The most physically challenging and critical section of the **INTERSTATE 66** is between the Virgin River Gorge of I-15 in St. George, Utah and Page, Arizona. If this section is built first, then the nuclear waste shipments would be routed around St. George to the South and avoid the
1 St. George City area, altogether.

If a nuclear depository is created in Southern Nevada, then the highway to transport the waste through Washington County should be built first !

Paul K. Bevan

Paul K. Bevan 715 North 1800 East St. George, Utah 84770 801-673-8007

RECEIVED MAR 1 1 1996

Private Citizen 2

THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
for the NEVADA TEST SITE and
OFF-SITE LOCATIONS IN THE STATE OF NEVADA

Nevada Test Site EIS Hearing Comment Sheet

Meeting Location: St. George
Please Enter Your Name, Organization and Address Below: *Meeting Date:* 3/5/96

L. Wilkinson
Your Name St. George *Organization*
Box 609 Washington St Ut.
Street Address *City* *State* *Zip Code*

Thank you for attending this hearing. Please use this sheet (and attachments if needed) to inform us of your written comments on this EIS.

When commenting, please indicate beside your comment the applicable issue category number from the list below. This will help us to ensure that your comment is considered in the relevant section of the EIS. You may identify additional issue categories as needed.

1. Land Use	12. Cultural Resources (includes American Indian Perspective)	16. Nuclear Policies	22. Work for Others Program
2. Transportation	13. Occupational and Public Health and Safety/Radiation (includes Human Health Risk)	17. Big Explosive Experiment Facility	23. Alternative 1 - Continue Current Operations (No Action Alternative)
3. Site Support Activities	14. Environmental Justice	18. Defense Program	24. Alternative 2 - Discontinue Operations
4. Socioeconomics	15. DOE Environmental Policies and Procedures	19. Waste Management Program	25. Alternative 3 - Expanded Use
5. Geology and Soils		20. Environmental Restoration Program	26. Alternative 4 - Alternate Use of Withdrawn Lands
6. Surface Hydrology		21. Nondefense Research and Development Program	27. NEPA Process
7. Groundwater			28. Other
8. Biological Resources			
9. Air Quality			
10. Noise			
11. Visual Resources			

TOPIC NUMBER COMMENT *(continue on back if needed)*

Please see attached

He feels he represents the silent majority who would like to keep the NTS open.

RECEIVED MAR 1 1 1996

Please hand this form in today or mail before May 3, 1996 to:

U.S. Department of Energy
Environmental Impact Statement
P.O. Box 14459
Las Vegas, NV 89195-8066

PRIVATE CITIZEN 2 (CONTINUED)

St. George, Utah
Memorandum March 5 1996

To: D.O.E. officials
From: Delwin Wilkinson and Family
Subject: Future Use of Nevada Test Site:

1 As members of the silent majority in this area, we wish to go on record as favoring continued use of the Nevada Test Site.

The noisy minority of the people here are motivated by political and money interests. They become almost hysterical over anything relating to Nuclear Energy and don't consider the problems of our day in a rational manner. It would be a tragic mistake to adhere to their demands for abandonment of the test site facilities.

2 The Test Site must be kept in readiness for future use in light of very unsettled world conditions. Perhaps more important however is the fact that these facilities can be used to dismantle nuclear weapons as world conditions justify. Of

3 course, the storage of nuclear waste is another valid option.

4 The possibilities for research there are unlimited, in fields not relating to Nuclear Energy. The facilities lends itself well for research and

PRIVATE CITIZEN 2 (CONTINUED)

4 cont. experimentation in solar energy, wind energy, environmental studies and medical research only to mention a few.

It would be a terrible waste of tax payers money to abandon the facilities when it lends itself so well for studies and experimentation into problems of our day.

We go on record as supporting the continued operation of the Nevada Test Site. The dynamics of the operation should be controlled and directed by D.O.E. officials and other knowledgeable personell, and not by crowd hysteria.

Sincerely,

Delwin Wilkinson
and Family,

PRIVATE CITIZEN 3

THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
for the NEVADA TEST SITE and
OFF-SITE LOCATIONS IN THE STATE OF NEVADA

Nevada Test Site EIS Hearing Comment Sheet

Meeting Location: ______________

Please Enter Your Name, Organization and Address Below: *Meeting Date:* 3-5-96

Dee R Beckstead — *Your Name*
Citizen - College Student — *Organization*
781 North Valley View Drive — *Street Address*
St George — *City*
Utah — *State*
84770 — *Zip Code*

Thank you for attending this hearing. Please use this sheet (and attachments if needed) to inform us of your written comments on this EIS.

When commenting, please indicate beside your comment the applicable issue category number from the list below. This will help us to ensure that your comment is considered in the relevant section of the EIS. You may identify additional issue categories as needed.

1. Land Use
2. Transportation
3. Site Support Activities
4. Socioeconomics
5. Geology and Soils
6. Surface Hydrology
7. Groundwater
8. Biological Resources
9. Air Quality
10. Noise
11. Visual Resources
12. Cultural Resources (includes American Indian Perspective)
13. Occupational and Public Health and Safety/Radiation (includes Human Health Risk)
14. Environmental Justice
15. DOE Environmental Policies and Procedures
16. Nuclear Policies
17. Big Explosive Experiment Facility
18. Defense Program
19. Waste Management Program
20. Environmental Restoration Program
21. Nondefense Research and Development Program
22. Work for Others Program
23. Alternative 1 - Continue Current Operations (No Action Alternative)
24. Alternative 2 - Discontinue Operations
25. Alternative 3 - Expanded Use
26. Alternative 4 - Alternate Use of Withdrawn Lands
27. NEPA Process
28. Other

TOPIC NUMBER — COMMENT *(continue on back if needed)*

1 13 My concern here is for the possible negative long-term downwind health effects on myself, my children & my grandchildren. Much has been said, & written about increased cancer risks like those that have been documented around Hanford Washington & Savannah River Georgia. Is my family at risk? If so, how much & what can I do to minimize, & protect my family?

2 19 I am interested in knowing more & possibly working in a field relating to waste minimization & risk.

RECEIVED MAR 11 1996

Please hand this form in today or mail before May 3, 1996 to:

U.S. Department of Energy
Environmental Impact Statement
P.O. Box 14459
Las Vegas, NV 89195-8066

PRIVATE CITIZEN 4

[redacted]

Mr. John E. Loskot
1401 Comstock Dr.
Las Vegas, NV 89106

MR DON ELLE, DIRECTOR,
ENVIRONMENTAL PROTECTION DIVISION
U, S, DEPARTMENT OF ENERGY.

DEAR SIR.

SAW YOUR NAME IN THE LOCAL PRESS AND YOUR REQUEST FOR COMMENTS RELATING TO THE NEVADA TEST SITE.

AS A FORMER EMPLOYEE, 1964 1968, I was interested.

1 SHOULD YOU BE INTERESTED TO KNOW. I HAVE SENT A LETTER, BY CERTIFIED MAIL, INFORMING MRS OLEARY THAT NUCLEAR WASTE CAN BE RECYCLED AND CAN BE RESTORED TO BETTER THAN ITS ORIGINAL VALUE AS FUEL FOR THE ATOMIC POWER INDUSTRY. OR CONVERTED INTO ELEMENTS OF ENHANCED MARKET VALUE,

BECAUSE I HAVE HAD A STROKE, AND IN A FEW MONTHS WILL BE 90 YEARS OLD, IT IS NOT WISE OR PRUDENT THAT I GET INVOLVED IN THIS WORK. SO I SUGGESTED THAT DOE CONTRACT WITH THE E, G, AND G, PEOPLE TO SEE IF THEY WOULD BE INTERESTED IN THE PROGRAM, AND SUGGESTED THAT SHE PUT MY FRIEND, MR W. H. H, KING AS ADMINISTER OF THE PROGRAM. MR KING IS THE ASSISTANT TO THE SECRETARY FOR ENVIRONMENTAL RESTORATION. BUT POLITICS BEING WHAT IT IS, I DO NOT EXPECT TO HEAR FROM MRS O RILEY, AND I AM NOT SEEKING INVOLVEMENT AT THIS TIME, BECAUSE OF A GAME THAT YOU ARE FAMILIAR WITH AND IS CALLED MUSICAL CHAIRS, HOWEVER IT IS TO BOTH MRS O RILEYS AND PRESIDENT CLINTONS ADVANTAGE TO SPONSOR THE WORK AS THEY CAN CLAIM THE CREDIT.

I AM PROBABLY JUST AS WELL OFF IF I SAY NOTHING MORE ABOUT MY WORK UNTIL AFTER THE ELECTION BECAUSE IF THEY WERE TO START MY PROGRAM AND THEN LOSE THE ELECTION, I WILL HAVE TO START ALL OVER AGAIN WITH THE NEW TEAM.

JOHN E, LOSKOT

RECEIVED MAR 11 1996

Private Citizen 5

February 26, 1996

Hotline comment

Commentor: Anonymous

This commentor called to express his opinion and to ask that someone call him back.

1 He is opposed to transportation of nuclear materials by train; i.e., through Las Vegas; and he is
2 against putting them in Yucca Mountain in any form.

3 He is also against all nuclear testing in general, and hopes that the Test Site can be used for other
4 purposes.

I told him I would pass along his request, and mentioned that he could submit his comments in writing to Mr. Elle at the address in the transmittal letter of the DEIS.

Private Citizen 6

RECEIVED MAR 18 1996

3-13-96

Dear Sir!

My father worked at Doe for 23 yrs till he died in 1983 The doctors told us it was Cancer But 2 ortopsee's never put on them what he died from <So we put papers in for the Benefits

(2)

to Be paid to
the families
for $75,000.00 from D.O.E.
Your doctors Said
we couldnt get
paid Because it
covered all these
Cancers But not
Lung Cancer
which your doctor
say he died from
But my doctor
+ 2 autopsies
did Not; Just
Cancer they

PRIVATE CITIZEN 6 (CONTINUED)

(3)

said. So then I
talked to a Lady
in senators "Reeds"
Office that Said
Write to you +
1 See if you Could
help me or see
what; or if we
could do anything.

Thank You So
Much

Rosie
Roundy

PRIVATE CITIZEN 6 (CONTINUED)

Roxie Roundy

85 west 200 South
P.O. Box 550
Panguitch, UtaH
84759
801-676-2433

My Fathers Name
was

Edward L. McCoy

please write or
Call me
Thank you

PRIVATE CITIZEN 7

SLAKEY BROTHERS, INC
1050 Linda Way
Sparks, NV 89431
Mail: P.O. Box 10025
Reno, NV 89510
(702) 359-7106

2-5-96

Hi

Thanks For Sending me The material on the DOE/EIS Draft. I would Like To comment on the Vol 2 Framework for Resource management Plan

Table 2-1 Pg 2-2

1 1. Future missions as yet unseen (to be added)

2 2. use of land for use as Recreation and other Activities

Pg 2-3 How resources on NTS managed and conserved

3 More open less secret

More of an Educational Site For Advance Studys

4 Less of a military Installation

Pg 3-8 Partnerships for Ecosystem management

5 A Visitor Center off Hy 95 South of Mercury. A 1st Class Visitor Center with Films, Books, musume etc. in Order to receive A Continueing update of Public opinion as time goes by

STEVE LADNIER
230 E. 8TH AVE.
SUN VALLEY, NV 89433

RECEIVED MAR 1 1 1996

PRIVATE CITIZEN 8

March 7, 1996

US Department of Energy
Environmental Impact Statement
PO Box 14459
Las Vegas, NV 89195-8066

Gentlemen:

I am unable to attend the meeting on Tuesday, March 26th, but I would like to add my comments--for what they are worth.

I believe the public is getting rather tired of the federal government trying to "protect us from ourselves." We are told that one (out of how many??) testing station registered too high two days out of 365 days last year. This test site is generally agreed by many, including experts, to be already contaminated due to its location. This means it is *not* typical of the area, so why is the entire area being judged based on results from this one site. You are threatening to impose mandates on the entire area--ignoring, I suppose, the test results from any of the other sites--based on readings of only two days during the year from one isolated site.

Mandates, gentlemen, are frightening to the public. It always means we are being compelled to do something that we would not do voluntarily. It also means that somebody wants to force their particular brand of control on others. In this situation, it would appear that what you plan to require, order and command us to do is not even generally accepted as necessary or for the public good. In any case, this is something that should be left up to the state or local governments to determine. (As most things are that the federal government has their hand in)

1 I would suggest that you take a hard look at that particular test site and its close surrounding area. Perhaps the answer is not imposing MANDATES to correct something that is not a problem, but moving the darn test site to an area that is not already precontaminated in its environment.

Sincerely,

Avis Dillon

Avis Dillon
981 Whitney Ranch #1316
Henderson NY 89014

PRIVATE CITIZEN 9

3-4-96

U.S. Dept. of Energy
Environmental Impact Statement
P.O. Box 14459
Las Vegas, Nevada 89195-8066

Dear Sir or Madam:

1 It would be difficult to express my disgust with the Nevada Test Site. I don't want any more testing. I don't want radioactive materials being transported on our roads and stored in Nevada.
2 I don't want any more promises about how "safe" these activities are for Utah residents.

My family has suffered considerably from illness and death which we feel are directly related to the testing program. I am now nursing my father through small intestine cancer which may also be related to the testing. We can count all the neighbors who have cancer, and who have died of cancer over the years, and the numbers are exploding.

We have suffered because of the government's arrogance. We paid our taxes and that money was used to take chances with our lives. My level of anger is beyond what you want to read,
3 but I protest any further testing. I protest against the use of the site for nuclear storage which
4 will subject us to dangers on our roads as well as in our air and soil. *I certainly protest the idea*
5 of nuclear powered rockets which could spray radiation in an accident. NO MORE!!! Leave us be.

6 7 Solar energy development does make sense. Wind energy development makes sense. Finding uses for recycled materials makes sense. These may not be as "sexy" as waiting until the wind
8 can blow poison our way, but useful non-hazardous projects are a better use of taxpayer funds.

Sincerely yours,

Sara Penny

Sara Penny
270 S. 200 W.
Cedar City, UT 84720

(801) 586-2286

PRIVATE CITIZEN 10

March 6, 1996

Department of Energy
P.O. Box 14459
Las Vegas, NV 89114

To Whom It May Concern,

1 This letter is to protest any further use of the Nevada Test Site. There has been a significant increase in cancer and related deaths can be directly linked to the testing that occured on this site for over 40 years. How can you ignore the evidence?

2 I urge you to leave the site alone (as in permanently close) as soon as possible. The earth needs to heal itself and you need to stop blantently ignoring the health and environmental problems caused by testing at this site.

If your family members were the ones in Southwest Utah and Nevada suffering from cancer you'd probably support closure of the base too. Please consider the resounding call for closure you are hearing from citizens of this region.

Sincerely,

Mary

Mary Wertheimer
P.O. Box 2105
Cedar City, UT 84721

PRIVATE CITIZEN 11

1 The nuclear weapons testing from 1951 to 1992 did horrendous damage to Utahns downwind from the Nevada Test Site.

2 There must be no alternative to the outright closure of the Test Site. It must be buried forever.

Iris A. Rowland
1225 Bryan Ave
Salt Lake City, Utah
84105

RECEIVED MAR 14 1996

PRIVATE CITIZEN 12

DOE
P.O. Box 14459
Los Vegas, Nevada 89114

Gentlemen:

Re: The Salt Lake Tribune's coverage of public hearings on fallout effects in the 1950 era.

1 The hearings did not cover the issue of long term storage of high level radioactive waste. This is by far the more important issue in closing the site.

I am a retired dentist who practiced 45 years in San Francisco. As a hobby, I used to set up cameras aimed over the San Mateo bridge at Frenchmans Flat early in the dark of the morning. Light from the nuclear blasts would fill the eastern sky with a false dawn of metallic-hued colors of the rainbow.

I will not belabor the truly major problems of storage of plutonium-related wastes. Half-lives of 24,500 years defy understanding in the complex tasks immediately facing our nation.
2 A place to bury them is absolutely essential. This is far more important than memories of earlier exposure to fall-out.

This is a cruel, but necessary judgement.

3 Do not close the nuclear testing site.

Ramon A Wilcox

Ramon S. Wilcox, DDS

PRIVATE CITIZEN 13

March 6, 1996

Don Elle, Director
Environmental Protection Division
U.S. Dept. of Energy, Nevada
Las Vegas, Nevada – 89114

Dear Mr. Elle,

I'm writing about article in Sunday's Las Vegas Sun 2/25/96 Test Site Future. I would like to request copies of the EIS infact as much information on what is the exact future of Nevada especially around Las Vegas. I was hoping to one day move permanently to LV. As we all know how LV is growing in so many ways.
1 At the same time I do not want to put my family or myself in any danger to our health. It's really disturbing when you read about hazardous waste, or contamination created by more than 800 - below-ground nuclear blasts, mention by the EIS. I would very much like a respond with all the information I've requested.

Sincerely,

Mrs. Linda Blanco

ENTERED MAR 14 1996

RECEIVED MAR 14 1996

PROCESSED MAR 14 1996

PRIVATE CITIZEN 14

Report for D.O.E. Meeting on the E.I.S. on N.T.S.

Pahrump, Nevada, March 13, 1996

My name is Sally Devlin and I live in Pahrump, Nevada. My home is 30 miles from the test site and 50 miles from Yucca Mountain. Both are located totally in Nye County, Nevada. The Federal Government owns approximately 93% of Nye County. We are the third largest county in the U.S.

Years ago I became interested in the transportation studies because there was a planned railroad to come through Pahrump. On page S-2 of the draft
1 E.I.S. on N.T.S. and Off Site Locations in the State of Nevada is a map of the state and the N.T.S. Deleted is highway 160 which goes from Las Vegas, Clark County through Pahrump, Nye County. This highway parallels highway 95 which also goes from Clark County to Nye County where N.T.S. is located.

Somehow in this draft E.I.S., Volume 1, Appendix 1, Transporation Study on Pages 3-18, 3-20, 3-22 are maps using highway 160 to transport waste. These routes are mapped on pages 3-25, the risks are on NV-5, NV-7 and NV-9, and others. Coming over from I-15 to 160 in Clark County is two lanes, over the pass at Mountain Springs which is approximately 5,500 feet and alternates 3 lanes for a short distance. Another 40 miles, 16 which are in Nye County are all 2 lanes except for 16 miles through the center of town which will be 4 lanes once construction is completed. Another 40 miles on 160's 2 lanes and then the highway connects with 95 which has 4 lanes to the N.T.S. The 90 or so miles on 160 has no auxiliary roads. We have a few paid firemen in our 55 member volunteer
2 group. We desperately need F.E.M.A. funds to train and equip our firemen. Las Vegas recently had 70 to 75 trained in Maryland for a week. We were totally ignored.

3 Liquid Nitrogen as well as liquid Cyinide, propane, gasoline and other hazardous materials travel this congested road 160 all the time. I gave a worst case senario on a spill at the Indian Springs Prison 95 with a hazardous waste spill. Listen to the tape or read the transcript from the N.W.T.R.B Sociological Meeting last spring. It could be a real prophectic tragedy.

Under alternate 3, page 3-32 of the summary is that 900,000 cubic meters of L.L.W. and L.L.M/W. would be stored at N.T.S. The Transporation study on page 2-14 states 1,154,963 cubic yards of the waste would come through with a potential of 24,246,796 cubic yards over the next 75 years.

4 On pages 3-30 through 40 of the Transportation E.I.S. there are bar graphs, N.V. 6 (which parallels 160) among the highest of every fatality risk from traffic fatalities to radiation induced cancer risks and the highest on hazardous index risk. If an accident happened on 95 the only access would be 160 through Pahrump.

(1)

PRIVATE CITIZEN 14 (CONTINUED)

5 N.T.S. currently stores 1,00 55 gallon drums of T.R.W. that may or may not go to W.I.P.P. If there is no W.I.P.P. will N.T.S. get another 5,000 gallon drums of transuranic waste?

6 From the recently declassified D.O.D. report the missing numbers are filled in to make up the 300 metric tons of H.L.W. that might be stored at N.T.S. if Yucca Mountain and a second repository (total $60 billion) are not built. Would the extra 150 metric tons be stored at N.T.S.?

7 There seem to be no viable plans for railroads coming to the test site from three directions. The federal government seems to have absolutely no interest in our demographics. Our unincorporated town (with no map of the boundries as they have never been surveyed by a licensed surveyor with a stamp) is as large as five eastern states. Our County Commissioners have allocated 48,000 parcels ranging in size from single parcels to 100 acres. This means that our 20,000 people today could become the third most populated town in Nevada. We have one of the largest and purest aquifers in the whole nation.

My questions are not only directed towards D.O.E. and D.O.D. and D.O.T. but to everyone in this country who is interested in the plans for N.T.S.
8 How can we take a stand against the governments total disregard for people especially the people of Pahrump and Nye county who will be impacted by these poisons?

Take the expendable people of Hanford, Washington who have been living with 55 million gallons of highly radioactive waste currently stored
9 in 177 underground tanks. If the plutonium and uranium 235 were to really go critical what would happen? This has been going on for 50 years and the characterization for 10. Cleanup would be 36 billion dollars. The government has allowed this mess to go on for almost 50 years I shudder at what they have in mind for us in Nye county.

10 Nationwide transport of this L.L.W., L.L.M.W., T.R.W. and H.L.W. will destroy our pristine county and what about the rest of the 43 states involved? We do not want what happened from a radioactive spill from Los Alamos that ended up at Cochiti Lake and polluted it with radio active
11 colloids. Why are there no colloidial studies being made when I have heard that there is a real need that is being ignored.?

12 Why don't we go to new science and reprocess and reactivate on site these dangerous elements? Nevada produces no radio active waste and yet the federal government wants to put it all here. The government knows as
13 do all of us who have been studying radio-biology that radiation can destroy our future generations. We must stop this nonscense for the preservation of our nation.

As a stakeholder I have absolutely no say about any of this. Information must get to all the people of this nation and the world about how dangerous these plans are. Please Mr. President stop it!

Sally Devlin

Sally Devlin
P.O. Box 2598, Pahrump, Nv. 890
702-727-6853

(2)

Cochiti

RECEIVED MAR 15 1996

PRIVATE CITIZEN 15

THE DRAFT ENVIRONMENTAL IMPACT :
for the NEVADA TEST SITE an
OFF-SITE LOCATIONS IN THE STATE O

Nevada Test Site EIS Hearing Comment

Mee

Please Enter Your Name, Organization and Address Below: *Meeting* ___

Your Name: JEFF JONNINGS *Organization:* PRESS GARD

Street Address: PO BOX 1427, *City* *State:* Pahrump NV *Zip Code:* 89041

Thank you for attending this hearing. Please use this sheet (and attachments if needed) to inform us of your written comments on this EIS.

When commenting, please indicate beside your comment the applicable issue category number from the list below. This will help us to ensure that your comment is considered in the relevant section of the EIS. You may identify additional issue categories as needed.

1. Land Use
2. Transportation
3. Site Support Activities
4. Socioeconomics
5. Geology and Soils
6. Surface Hydrology
7. Groundwater
8. Biological Resources
9. Air Quality
10. Noise
11. Visual Resources
12. Cultural Resources (includes American Indian Perspective)
13. Occupational and Public Health and Safety/Radiation (includes Human Health Risk)
14. Environmental Justice
15. DOE Environmental Policies and Procedures
16. Nuclear Policies
17. Big Explosive Experiment Facility
18. Defense Program
19. Waste Management Program
20. Environmental Restoration Program
21. Nondefense Research and Development Program
22. Work for Others Program
23. Alternative 1 - Continue Current Operations (No Action Alternative)
24. Alternative 2 - Discontinue Operations
25. Alternative 3 - Expanded Use
26. Alternative 4 - Alternate Use of Withdrawn Lands
27. NEPA Process
28. Other

TOPIC NUMBER	COMMENT (*continue on back if needed*)
4	1 Full development in harmony with Manhattan Projects 1-2

Please hand this form in today or mail before May 3, 1996 to:

U.S. Department of Energy
Environmental Impact Statement
P.O. Box 14459
Las Vegas, NV 89195-8066

RECEIVED MAR 15 1996

PRIVATE CITIZEN 16

3-9-96

To: US Dept of Energy - Environmental Impact

RE: Downwinders in St George Utah

We have lots of evidence here in St George that hundreds of residents were victims of the tests in Nevada.

1 Please stop the testing & don't send more to their deaths or for more cancer related problems

You wouldn't do the tests of any kind if the wind was blowing into Las Vegas

2 There has already been too much negligence. Don't ignore our pleas to stop All tests & don't send innocent people into the area to experiment with the results!

Herman B. Ferdenandi
PO Box 625
St George Utah 84771

RECEIVED MAR 1996

PRIVATE CITIZEN 17

THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
for the NEVADA TEST SITE and
OFF-SITE LOCATIONS IN THE STATE OF NEVADA

Nevada Test Site EIS Hearing Comment Sheet

Meeting Location: PAHRUMP, NV
Meeting Date: 13 MAR 96

Please Enter Your Name, Organization and Address Below:

TONY ADKINS (Your Name) — NONE (Organization)
P.O. BOX 864 (Street Address) — NUCLA (City) — CO (State) — 81424 (Zip Code)

Thank you for attending this hearing. Please use this sheet (and attachments if needed) to inform us of your written comments on this EIS.

When commenting, please indicate beside your comment the applicable issue category number from the list below. This will help us to ensure that your comment is considered in the relevant section of the EIS. You may identify additional issue categories as needed.

1. Land Use
2. Transportation
3. Site Support Activities
4. Socioeconomics
5. Geology and Soils
6. Surface Hydrology
7. Groundwater
8. Biological Resources
9. Air Quality
10. Noise
11. Visual Resources
12. Cultural Resources (includes American Indian Perspective)
13. Occupational and Public Health and Safety/Radiation (includes Human Health Risk)
14. Environmental Justice
15. DOE Environmental Policies and Procedures
16. Nuclear Policies
17. Big Explosive Experiment Facility
18. Defense Program
19. Waste Management Program
20. Environmental Restoration Program
21. Nondefense Research and Development Program
22. Work for Others Program
23. Alternative 1 - Continue Current Operations (No Action Alternative)
24. Alternative 2 - Discontinue Operations
25. Alternative 3 - Expanded Use
26. Alternative 4 - Alternate Use of Withdrawn Lands
27. NEPA Process
28. Other

TOPIC NUMBER — COMMENT (*continue on back if needed*)

5, 26 — 1 — THE EIS SHOULD CONSIDER THE POTENTIAL OF THE NEVADA TEST SITE FOR MINERAL EXPLOITATION. . A REVIEW OF THE AVAILABLE GEOLOGIC DATA INDICATES THAT ECONOMIC MINERAL DEPOSITS, BOTH PRECIOUS & BASE METALS, ARE QUITE LIKELY. PARTICULARLY SINCE EXPLORATION METHODS & THE GEOLOGIC UNDERSTANDING OF MINERAL DEPOSITS HAS EVOLVED SIGNIFICANTLY FROM THE TIME THE NTS WAS CLOSED TO MINERAL ENTRY.

MINING PAYS EXCELLENT WAGES, TRAINS & EMPLOYES SKILLED WORKERS AND GENERALLY IS FUNDED BY THE PRIVATE SECTOR. THIS WOULD LESSEN THE NEED FOR FEDERAL FUNDING OF TEST SITE ACTIVITIES

Please hand this form in today or mail before May 3, 1996 to:
U.S. Department of Energy
Environmental Impact Statement
P.O. Box 14459
Las Vegas, NV 89195-8066

PRIVATE CITIZEN 18

Verbal Comment 1-800 Line

Comment Code: Private Citizen 18–1
Name: Coleman Cottrill
Date: March 27, 1996
City: Las Vegas

- [x] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment: He opposes the Yucca Mountain Project!!

PRIVATE CITIZEN 19

1271 Town Center Drive, MS 423
Las Vegas, NV 89134
(702) 295-4925 voice
(702) 295-5223 FAX
jim_boone@notes.ymp.gov
19 March 96

Donald R. Elle
Director, Environmental Protection Division
DOE, NVO
P. O. Box 14459
Las Vegas, NV 89114

Dear Donald,

Thank you for the opportunity to comment on the draft EIS for the Nevada Test Site and surrounding areas.

I would like to draw your attention to Table 4-30 on pages 4-170 and 4-171. Several species of interest (formerly Federally Listed Category-2 Species) were not included in the table, and several species listed in the table are more widespread than noted. My data are from several sources, including personal knowledge, field guides, published accounts of the species, this draft EIS, and discussions with experts.

1 Enclosed find changes to Table 4-30 that should be considered for the final EIS.

Sincerely,

James L. Boone, Ph. D., Ecology

PRIVATE CITIZEN 19 (CONTINUED)

Table 1. Modifications to EIS table 4-30. Species for which there were no changes are not included in this table. For the species listed in table 4-30 that required changes, upper case (X) indicates an addition and lower case (x) indicates no change. Seven species were added; no species were deleted.

Species listed as endangered, threatened, or candidates under the Endangered Species Act that may be found on the Nevada Test Site (NTS), Tonopah Test Range (TTR), Central Nevada Test Area (CNTA), Project Shoals Area (PSA), Dry Lake Valley (DLV), Eldorado Valley (EV), and Coyote Springs Valley (CSV).

species	NTS	TTR	CNTA	PSA	DLV	EV	CSV
Endangered							
eagle, bald	x	x	x	x			X
Threatened							
tortoise, desert	x				x	X	x
Candidates - Birds							
hawk, ferruginous	x	x	x	x	x	X	X
owl, western burrowing	x	x	x	x	x	X	X
tern, black	x	x	X	X			
Candidates - Mammals							
bat, allens big-eared					X	X	X
bat, big free-tailed	X	X	X		X	X	X
bat, fringed myotis	x	x	x	x	x	X	X
bat, greater mastiff					x	X	X
bat, leaf-nosed					X	X	X
bat, long-eared myotis	x	x	x	x	x	X	X
bat, long-legged myotis	x	x	x	x	x	X	X
bat, townsends big-eared	X	X			X	X	X
bat, small-footed myotis	x	x	x	x	x	X	X
bat, spotted	x	x	x	x	x	X	X
bat, yuma	X	X	X	X	X	X	X
rabbit, pigmy			x	X			
Candidates - Reptiles							
chuckwalla	x				X	X	X
monster, gila					X	X	X
Candidates - Amphibians							
toad, arizona					X	X	X

Private Citizen 20

STATEMENT OF PAUL MCGINNIS, NTS EIS HEARING, MARCH 26, 1996

1 Although the DOE prepared a comprehensive environmental impact statement (EIS) for the Nevada Test Site, I am bothered by what was omitted for "national security" reasons. For example, the DOE tried to obscure the existence of a classified appendix to the EIS that discusses the Lyner complex in Area 1 among other topics.[1] Without the information in the classified appendix, it is difficult for the public to determine the safety and health risks posed by some NTS projects.

2 Another project that the DOE has studied, that is omitted from the EIS, is the Air Force's nuclear rocket program originally code-named TIMBERWIND, that later became the Space Nuclear Thermal Propulsion (SNTP) program, that was notorious for having a classified EIS. This 253 million dollar program was planned for a site near Saddle Mountain in Area 25 of the Nevada Test Site.[2][3] If you want to discuss safety risks, consider the effects of a rocket explosion like that of the Space Shuttle Challenger or the Titan missiles, except with a nuclear reactor onboard.

Perhaps the biggest thing that the DOE has tried to conceal is their role, and the role of the Atomic Energy Commission (AEC) in the saga of the Air Force's secret airbase at Groom Lake. The EIS mentions plutonium contamination in what it describes as Area 13 of the Nellis Air Force
3 Range Complex, and then shows maps in the EIS that clearly indicate that Area 13 is part of the Groom Lake base.[4] The northeastern part of restricted airspace R-4808N, shown in the EIS maps, forms a rectangular box on military maps, sometimes referred to as "Dreamland" by military pilots, that contains Groom Lake and its secret Air Force base.[5] The maps show that the NTS
4 supplies electrical power to the Groom Lake base and provides access to Groom Lake on 2 NTS roads, Mercury Highway and Valley Road. Although R-4808N contains an Air Force facility, this restricted airspace is controlled by the Department of Energy.[6]

AEC documents from the 1950s and 1960s have been released that reveal the role of the DOE's predecessor at Groom Lake. The Groom Lake base was originally built in the mid-1950s by the AEC's contractor REECo (Reynolds Electrical Engineering Company) under the cover name "Watertown Strip" [7] for the CIA's U-2 aircraft program. A 1957 press release about a pilot who had to make an emergency landing at Watertown Strip revealed that "the Watertown landing strip is in the Groom Lake area at the northeast corner of the Nevada Test Site."[8] The Groom Lake facility eventually became known as Area 51 Camp and was frequently referred to as such in Nevada Test Site employee bulletins in the 1960s. For example, one bulletin even provided the telephone numbers for Area 51's base commander and security office.[9]

5 By withholding information, like that described above, during a public environmental impact statement process, the DOE decreases the public's trust and violates the spirit of Secretary O'Leary's openness initiative.

References

[1] Dept. of Energy, Nevada Operations Office. Draft Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada. Volume 1, Appendix A. DOE/EIS 0243. January 1996: page A-12.

[2] Dept. of the Air Force. Space Nuclear Thermal Propulsion Program, Particle Bed reactor Propulsion Technology Development and Validation. AD-A281 442. May 1993.

[3] Dept. of Energy. J.F. Whitbeck and T. Olsen. Preliminary study of facility options for ground testing of a Nuclear Thermal Propulsion Engine. EGG-NPD-9548 (DOE contract AC07-76ID01570). June 1991.

[4] Dept. of Energy, Nevada Operations Office. Draft Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada. Volume 1, Chapter 4, Part A. DOE/EIS 0243. January 1996.

Private Citizen 20 (continued)

[5] Defense Mapping Agency. Nellis AFB Range Chart. NRCXX01. October 1988.

[6] Defense Mapping Agency. Area Planning, Special Use Airspace, North and South America. AP/1A. September 14, 1995: page 81.

[7] Atomic Energy Commission. Col. Alfred Starbird. Telex 8103 to K.F. Hertford on the Watertown Project. October 17, 1955.

[8] Nevada Test Organization, Office of Test Information. Watertown press release. OTI 57-70. July 29, 1957.

[9] Nevada Test Site. NTS Bulletin Volume IV, Number 2. January 15, 1960.

For further information, contact:

Paul McGinnis
P.O. Box 28084
Santa Ana, CA 92799
daytime phone: (714) 753-7864 ext. 294
Internet: TRADER@cup.portal.com / PaulMcG@aol.com
http://www.portal.com/~trader/secrecy.html

PRIVATE CITIZEN 20 (CONTINUED)

34090

OTI-57-70

Nevada Test Organization
OFFICE OF TEST INFORMATION
1235 South Main Street
Las Vegas, Nevada

July 29, 1957

Telephone: DUdley 2-6350

FOR IMMEDIATE RELEASE

A pilot who landed his small private aircraft late Sunday on the Watertown air strip within the restricted air space over the Nevada Test Site was to take off today after being detained overnight at Mercury.

The pilot is [redacted] of Redondo Beach, California, an employee of the Douglas Aircraft Company. He was on a cross country training flight from Torrance, California, to Las Vegas when he lost his way, ran low on gas, and landed at Watertown.

The Watertown landing strip is in the Groom Lake area at the northeast corner of the Nevada Test Site.

Nevada Test Organization security officials reported the incident to the Civil Aeronautics Administration, which administers the air closure over the Test Site.

-0-

PRIVATE CITIZEN 20 (CONTINUED)

COPY

TWX 8103 /PRIORITY/

Recd. Oct. 17, 1955
11:07 AM

FROM USAEC WASHINGTON DC OCTOBER 55 161703Z

TO USAEC SFOO ALBUQUERQUE NM

0142174

/ OFFICIAL USE ONLY/

UNCLASSIFIED

FROM COL ALFRED D STARBIRD

TO K F HERTFORD

REFERENCE YOUR MEMORANDUM SEPTEMBER 19 CONCERNING REQUEST OF THE LAS VEGAS REVIEW JOURNAL FOR A PROGRESS REPORT ON WATERTOWN PROJECT, APPROVED RELEASE IS AS FOLLOWS:

"CONSTRUCTION AT THE NEVADA TEST SITE INSTALLATION A FEW MILES NORTH OF YUCCA FLAT WHICH WAS ANNOUNCED LAST SPRING IS CONTINUING. DATA SECURED TO DATE HAS INDICATED A NEED FOR LIMITED ADDITIONAL FACILITIES AND MODIFICATIONS OF THE EXISTING INSTALLATION. THE ADDITIONAL WORK WHICH WILL NOT BE COMPLETED UNTIL SOMETIME IN 1956 IS BEING DONE BY THE REYNOLDS ELECTRICAL AND ENGINEERING COMPANY, INCORPORATED UNDER THE DIRECTION OF THE ATOMIC ENERGY COMMISSIONS LAS VEGAS BRANCH OFFICE".

END REF MA: LPG AEC-8103

For our guidance if press queries, data additional facilities and modifications refer to the satellite installation.

PRIVATE CITIZEN 21

[redacted]

DEPARTMENT OF ENERGY
ENVIRONMENTAL IMPACT STATEMENT
P.O.BOX 14459.
LAS VEGAS NEV. 89195 8066

Mr. John E. Loskot
1401 Comstock Dr.
Las Vegas, NV 89106-2009

GENTLEMEN:

BY THE TIME THAT YOU GET AROUND TO PUBLISHING YOUR STATEMENT I WILL BE 90 YEARS OLD.

AS YOU READ THE VITAL STATISTICS COLUMNS IN YOUR LOCAL NEWSPAPER YOU WILL NOTICE THAT VERY FEW OF US MEN ARE ALIVE AT THIS AGE, MOST ARE DEAD,

THIS REALITY CAUSES ME TO QUESTION THE PRUDENCE OF MY INVOLVING MYSELF IN NUCLEAR MATTERS. ESPECIALLY WHEN I DO NOT NEED TO. AND I AM JUST NOW RECOVERING FROM A STROKE, AND LET US BE HONEST AND ADMIT THAT THE OLD MAN JUST AINT WHAT HE USED TO BE,

THE REALITY IS THAT IF I WERE TO DEVELOP MY WORK WITH THE HELP FROM D, O, E, HIGH ENERGY LEVEL NUCLEAR WASTE WOULD ALL BE RECYCLED, AND CONVERTED BACK INTO URANIUM OF ISOTOPE 238 AND THERE IS NO BETTER GRADE FOR FUEL FOR THE NUCLEAR POWER INDUSTRY.

THE CONVERSION COULD AND SHOULD BE DONE AT THE NEVADA TEST SITE AND I SUGGEST THAT IF THE WORK IS TO BE DONE, THAT E, G, AND G . BE GIVEN THE CONTRACT, AS THEIR OFFICE IS NOT FAR FROM WHERE I LIVE AND THAT IS IMPORTANT TO ME AS I NO LONGER HAVE MUCH STREGNTH LEFT TO GET UP AND GO.

THE DESIGN AND ENGINEERING COULD BE DONE AT THEIR LOCAL OFFICE,

I WORKED FOR REYNOLDS BACK IN 1964 1968,

JOHN E. LOSKOT.

RECEIVED APR 0 4 1996

PRIVATE CITIZEN 22

To whom it may concern,

March 20, 1996

I have a few misgivings about the article I read in the Salt Lake Tribune concerning your test sight. As a member of the Utah populace I feel an active letter to you was in order, as I hope did many others.

My concerns are many, but chiefly I am worried about you apparent lack of hope in both living and nonliving matter. By that I mean because you are not interested in completely shutting down your facility, it shows that you have very little respect for humans and the land you will destroy and have obliterated already. There is already condemned land that is obviously inaccessible to humans, do we really need more land that is worthless at the hands of man? I think not. I want my grandchildren to be able to roam happily on a healthy planet. People are dying essentially at your mercy by little or absolutely no fault of their own, damaging the lives of their loved ones, and making you look like the devil's advocate.

Have you ever gone threw the pain of losing someone you love? I have, too many times. I cannot stand the thought of someone else needlessly going threw the same torture. You may think the word torture a bit extreme, but there is no word I can think of to cover all the aspects of what death feels like to the ones still living.

You are not evil people, but you are people who need to ask yourself one question: "Is money more important than human lives"? Those of you who say yes are heartless, and I hope our paths never cross. But to those who say no, you are headed in the right direction and all I can say is follow the path of life, not cruelty and death.

I can show you the way, all you must do is listen to your heart. I hope this letter was not laughed at, or made fun of. I am a humble girl, wanting the world and all Her inhabitants to be happy, safe and healthy. Thank you for your time.

Sincerely,

Amanda Beno

Amanda Beno
Wasatch Academy
Mt. Pleasant, Utah 84647

RECEIVED APR 0 4 1996

PRIVATE CITIZEN 23

Chandler McPherson
2555 D Street - Apt. E
Sparks, NV 89431-4141
(702) 331-5484

March 28, 1996

Donald R. Elle, Director
Environmental Protection Division
U.S. Dept. of Energy Nevada Operations Office
P.O. Box 14459
Las Vegas, NV 89114

Dear Mr. Elle:

This is a response to the "Draft Environmental Impact Statement on the Nevada Test Site". I have carefully reviewed the document and support Alternative 3 for expanded use of the NTS. While the "Cold War" may be over, I am not convinced that scaling back the activities of the NTS as proposed in Alternatives 2 and 4 is appropriate. We are a nuclear power and need to maintain the expertise at both the National Laboratories and the NTS to be able to respond to any national defense need. Proliferation of nuclear weapons is a fact. For instance, while South Africa has dismantled its nuclear weapons program, the fact they had a successful one underlines this danger. I have concerns that weapons and weapons material security in the former Soviet Union may have contributed to proliferation. We simply cannot scale our efforts back too severely without risk.

Stockpile Stewardship properly needs some of the proposed enhancements and additions of facilities to the NTS as proposed in Alternative 3. The emphasis on low or no yield testing to ensure the safety of the stockpile, the proposed storage of surplus pits in the P-Tunnel and the continued environmental remediation at the NTS and off-site test locations should continue. I support such activities as a resident of Nevada.

1 The Draft EIS in several places concerning Project Shoal, refers to the emplacement depth as 1350'. The AEC's "Site Disposal Report - Fallon Nuclear Test Site (Shoal)" of May, 1970, indicated that the entry shaft was mined to 1320' below the surface and that the device was finally emplaced in a 30' "buttonhook" at the end of a 1050' easterly drift. The final emplacement depth was 1211" below the surface.

Sincerely yours,

Chandler McPherson

Chandler McPherson

PRIVATE CITIZEN 24

Verbal Comment 1-800 Line

Comment Code: Private Citizen 24-1

Name: Mary Shape

Date: April 10, 1996

City: Boulder City

- [x] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment: No nuclear waste either low- or high-level waste stored in Nevada or traveled across or on our roads or highways.

PRIVATE CITIZEN 25

C.O.R.E. Workshop

Name: Councilwoman Iris Bletsch
Address: 890 Fairway Dr
City, State: Boulder City, NV 89005 Zip:
Phone: 702-293-4747
Date: 4-8-96
Comments:

1 1. How much money has been spent on the EIS process - totally to date and projected by completion?

2 2. Discontinue transportation of nuclear wastes. If it's so safe, keep it where it's generated.

If you only wish to record this as a written comment to DOE, please give to the stenographer.

☐ Check here if you wish to make a formal statement.

PRIVATE CITIZEN 26

Salt Lake City, Utah
April 9, 1996

Department of Energy
P.O. Box 14459
Las Vegas, NV. 89114

Dear Sirs:

I am writing to comment on what you should do with the Nevada Test Site out by Indian Springs.

My father, Roderick W. Spencer, periodically worked and lived at the site from 1955 through 1961. He eventually got cancer of the larynx. He died with radiation burns still on his ankles after walking through the dust to retrieve any salvageable materials after a bomb blast named "Eddy", "Operation Hardtack", on September 19, 1958.

My claim filed with the Radiation Exposure Compensation program, like nearly all the others, was denied..."no proof radiation caused his cancer."

1 I want that deadly place closed permanently with no further testing out there of any kind. I also would like a memorial erected at the entrance for all those who died of various cancers and were pushed by the wayside.

Sincerely,

Ann Spencer Powers

Ann Spencer Powers
6660 South 2300 East
Salt Lake City, Utah 84121

(801) 943-1834

PRIVATE CITIZEN 27

Verbal Comment 1-800 Line

Comment Code: Private Citizen 27-1

Name: Ms. Tamara Rosta

Date: April 10, 1996

City: Las Vegas

- [X] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment: Should keep NTS open, and use NTS for other purposes and testing, not necessarily nuclear.

PRIVATE CITIZEN 28

Verbal Comment 1-800 Line

Comment Code: Private Citizen 28-1

Name: William Blockley

Date: April 25, 1996

City: Boulder City

- [X] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

1 Comment: Comments for transportation of nuclear waste through Boulder City. Suggests routing be restricted to Hwy. 95--NOT allow any nuclear waste over Hwy. 93. OK over Hoover Dam area. Hwy. 95 would have to be improved in some areas, but it does take hazard away from trucks carrying material over Hoover Dam.

2 Wants to bypass roads constructed around Las Vegas so waste is not required to be transported through highly populated areas with high traffic volumes

PRIVATE CITIZEN 29

Verbal Comment 1-800 Line

Comment Code: Private Citizen 29-1

Name: Mr. Richard Fletcher, Sr.

Date: April 25, 1996

City: North Las Vegas

[X] Telephoned
[ ] Returned your call
[ ] Please call
[ ] Will call again

Comment: Votes to keep NTS open because there is plenty of research they can do on other things besides testing; there is other research they can do, and other defense work they can do.

PRIVATE CITIZEN 30

Verbal Comment 1-800 Line

Comment Code: Private Citizen 30-1

Name: Mr. Daniel Romero

Date: April 25, 1996

City: Las Vegas

[X] Telephoned
[ ] Returned your call
[ ] Please call
[ ] Will call again

Comment: Does not want the NTS closed.

PRIVATE CITIZEN 31

Verbal Comment 1-800 Line

Comment Code: Private Citizen 31-1

Name: Mr. Donald R. Fletcher

Date: April 25, 1996

City: Las Vegas

- [x] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment: Wants to keep NTS open.
Would like to see a combination of work at NTS, including low-level waste storage and dismantling of weapons, and would like to see it remain in a ready mode for testing.

PRIVATE CITIZEN 32

Verbal Comment 1-800 Line

Comment Code: Private Citizen 32-1

Name: Mr. Luciano Falozant

Date: April 25, 1996

City: North Las Vegas

- [x] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment: Voting to keep NTS open.

PRIVATE CITIZEN 33

Verbal Comment 1-800 Line

Comment Code: Private Citizen 33-1

Name: Ms. Fannie White

Date: April 25, 1996

City: Mercury

- [x] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment: Wants to keep the test site open.

PRIVATE CITIZEN 34

Verbal Comment 1-800 Line

Comment Code: Private Citizen 34-1

Name: Ms. Katherine M. Wilson

Date: April 25, 1996

City: Boulder City

- [x] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment: Does not want waste material brought thru Boulder City or over the Hoover Dam.

Private Citizen 35

Verbal Comment 1-800 Line

Comment Code: Private Citizen 35-1

Name: Ms. Bertha A. Sexton

Date: April 26, 1996

City: Las Vegas

- [x] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment:

- NTS remain open.
- Low-level waste come to NTS.
- Dismantling of armed nuclear devices.
- As well as what we are continuing to do now at the NTS.

Private Citizen 36

Verbal Comment 1-800 Line

Comment Code: Private Citizen 36-1

Name: Ms. Terry Anderson

Date: April 26, 1996

City: Indian Springs

- [x] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment:

- NTS stay open.
- Have low-level waste at the NTS.
- Continue to do the work we do now, and
- Dismantling of devices.

1

PRIVATE CITIZEN 37

Verbal Comment 1-800 Line

Comment Code: Private Citizen 37-1

Name: Mr. Harold D. Sanquist

Date: April 26, 1996

City: Las Vegas

- [x] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment:

- Works at the NTS.
- Wants to see more work at the NTS.
- Wants to continue the work at NTS.
- Necessary for the country, and we need it.

PRIVATE CITIZEN 38

Verbal Comment 1-800 Line

Comment Code: Private Citizen 38-1

Name: Ms. Tracy Sanquist

Date: April 26, 1996

City: Las Vegas

- [x] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment:

- NTS provides jobs.
- NTS is only thing in Nevada that is stable.
- Nothing finer in the state of Nevada than the NTS.
- What else are you going to do with that land that has been damaged in that way?
- NTS is stable -- keep it going for people in Las Vegas and in Nevada.

PRIVATE CITIZEN 39

Verbal Comment 1-800 Line

Comment Code: Private Citizen 39-1

Name: Dorothy Anderson

Date: April 26, 1996

City: Henderson

- [x] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment: She would like someone authorized to answer questions for her regarding transportation of nuclear waste across the dam. She is opposed to this.

PRIVATE CITIZEN 40

Verbal Comment 1-800 Line

Comment Code: Private Citizen 40-1

Name: Mr. James J. McGraw

Date: April 26, 1996

City: Pahrump

- [x] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment: Employed at NTS for 18 years. NTS has been good for the economy and my family.
He has known about the many programs at the NTS, and he thinks there is over emphasis on nuclear testing.
Feels people who are against the NTS are against him. Appreciates if his telephone call has any impact on maintaining the NTS.

PRIVATE CITIZEN 41

Verbal Comment 1-800 Line

Comment Code: Private Citizen 41
Name: Mr. & Mrs. William Wootan
Date: April 29, 1996
City: Boulder City

- [x] Telephoned
- [ ] Please call
- [ ] Returned your call
- [ ] Will call again

Comment: Re: Low-level waste being transported on Highways 93 and 95, and with more concern over dangerous liquified natural gas being transported from Mexico with Mexican drivers. We don't understand why this is going to be done, and we object to it. Why is there such a cavalier attitude toward this? Trucks should be taken off this highway and run through the Willow Creek Bridge which should have been built with the money spent on the theatre and nonsense at Boulder Dam.

PRIVATE CITIZEN 42

Verbal Comment 1-800 Line

Comment Code: Private Citizen 42
Name: Ms. Patricia Dawson
Date: April 29, 1996
City: Boulder City

- [x] Telephoned
- [ ] Please call
- [ ] Returned your call
- [ ] Will call again

Comment: Send summary only. Has home less than 1/4 mile from Highway 95 that goes through Boulder City. Traffic is very heavy on that road. There are accidents all the time. Her concern is about if there is an accident which could happen on that road, or leakage—this would effect the air and water in that area and among those homes. Homeowners are very concerned about this. St. Jude's Ranch is nearby which houses children.

PRIVATE CITIZEN 43

April 30, 1996

Donald R. Elle, Director
Environmental Protection Division
U.S. Department of Energy
Nevada Operations Office
P.O. Box 14459
Las Vegas, NV 89114

RE: SUBMISSION OF COMMENTS ON THE DRAFT NTS EIS

Dear Mr. Elle:

Enclosed are five comments I have on the Environmental Impact Statement for the Nevada Test Site. Please transmit to me a copy of the Final EIS once it has been completed.

Jeff Brown
1508 Splinter Rock Way
North Las Vegas, NV 89031

PRIVATE CITIZEN 43 (CONTINUED)

Comment 1.. Reference page S-21 lines 7-9, 15,16, 21-26 , and table S-3 (page 4 of 7)

This applies to alternatives 1,3

Approximately 10,420 acres of previously undisturbed habitat under alternative 3 and 7,490 acres under alternative 1 are to be cleared, of which 3,015 **could be desert tortoise habitat.**

1 A number of plant and animal species are known to inhabit the NTS, Tonopah Test range and NAFR complex, Specifically the desert tortoise. Currently in the private and commercial sector it is required that prior to any land disturbance, a search must be done to determine if the area is inhabited by the desert tortoise. This appears not to have been accomplished by the NTS. No real specifics are identified as to how or what corrective actions will be taken to provide alternative habitat for the displaced desert tortoise (currently federally listed as a threatened species), if found to be inhabiting these sites.

Comment 2 Reference page S-22 lines 10-16 regarding air quality and climate:

Also Table S-3 (page 1 of 7) for alternatives 1,3,4

The addition of the New Solar Enterprise Zone (new land disturbance of some 2,402 acres)

2 Because there are no air monitoring stations in this area it is assumed air quality is good. In the interest of safety and the environment, I would recommend that a NAMS (National Air Monitoring site) or a SLAMS (state and Local Air Monitoring Site be situated in the project School area and the Central Test site area to determine what levels of fugitive dust

PRIVATE CITIZEN 43 (CONTINUED)

2 cont. are present. These areas are subject to the same high winds as the NTS and NAFR complex. With the proposed increased activity (table S-3), the project Schoal and Central Test site area's should evaluated for PM10 compliance as specified by the National Ambient Air Quality Standard (i.e. 150 microns per cubic meter in a 24 hour period, and 50 microns per cubic meter annual average.) for a period of one year to baseline PM10 levels.

Comment 3. Reference page S-30 lines 7-9.

Two off-site nuclear test sites.

For alternative 1,3

3 I would be opposed to any further nuclear testing in off-site locations whether authorized by the president or not.

4 Although the off-site locations are not mentioned specifically, these should be included in the restoration activities described in this EIS. These sites should not be used in any alternative with regard to waste management storage. These off-site locations should have all radionuclides removed and transported to NTS sites already being used for this purpose. Once the sites have been returned to pretest topology, They could then be used for environmental studies, or if the ecosystem is suitable , could be used to relocate desert tortoise displaced under alternatives 1,3 (mentioned in Comment 1.)

PRIVATE CITIZEN 43 (CONTINUED)

Comment 4. Reference entire EIS

alternatives 1,2,3,4

5 Although all alternatives have some degree of environmental impact, negative and positive. I would recommend a consolidation of 2 alternatives, namely alternatives 3 and 4.

I like the socioeconomics of alternative 3 and the increased activity, but opposed to any

6 off-site transportation of hazardous materials. Exception: to bring hazardous materials (both radionuclides and toxics) from other sites to the NTS, supporting efforts to restore the off-site locations to pre-contamination state. Expand the scope of this EIS to include these sites, implement the Solar enterprise project, Possibly in the restored off site

7 locations. Determine if the solar enterprise project could be developed in a way that would allow any displaced species whether plant or animal, be introduced back into solar enterprise project lands (restored off-site locations). Under alternative 4 there is a potential for some land to be relinquished for public use, develop these lands for this use and include any lands designated for the solar enterprise project.

Comment 5. Reference entire EIS

This EIS was informative and well written, however some areas were difficult to follow. The document assumes the common person reading this document knows what the

8 current operations are at the NTS (alternative 1). A more in depth description of current operations needs to be included so the public can better assess the other three alternatives.

PRIVATE CITIZEN 43 (CONTINUED)

There is some confusion created as a person reads through the text, constantly going
9 from text to the tables. I would suggest the tables be used for purely statistics and ratios, whereas the text could include a comparison of the alternatives. Some of this EIS seemed biased towards alternative 3. I understand the costs involved with including any graphics
10 in a document this size, including some pictorials on some of the sites mentioned would have made it less difficult to comprehend.

PRIVATE CITIZEN 44

23 Apr 96

DOE Personnel

Please do not reopen the Nevada Test Site for any form of nuclear testing or disposal of radioactive waste that would continue to endanger the health of people living in Nevada or the surrounding states.

Sincerely,

Julia A. Jones
120 Aspen Terrace
Park City UT 84098

PRIVATE CITIZEN 45

4840 Bruges Ave.,
Woodland Hills,
California, 91364
(818) 225-7735
24 April, 1996

TO: Mr. Don Elle, Director of Environmental Departmental Division,
United States of America - Department of Energy,
P. O. Box 14459,
Las Vegas, Nevada, 89114

SUBJECT: Transportation Routes for The Transporting and Disposal of Low Level Radioactive Waste.

Dear Mr. Don Elle - AND Associate Members of The Environmental Impact Study GROUP:

We are writing this letter - to you SIR - and to the Associate Environmental Impact Study (E.I.S.) personnel - who will and are Investigating and Author The E.I.S. Report - concerning The Ten Proposed Routes for The Transportation of Low Level Radioactive Waste - to "The DISPOSAL Test Site" or HOPEFULLY - through the STATE of Nevada. It is NOT the Destination of the Radioactive waste - that is the topic of CONCERN - although WE CANNOT IMAGINE - IN OUR "WIDEST NIGHTMARES" - WHY THE STATE OF NEVADA - WAS CHOSEN TO BE THE "TRASH CONTAINER and STORAGE FACILITY" - FOR THE REST OF THE UNITED STATES OF AMERICA. OUR OPINION IS - THAT NEVADA DOES NOT HAVE THE CONGRESSIONAL STRENGTH OR ELECTORIAL VOTES - TO COUNTER - THE ACTIONS OF "HAVING THIS RADIOACTIVE WASTE - RAMMED - DOWN OUR THROATS" - OR - UP - ANOTHER PART OF OUR ANATOMY. THE PEOPLE OF NEVADA HAD THE "CRAZY" IDEA - THAT DEPT. OF ENERGY (D.O.E.) SECRETARY - MR. BABBITT - WAS "OUR FRIEND" - OUR FEDERAL PROTECTOR - AN ENVIRONMENTALIST - AND - WOULD NEVER LET THIS HAPPEN !!! AFTER ALL - WASN'T ENOUGH OF THE STATE OF NEVADA - RUINED - BY THE NUCLEAR TESTING - ABOVE GROUND - AND - BELOW ??? THIS NEVADA LAND - RUINATION - WENT-ON - FOR - HOW MANY YEARS ??? THE DEFENSE OF OUR COUNTRY - WAS AT STAKE - SO EVERYONE DID THEIR "PART" - ESPECIALLY NEVADA and UTAH!!!! NOW - THE STATE OF NEVADA IS "SELECTED" - TO BE - THE NUCLEAR and RADIOACTIVE WASTE "DUMP" - FOR THE UNITED STATES OF AMERICA !!!! AND - TO FURTHER - "PUT SALT IN THE OPEN WOUND" - WE HAVE TO - ATTEND - DISCUSS - ASK - AND PLEAD - while WE ATTEND - GOD KNOWS - HOW MANY MEETINGS - AND LISTEN TO - HOW MANY "EXPERTS" - FOR HOW MANY HOURS, DAYS AND MONTHS - AND YES - NOW YEARS - TO HAVE - THIS RADIOACTIVE WASTE - <u>NOT</u> - TRANSPORTED THROUGH <u>OUR</u> COMMUNITIES. A U.S.-D.O.E. OFFICIAL - HAS STATED (PER THE BOULDER CITY NEWS of 4/18/1996 - PAGE ONE - FIFTH PARAGRAPH) - "LOW LEVEL RADIOACTIVE WASTE TAKES THOUSANDS OF YEARS TO BREAK DOWN BEFORE IT IS UN-HARMFUL TO HUMANS !"

PRIVATE CITIZEN 45 (CONTINUED)

AND NOW - ONCE AGAIN - THE CITIZENS OF NEVADA - AND - MORE SPECIFICALLY - THE CITIZENS OF BOULDER CITY and HENDERSON, NEVADA - ARE THREATENED - EVEN FURTHER - BY THE GOVERNMENT OF THE UNITED STATES OF AMERICA - WITH HAVING - "A CONTAMINATE DANGER - FOR THOUSANDS YEARS" - TRANSPORTED THROUGH THE STATE OF NEVADA and THESE TWO COMMUNITIES.

Facilitator Brad Benson, stated (B.C. News, 4/18/1996 - Page ONE - Second Paragraph) - that HE was disappointed with the "low turnout" (of The April 8, 1996 meeting), especially after residents Provided valuable input at a similar meeting THREE MONTHS AGO. (B.C. NEWS, 4/18/1996, PAGE ONE - FOURTH PARAGRAPH) - AGAIN MR. B. BENSON - "BACK IN JANUARY 1995 D.O.E. HELD A SCOPING MEETING AND ONE THING THAT CAME OUT WAS, MOST RESIDENTS DID NOT REALIZE A LOW LEVEL ROUTE WAS COMING THROUGH THE CITY. IT REALLY UPSET A LOT OF PEOPLE." AGAIN (B.C. NEWS, 4/18/1996, - PARAGRAPH SIX - which starts ON Page ONE AND ENDS ON Page THREE - TOP MIDDLE OF PAGE THREE) - ORIGINALLY the D.O.E. - DID NOT - SELECT BOULDER CITY as one of the sites for meetings - BENSON - (AGAIN) said, but several people pressured them into it. "The community made their apprehensions known and in doing so the DOE included Boulder City. EVEN - THE MAYOR of BOULDER CITY - "HIS HONOR" MR. ERIC LUNDGAARD - brought up the "lack of response as being apathy" before the last City Council meeting.

MR. DON ELLE (DIRECTOR OF ENVIRONMENTAL DEPARTMENTAL DIVISION - OF THE U.S. DEPT. OF ENERGY), YOUR HONOR - MR. MAYOR - MR. ERIC LUNDGAARD (that calls people "animals" and statements of that effect - when THE CITIZENS - OF THE B.C. COMMUNITY - EVEN DARE - TO DISAGREE - WHEN ATTENDING - ONE OF "HIS HONOR's" MEETINGS), PROFESSOR PAUL RICHITT (U.N.L.V. Environmental Studies Program), MR. BRAD BENSON - FACILITATOR (WEBSTER's DICTIONARY states A FACILITATOR - AS ONE WHO ATTEMPTS TO MAKE THINGS - EASY or LESS DIFFICULT), and THE THIRTY or so - EXPERTS FROM THE DEPARTMENT OF ENERGY, the UNIVERSITY OF NEVADA, LAS VEGAS COMMUNITY OUTREACH AND EDUCATION (CORE) (Reference: B.C. NEWS, 4/18/1996, Page ONE, Paragraph THREE) - AND ANYONE ELSE - WHO HAS STATED AN OPINION ABOUT "THE POOR TURN-OUT - OF THE BOULDER CITY APRIL 8, 1996 CITY HALL MEETING!"

WE, - NANCY and ROY J. KASSEBAUM (LAND OWNER's IN THE CITY OF HENDERSON, NEVADA - AND VERY SOON - IN THE FUTURE - RESIDENTS OF BOULDER CITY, NEVADA) - WOULD LIKE TO "STATE" OUR OPINIONS:
#1.: - CONCERNING THE MATTER OF "LOW ATTENDANCE" OF THE D.O.E. MEETINGS, #2.: - THE TEN PROPOSED TRANSPORTATION ROUTES OF LOW LEVEL RADIOACTIVE WASTE - THREE OF WHICH - ARE PROPOSED TO TRAVERSE THROUGH THE COMMUNITIES OF BOULDER CITY - AND/OR - HENDERSON, NEVADA.

PRIVATE CITIZEN 45 (CONTINUED)

OPINION NUMBER ONE - CONCERNING THE MATTER OF "LOW ATTENDANCE" OF THE D.O.E. "ROUTE" MEETINGS. THIS OPINIONATED REPLY IS PRIMARILY DIRECTED TO THE GENTLEMEN MENTIONED IN THE NEXT TO LAST PARAGRAPH - ALTHOUGH NOT CONSTRUCTIVE - IT IS "FOOD FOR THOUGHT". Did it ever occur to ANYONE OF YOU - WHY THERE IS APATHY and POOR ATTENDANCE - concerning These Recent (Before Referenced) Meetings ??? As BRIEFLY mentioned before - LOOK BACK AT THE HISTORY OF THE STATE OF NEVADA - JUST from WW II - to PRESENT DAY - INCLUDING MEETINGS.

THE STATE of Nevada has been The United States' "DUMP" - as far as ANYTHING EVEN REMOTELY CONCERNING - NUCLEAR - Be it TESTING (Above or Below the surface) - OR NOW - DISPOSAL of LOW Level Radioactive "WASTE" !!!! HOW MANY OF THESE TYPES OF FEDERAL, CONGRESSIONAL, STATE, CITY or COMMUNITY MEETINGS HAVE BEEN HELD - JUST SINCE WW II - ON THESE VERY SUBJECTS and CONCERNS ?????? DID THESE MEETINGS - THAT SHOWED THE NEVADA CITIZENS "CONCERNS","WORRIES" AND "DISPLEASURES" - DO ANY GOOD ????? HOW MUCH OF THE TOTAL - ACREAGE OF THE TOTAL - LAND MASS of the STATE OF NEVADA IS NOW - UNDER CONTROL OF - OR OWNED - BY THE UNITED STATES GOVERNMENT ????? DID THE "CONCERNS" and "MEETINGS ATTENDED" - OF THE PAST and PRESENT CITIZENS OF NEVADA - REALLY - MAKE A DIFFERENCE ????? WHEN A NUMBER OF B.C. CITIZENS - DISAGREED WITH MAYOR E. LUNDGAARD - OVER A "LOCAL" MATTER - THEY WERE CALLED "ANIMALS" - OR WORDS TO THAT EFFECT !! IF YOU WERE or ARE - A CITIZEN OF THE STATE OF NEVADA - WOULD - YOU - ATTEND - MORE - OR ANY - OF "THESE MEETINGS" - GIVEN THE PAST HISTORY - OF THE RESULTS OF THESE MEETINGS - "CHAIRED" BY and FOR the U.S. Government, STATE Government or CITY and - THEIR - PROPOSALS and "MATTERS"????? OR WOULD YOU "JUST STAY AT HOME" - AND WATCH YOUR "FORNICATION" - OVER THE T. V.??? BECAUSE OF THE PAST HISTORY - OF ALL OF THESE MEETINGS - HAS SHOWN - THAT - YOUR - CONCERNS (and in B.C.'S recent case) - OPINIONS - ARE INTERFERING WITH THE DECISIONS - THAT HAVE - ALREADY MADE !!! BUT-DO YOU KNOW WHAT - THE PUBLIC SERVING - T.V. STATION and EVEN THE UNITED STATES GOVERNMENT D.O.E.(Chairing these meetings) - DOES NOT CARE ENOUGH - TO INSURE - THAT THESE "VITAL" and "CONCERNING" MEETINGS - HAVE BROAD-CAST AUDIO SOUND - FOR THESE - "VITAL MEETINGS" - SO THAT "THEY" COULD BE SEEN and HEARD BY THE DISABLED or SHUT-IN's - AND/OR THE CONCERNED CITIZENS - WHO - NOW - PREFER TO TAKE "THEIR VERBAL ANAL-FLOSS and EVENTUAL SANDY FORNICATION" - AT LEAST - IN THEIR EASY CHAIRS AT HOME !!!! LOOK AT THE PAST HISTORY - AND - THINK - HONESTLY - ABOUT THE RESULTS - AND THE NEVADA LAND OWNERSHIP and <u>WHO</u> IS GETTING THE "DUMP" RESULTS !!!!!! I SHALL NOW INDICATE AND "POINT-OUT" - AGAIN - JUST FROM THE MEETINGS - MENTIONED - IN THE B.C. NEWS dated 4/18/1996 (THE ARTICLE by MR. ROY THEISS ON "WASTE TURNOUT LOW") - THAT D.O.E. MEETINGS "BACK IN JANUARY, 1995, THE "SIMILAR MEETINGS - THREE MONTHS AGO" AND THE APRIL 8,1996 MEETING - ALL REFERENCED OPINIONS THAT WERE STATED - TO THE EFFECT - "THE COMMUNITY MADE THEIR APPREHENSIONS KNOWN" AND "IT REALLY UPSET A LOT OF PEOPLE" AND EVEN THE B.C. MAYOR - STATED AT THE CITY COUNCIL MEETING "WE TAKE THEIR ADVISE VERY SERIOUSLY" (IS IT <u>CONTRACT</u> RENEWAL TIME - ALREADY ???).

3

PRIVATE CITIZEN 45 (CONTINUED)

THE POINT - I AM INDICATING - IS - THE PEOPLE OF THE COMMUNITIES OF BOULDER CITY, LAS VEGAS AND EVEN ST. GEORGE - HAVE - MADE - THEIR OPINIONS KNOWN - AND THAT IS - THEY ARE VERY UPSET - WITH - ANY PROPOSED LOW LEVEL RADIATION WASTE TRANSPORTATION ROUTE - THAT GOES THROUGH - OR EVEN - NEAR - THE COMMUNITIES OF HENDERSON AND/OR BOULDER CITY - TO OBTAIN THE "DUMPS" DESIGNATED FOR Ol' NEVADA. THAT IS PRETTY CLEAR - IS IT NOT ??? EVEN - WE - CAN COMPREHEND "THAT MUCH" - FROM THE B.C. News of 4/18/1996 !!!! WHY ARE THESE MEETINGS - EVEN BEING CONDUCTED - GIVEN THE PAST HISTORY OF THE STATE OF NEVADA - OR IS IT "MEETING TIME" - TO CALL FOR A BOWL AND PITCHER OF WATER - IN ORDER - TO "WASH MY HANDS OF THIS ENTIRE MATTER ???"

OPINION NUMBER TWO - (a.): THESE ARE MY WIFE'S AND MY OPINIONS - CONCERNING - THE PROPOSED - TEN LOW LEVEL RADIOACTIVE WASTE ROUTES. THE B.C.NEWS ARTICLE STATED THAT - TWO PROPOSED ROUTES WOULD TRAVEL OVER HOOVER DAM AND ONE PROPOSED ROUTE FROM CALIFORNIA GOES ALONG LAKE MEAD DRIVE IN HENDERSON NEVADA. THE ARTICLE FURTHER STATES - THAT THE D.O.E. HAS "SUGGESTED" - THREE ROUTES - THAT BY-PASS BOULDER CITY. WHY IS THERE A MEETING - OR EVEN A QUESTION CONCERNING - ANY - OF THE PROPOSED ROUTES - WHEN - <u>ANY</u> - OF THE SAFETY AND WELL-BEING - OF - <u>ANY</u> - POPULATED COMMUNITY IS CONCERNED ???????? ESPECIALLY - WHEN - THREE - D.O.E. SUGGESTED - ROUTES - BY-PASS BOULDER CITY - AND - I PRESUME - NEIGHBORING HENDERSON, NEVADA ????????????????

MR. D. ELLE - WAS QUOTED AS STATING - "THERE IS A CERTAIN RISK WHEN GOING THROUGH THE COMMUNITIES" (WITH LOW LEVEL RADIOACTIVE WASTE TRANSPORTATION). MR. D. ELLE FURTHER STATES - "BUT THE CHANCE OF AN ACCIDENT HAPPENING ARE VERY LOW". WHEN and WHERE - HAS THE AMERICAN PUBLIC "HEARD" THAT STATEMENT - BEFORE ?? WAS IT WHEN NUCLEAR REACTORS WERE FIRST PUT "ON-LINE" - ALONG THE EAST COAST - OR - WAS IT FROM RUSSIA - BEFORE OR AFTER - KIEV - AND THE "ACCIDENT" - THAT IS STILL - KILLING "SICK" PEOPLE, ANIMALS AND EVEN INSECTS - UP TO 60 RADIUS MILES AWAY FROM "THE ACCIDENT" SITE ??? OR BETTER STILL - LET'S LOOK AT THE ACCIDENT RATE - OF TRUCKING - THAT IS - LOCAL - OR IN CALIFORNIA - OR ANYWHERE - AND - THEN - TRY TO CONVINCE - ANYONE - THAT THE CHANCE OF AN ACCIDENT HAPPENING - IS VERY LOW !!!! ONLY - IN THIS CASE - IT COULD - AND WOULD INVOLVE - LOW LEVEL RADIOACTIVE WASTE - THAT COULD "ENTER" and/or "BE ACCIDENTLY - DEPOSITED" - IN ANY NUMBER OF COMMUNITY FACILITIES - FROM ROADS(minimum), WATER SUPPLY, ELECTRICAL SERVICE and - EVEN - TO THE - <u>AIR</u> - THAT IS BREATHED.

MR. D. ELLE AND MEMBERS OF THE E.I.S. REPORT COMMISSION - MAY I INDULGE IN A "WHAT-IF" ?? LET'S INDULGE IN THE PREMISE - THAT ONE OF THE FINAL SELECTED AND APPROVED TRANSPORTATION ROUTES - GOES OVER THE HOOVER DAM. LET'S FURTHER INDULGE - AND STATE THAT AN ACCIDENT OCCURRED ON HOOVER DAM AND INVOLVED A LOW LEVEL RADIOACTIVE WASTE TRANSPORTATION VEHICLE.

4

PRIVATE CITIZEN 45 (CONTINUED)

LET'S FURTHER STATE - THAT AS A RESULT OF THE ACCIDENT - ANOTHER
"ACCIDENT" OCCURS - AND RADIOACTIVE WASTE, DIRT OR CONSTRUCTION DEBRIS
- ENTERS THE WATERS OF LAKE MEAD AND/OR THE INTERNAL OPERATIONS OF THE
1 GIGANTIC HOOVER DAM - ELECTRICAL GENERATING FACILITIES. THIS IS THE
SAME RADIOACTIVE WASTE MATERIAL THAT HAS BEEN QUOTED AS "TAKING
THOUSANDS OF YEARS TO BREAK DOWN - BEFORE IT BECOMES UNHARMFUL TO
HUMANS" !!! HOW MUCH - AREA - ALONE - WOULD BE FURTHER CONTAMINATED ?
A SIXTY MILE RADIOACTIVE RADIUS - COVER - FOR - ALL - OF LAKE MEAD -
AND - THE RIVERS - ABOVE AND BELOW - THE "LOW ACCIDENT RISK" -
"CONTAMINATED" WATERS?? HOW WOULD THIS RADIOACTIVE WASTE - EFFECT THE
2 ELECTRICAL SYSTEMS OF HOOVER DAM - THAT SUPPLIES ELECTRICAL POWER TO
AN AWFUL LOT OF THE WESTERN UNITED STATES ?? I BELIEVE ENOUGH "WHAT-
IF's" - HAVE BEEN STATED - TO INDICATE THAT - ANY - WASTE TRANSPORTA-
TION ROUTE OVER HOOVER DAM AND THROUGH THE COMMUNITY OF BOULDER CITY -
HAS TO CONSIDER - THE ABOVE - "WHAT-IF" !!!! AS PREVIOUSLY STATED -
ANY - WASTE MATERIAL TRANSPORTATION ROUTE THAT ENDANGERS - ANY -
COMMUNITY - EVEN WITH THE - REMOTEST - "WHAT-IF" - SHOULD BE DISCARD-
ED, DISAPPROVED AND STATED - AS BEING DISAPPROVED "OF" IN - NO UNCER-
TAIN TERMS - TO - THE - OR - ANY - RADIOACTIVE WASTE TRANSPORTATION
CONTACTED CONTRACTOR - IN HIS CONTRACT - AND "STAMPED UPON HIS
BRAIN"!! WE FEEL THAT - THIS -AND - ANY - AND - ALL "RADIOACTIVE
WASTE ENDANGERMENT STATEMENT PERTAINING TO - ANY POPULATED COMMUNITY -
MUST BE STATED AND AGREED TO - IN - ANY WRITTEN AGREEMENT OR CONTRACT
- WITH ANYONE - OR ANY - CONTRACTOR - THAT EVEN - REVIEWS - THE
CONTRACT FOR THE LOW LEVEL RADIOACTIVE WASTE TRANSPORTATION "JOB" !!!

OPINION NUMBER TWO - (b.): - CONCERNS THE PROPOSED ROUTE FOR THE TRANSPORTATION OF RADIOACTIVE WASTE - FROM CALIFORNIA - THAT "GOES ALONG LAKE MEAD DRIVE IN HENDERSON". ONCE AGAIN - WE WILL STATE - THAT WE ARE UNCOMPROMISINGLY - AGAINST - ANY - AND - ALL - PROPOSED ROUTES THAT WILL CARRY - ANY - AND EVEN - "AN EMPTY RETURN LOAD" - AND/OR - EVEN ONE MICRON OF A SPECK OF LOW LEVEL RADIOACTIVE WASTE - THROUGH - ANY - AND ALL - POPULATED COMMUNITIES - OF ONE PERSON OR MORE !!!!!! ESPECIALLY WHEN THE D.O.E. - HAS SUGGESTED - THREE ROUTES THAT BY-PASS BOULDER CITY. THESE THREE BY-PASS ROUTES - ALSO MUST - INCLUDE - HENDERSON, NEVADA - ESPECIALLY THE NEWLY POPULATED AND EXPLODING HOUSING and POPULATION - ALONG LAKE MEAD DRIVE - FROM I-15 (TO THE WEST) and AT LEAST 10 MILES PAST or EAST of the BOULDER CITY HIGHWAY - THAT TRAVERSES HENDERSON, NEVADA. HAS - ANYONE - TOLD THE D.O.E. PERSONNEL - AND/OR - THE E.I.S. PERSONNEL - AND ESPECIALLY MR. DON ELLE - ABOUT THE "ACCIDENTAL" - CHEMICAL CLOUD - THAT - "NEVER WOULD HAPPENED" - BUT - DID HAPPEN - TO HENDERSON NEVADA ?? THIS CLOUD - NOT ONLY - HAPPENED - BUT - "DRIFTED" - SOUTH - BY WIND CURRENTS - FROM IT'S ORIGIN (NEAR THE INDUSTRIAL RAILROAD TRACKS) (JUST NORTH OF LAKE MEAD BLVD.). THERE ARE "VARYING" "STORIES", "STUDIES" - AND "RESULTS" - AS TO "THE CLOUD's TOXICITY" AND - ALSO - AS TO "THE EFFECT THAT THIS CLOUD - HAD ON THE TOWN'S - POPULATION - OF WHAT IS NOW CALLED - HENDERSON, NEVADA.

PRIVATE CITIZEN 45 (CONTINUED)

WE FEEL, WE DO NOT HAVE TO INDULGE IN FURTHER - "WHAT-IF's" CONCERNING AN "ACCIDENT GENERATED" LOW LEVEL RADIOACTIVE WASTE - CLOUD - OF TRANSPORTED DIRT OR CONSTRUCTION DEBRIS AND IT'S "EFFECT" - ON THE EVER EXPANDING POPULATION (ALONG LAKE MEAD DRIVE) - ESPECIALLY FROM I-15, THROUGH GREEN VALLEY and HENDERSON - AND - THE POSSIBILITY THAT IT COULD REACH LAKE MEAD AND/OR BOULDER CITY, NEVADA - ALSO.

ANOTHER QUESTION - CONCERNING THE TRANSPORTATION OF THE LOW LEVEL
RADIOACTIVE WASTE ??? HOW LONG OF A TIME PERIOD - IS THIS TRANSPORTA-
3 TION OF THE LOW LEVEL RADIOACTIVE WASTE - SCHEDULED - FOR OPERATION ??
SPECIFICALLY IN DAYS, WEEKS, MONTHS AND YEARS ???

ANOTHER QUESTION - WHAT "ABSOLUTE" "TOTAL" - SAFEGUARDS - ARE
SPECIFICALLY "CALLED - OUT" IN THE RADIOACTIVE WASTE TRANSPORTATION
CONTRACT ??? IS THERE AN INDEPENDENT "BONDED" QUALITY ASSURANCE -
VEHICLE AND SAFETY INSPECTION CONTRACTOR - THAT IS CONTRACTED -
ENTIRELY SEPARATELY - FOR THE DAILY "INSPECTION" and CERTIFICATION -
OF - ANY - AND - ALL - VEHICLES - AS TO THEIR OPERATION - AND - LEAK-
PROOF - SAFETY STATUS ?? SUCH AS - "PROPER" BRAKING SYSTEMS, HEAD AND
4 RUNNING LIGHTS OPERATION AND ADJUSTMENT, LOAD WEIGHT VERIFICATION - AT
A MINIMUM OF - THREE - SEPARATE WEIGHT VERIFICATION STATIONS - FOR
EACH TRIP - AND - EACH WAY ?? ADDITIONAL ITEMS - SUCH AS EACH VE-
HICLE's TIRE TREAD - THICKNESS - AND - TIRE SAFETY STATUS - FOR EACH
TRIP - EACH WAY ?? THESE ARE - "JUST A MINUTE PORTION" - OF SOME OF
THE SAFETY ITEMS - THAT - MUST BE - "AGREED-TO" - AND STRICTLY ADMIN-
ISTERED - FOR EACH VEHICLE - AND EACH ONE-WAY "TRIP" - AT - THE
FEDERAL, STATE AND COMMUNITY LEVELS !!!!

ANOTHER QUESTION - HOW ARE THE VEHICLE'S STORAGE FACILITIES - FOR
5 THE RADIOACTIVE - LOW LEVEL - WASTE - CONTAINMENT - BEING VERIFIED AND
INSPECTED FOR EACH WAY OF EACH TRIP ?? WHETHER "LOADED" OR "NOT-LOAD-
ED"?? AS WE ARE - ALL - "AWARE OF" AND IN FACT - ANYONE - THAT HAS
TRAVELED - ANY ROAD - IN NEVADA - OR ANY OTHER STATE - AND/OR - IN
FACT - ANY TOWN OR CITY STREET OR ROAD - HAS BEEN - "SPATTERED"
"PELTED" AND OTHERWISE - UNACCEPTIVELY "RECEIVED" - DEBRIS THAT - ANY
TRANSPORTATION VEHICLE - WAS OR IS - CARRYING - BOTH - "FULL" AND
ESPECIALLY "EMPTY" "LOADS" - BE "IT" - DISPLACED - AIR - OR GRAVEL -
OR DIRT "VAPOR" - THAT WAS "SENT" - JUST FROM - THIS VEHICLE's OPERA-
TION and "MODUS OPERANDI".

ANY - WASTE OR DEBRIS TRANSPORTATION VEHICLES - EVEN IF THEY ARE "SO-CALLED" COVERED - OR - THE LOAD IS SO-CALLED "CONTAINED" - HAS "LOST PART OF and SOMETIMES - ALL - OF IT'S WASTE OR DEBRIS - CARGO - BECAUSE OF THE VIBRATION, STRESS AND BREAKDOWN OF THE ATTACHED and ASSOCIATED WASTE OR DEBRIS - STORAGE CONTAINMENT FACILITY - ON - ANY - OF THESE TYPES OF VEHICLES.

6 WHAT - ABSOLUTE - SAFEGUARDS - FOR THESE ABSOLUTE - QUALITY INSPECTIONS AND ONE-WAY TRIP - VERIFICATION SAFEGUARDS - HAVE BEEN INSTITUTED AND CONTRACTUALLY GUARANTEED - TO INSURE AND PREVENT - ONE MICRON - OF ONE SPECK - OF LOW LEVEL RADIOACTIVE WASTE - THAT IS POTENTIALLY "FATAL" - FROM LEAVING THESE TRANSPORTATION VEHICLES - AND - CONTAMINATING - ANY - AND - ALL VEHICLES - WITHIN IT'S TRAVELING AND/OR TRAVELED PROXIMITIES ??? THESE GUARANTEES - SHOULD - ALSO - SPECIFY - AND - INCLUDE - ANY MICRON - OF A SPECK - OF DIRT, MATERIAL - OR - ANYTHING - THAT COULD, WOULD AND "DOES" - STICK, WEDGE AND IMBED - IT'S SELF - IN THESE TRANSPORTATION VEHICLES' TIRES - AND - UNDERCARRIAGES. THESE - ALSO - POTENTIALLY "FATAL" - "OBJECTS" - ARE LATER - DISMISSED and/or CENTRIFICALLY "THROWN" FROM THESE - OR - ANY VEHICLE !!! DO "WE" NEED - RADIOACTIVE - "THOUSANDS OF YEARS - ACTIVE - OR "HOT" - PARTICLES - OF ANY KIND - BEING "ACCIDENTLY" - "THROWN-AT" OUR PERSONAL VEHICLES - OR - "PLACED" - ON - OR NEAR - ANY TRANSPORTATION ROUTE - OF - ANY - STATE'S - OR - COMMUNITIES - TRANSPORTATION ROUTES - WHETHER PAVED OR NOT ??????

7 NEXT QUESTION - HAVE ANY SAFEGUARDS OR VERIFICATION INSPECTIONS - BEEN CONTRACTUALLY INSTITUTED - THAT GUARANTEES - THAT THE WASTE MATERIAL BEING TRANSPORTED ON - A - PARTICULAR "LOADED" - TRANSPORTATION VEHICLE - AND/OR - IN A PARTICULAR - THE VEHICLE'S CARGO - HAS BEEN INSPECTED AND VERIFIED - TO BE - AT A SPECIFIC LEVEL - OR UNDER - A SPECIFIED PRE-DETERMINED - STANDARD - FIGURE - OR - TRANSPORTABLE AMOUNT - OF - "SO MANY RADIATION - CURIES" ???

8 YET - ANOTHER QUESTION - WILL - OR - MAY - THESE TRANSPORTATION VEHICLES - OF THIS LOW LEVEL RADIOACTIVE WASTE - BE IDENTIFIED - WITH "SPECIAL" MARKINGS - AND - COLORS - AND LETTERING - THAT STATES - THAT THESE VEHICLES ARE TRANSPORTING LOW LEVEL RADIOACTIVE WASTE - AND THAT 50 YARDS OF DISTANCE - SHOULD - AND MUST BE - MAINTAINED - AT ALL TIMES - IN ORDER TO MAINTAIN HUMAN HEALTH - AND - SAFETY ?? I WOULD FURTHER REQUEST - THAT THESE RADIOACTIVE WASTE TRANSPORTATION VEHICLES - BE "EASILY" AND UNIQUELY - VISIBLY - IDENTIFIED - SO THAT THEIR "SPECIAL" MARKINGS, COLORS AND LETTERING - CAN BE "SEEN" AND IDENTIFIED - FROM A 20/20 VISION DISTANCE - OF ONE HUNDRED YARDS (OR THREE HUNDRED FEET) DISTANCE - AWAY.

9 EVEN IF THESE - ABOVE REQUESTS, COMMENTS and QUESTIONS - CONCERNING SAFEGUARDS, INSPECTIONS, VERIFICATIONS AND SAFETY - GUARANTEES ARE "COMPLIED-WITH" - WHAT ASSURANCES CAN BE "INSTALLED" - THAT - ARE - AND WILL BE INSTITUTED - TO INSURE - THAT - ALL - OF THESE SAFEGUARDS WILL BE GUARANTEED - FOR EACH ONE-WAY PORTION OF EACH WASTE TRANSPORTATION JOURNEY OR TRIP ?? WE - ARE ESPECIALLY CONCERNED - WHEN THE TRANSPORTATION VEHICLES, DRIVERS AND SAFEGUARD INSPECTORS - BECOME "VETERANS" - AND COMPLACENT - WITH THEIR INSPECTIONS AND CONTRACTUAL SAFETY REQUIREMENTS - MONTHS - OR YEARS - AFTER - "THE OPERATION COMMENCES !!

Mr. Don Elles, and/or your Associates - I hope - you have "made-it" - this far - in this letter - SO THAT I MAY EXPRESS MY "THANKS" - concerning - THIS POTENTIALLY "LIFE-THREATENING" "DEADLY" TRANSPORTATION WASTE "PROBLEM" - AND - YOUR Assistance, Help and Concerns - that appeared - in print - to be Very Sincere !!

WE ARE ESPECIALLY AWARE - THAT YOU ARE TRYING TO "SELL" - THE PEOPLE OF NEVADA - AT THIS MOMENT IN TIME OF THIS OPERATION !! WE THEREFORE ARE "REQUESTING" - VERY POLITELY - YET - VERY STRONGLY - THAT THESE BEFORE MENTIONED GUARANTEES and - ALSO - ESPECIALLY - THE THREE COMMUNITY "BY-PASS" ROUTES and THE SAFETY GUARANTEES(THAT WERE ASKED IN THIS LETTER - IN THE FORM OF A QUESTIONS, COMMENTS AND STATEMENTS) - BE ABSOLUTELY - INSTITUTED !! THEIR INSTALLATION INTO THIS LOW LEVEL RADIOACTIVE WASTE TRANSPORTATION OPERATION - WILL MINUTELY - OR - PARTIALLY "HELP" - SO THAT THESE - ABSOLUTE - MINIMUM - SAFETY STANDARDS AND GUARANTEES - WILL - AID - AND PARTIALLY - INSURE - THAT THE TRANSPORT OF THIS - LOW LEVEL - SIGHTLESS, ODORLESS - SILENT, FATAL AND DEADLY MATERIAL - CANNOT AND WILL NOT - CAUSE - ANY OF THE "ACCIDENTAL OCCURRENCES AND/OR MISHAPS" - THAT HAS - "ACCOMPANIED" - THIS TYPE OF MATERIAL AND IT'S "HANDLING" - SINCE IT's INCEPTION !!! - WE WILL NOT EVEN MENTION - IT's USAGE AND "OCCURRANCES" - for AT LEAST ~~THIRTY YEARS !!!~~ THE LAST THIRTY YEAR TIME PERIOD !!!

THANK YOU - AGAIN - FOR YOUR - PRINTED COMMENTS, CONCERNS and the COMMUNITIES - RECOGNITION - OF YOUR - OFFICIAL - HELP, CONCERNS AND EFFORTS - CONCERNING - THIS LIFE AND HEALTH - THREAT - TO OUR "FUTURE" RESIDENCE AND HOME !!!

SINCERELY,

Nancy and Roy J. Kassebaum

NANCY and ROY J. KASSEBAUM
4840 Bruges Ave.,(FOR THE TIME BEING)
Woodland Hills, Calif., 91364
(818) 225-7735

P.S.- DON'T - WE - HAVE - ENOUGH - NATURAL - DISASTERS - SUCH AS EARTHQUAKES, BLIZZARDS, TORNADOES AND NEVADA's HISTORY FLASH FLOODS ?? DOES - MANKIND - AND SPECIFICALLY - THE TRANSPORTATION OF LOW LEVEL RADIOACTIVE MATERIAL and/or WASTE - THROUGH - ANY - POPULATED COMMUNITY - HAVE TO BE - ADDED - TO THIS - ALREADY - TOO LONG - LIST - OF CATASTROPHIC OCCURRANCES ?????

Private Citizen 46

Comments submitted by Connie Simkins, P.O. Box 333, Panaca, Nevada 89042, private citizen
April 23, 1996
Nevada Test Site Environmental Impact Statement
NTS EIS draft Volume 1, Appendix I Transportation Study January 1996

Transportation and all of its issues are of vital concern to rural Nevadans, especially those in Lincoln County which is under consideration for both truck traffic, heavy haul route, or rail shipments, possibly a new rail route here. Routings, options, management of shipments, incident risks, accident risks, and related plans bring opportunities and challenges to those living in rural Nevada.

Page 2-3 Stakeholders issues, Table 2-1 line 15

1 I question the wisdom and thoroughness of any study meeting done on Lincoln County issues and stakeholders that is held in Las Vegas. The other communities of Henderson, Boulder City, Goldfield, Tonopah, and Ely each had meetings in that particular community.

2 Page 3-10 Line 30 Waste Definitions is the only place I find reference to high level waste. This brings out a major shortcoming of this entire EIS. The lack of consideration or inter-relationships between current programs at NTS, expanded programs at NTS, no programs (shutdown) at NTS, and the proposed Yucca Mountain Waste Repository program.

3 I understand for political reasons the two EIS have distanced themselves from each other. I don't think this is a realistic approach. The two programs DO AFFECT each other. The sheer size and scope of operations of Yucca will mean many changes in how regular operations at NTS are conducted.

4 Pages 3-14 through 3-23 detail the ten routes being considered to take waste to NTS. IF Yucca mountain is developed, they will probably have a route that will take the waste around the Las Vegas valley somehow, not through Interstate 15 - 95. It is not reasonable to assume Yucca does not exist for this reason. The roads or rails (whichever is chosen) will be upgraded and could certainly handle all other types of waste going to NTS, including the Yucca waste.

5 Pages C-137 expanded use truck routes - and Pages C-141 through C-150 traffic fatality risks along routes could reflect a variety of changes downward in numbers and hazards if traffic is routed outside Las Vegas valley, as I think the political pressures will mandate as this process is

Private Citizen 46 (continued)

5 cont. finalized. Anytime you can keep hazards, risks, accidents away from one million plus people in one valley, you make things safer for the voters who elected you.

6 The most serious fault of this EIS I find is mentioned in the Transportation meeting comments on pages D-4 and 5, starting with Number two: "not integrated yet with Yucca Mountain". Basically what is says is first DOE said the Yucca EIS WOULD CONTAIN an integration of all transportation issues - nuclear and other wastes - in the Yucca EIS now being prepared. After the meeting 4-20-95 (and I quote) "Following the preparation of this response, a meeting was held with representatives of Yucca Mountain Site Characterization projects Office and a decision was made NOT TO commit Yucca Mountain to consider Cumulative impacts associated with NTS waste shipments. The DOE will consider cumulative impacts; however, Yucca Mountain may not be the organization that does this work.

7 If not now, WHEN, If not this EIS - WHO? WHAT? WHEN? WHERE? WHY? Serious Serious breach of public confidence going on here. To prepare an EIS that does not include all current NTS activities, future uses, closure and cleanup, Yucca Mountain project - at whatever level Congress decides to mandate, plus the Nellis Complex Range activities, is a pure waste of time and effort plus public money.

8 Technical correction needed: Rail Access study page F-2 and F-3. Names given to places do not make sense. They don't line up. If you go from Crestline to Sheep to Panaca to Condor Canyon makes no geographical sense at all. I am familiar with the routes suggested as much as ten years ago for this rail route by Lincoln County Commissioners and this is NOT it!
Volume I, Appendix A pages A-95 through A-102

9 There is a "backroad" into NTS through western Lincoln County. It is commonly called "The Back Road" by local residents who use the road to commute daily to work at NTS. For years we have had promises from Senators and from US Air Force that this dirt road would be improved to enhance safety and insure all weather access and save on wear and tear of resident's vehicles. Several years ago the Air Force did pay to have parts of it graveled. Lincoln County would like to see paving put into the planning process for this road. Our county commissioners have continued to mention this in meetings and negotiations with DOE and Air Force and NTS contractors. We want to keep this "on the record".

PRIVATE CITIZEN 46 (CONTINUED)

Volume 1, Appendix E pages E-5 through E-8

Section E.2.2.2 Off-site traffic, Page E-8

10 About 50 Lincoln County residents commute daily onto NTS via the "Back Road". While this is a small percentage of the whole, we feel it should be documented in any study discussing environmental impacts.

Draft EIS NTS January 1996 "Summary"

11 I believe the summary booklet and the entire EIS would mean more to the public and be easier to read, understand, and move around in IF the "Reader's Guide" to the USDOE Draft EIS NTS was placed at the FRONT of the summary booklet, instead of in the very back. This helps citizens understand what this EIS is and how to find out what they are interested in.

Page S-6 discussion begins about alternatives 1 through 4

Alternative 1 states, in part, Stockpile tests for nuclear weapons readiness - "would be conducted on Pahute Mesa or on Yucca Flat". This convinces me that the balance of the NTS could be planned as useful for expanded uses alternative 3. Alternative 3 is our preferred plan of action. Make careful priorities, don't destroy any animal or plant life, but put Man at the top of the priority - his survival - his health - his gainful employment - and the national good produced when he works on projects at NTS which benefit the general population - such as the solar energy projects suggested and other expanded future uses which provide science and technology a chance to improve the quality of life for American people.

Affected environments -

Pages S-12 and 13

12 Line 14 on page S-12 - correct as written but incomplete. NTS is in Nye County. But we must add of Area 13 - see figure S-1 on page S-2 in this volume. It clearly shows area 13 straddling the line.

Now the big subject no one is supposed to talk about - Area 51. It is there. People work there. Operations are taking place. Environment is affected. I know it is secret operations, but the activities are there and they are affecting everything - people - businesses- environment - future uses of area.

Over the past 20 years or so the Area 51 has been expanded, the Air Force claims for

PRIVATE CITIZEN 46 (CONTINUED)

security reasons. In fact what they are doing is taking up all the mountain tops, so the public cannot get on top of the mountain and look at what is going on in 51. This "taking of view shed" concept is dead wrong in my book. The Nevada Division of State Parks has tried it in Lincoln

13 County to get control of the water but it did not work. Leave "view shed concept" out of all plans and future projects at NTS. More than 95,000 acres have been withdrawn from public use to service the "view shed" at Area 51. Wrong, wrong, wrong! Unnecessary!

14 S-13 paragraph about Coyote Spring Valley contains inaccurate mileage distance information. It is not a part of a designated wilderness management area where the site would be built. It is bordering a DWMA but not on one. I believe DOE is using this to "eliminate" a Lincoln County site from consideration.

Page S-18 Lines 3 and 4

15 Is this statement correct? What basin is Coyote Springs, Dry Lake, and Eldorado Valleys located in if they are not in the Great Basin?

Alternative 3 - Expanded Use Page S-39

16 The comment about groundwater in Coyote Springs Valley - may be modified when DOE uses information developed by the Air Force when they drilled wells in that valley for the MX missile in the early 1980's. The well logs and test data was given to the state Water Resources Division. The Air Force maintained pumping these wells would not adversely affect the Moapa dace. Who is right? Who is/was telling the truth?

PRIVATE CITIZEN 46 (CONTINUED)

Connie Simkins comments on Volume 2 Framework for Resource Management Plan

January 1996 draft EIS for NTS

April 23, 1996

There is a public perception that there is no difference between the Air Force, Department of Energy, Bechtel, or BLM. They are all thought of as "government". All of these have maintained a certain level of secrecy in their operations about what was being done at NTS. Perfect example is Area 51. Much of the public opinion comes from the treatment of the persons who contracted cancers because of the above ground nuclear testing that sent radiation over Lincoln County adversely affecting the health of residents here.

WE were told the test were "safe" yet we still have people dieing of radiation related reasons. People who were employed on areas of the test site were kicked off, miners, hunters, ranchers, casual uses completely stopped. We were told in the beginning that the restrictions would last only as long as the military needed the area for training for World War II. Well we all know how long ago that was over and the military and DOE still have control over the NTS area, plus they are extending that control to include the "view shed" concepts in many areas.

17 I think we must be most careful in setting priorities on how to manage NTS. There should be a direct balance between protecting the natural resources on NTS and allowing the existing activities to continue and new uses to be established. Man should have first priority, technology development and related economic development should be emphasized.

18 Do not manage for an environmental showcase. Take a look at where the plant and animal species are now and how healthy these populations are. Alternative I says the Pahute Mesa and Yucca Flat areas will continue to be used for "weapons readiness" tests. OK then look at the rest of the NTS and see where the sensitive plants and animals are now and make plans so these populations will maintain healthy levels, not expanded, not eliminated, - a true balance as nature intended it.

It is OK to manage for biodiversity but put a sense of reality into the plans to allow future economic development and expansions. Make sure ecosystem management is not just a tool for DOE, Bechtell, DOD to save their jobs. A lot of paperwork, studies, reviews, plans, and shuffling can go into a complicated ecosystem management. Put common sense into it. Make it real. We

PRIVATE CITIZEN 46 (CONTINUED)

19 must put in a practical sensible function of "how clean is clean". Make sure future plans don't make things worse by trying to clean something up and move it, rather than dealing with it safely on site. Take things on a site by site and case by case basis, rather than painting the whole NTS operations by a broad brush that must be "ecosystem" managed to the detriment and elimination of jobs and chances to develop new ideas to help people.

20 Page 2-2 Table 2-1 Resource issues

Under Land category - has a USDA Soil Conservation Service soil survey been done on NTS? This information would apply here if available.

21 Water category - what is definition of subsurface water - how deep - what is DOE perception of interconnection of basins of water? What information has been developed to backup this water basin theory. Cite studies and information gathered.

22 Page 2-3 Step 3 management actions

Include the CAB on lines 24 and 26 as "other interested parties".

23 Section 3.2 characteristics of environment

pages 3-4 and 3-5 tell us that no species have been destroyed to date as a result of operations at NTS and no plant species are endemic (prevalent in or peculiar to an area) at NTS. This supports my earlier suggestion to manage the area on a site by site specific basis. Look at what is there, manage to keep it while allowing current and future uses to flourish. Is there halogeton at NTS?

24 Page 3-6 section 3.2.5 use of natural resources at NTS

It says not much of the natural resources are used for economic, recreational or social benefits. This is because people have not been allowed on NTS.

RMP goals should be established at appropriate scales. Agree we should develop compatibility goals for resources of greatest importance and most likely to be affected - man - business - status quo priorities. Agree monitoring is crucial step to predict impacts and find suitable land uses.

25 Question: Page 4-3 section 4.2 site support activities. When will the maps identifying facility and other infrastructure features be available? I feel this is a major shortcoming of this planning effort which, if the maps were included, would help in reducing time and duplications of

PRIVATE CITIZEN 46 (CONTINUED)

25 cont. these infastructure facilities and services.

26 Question: Section 4.5 Water page 4-5 Why is DOE exempt from State water law. Define 27 what the primary mission activities are? How do future plans fit into the DOE "primary mission 28 activities"? How are future water needs planned for?

29 Section 4.10 Airspace - With the ban of nuclear tests both above and below ground, I see no need to maintain restrictions over NTS. Yes, I support restrictions during times of active training at Bombing Range. This is necessary and desirable. But let the pilots, private and commercial fly over NTS. The big lid of secrecy is off now. Travel times and expenses would be greatly enhanced if pilots did not have to detour around NTS.

30 Section 4.11 Socioeconomics page 4-8. NTS is not located entirely within Nye County. Area 13 straddles the Nye/Lincoln line and Area 51 is in Lincoln County, plus all the "viewsheds" taken out of public land status recently are in Lincoln County. This is a use solely connected to NTS and lies in Lincoln County.

31 Transportation - Any framework for resource management plan must include specific steps to be taken and contracts to be used for every shipment going into NTS, Yucca, and Nellis Range Complex setting out routes, stops, liabilities, insurances, responsibilities, and accountabilities.

7

PRIVATE CITIZEN 47

May 1, 1996

Dr. Donald R. Elle, Director
Environmental Protection Division
U.S. Department of Energy: NVOO
P.O. Box 14459
Las Vegas, NV 89114

Dear Dr. Elle,

I hope that future Department of Energy Environmental Impact Statements will utilize many of the innovations seen in the Environmental Impact Statement for the Nevada Test Site.

Enclosed are my comments which represent my views, and not necessarily those of my fellow Community Advisory Board members. If you have any questions or concerns regarding my comments, please feel free to write me.

Sincerely,

Mary O'Brien

Mary O'Brien
CAB Representative

Enclosures: EIS Comments
1. General Comments
   - Alternative 5 Proposal: Peter, Paul and Mary Alternative
   - TCE/Alternative Contamination Concerns
   - Citizen Concerns - Blowin' in the Wind
   - How Clean is Clean?
   - Land Withdrawal
2. Specific EIS Comments
   - Summary
   - Framework for Resource Management Plan (Vol 2)
   - Volume 1, Chapter 3

Private Citizen 47 (continued)

GENERAL COMMENTS

Peter, Paul and Mary Alternative 5

For several months, I have wrestled with the different alternatives of this EIS, trying to decide which parts I favor and which I don't. However, I always felt that something was missing. As I listened to "Peter, Paul and Mary" during their concert here in Las Vegas on April 26th, the answer came during Mary Traver's comments on waste generation and storage. Therefore, I would like to recommend another alternative to this EIS, Alternative 5: The "Peter, Paul and
1 Mary" Alternative of Waste Reduction and Neutralization. This is probably the first time celebrities have provided input into an EIS.

Alternative 5 posits that every effort will be made to reduce the development of waste as well as to neutralize our current waste. This alternative also involves the commitment of our nation to a policy of waste reduction (and eventual waste elimination) as well as the commitment of the Department of Energy (DOE) to investigate and adopt new waste/storage technologies.

One example of the new technologies is the process a MIT graduate developed two years ago to convert waste into glass and steel though high heating. This was mentioned by me at a CAB meeting after seeing the television news story. According to the news story, all hazardous chemicals were neutralized through this process.

Due to the high cost of developing waste conversion (over $500 million for the MIT process), this technology or a comparable technology would require national DOE funding as our current NTS Waste Management and Environmental Restoration budget is $80 million a year.

Alternative 5 encourages considering the NTS as a prime location for this waste conversion technology.

TCE / Alternative Contamination Concerns

As I read this EIS, I encountered what appears to be a focus of the DOE to study only radioactive contamination at the NTS. Volume 1, Appendix A (Page 88) discusses that "domestic and industrial waste water is transported though the sewage systems into sewage lagoons or septic systems located in the base camps throughout the NTS." However, the text does not discuss what happens to industrial wastes in NTS areas such as the Decontamination Pad in Area 5.

As my fellow CAB members know, my past affiliation with Hughes Aircraft Company in Tucson, Arizona, has permanently changed my perspective on TCE contamination and its detrimental effects to the environment and the community surrounding the contamination. The deaths of many of my friends and co-workers at Hughes showed me that chemicals which were purported to be non-hazardous can sometimes be more dangerous than known hazards.

I personally know from my procurement activities with Reynolds Electrical and Engineering Company that 50 gallon drums of degreasers laced with TCE were routinely doused over machine parts during decontamination processing in the Decon Pad in Area 5 at the NTS.
2 Therefore, I am requesting with this EIS that two questions be answered: 1. Will the DOE include non-radioactive chemicals in their present and future environmental studies at the NTS?

Private Citizen 47 (contined)

3 and 2. Will the DOE commit specifically to include the chemical TCE in all water studies done henceforth at the NTS?

Citizen Concerns: Blowin' in the Wind

Section 4-1, Volume 2 of this EIS asks for input on the NTS resources which are important and the goals for resource management.

For me, the answer to this is contained in the "Peter, Paul and Mary" hit, "Blowin' in the Wind". Although most people think of this song as anti-war, it also is a reminder of our human ecosystem and the ties each of has.

I believe that many Nevadans fear what's "blowin' in the wind" from the NTS. They hope that the soil on the Test Site is safe, and that whatever happened on the Test Site will never impact them. I also think that most Nevadans want a safe future and a world that is safe for themselves and their families.

Following are the specific resources I believe are most important to the NTS:

Water
Land, including vegetation and cultural history
Air
Present and future waste storage
Technologies to reduce waste
Technologies to neutralize waste

Resource management goals follow:

1. "All resources at the NTS are valuable national resources". (This is already stated in the DOE Land- and Facility-Use Management Policy, Section 1.3, Volume 2 EIS.)

2. "All resources should be returned to their natural state whenever feasible". This does not mean that we have to spend billions of dollars to try to undo the past 50 years at the NTS. Nor does this mean the the DOE should be relieved of their responsibility to try to restore areas of the NTS to pre-NTS state. Whenever this isn't possible, the DOE must develop a consistent policy to assess when restoration processes should occur.

3. "All storage sites must safely and effectively contain the waste storage." During a NTS tour with our Community Advisory Board, I asked whether or not the DOE has a master listing of all of the contents of each storage container at the NTS? I was told no, although present records are more detailed than those of the past. I therefore recommend that __all__ storage containers be
4 tracked into a master listing by contents and exact NTS location. This is critical should retrieval be necessary.

5 4. "New storage technologies should be evaluated and considered for NTS use." This does not ask for a re-invention of the wheel. However, as safety should be an important priority, this asks that the DOE keeps an open mind about storage technologies.

PRIVATE CITIZEN 47 (CONTINED)

6 5. "The NTS should reduce waste whenever possible and encourage other DOE sites to do likewise." Much of the storage controversy at the NTS over the years has concerned two facets: A) The type of waste being stored. and B) The volume of waste. Face it, most Nevadans do not want the NTS to become the waste storage dump of the United States. This goal tackles the issue on the NTS as well as off-site. This could be realistically implemented by establishing waste storage goals such as, "Reduce overall waste generation at the NTS by 20% yearly." Likewise, other DOE sites should strive for a decrease in waste generation. The old "more is better" philosophy is a definite roadblock to achieving decreases in our waste generation.

7 6. "The NTS should neutralize waste whenever possible and encourage other DOE sites to do likewise." Imagine a DOE complex without waste!! Think of all the billions of dollars which would be saved as well as elimination of safety and political concerns. While many government officials may state that this is not a realistic goal, I challenge this thinking by saying, "Why?" The DOE needs to identify its roadblocks to achieving this goal and to eliminate these roadblocks. Any reduction in this area is definitely a benefit.

Also, at the risk of sounding Orwellian, we do not know what problems our waste will pose for us in the future. Is it possible (like TCE) that the chemicals we presently consider safe will become known hazards in the future? I believe, therefore, that it is to our advantage to neutralize our waste whenever possible now, and to avoid postponing waste neutralization.

How Clean is Clean?

Ever since I have been a CAB member, we have wrestled with the question, "How clean is clean?" for the NTS. What priorities should be placed on funding? Should Nevadans insist on total cleanup, or cleanup to a certain level? If so, what level? Should we tackle the most contaminated areas first, or begin with sites which are easier to restore? A combination of easy and hard to restore areas? Will it be advantageous to clean up areas if we have to resume testing?

8 While our CAB has not answered all these questions, I believe that the DOE needs to establish environmental restoration criteria and standards in this EIS so true public discussion can evolve.

Land Withdrawal

It is apparent from this document that numerous groups with different goals and agendas exist for land use at the NTS. The DOE almost needs the wisdom of Solomon to decide what is the best future for the NTS. While one might be tempted to support some of the alternative Test Site uses, this document does not seem to satisfactorily answer two questions:

9 *Once land is given away, can it be reclaimed by the DOE? and
*What liability will the DOE have for the land it gives away, and for how long?

SPECIFIC EIS COMMENTS

SUMMARY

10 Page S-1 states that the EIS covers a 10-year period, yet there are references in this

PRIVATE CITIZEN 47 (CONTINED)

10 cont. document to longer periods of time being needed to complete environmental restoration at the NTS. What happens after this 10 year period?

I also agree with Dennis Bechtel that the Dry Lake Valley, Eldorado Valley and Coyote Spring Valley sections are rarely mentioned. For the record, I also had hoped to see some comments on Area 51. Why is Area 51 eliminated?

11 Page S-2. Why is Pahrump and Armagosa omitted? Should they be added?

12 Page S-3, lines 20-23. Is wording missing? "And" on line 21 does not seem to fit.

Volume 2 Framework for Resource Management Plan

13 Page 1-4, lines 8-9. Why does the Defense Program have the ultimate say in landlord programs at the NTS? Will this change if the moratorium continues?

14 Page 1-5, lines 8-9. Why will the RMP (Resource Management Plan) take at least 2 years after the final EIS is released? What takes this long? Is there any way to expedite this process?

15 Page 1-6, lines 7-8. This states that large, remote areas are required for DOE NTS missions. How long is a realistic period to change DOE NTS missions?

16 Page 2-2, Table 2-1. Following are two possible areas for additional resource issues:

Waste Management Technology	Containers and other methods to store NTS waste
Transportation	Rail, aircraft, commercial and private

17 Should Emergency Response Teams be part of the Health and Safety resources?

Page 2-3, Public imput on resource management and conservation:

1. Maintain a master listing of all containers by contents and exact location.
2. Emphasize neutralizing waste whenever possible.

18 Page 3-5, line 14. What exotic plants were encroached onto the NTS? What do you consider an exotic v. a non-exotic plant?

19 Page 3-5, line 20. The writer distinguishes between private lands and lands owned by Indian tribes near the NTS. Does that mean that the Indian lands are federal lands? Do these private lands include lands that were once owned by residents of Lincoln County?

20 Page 3-6, Lines 1-2. Why is the wording "too little" used? What caused this? Funding? If so, why amount of funding would it take to characterize invertebrates? As a corollary, if only so much can be budgeted, how will the DOE decide whether waste and land studies be funded

PRIVATE CITIZEN 47 (CONTINED)

20 cont. versus ecosystem studies?

21 Page 3-6, Line 15. Studies of the Chernobyl ecosystem show that wildlife even 10 years after the "meltdown" are radioactive. Given the past nuclear testing activities at our NTS, is hunting animals for consumption a safe and healthy desire?

22 Pages 3-7 and 8, Lines 32-34 and 1-2. The DOE traditionally plans in 5- or 10-years increments. Yet this text states that some desert ecosystem components recover "over much longer periods". What will the DOE do therefore to cover the total "disturbance recovery" period?

23 Page 3-8, Lines 16-27. This section discusses partnerships, yet seems to omit those of Nye and Lincoln counties. Why aren't those listed? Although several partnerships exist, how will the DOE ensure that those partnerships do not have mutually exclusive goals and intended outcomes? (As one example, several Lincoln County residents want NTS land returned to them while the Indian tribes want all NTS land returned to them.)

24 Page 3-9, line 16. This states that interdisciplinary teams will be used. Does the DOE know who will be on this team? If not, is the DOE open to suggestions, or will this be decided internally?

25 Page 3-9, line 23. This states that "Risk assessments or cost benefit analyses may be used to identify those models of greatest importance." Who will define which areas are of greatest importance? Will there be a chance for public review of these models? (One of our CAB meetings concerning water models, for example, took exception to models which utlized only "normal" rainfall and did not have parameters considering greater than normal rainfall.)

26 Page 3-10, lines 18-19 states that the "RMP will be a 'living' plan that can be modified quickly". How quickly can this plan be modified? Will it be solely at the DOE's discretion? How do you plan to do these modifications? If you do any modifications, will you let the public know?

27 Also, it has been my experience as a CAB member that there have been numerous references to the Nevada Test Site made by other EIS's. What mechanisms do you have to review other EIS's? If other EIS's include potential impacts to the NTS, how will your RMP be modified?

Page 4-2, Resources and Goals has already been covered in my "General Comments" section.

28 Page 4-5, Lines 21-22. What is the basis for this exemption? Is this a fixed exemption or one that may change over time?

29 Page 4-8, line 1. If mining is going to be allowed under one of your alternatives, will the DOE sell or lease the land? What happens if the nuclear testing moratorium is lifted? If the land is leased, what is the DOE's liability if workers are exposed to high radiation doses while mining?

30 If land is relinquished, are you going to require that all regulations you currently must comply

PRIVATE CITIZEN 47 (CONTINED)

30 cont. with are followed such as the Open Skies Treaty and your agreements with the State of Nevada?

31 Page 4-8, line 16. What restrictions, if any, are planned for these increased military training flights? Will bombing be allowed? (I don't think that bombing of any sort should occur on the Test Site due to soil/air disturbances.)

32 Page 4-8. lines 26-32. Why isn't Lincoln and Clark Counties considered as there may be impacts on these citizens, particularly regarding transportation?

33 General: Hasn't the Community Reuse Organization changed its name?

Volume 1, Chapter 3

34 Page 3-21, Line 8. What is the Alternative Fuels Demolition Project? Why would this project be reduced under Alternative 4? Does this imply that it would be expanded under another alternative?

35 Page 3-21, Lines 11-12. If Alternative 4 is selected, where would conventional weapons demilitarization activities be transferred?

36 Page 3-21, Line 15. If land is relinquished, are you going to require that all regulations you currently must comply with are abided by, such as the Open Skies Treaty and your agreements with the State of Nevada?

37 Page 3-21, Lines 22-27. This mentions that possibility of a "nuclear era museum" at the NTS. Where would you locate this? How much would it cost? Would would manage it? If you don't do a museum on the NTS, would you have an off-site museum?

38 Page 3-21, Lines 29-31. This concerns increased NTS field trips. Would the DOE provide transportation to the Test Site? If yes, would the DOE expect reimbursement for this transportation? How will security be impacted if you are having more private citizens on the NTS?

39 Page 3-22, Lines 1-5. I have seen the destruction of petroglyphs at the Valley of Fire. What protection, if any, would exist at this location? (I concur with the American Indian recommendation in Volume 1, Appendix G-71). What monitoring has been done at this location? Would drinking water have to be provided at this location for visitor use?

40 Page 3-22, Lines 8-9. Would these car races exist only on the roads already built? (Some of these roads have dips and other barriers to high speeds.) If a car crashes, how will prompt medical treatment be provided? How will you ensure that these races do not disturb existing contaminated nuclear soil?

41 Foot/bicycle races: How are you going to police participants? Can you design courses that will avoid contaminated areas?

Private Citizen 47 (contined)

42 Page 3-27, Lines 3-9. The EIS covers a ten year period, yet this text states that, "subsequent remediation activities could not be completed before the year 2030." How was this ending date determined? What remediation activities are excluded? Does this ending date assume current funding levels? If yes, what effect would reduced funding levels have? To what level (how clean is clean?) is included in your remediation activities? Do you have a set timetable for these remediation activities?

43 Page 3-27, lines 30-33. The text talks about emplacing low-level waste in Area 3 craters. Since testing caused these craters, how do you know that adding waste to contaminated areas won't increase the risk of additional spillage? Are your storage containers tested and rated for storage in contaminated soils? How do you know that nuclear contaminants will not cause decomposition of the storage containers or some other safety breach?

44 The text also states that filling these craters will "prevent the downward migration of precipation into the waste." Two questions emerge: 1. How do you know this to be true? and 2. Assuming this is true, then where will the waters travel? Is it possible that restoring the "natural drainage patterns" will cause the water to flow to a more hazardous area?

45 Page 3-38, lines 2-7. The text states that there is no radioactive contamination noted in Area 5. However, were TCE tests ever conducted? If not, will TCE be considered in future tests as already discussed in my "General Comments" section?

Private Citizen 48

Verbal Comment 1-800 Line

Comment Code: Private Citizen 48

Name: Heidi Harr

Date: May 3, 1996

City: Boulder City, NV

- [x] Telephoned
- [ ] Please call
- [ ] Returned your call
- [ ] Will call again

Comment: Wants to be sure to receive final EIS (she has the draft.

PRIVATE CITIZEN 49

Ernest E. Goitein
167 Almendral Avenue
Atherton, CA 94027
415 369 6690

May 2, 1996

Donald R. Elle, Director
Environmental Protection Division
US Department of Energy
PO Box 14459
Las Vegas, NV 89114

Subject: DEIS for the Nevada Test Site and Off-site Locations in the State of Nevada

Dear Mr. Elle,

I was amazed at the inadequacy of site investigation for the Nevada Test Site, and lack of analysis of consequences to adjacent communities.

Investigation of the proposed Yucca Mountain repository have revealed that ground water has been contaminated and that the source of contamination is the test site. The Nevada Department of Fish & Game have taken blood samples from deer and found them to be radioactive. On following up the lead the rangers discovered contaminated springs.

Only limited tritium or chlorine 36 testing has been performed to measure the extent of the subsurface contamination.

Relying on the presence of chloride ions to prove that no moisture has percolated assumes that there are no preferred pathways. This is not realistic, since faults and fissures are common and water will naturally choose the easiest path.

1 Are the Indian tribes/nations not considered cooperating agencies? It is not apparent that their input is reflected in the DEIS

PRIVATE CITIZEN 49 (CONTINUED)

2 Is the USGS not a cooperating agency that must be consulted under the NEPA rules?

3 The effect of ground water contamination below the test site on the Amargosa aquifer, the Amargosa River and eventually Death Valley National Park must be considered.

4 The effect of the ground water contamination on the water supply for Las Vegas and other communities dependent on groundwater supplies must be addressed.

5 The whole regime of ground water flow -direction and movement- must be better understood and described, based on measurements and tests.

6 The effect of continued deposition of radioactive contaminated hardware (from the Gulf war among other sources) and radioactive waste needs to be described, and limitations of such future deposition must be defined.

7 I hope that a revised DEIS will clearly reveal the extent of the NTS contamination, so that means of confining the waste can be initiated as early as possible, and some the NTS can be restored. To do this, it will be necessary to perform an adequate site characterization and involve agencies and advisors that do not have to pretend that all is well.

Cordially,

Ernest Goitein

PRIVATE CITIZEN 50

Verbal Comment 1-800 Line

Comment Code: Private Citizen 50

Name: Mr. Matt Kennedy

Date: May 2, 1996

City: Las Vegas

- [x] Telephoned
- [ ] Returned your call
- [ ] Please call
- [ ] Will call again

Comment: Pick Alternative 2

PRIVATE CITIZEN 51

Fax to : 702 295 1264 Donald R. Elle, Director Environmental Protection Divison, U. S. DOE
Nevada Test Site (NTS).

Fax from : 602 924 9141 Paul J. Kennedy

Subject : DOE/EIS 0243 for the NTS.

I am a *gravely* concerned citizen regarding all activities that involve nuculear material.

I oppose any activity that involves movement of such materials.

I recommend a full-blown Congressional hearing on this entire subject with appropriate nationwide media coverage so that an INFORMED general public can let their Representatives know their feelings on this serious matter.

Because these nuculear activities portend such horrifying consequences, I propose a Presidential Moritorium on such activities until Congress completes its investigation, solicits public feedback and makes their recommendations.

Paul Kennedy

Paul Kennedy
5106 E. Emelita Ave.
Mesa, Arizona 85206

Private Citizen 52

Heide Dahl • Germany • Allemagne • Italian Poppy • Pavot Italien

Doe,

1 I am a Utahn, adamantly AGAINST any kind of nuclear testing, waste disposal or other activity that lowers the quality of health or life to people. You must Close the Nevada Test Site to all such activity; it is proven that human life has been harmed as a result of past testing. How dare you - How would you like to suffer as others have?

DOE
P.O. Box 14459
Las Vegas, Nev.
89114

unicef
United Nations Children's Fund
Fonds des Nations Unies pour l'enfance

93285 Printed in U.S.A./Imprimé aux É.-U.

Private Citizen 53

Revision 1

May 3, 1996

Vernon J. Brechin
255 S. Rengstorff Ave. #49
Mountain View, CA 94040 1734
(415) 961-5123

Donald R. Elle, Director
Environmental Protection Division
U.S. Department of Energy
Nevada Operations Office
P.O. Box 14459
Las Vegas, NV 89114
(702) 295-1433

Dear Mr. Elle:

Following this cover letter are my comments on the "Draft Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada-January 1996" DOE/EIS 0243 (NTS DEIS).

Although I was quite impressed with the amount of new information that was included in this second EIS for the NTS I was also surprised at some of the items that had been left out.

I did like the set of color and line drawing plates in the back of the "Framework" document and hope to see more of these with some good descriptions, analysis and references to the sources of this GIS work.

I believe that the Environmental Protection Division has done a poor job of presenting the "Close the Test Site Alternative." I hope you give this option some serious consideration in the near future.

Many of the comments that I submitted, during the "Implementation Plan" phase, were squirreled away in a new comment category reserved for comments that DOE/NV considered to be editorial in nature. I do not believe this conforms with the spirit an intent of NEPA and as a result I am distributing my comments widely.

Sincerely,

Vernon J. Brechin

Vernon J. Brechin

cc: Senator Harry Reid-(Nevada)
Senator Richard H.-Bryan (Nevada)
Senator John Glenn-(Ohio)
Representative John Ensign-(Nevada Dist.1)
Representative Barbara Vucanovich-(Nevada Dist. 2)
John B. Walker-State of Nevada Nuclear Waste Project Office
Earl Dixon-Harry Reid Center for Environmental Studies, LV
Dan W. Reicher-PDAS for Policy (HQ DOE)
Robert Alvarez-DAS for Natl Sec & Env Rest Pol (HQ DOE)
Sandi Carroll-US EPA Region IX

PRIVATE CITIZEN 53 (CONTINUED)

Revision 1

PREFACE

The availability of the "Draft Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada" January 1996 (DOE/EIS-0243) (NTS DEIS), was announced in the Federal Register / Vol. 61, No.23 / Friday, February 2, 1996 on page 3924 (61 FR 3924). The complete Impact Statement consisted of eight public documents and an unreleased classified appendix. The eight public documents were made available for public review and comments. The comments were to be submitted by May 3, 1996.

The "Draft Implementation Plan for the Nevada Test Site Environmental Impact Statement" February 1995 (DOE/NV-390) Revision 0, contains a "Work Schedule" on page B-1. This work schedule indicated that the Draft EIS was expected be made available during the middle of May, 1995 and the Final EIS was expected to be released during the middle of April, 1996.

On February 20, 1996, the Department of Energy (DOE) published a "Notice of Proposed Rulemaking" in the Federal Register (61 FR 6414) in which they proposed doing away with their policy of requiring that Implementation Plans be made a part of the public processes of preparing EISs.

The original law, that requires the preparations of EISs, is the National Environmental Policy Act (NEPA).

==

The complete set of NTS DEIS documents, consist of the following items:

Document 1 - Summary (Includes the "Reader's Guide" in the rear)
Document 2 - Volume 1, Chapters 1-9, Part A
Document 3 - Volume 1, Chapters 1-9, Part B
Document 4 - Volume 1, Appendices A-F A-Description of Projects and Activities, B-Federal Register Notice, C-Relevant Regulatory Requirements, D-Distribution List, E-Impact Assessment Methods, F-Project-Specific Environmental Analysis
Document 5 - Volume 1, Appendix G American Indian Comments
Document 6 - Volume 1, Appendix H Human Health Risks and Safety Impacts Study
Document 7 - Volume 1, Appendix I Transportation Study
Document 9 - Volume 1, Appendix J Classified Supplement: Project-Specific Environmental Impact Analysis (Lyner Complex) (Not available to the general public)
Document 8 - Volume 2, Framework for Resource Management Plan

==

In addition, to the set of documents that were distributed to the public, there is an internal "controlled" set of NTS EIS documents titled "Draft Nevada Test Site Environmental Impact Statement" 1995 (DOE/EIS-0239).

PRIVATE CITIZEN 53 (CONTINUED)

Revision 1

COMMENT REMARKS and ORDER

Due to time constraints, I was only able to comment on about 30% of the items I thought were significant. I did not get to any of the items I had marked in the Appendixes and of course was not able to review the material contained in the classified Appendix J.

What follows are 42 pages of my comments listed in the following order:

Document	Comment page
Summary (document 1)	pages 1 through 28
Reader's Guide	pages 29 through 30
Volume 2, (document 8) Framework for Resource Management Plan	pages 31 through 36
Volume 1, (documents 2 and 3) Part A and part B of the main NTS DEIS	pages 37 through 42

==

Vernon J. Brechin
May 3, 1996

PRIVATE CITIZEN 53 (CONTINUED)

1

COMMENTS ON THE DRAFT NTS EIS - January 1996, (DOE/EIS 0243)
(Comments Revision 1)

SUMMARY Volume

"Summary" volume

Back of front page "Summary" volume

1 1st Paragraph
5th line
"The NTS occupies 3,496 square kilometers (1,350 square miles)..."
Correct the numerical values to read the legal values of 3,221 and 1,244, respectively.

2 2nd Paragraph
This paragraph should mention the numerous other facilities that the Nevada Operations Office is responsible for in the State of Nevada and in at least five other states.

3 1st Bullet
Remove this, since conducting subcritical experiments and preparing for the development of advanced weapons designs, during test ban negotiations, is not supportive.

4 3rd Bullet
Move this to the bottom of the list, since the only alternative energy project that was considered was solar and the deployment at the NTS has been rejected.

5 4th Bullet
A recently released ORIF document, from DOE's Defense Program office, indicated that new nuclear weapon design concepts were being considered. If these considerations were recent, then that would be a clear violation of current US policy.

6 6th Bullet
"Manage wastes generated on the NTS and at other DOE-approved facilities across the United States."
The Nevada Operations Office is being held responsible for waste management operations in other states due to the operations they performed there in the past.

7 7th Bullet
"Perform site characterization and environmental restoration activities required to minimize of eliminate the impacts of past operations."
Replace the term "minimize" with the term "reduce."

PRIVATE CITIZEN 53 (CONTINUED)

2

"Summary" volume

INTRODUCTION

8 p. S-1, line 11, "This EIS examines existing and potential impacts to the environment that have resulted, or could result, from current and future DOE operations in southern Nevada during the next 10-year period."
001. Considering, that the previous NTS EIS was conducted almost 19 years ago, the 10-year period may not cover a sufficient time span. More importantly, because of the special nature of radioactive waste and contaminated materials, the 10-year period of study tends to ignore the extremely long-term consequences of materials which will remain hazardous for up to a quarter million years. Though, the NTS contains similar radioactive materials to those which may be deposited in the potential Yucca Mountain Repository, it is not required to comply with the same containment requirements which specify a 10,000-year period of isolation. These requirements are set forth by the U.S. Environmental Protection Agency in the U.S. Code of Federal Regulations (see 40 CFR 191.13 through 191.16). The radioactively contaminated materials, at the NTS, also remain exempted from the regulations of the Nuclear Regulatory Agency.

p. S-1, line 13, "This EIS examines existing and potential impacts from DOE programs at the following sites:..."
9 002. This sitewide EIS should include all the far-ranging facilities for which the Nevada Operations Office (DOE/NV) is responsible. The draft and final "Implementation Plan for the Nevada Test Site Environmental Impact Statement" June 1995 (DOE/NV--390 Revision O) (section 3.4.1.3 Environmental Restoration) indicated that a formal program has been in place called the Nevada Environmental Restoration Project (NV ERP). This project was started in 1988 and involves numerous contractors, research and educational institutions, as well as other government agencies. The primary contractor, that handles much of the site evaluation work, is the IT Corporation. A series of internal report documents has been created since FY 1992 which describe a vast program that include operations at 10 off-site underground nuclear explosion sites which are located in Mississippi, Alaska, Colorado, New Mexico as well the two, Nevada based sites, which are covered in this draft EIS.
10 On page 3-9 of the final Implementation Plan it was stated that "Therefore, analysis of waste generation and transportation issues associated with Nevada Environmental Restoration Project work in other states will be addressed in the waste management section of the Environmental Consequences chapter of the EIS. Additionally, out-of-state Nevada Environmental Restoration Project waste issues will be addressed in the transportation study."
The NTS Draft EIS fails to mention the formal NV ERP program, the off-site test areas, other than those within the State of Nevada, and does not mention or otherwise

PRIVATE CITIZEN 53 (CONTINUED)

10 cont. address the waste management or transportation issues associated with the, out-of-state, underground nuclear test sites. No public comments were received, during the EIS implementation phase, that suggested that references to the, eight out-of-state test sites, the NV ERP, or the references to the internal documents, should be excluded from the Draft EIS.

One of the internal documents is titled the "Nevada Environmental Restoration Project FY 94-99 Cost, Schedule, and Technical Baseline Project Management Support." (Performance Baseline) It was Revision 1 and was issued as two volumes during November of 1993 by the Environmental Restoration Division of DOE/NV. Apparently, many of the

11 decisions that are made, concerning the majority of off-site areas, are made without the benefit of formal environmental assessments and without local community involvement. The reports of the work has been issued in internal documents such as "Environmental Restoration and Waste Management: An Overview" January 1995. This document was prepared by the by the Environmental Restoration and Waste Management (ERWM) Program division of DOE/NV.

12 Another two volume internal report titled "U.S. Department of Energy Nevada Operations Office Annual Site Environmental Report - 1993" September 1994 (DOE/NV/11432-123) list numerous other facilities which DOE/NV is responsible for but are not mentioned in the Draft NTS EIS. These facilities are, the Nevada Operations Office, Las Vegas; the extensive North Las Vegas Complex and the Remote Sensing Laboratory at the NAFB in North Las Vegas, Nevada; Amador Valley Operations, Pleasanton, California; Kirtland Operations that includes the Craddock Facility and facilities at Kirtland Air Force Base, Albuquerque, New Mexico; Los Alamos Operations, Los Alamos, New Mexico; Santa Barbara Operations that includes the Robin Hill Road and Francis Botello Road Facilities, Goleta, California; Special Technologies Laboratory, Santa Barbara, California; Washington Aerial Measurements Department, Andrews Air Force Base, Maryland; and Woburn Cathode Ray Tube Operations, Woburn, Massachusetts.

13 p. S-2, "Figure S-1. NTS and selected areas of interest."

003. The 38,556 acre section of property described in Public Land Order 1662 was omitted on this map. At one time it was labeled as Area 51. This, and all the following maps, should consistently show all the properties that are legally assigned to the Department of Energy's (DOE) Nevada Operations Office (DOE/NV).

14 The boundary of the Nellis Air Force Range Complex (NAFR), that lies just east of the Area 13 box, should be updated and remain consistent in all all the maps in the Final EIS. The boundary, shown on this map, was changed over five years ago.

15 The positioning of the Area 13 box could be made more precise. The section of Pahute Mesa which is part of the NAFR but assigned to the DOE/NV, under the "Memorandum Of Understanding Between The Department Of The Air Force Tactical Air Command Tactical Fighter Weapons Center And The Department Of Energy Nevada Operations Office" (E-AI08-82NV10283), should be shown as a

PRIVATE CITIZEN 53 (CONTINUED)

15 cont. separate entity by a line that follows the boundaries of the NTS land withdrawals.

Purpose and Need

p. S-3, line 33, "Presently, the primary mission of the DOE at the NTS is to maintain a readiness to conduct test, and, in an unlikely circumstance, to conduct test if so directed by the President."

004. From 1964 until 1993 a state of readiness was maintained on Johnston Atoll in order to resume atmospheric testing if so directed by the President. The "Safeguard C" atmospheric nuclear testing readiness capability program consumed $1.6 billion before Congress was made aware of the program's continued existence and that there had been virtually no probability that the President would have ordered the resumption of atmospheric testing during the last quarter century of the program. Let us not forget this lesson. The NTS readiness program will likely consume far greater quantities of public funds then the "Safeguard C" program did.

p. S-4, line 8, "The DOE requires management of all of its lands and Facilities as valuable national resources with stewardship based on the principles of ecosystem management and responsible development."

16 005. Most environmental scientist agree that the level of development that can be sustained in a fragile desert environment is extremely limited. Therefore, proper ecosystem management of the NTS can only be achieved by severely limiting the development of the man-made resources at the site.

The "Framework for the Resource Management Plan," which is contained in Volume II of this EIS, presents a series of draft goals which strongly suggest that the existing, human mission goals should take precedence over concerns for environmental sustainability.

Programs Considered

Defense Program.

p. S-4, line 22, "Defense Programs. "The primary mission of the Defense Program is to help ensure the safety and reliability of the nation's nuclear weapons stockpile.

17 006. A document, recently released by the Office of Research and Inertial Fusion (IRIF) at DP-11 of the Defense Programs office of DOE Headquarters, strongly suggest that new concepts in the design of nuclear weapons has been recently considered. If this is accurate, then this would mean that the public and their Congressional Representatives were misled. It would also violate the stated goals of the U.S. Government in regards to its position on achieving an early signing of a Comprehensive Test Ban Treaty and its compliance with the provisions of Article VI of the Treaty On The Non-Proliferation of Nuclear Weapons.

The Defense Program paragraph should clearly state what the actual missions are.

PRIVATE CITIZEN 53 (CONTINUED)

Waste Management Program

p. S-4, line 30, "The NTS presently serves as a disposal site for...a limited amount of transuranic mixed waste."

007. These limits should be clearly stated in the main document
and if the cleanup of large areas of plutonium-239
18 contaminated surface areas is expected to cause this limit
to be exceeded, then an alternative storage and
transportation solution should be included in the NTS EIS.

p. S-4, line 33, "...low-level, transuranic, mixed, hazardous and classified wastes have been disposed of in..."

008. The NTS EIS as well as the Waste Management PEIS should
provide more information on the various categories of
"classified wastes" including the estimated volumes, the
19 curie levels, and some of the basic properties of these
waste forms. These documents should also present more
specifics on where these waste forms are stored
and buried, and should indicate the quantities at each site.

Environmental Restoration Program

p. S-5, line 1, "The goal of the Environmental Restoration Program is to ensure that risks to the environment and to human health and safety,...are either eliminated or reduced to protective levels."

009. The term "protective levels" needs to be added to the
Glossary and defined. The EIS should be very specific about
what is meant by this term. This explaination should
20 indicate how these levels are determined and what techniques
will be required to achieve this protection. The length of
time, that protective measures will need to be emplaced,
should also be covered.
This section should also mention the formal Nevada
Environmental Restoration Project (NV ERP) and provide
21 specific references to the many internal documents which are
associated with this ongoing project.

ALTERNATIVES

p. S-5, line 24, "These alternatives have been designed to analyze and compare the potential effects of a wide range of use options. The use the DOE ultimately selects, however, may not be one of the alternatives in its entirety,..."

010. Section 3.2 Alternatives Eliminated from Further
Consideration on page 3-26 mentions that many proposed
alternatives were eliminated early in the public scoping
process. The DOE determined that certain uses of the site
were unreasonable. The proposal to use the site for a single
22 program was rejected by DOE/NV because "...this alternative
fails to meet the DOE's need for a site that can support
evolving DOE missions." This suggest that the decision was
based more upon the mission needs of the DOE then by the
needs of the public stakeholders. This continuing arrogant
attitude of DOE indicates that many of their members have
not benefited from the DOE's "Lessons Learned" program.

PRIVATE CITIZEN 53 (CONTINUED)

This EIS report treats the option of non-use as an
23 impractical alternative. The DOE is occupying withdrawn
public land and therefore it should not be the entity that
determines the use of the land. The public stakeholders
should make the use determination based upon the revised
priorities of the Post Cold-War Era. The last statement
tends to indicate that the alternative, chosen in the EIS.
24 Record of Decision (ROD), will not need to be strictly
adhered to.

p. S-5, line 27, "As part of the planning process related to each alternative, land-use maps have been developed to illustrate the zoning that would be implemented for each alternative and the selected activities within the alternative. The land-use maps indicate existing land status to the extent that past or present activities might influence future land use."

011. The base maps, used to show the zoned areas, are defective.
The former Area 51 has been deleated and the NTS site
borders on the eastern side of Area 15 have been left open.
The base maps should include all the areas of the NTS
25 including the area that was once labled as Area 51. The maps
should have a continuous, non-interrupted, border line.
The map, shown in Figure 4-3. on page 4-10, approaches an
accurate depiction of the NTS boundries.
The shading of the maps also indicates that most of the
underground nuclear explosive testing area, that lies in the
26 Nellis Air Force Range (NAFR), will remain under the
control of the DOE. This maintainance, of DOE control,
should not be assumed.
The map, Figure 3-2. on page 3-12, which depicts the land
use associated with Alternative 2, Discontinue Operations,
indicates that the entire test site will remain as a
monitored and restricted zone. It also shows that the Yucca
Mountain Site Characterization Zone would remain.
A government agency, such as the DOE, which has created
environmental problems which will cost present and future
generations hundreds of billions of dollars to deal with,
27 should not base future land zoning upon the past use
of the land. The "Lessons Learned" program of the DOE
should extend to the realization that past zoning practices
often led to tragic abuses of DOE managed property.

Alternative2 - Discontinue Operations

p. S-6, line 23, "Control of the NTS would be maintained by the DOE."

012. Since the DOE was responsible for the human health, safety and security problems at the NTS they should not be the federal agency that is rewarded with long-term control of the property. The public may be unwilling to fund this agency for the next quarter million years in order to protect them from the problems created at the NTS.

PRIVATE CITIZEN 53 (CONTINUED)

Other Alternatives

p. S-7, line 22. "These alternatives were considered and dismissed as unreasonable for such reasons as..."
013. Refer to comment no. 010.

Table S-1 Comparison of program activities for the alternatives (4 pages)

(Page 2 of 4)
p. S-9, "Waste Management," Alternative 1, 3 and 4, Area 5, Storage, "Transuranic Waste."
28 014. The waste category called Classified Transuranic Waste (CTRU) appeared in the Draft EIS Implementation Plan. This waste category should also appear in the EIS.

p. S-9, "Waste Management," Alternative 2, "No Activity"
29 015. The activities that are mandated by existing legal agreements with the State of Nevada and the Environmental Protection Agency (EPA) should be listed here. The DOE is required, by federal and state laws to take corrective actions.

(Page 3 of 4)
p. S-10, "Environmental Restoration," Alternative 2, "No Activity"
016. Refer to comment no. 015.

p. S-10, "Environmental Restoration," Alternative 1, 3 and 4.
30 017. The Central Nevada Test Area and the Project Shoal Area should be listed under the "Underground Test Area Corrective Action Unit" heading if, like the underground nuclear explosion sites at the NTS, they have been moved from the EPA's regulatory framework of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments Reauthorization Act (SARA) of 1986 to the regulatory framework of the Resource Conservation and Recovery Act, (RCRA) as amended by the Hazardous and Solid Waste Amendments of 1984. All of the 11 underground nuclear explosion sites should be treated equally under the same regulatory framework. The reason and justification for this transfer, from one regulatory framework to another regulatory framework, needs to be clarified.
31 Under Alternative 3 and 4 the "Project Shoal Area" is listed. Under this heading is stated,
" - Continue Characterization and Remediation"
" - Accelerate Characterization and Remediation of Site."
The two statements are redundant and the first one should be removed.
32 The references to the Project Faultless site and the Central Nevada Test Area (CNTA) are missing and should be included in these Alternative columns.
The site characterization programs have existed for at least eight years and have been applied unequally to the "off-site" and "on-site" test areas. Information, concerning the historical pace of these characterization programs and

PRIVATE CITIZEN 53 (CONTINUED)

the immediate test results from contractors such as the Desert Research Institute (DRI) and the International Technology Corporation (IT Corp.), should be posted on the Internet World Wide Web home pages of the DOE. Additional historical information should be posted including the fact that all of the off-site testing areas have already undergone one or more rounds of site restoration activities in the past.

(Page 4 of 4)
p. S-11, "Work for Others," Alternative 1 and 3.
33 018. There is very little discussion, of most of the activities listed here, in the main body of the EIS. Activities such as "Dipole Hail" and "Cut and Cover" are not mentioned in any other part of the EIS.
34 Despite the fact that there was little public input, concerning this topic, it has been considerably altered since the issuance of the draft and final Implementation Plans. These plans indicated that the U.S. Air Force's use of the airspace was an issue. This topic has been eliminated without an explanation.
35 The main body of the EIS should provide a detailed listing of the other government agencies for which the DOE provides services. The service programs should also be listed along with the contract numbers, interagency agreements and the period in which the contract is expected to run. This information should also be made available on the DOE's, web based, public home pages.

(Page 4 of 4)
p. S-11, "Site Support Activities," All Alternatives.
36 019. This is a topic that has been radically revised since the issuance of the draft and final Implementation Plans. In fact, this topic is a replacement for the previous topic which was titled "Disposition of Withdrawn Lands." The disposition of withdrawn land refers to the transfer of land administration from DOE or Air Force control to another agency or to the private sector. The site support activities, listed in Table S-1 of the NTS Draft EIS, is not related to the potential loss of the DOE's administrative control over the withdrawn lands which are now known as the Nevada Test Site.
37 The "turn back of selected remediated lands to public domain," that was presented in Table D-1 of the final Implementation Plan, is not mentioned under Alternative 4 of the Site Support Activities section in Table S-1. Now, this section only presents positions which assume continued DOE control of the withdrawn lands that make up the NTS.
38 The previous suggestion of the transfer of the nuclear explosive testing area at Pahute Mesa, from the Air Force's Nellis Air Force Range (NAFR) to the DOE, was dropped.
39 Under Alternative 2, the suggestion that test site activities be continued at the Tonopah Test Range, was introduced in the draft EIS. These changes were not reflected in the stakeholder comments which appeared in the final Implementation Plan.

AFFECTED ENVIRONMENTS
Land Use and Airspace

p. S-12, line 13, "The NTS encompasses approximately 3,500 square kilometers...(1,350 square miles...) of land area reserved to the jurisdiction of the DOE.

40 020. The area values should reflect the area of the lands that were withdrawn to either perform or support nuclear explosive testing at the NTS. The legal values for this area are 3,221 kilometers and 1,244 miles, respectively. The airspace, that is controlled by the DOE, includes an extension that goes well beyond the surface boundaries of the NTS. This extension surrounds the area that was once labeled as Area 51.

p. S-13, line 1, "The site was returned to the U.S. Bureau of Land Management in 1970."

41 021. The DOE needs to cite evidence that this transfer occurred.

Transportation and Waste Management

p. S-15, line 9, "Transuranic, mixed transuranic, mixed low-level, hazardous waste, and Toxic Substances Control Act waste are stored at the NTS."

42 022. The NTS EIS draft Implementation Plan, Appendix D, page D-3, indicated that classified transuranic waste (CTRU) was also stored at the NTS. The final EIS should provide a detailed listing of the volumes, locations, and general characteristics of the CTRU. Because, it is now the stated policy of the DOE to avoid hiding environmental issues behind a veil of secrecy, the Record of Decision (ROD) should not be signed until there is a proper accounting of the CTRU.

Geology and Soils

p. S-16, line 26, "Underground nuclear testing has resulted in impacts on the physical environment in terms of ground motion, disruption of geologic media, surface subsidence, and contamination of the subsurface geologic media and surficial soils."

43 023. After the word "nuclear" insert the word "explosive."
Replace the phrase "has resulted in" with the phrase "created direct."
Replace the phrase "disruption of" with the phrase "damage to."
In two places, Replace the phrase "geologic media" with the phrase "subsurface environment."
Replace the word "subsidence" with the word "collapse."
Replace the word "surficial" with the word "surface."

p. S-16, line 28, "Waste disposal operations have also contributed to surface disturbances and placement of materials having long-term impacts on the environment."

44 024. Replace the word "contributed" with the word "added."
Replace the phrase "surface disturbances" with the phrase "surface and near surface disruption."

44 cont. Replace the phrase "and placement" with the phrase "due to the disposal."
After the word "having" add the word "extremely."

Table S-2. Summary of remaining radioactivity on the NTS

p. S-17, line 6, "Atmospheric & Tower Tests," "MAJOR KNOWN ISOTOPES OR WASTES." column and "REMAINING INVENTORY" column

45 025. After Europium, add "Plutonium-239."

46 The curie level is considerably higher than 20. this figure needs to be corrected to reflect the total emissions from all the atmospheric test. A figure, provided in Table 1-1 on page 4 of the Congressional Office of Technology Assessment document titled "The Containment of Underground Nuclear Explosions" (OTA-ISC-414), suggest that the figure should be closer to 12,000,000,000 curies. This error, may suggest, that many other estimates in this column may be seriously underestimated.

p. S-17, line 8, "Safety Test"

47 026. In the "SOURCE OF RADIOACTIVITY" column replace the phrase "Safety Tests" with the phrase "Plutonium-239 dispersal experiments."
In the "TYPE OF AREA" column replace the overly general phrase "Above Ground Experimental Areas" with the terms, U.S. Air Force Nellis Air Force Range "(NAFR)," Tonopah Test Range "(TTR)" and "NTS Atmospheric Test Areas."

p. S-17, line 16, "Crater Disposal"

48 027. In the "TYPE OF AREA" column replace the word "induced" with the word "created."

p. S-17, line 20, "Deep Underground Test"

49 028. Either add, to the above title, "Nuclear Excavation Experiments," or create another category for the "Nuclear Excavation Experiments." The excavation experiments created large, surrounding, areas where the surface remains highly contaminated.

50 In the "MAJOR KNOWN ISOTOPES OR WASTES" column, remove the term fission and add the terms "plutonium-239," "cesium-137," and "strontium-90."

p. S-17, line 24, Additional comments for Table S-2.

51 029. The "MAJOR KNOWN ISOTOPES OR WASTES" column, for all the Sources of Radioactivity categories, should provide consistent and more detail in the listing of the isotopes. The major isotopes should be shown with their atomic weight and the estimated mass, of isotopic material, should be provided in grams.

Surface Hydrology and Groundwater

p. S-19, line 8, "Underground nuclear testing has resulted in contamination of groundwater in the immediate vicinity of a number of tests."

52 030. Replace the very vague phrase "immediate vicinity," with a more specific phrase such as "within a 1,000 foot radius."

52 cont. Replace the vague phrase "a number of tests," with a more specific value such as "more than 100 tests."

p. S-19, line 9, "The quality of the groundwater has been impaired, but is limited to those areas where test have occurred."

53 031. Replace the word "impaired" with the word "destroyed."
54 Based upon a 1,000 foot radius exclusion zone, provide the area that may been affected. This figure may be more than 100,000 acres.
55 The figure should include the underground nuclear explosion test areas at the off-site areas in Mississippi, Colorado, Alaska, New Mexico, as well as the two sites in central Nevada.
56 Since many underground nuclear explosions involved the dispersal of many tons of lead, this and other heavy metals are likely to add to the water pollution problems.

p. S-19, line 10, "To date, no radioactive contamination has been detected in on-site water supply wells or in off-site monitoring wells."

57 032. This sentence should state that radioactive contamination has been detected in many of the on-site monitoring wells and that contamination may start showing up, in some of the supply wells, several decades from now. Radioactive contamination has shown up in numerous off-site wells and this is documented in the DOE's own publications. Monitoring wells UC-1--P-2SR located at the Project Faultless underground nuclear explosion site at the Central Nevada Test Area, EPNG 10-36 located at the Project Gasbuggy site in New Mexico's Carson National Forest, DD-1 at the Project Gnome-Coach site near Carlsbad, New Mexico, GZ No.1 at the Project Long Shot site on Amchitka Island, Alaska, and at least six wells at the Project Dribble site (Salmon site), have all produced evidence of radioactive contamination resulting from the deep underground nuclear explosions.

58 At the NTS, a radioactive tritium concentration level of 26,000 picocuries per liter was detected in water drawn from the UE-5n well. This was recently reported in the DOE/NV internal document titled "Nevada Test Site Annual Site Environmental Report - 1994" (DOE/NV/11432-175). The previous Annual Site Environmental Report did not refer to this well and the EPA's monitoring reports fail to mention this well after 1989 when the tritium concentration was reported at 480 picocuries per liter. The DOE/NV should produce a report, on this well, that documents its history, including all sampling and reporting that has taken place since it was constructed. The report should explain why this well was not monitored on a regular basis after high levels of contamination were detected.

p. S-19, line 11, "In addition to monitoring, the results of groundwater models developed to investigate potential containment migration suggest that there will be no measurable contamination from testing in areas not under control of the DOE or the U.S. Air Force."

PRIVATE CITIZEN 53 (CONTINUED)

59 033. This sentence assumes that the DOE and the U.S. Air Force will remain in control, of the vast areas surrounding the contamination sources, for something like a quarter million years. This is absurd. These agencies and the American public need to be reminded that this property is public land, and that this land has only undergone a temporary withdrawal from the public domain for certain restricted uses.
60 Now that nuclear testing has ended, the DOE is no longer in compliance with the laws which withdrew the land. It's the height of arrogance to assume that the public's access, to the nuclear contamination, will be restrained for the next quarter million years.
61 Some of the groundwater modeling also suggest that the flow of contaminates may be much more complex than was once thought. The nuclear chimneys, formed by the underground explosions, may provide a path for contamination to move toward the surface.

p. S-19, line 25, "The Long-Term Hydrologic Monitoring Program includes sampling of five wells and one spring in Hot Creek Valley outside of the Central Nevada Test Area. No contamination related to the Faultless tests has been detected in samples from those wells.

62 034. One of the DOE's own contract reports, "Evaluation of Groundwater Monitoring at Offsite Nuclear Test Areas - March 1991 (DOE/NV/10845--7) indicated that many of the monitoring wells were to distant or located in regions that would prevent them from ever "seeing" a contaminant plume.

Occupational and Public Health and Safety

p. S-25, line 7, "A total of 230 radiation-contaminated areas have been identified and mapped on the NTS, the NAFR Complex, and the Tonopah Test Range. These areas are posted, and if contamination is severe, they are fenced. There are 135 sq. km. (52 sq. mi.) of posted areas and 13 sq. km. (5 sq. mi.) of fenced areas."

63 035. These 230 contaminated areas should be identified by a number. Each should be surveyed and a legal description should be provided of the boundaries. This description should also be provided in terms of standard geographic coordinates. The words, shown on the posting sign, should be provided along with a description of the type of contamination that is suspected within the posted area. This description should include a map, which indicates the areas where the contamination levels are highest, the peak readings in these areas and the suspected depth of the contamination. The description should also give the date of the first contamination and a rough estimate of the year that it might be cleaned up. All this information should be provided in the Final NTS EIS.

Project Shoal site

p. S-25, line 14, "Results of U.S. Environmental Protection Agency monitoring of the groundwater in the vicinity of the detonation demonstrate that the tritium concentration is below the Safe Drinking Water Act limit for drinking water. Because of low groundwater velocities, migration of radionuclides to the nearest water supply well would take about 750 years."

036. Refer to comment no. 035. The nearest monitoring well is about three miles to the west and on the wrong side of the water divide. The nearest water supply well is much further
64 away. The final sentence is based upon the assumption that no new water supply wells will be added to the area within the next 750 years. This is a highly unrealistic assumption given that the wells in this area are less than 50 years old.

Project Faultless site (Central Nevada Test Area)

p. S-25, line 22, "Tritium was not detected in the groundwater outside the chimney in concentrations above background until July 1972. At that time, it was detected at a depth of 236 m (774 ft) in one on-site monitoring well located near the test cavity. The monitoring well was HTH-1.

037. The date should probably be changed to 1992 and replace the
65 term "near" with 924 m (3,030 ft). If this represented an actual pulse of tritium leaving the test region then it moved about half a mile in 24 years.

COMPARISON OF ENVIRONMENTAL CONSEQUENCES

Defense Program

p. S-25, line 22, "Evaluation of the alternatives in this EIS for the Defense Program does not identify significant physical environmental impacts that would change the environmental baseline established by past activities."

038. The environmental baseline should not be determined by the DOE based upon its past activities. This would surely violate the spirit and original intent of the NEPA process. The 935 nuclear tests conducted in and around the NTS through DOE's Defense Program Office has created one of the most damaged pieces of property in the United States. The DOE has admitted that many of the problems, created by the nuclear testing program can not be fixed. Due to the highly classified nature of many of the activities that are conducted at the NTS, this site has not yet received the
66 same level of environmental scrutiny as many other of the sites in the DOE's weapons complex. Clean-up at many DOE sites is increasingly being limited, not by the levels of the contamination but, by limited national economic resources and by limited political will. It does not make sense to further contaminate sites which we can not now fix and for which many future generations will be paying for. The environmental baseline should be based upon the condition of the site before it was withdrawn for restricted uses and before it underwent institutional developments.

p. S-26, line 5, "The construction of new facilities would have a minor, localized impact to the physical environment of the site, but would not lead to off-site impacts."

67 039. Replace the word "but" with the word "and."

68 The explosive dispersal of substantial quantities of

68 cont. plutonium-239 in the LYNER complex's underground rooms, which will then be abandoned after each shot, is not a minor impact.

Congress will not be happy when they learn that they will need to allocate funds, in order to safeguard the site, for the next quarter million years.

The last part of the sentence ignores the fact that major construction projects, at the NTS, rely, heavily, upon the vast contractor support facilities in North Las Vegas and
69 require, close to 90 mile trips to and from the test site. A federal agency which brags about its concern over fuel efficiency and conservation of energy resources should be held accountable for the energy it uses in maintaining the NTS.

p. S-26, line 6, "The most significant impacts would be the loss of income and jobs resulting from the elimination of the Defense Program."

040. Jobs that are oriented around cleaning up this country and developing renewable resources would be a far better investment of our nation's limited resources.

p. S-26, line 10, "Based on the more than 40 years of operations and information collected, many of the consequences of past Defense Program activities have been well-documented."

041. Because the Defense Program involves nuclear weapons a great amount of secrecy still hinders the full evaluation of the the environmental impacts of this program. The exact nuclear yields, given in terms of the number of thousands or millions of tons of high-explosive equivalent, is still classified for the vast majority of test. A full accounting of the vast quantities of highly radioactive waste materials, left by 40 years testing, has yet to be made for the 839 individual underground nuclear test performed on and off the test site. The ongoing site characterization program continues to expand but is now being restrained by economic limitations. The well drilling program is also restrained by the fear that it may reveal classified data if it is allowed to drill close to the nuclear explosion cavities. As a result, vast quantities of public funds are being expended in looking into the symptoms of a problem
70 rather than looking at the original cause of the environmental problem. The Defense Program Office has much of the so-called "source term" data, that the environmental researchers need, but refuse to release it.

The reason the NTS has undergone a great deal of study is due, largely, to the extremely hazardous nature of the activities that are conducted there. Despite the extensive safety precautions that have been taken, future generations will still have to pay a high cost for the experiments that have been conducted at the NTS.

Though an extensive amount of documentation exist, on the operations of the NTS, a substantial amount of documentation is either classified, incomplete or even missing. I suspect some information may even be distorted due to a desire to gloss-over potentially embarrassing problems.

PRIVATE CITIZEN 53 (CONTINUED)

p. S-26, line 113, "As discussed..., underground testing has resulted in unavoidable adverse impacts to portions of the land, geologic, and groundwater resources, making them unusable for most purposes."

042. The portion of the land affected is over 100,000 acres. The volume of geologic and groundwater resources affected probabaly approaches close to 50 cubic miles. Of course, additional impacts are avoidable if all nuclear tests are banned.

p. S-26, line 18, "Pockets of radioactive contamination surround each expended underground test location. The quantity of radioactivity remaining in the subsurface media can be estimated based on the half-life of the fission products."

71 043. Replace the word "quantity" with the word "level." The
actual mass of each radioactive isotope should be provided
in terms of the gram quantities as well as in terms of the
72 radioactive curie level. In addition, the massive
quantities of hazardous materials, such as lead, that make
up the nuclear explosion produced mixed-waste soup, should
also be provided in the Final NTS EIS. The estimate, which
is based upon the fission products, provides an incomplete,
if not a deceptive accounting of the hazardous materials
73 which were dispersed by the underground nuclear testing
program. The quantities of unfissioned plutonium-239 and
neutron activation products should also be provided, in
units of grams and curies, for each of the 839 tests
locations. The contamination data for the off-site test
locations in Mississippi, Alaska, Colorado, New Mexico and
Nevada should be provided to those state's environmental
pollution control departments.
The extreme cost of performing environmental assessments and
follow-up activities requires that, now classified data, be
rapidly declassified and be made available to the American
public and their elected representatives.

p. S-26, line 22, "Much of this radioactivity remains captured in the original cavity, and thus is not available to leach into the groundwater."

044. Let me remind the reader that each nuclear explosion is like an instantaneous explosion of a small nuclear power reactor and the result is the vaporization, dispersal and condensation of its spent nuclear fuel and fission products. The highly radioactive materials, and often massive quantities of chemically hazardous components, wind up mixed with thousands of tons of resolidified rock. This is the host rock that once surrounded the nuclear explosive device. The blast cavity is generally connected to a vast network of fractures that extend radially out to several cavity radii. A small fraction of the mixed-waste materials are located in this fracture network. The vast majority, of the mixed-waste materials, resides in the giant pool of resolidified rock. The solidified rock is quite different, both chemically and physically, from the laboratory grade borosilicate glasses that are now being used to isolate and immobilize High-Level Nuclear Waste. Little is now known concerning the breakdown of the resolidified rock slag over

PRIVATE CITIZEN 53 (CONTINUED)

periods of thousands of years.
The resulting burial of nuclear waste, created by underground nuclear explosions, is not regulated by anything like the regulatory structure that surrounds the eventual disposal of other forms of nuclear waste such as Spent Nuclear Fuel and High-Level Nuclear Waste. For example, the waste generated by underground nuclear explosions is not required to be surrounded by multiple engineered barriers.

p. S-26, line 25, "Radioactively contaminated surface areas on the NTS resulted primarily from atmospheric testing of nuclear weapons from 1951 to 1962."

045. The most troublesome surface hot-spots at the NTS are the
result of underground nuclear experiments that either were
designed to vent radioactive materials to the surface or
were intended to not vent, but did anyway. As part of the
74 United State's Atoms for Peace Program, Peaceful Nuclear
Explosive tests were conducted which seriously contaminated
large areas around their excavation craters. Some of these
experimental tests were named Sedan (1962), Palanquin (1965),
Cabriolet (1968), Buggy (1968), and Schooner (1968).
The Baneberry test produced a spectacular venting when its
containment system failed in 1970.

p. S-26, line 26, "Additionally, safety tests conducted at the surface from 1954 to 1963 resulted in the radioactive contamination of the soil."

046. Replace the phrase "safety tests" with the phrase
75 "plutonium-239 dispersal experiments." Remove the phrase
"radioactive contamination of the soil" and replace with it
the phrase "contamination of at least five square miles of
soil with plutonium-239 particles."

p. S-26, line 27, "More than 200 radiation-contaminated controlled areas have been identified and mapped on the NTS.

047. Refer to comment no. 035.

p. S-26, line 30, "The DOE has established a monitoring program on and off the NTS to detect radionuclides in air and in groundwater.

048. Refer to comment no. 032.

p. S-27, line 5, "Models show that there will be no measurable tritium resulting from testing in areas that are not under control of the DOE or the U.S. Air Force."

049. Refer to comment no. 033.

Waste Management Program

p. S-27, line 17, "Waste management has been an integral part of the NTS operations since the establishment of the NTS in 1951."

050. If the waste management practices of the past were effective then why is it that the DOE estimates that $230 billion will need to be spent on environmental stabilization during the next several decades? The NTS was excluded from this estimate, not because it did everything right in the past. The present waste management program, at the NTS, deals

PRIVATE CITIZEN 53 (CONTINUED)

largely with handling problems created in the past. In addition, since 1951 the cost of waste management has skyrocketed.

p. S-27, line 18, "The environmental impacts related to the Waste Management Program are minor compared to those of the other programs."
051. Now that the Environmental Management Program has become a major component of the DOE budget, one must wonder what kind of environmental impact is caused by the other programs.

p. S-27, line 34, "Use of the craters for waste disposal is a beneficial use of lands that have been significantly and unavoidably impacted by past actions."
052. It would have been possible to avoid the creation of such craters if the test had been conducted deeper, in another area or, better yet, not at all.

p. S-28, line 1, "Even if low-level waste disposal were to result in the downward movement of contaminants to the deep subsurface, the incremental contribution of contamination to the radiologic source contained at and near the detonation would be negligible."
053. This should be quantitatively analyzed to provide a solid figure for the incremental contribution. This would involve
76 revealing the radiologic source terms of the contaminants contained in the underground cavity. This might be difficult since the specific values remain classified.

Waste management site Performance Assessment.

p. S-28, line 26, "Preliminary results of the Area 5 Radioactive Waste Management Site Performance Assessment indicate that the risk of potential exposure to the public from waste disposal activities through surface water is not significant."
77 054. A similar analysis for the Area 3 Radioactive Waste Management Site should be provided in the Final NTS EIS.

p. S-28, line 31, "The limiting scenarios identified in the Area 5 performance assessment are the inadvertent intruder scenarios, which are postulated to occur thousands of years in the future when areas previously used for waste disposal would be mined or farmed."
78 055. Explain what is meant by the term limiting." What is being limited?
Considering, that the NTS has been in existence less than
79 50 years and few stable governments have lasted more than three centuries, then the "thousands of years in the future" concept may be unrealistic.

p. S-29, line 2, "The performance assessment is a continuous process used to improve the design and operation of DOE waste management facilities."
056. Perhaps this is also designed to justify the continued acceptance of the waste.

PRIVATE CITIZEN 53 (CONTINUED)

Environmental Restoration Program

p. S-29, line 7, "Approximately 10,000 acres of land would be disturbed during the restoration activities under Alternatives 1, 3, and 4. However, after restoration the land would be available for unrestricted use."
057. The Final NTS EIS should provide detailed maps which clearly show the locations of all the 10,000 acres of land that would be disturbed. In addition, a description should be
80 provided that explains, the reason each piece property is being restored, what the restoration activity is expected to involve, and a description of any previous restoration that occurred in the past. The statement that "the land would be available for unrestricted use" may be misleading. The availability, apparently depends upon a number of factors. One of these factors has to do with the level of clean-up that is chosen, and in most instances, it appears that this has not been decided. Truly unrestricted use
81 would involve the withdrawal of the land from restricted use by the DOE and a return to the public domain. Drilling and mining might also be allowed in this case.
The term, "unrestricted use," used in the above quote, is likely to refer to land which remains under restricted use by the DOE. This land will probably be restored to a level suitable for the nearly unlimited use by the DOE.
The Final EIS should provide details on the history and latest work of the "Nevada Environmental Restoration Project"
82 This should include numerous references to the DOE/NV contractors such as the IT Corporation and to the latest internal progress report documents.
Also refer to comment no. 002.

p. S-29, line 9, "Under Alternative 2, environmental restoration activities would cease. This would result in a condition of noncompliance with environmental requirements and limit the future use of the land."
058. The National Environmental Policy Act (NEPA) requires that only reasonable alternatives be presented in the EIS. The DOE seems to have structured Alternative 2 so that it is
83 unreasonable. The existing agreements with the State of Nevada and the EPA may still require that some environmental restoration activities proceed under an Alternative 2 situation.
The restoration of the NTS and off-site areas should not be held hostage by the DOE through its continuing control over the withdrawn lands. This federal agency must be held held accountable whether it controls the property or not.

Work for Others Program

p. S-29, line 19, "The Work for Others Program under Alternatives 1 and 3 is similar to historic activities and not expected to have siginificant impacts."
059. Since the Work for Others Program often involves internal interagency agreements and classified research, the public frequently has little understanding of what kind of work is involved and how this work might impact the environment.

Though, the statement above suggest that historic levels of activity will continue, the public has no way of evaluating the accuracy of this statement.

84 The DOE should provide the public with detailed descriptions and work breakdowns of its Work for Others programs during the last decade. This should include a list of clients. The brief, non descript entries, provided in Table S-1, are not sufficient for a analysis of the alternatives.

UNAVOIDABLE ADVERSE EFFECTS

p. S-29, line 26, "Unavoidable impacts result from a substantial adverse change to existing environmental conditions that cannot be fully mitigated."

060. The reader should note that the level of mitigation, that can be expected for an underground nuclear explosion, is essentially zero.

Alternative 1 - Continue Current Operations (No Action)

p. S-29, line 32, "All continuing programs and operations at the NTS and NAFR Complex would produce some environmental impacts that may not be possible to mitigate."

85 061. Replace the word "may" with the word "will."

p. S-29, line 34, "Past nuclear testing has resulted in the release of large quantities of radioactivity into the subsurface and the formation of subsidence craters."

86 062. Replace the qualitative phrase "large quantities" with the quantitative phrase of "tens of billions of curies." Replace the term "radioactivity" with the phrase "radioactive materials" and follow with the phrase "and thousands of tons of hazardous materials." Before the word "subsurface" add the phrase "atmosphere, surface, the."

p. S-30, line 4, "Other testing and experimental activity in support of stockpile stewardship programs would have smaller impacts."

87 063. The qualitative term "smaller" should be replaced by a quantitative figure. The environmental impacts of the BEEF complex and the LYNER complex should be included. The description of the subcritical test in the LYNER complex should describe the explosive dispersal of substantial quantities of plutonium-239 and the abandonment of the plutonium contaminated shot rooms.

88 Also Appendix J should be immediately declassified.

==

Table S-3. Summary comparison of environmental impacts of the alternatives (7 pages)

Land Use, Site Support Activities, Airspace

p. S-31, (p.1)

Land Use

Alternative 1

89 064. Why would similar land uses be located on the borders?

90 Why is the TTR, Shoal site and the Faultless site at the CNTA not mentioned?

91 Why is there no mention of the property at the North Las Vegas complex as well as the DOE/NV Remote Sensing Laboratory at Nellis Air Force Base?

92 Why are the DOE/NV underground nuclear explosion test sites in Mississippi, Alaska, Colorado, and New Mexico not covered here?

Alternative 2

"Closure without environmental restoration would not meet U.S. Bureau of Land Management criteria for public use."

93 065. This may be true, but this statement has no place here if this federal agency is required, by law, to restore the surface of the public lands that it damaged. Also refer to comment no. 064.

Alternative 3

94 066. Remove all references to the New Solar Enterprise Zone activities in this and Alternative 3 since this project will not be located on the NTS and will now be independent of the listed alternatives.

Alternative 4

"Potential public uses of relinquished NTS lands would be... surrounded by buffer zones."

95 067. Why would buffer zones be needed, if the activities at the NTS are performed safely?

96 "Figure 3-4. NTS Alternative 4 land use map," on page 3-24 in Volume 1, Part A, indicates that the potential relinquished lands would not be completely surrounded by buffer zones which are to here as "Reserved Zones." The explanation, concerning the uses of the "Reserved Zones," should be detailed and very specific. If the relinquished land were to be surrounded by buffer zones, then what would be the depth of the buffer zones and what kinds of security barriers would be emplaced? Would the surrounding buffer zones reduce the area of the "Potential Turn Back Areas" shown in Figure 3-4?

97 "Land uses at the Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area would be similar to those listed under Alternative 1." This table does not "list" land uses under the Alternative 1 column. In addition, the term "similar" is far too objectively vague. The Final NTS EIS should provide far more specifics.

98 "Land-use designations and zones would be incompatible with existing designations and zones." I suggest, that this invalidates the DOE's plans to retain control of the withdrawn lands under Alternative 4, thus creating another unreasonable Alternative. Since nuclear testing was halted

PRIVATE CITIZEN 53 (CONTINUED)

98 cont. in September of 1992, the DOE has been in violation of the four Public Land Order withdrawals which formed most of the test site complex.

Airspace

Alternative 2

"The NTS and Tonopah Test Range would experience reduced flight operations; otherwise, there would be no impacts to airspace."

99 068. The subjective term "reduced" is to vague and needs to be quantified.

100 The reason for continued flight activities also needs to be explained in detail. Apparently, the change of mission and perhaps, even an eventual change in the control of the land surface, under Alternative 2, will not affect the highly restricted status of the vast airspace, over and around the test site.

101 All portions of the airspace, that are now designated as R-4808, should be redesignated in order to return it to the domain of General aviation and the public. This includes the highly restricted airspace that surrounds the Groom Lake area and is presently managed by the DOE.

102 The airspace control authority, of the Federal Aviation Administration (FAA), should be transferred from the DOE to the Air Force and then back to the FAA, where Congress had originally intended the authority to reside.

103 The return, of the presently Restricted airspace to the public domain, should be applied to both Alternatives 2 and 4.

Geology and Soils

p. S-33, (p.3)

Alternative 1

"Testing impacts would include ground motion hazards and secondary seismic effects, soil contamination, alteration of natural drainage paths, and decreased surface stability. Impacts from other activities would include dust creation, soil contamination, and an increase in erosion potential."

104 069. Expand the first phrase, "soil contamination," with the phrase, "massive, unremedable soil contamination with radioactive mixed waste."
follow the second occurrence of the phrase, "soil contamination," with the phrase, "with plutonium-239."

Alternative 3

070. Refer to comment no.069.

Alternative 4

105 071. Since the Defense Program activities create the most serious contamination problems, this Alternative would result in far less impacts.

Alternative 2

"Discontinuing operations would result in no additional impacts to geology and soils. However, the media that have been contaminated and altered from past activities would not be available for unrestricted use."

PRIVATE CITIZEN 53 (CONTINUED)

106 072. The immense quantity of deep soils, that have been massively contaminated and altered by past nuclear explosion activities, will never be available for unrestricted use, even if operations at the site are drastically increased. The DOE has admitted, on many occasions, that the underground contamination is unremedable. In any case, and for any of the Alternatives, the underground test areas will never be deliberately made available for completely unrestricted use. Even, for the vast majority of those surface areas that are completely remediated, DOE/NV intends to retain control and restrict access to the public.

Hydrology (surface Hydrology and Groundwater)

p. S-34, (p.4)

Surface Hydrology

Alternative 1, 3 and 4

"There would be minimal potential impact from the alteration of existing dranage paths because of testing."

107 073. In some areas such as the extensive underground nuclear testing areas the existing surface areas have been drastically altered. Continuing and expanded activities should not be compared to the already existing damage.

Groundwater

Alternative 1

"Total effects from continuing groundwater withdrawals are expected to be minor. Local effects to the Yucca Flat basin could be substantial if the annual water demand exceeds the basin's perennial yield."

108 074. New findings suggest that the area's existing recharge rates are much lower than originally estimated. Therefore, existing withdrawals are likely to be excessive. Since large amounts of the groundwater in Yucca Flat have been made unusable, due to contamination and potential contamination caused by the underground nuclear explosion program, the estimated "perennial yield," of the basin, has been drastically reduced. This is a permanent loss of resources. Existing plans, are intended to work around around this loss.

Alternative 3 and 4

"However, the Solar Enterprise Zone has been estimated to require up to 5,550 ac-ft per year of water. Local effects to the affected basin such as those near Dry Lake Valley could be substantial if the annual water demand exceeds the perennial yield of the basin."

109 075. The sections, dealing with the Solar Enterprise Zone, should be removed for several reasons. Firstly, it is outdated. The technologies that will be used for the project will not utilize anything close to the 5,550 ac-ft per year of water that was once estimated. In addition, a decision took place over a year ago to not site the solar facility at the NTS. And lastly, a division of the DOE which, for the last 50 years, has had the job of promoting nuclear power, should not be expected to be highly supportive of alternative energy

PRIVATE CITIZEN 53 (CONTINUED)

109 cont. technologies. I suggest, that the tone of this report clearly reflects a conflict of interest.

Alternative 1 and 2
"Increased waste quantities would not result in impacts."

110 076. Replace this sentence with, "Increased waste quantities will continue to result in significant impacts." This should be repeated in Alternative 1, 3 and 4. The operation of the waste management facilities involves the use of large quantities of groundwater to wet the facility surfaces in order to control dust. In addition, surface barriers are often constructed to control surface water flow.

111 The fuel use, associated with the transportation of large quantities of waste, over great distances, has been ignored in this EIS study. The fuel usage constitutes a highly significant use of nonrenewable fossil fuels. The burning, of this fuel, also results in the release of an equivalent quantity of hazardous emissions including the greenhouse gas, CO_2. As a federal agency, that claims to be concerned with conservation of fossil fuels and the reduction of harmful air emissions, the DOE should have provided a detailed analysis of the fuel usage, associated with the operation of the NTS.

112 The Final NTS EIS document titled, "Transportation Study, contained in Volume 1, Appendix I, should contain an analysis of the environmental impacts, associated with the consumption of fossil fuels that result from the operation of the NTS.

Alternative 2
"Water demand would be reduced to that required for environmental monitoring and for potable water for the caretaker workforce."

113 077. The Final NTS EIS should describe the need, composition, and size of this workforce. It should also describe why this workforce will need to be employed for thousands of years.

"Contaminated areas would not be restored, resulting in continued possibility of groundwater contamination."

114 078. The DOE has admitted that it is impossible to restore the contaminated areas in and around the nuclear blast cavities. Groundwater contamination is not a possibility but a reality. I believe the quoted statement is highly deceptive. The stakeholders, including the general public and their elected representatives, deserve better.

Alternative 1
"There could be localized impacts related to underground tests conducted under or near the water table. Monitoring has revealed few instances of migration of radionuclides beyond the near test environment."

115 079. Replace the phrase "could be localized" with the phrase "would be regional."

116 Maps, such as the one found in Figure 4.12-2., on page 4-526 of the Draft PEIS for Stockpile Stewardship and Management (DOE/EIS-0236), show the existing nuclear explosion test

PRIVATE CITIZEN 53 (CONTINUED)

sites, surrounded by a 1,000 foot radius region that represents the area that may be potentially impacted. The total impacted area could be more than 10,000 acres and the impacted volume could exceed 50 cubic miles. Each, new, large, underground nuclear explosion could potentially impact nearly a quarter cubic mile of the surrounding underground environment.

117 In the second quoted sentence, replace the phrase "the near test environment" with the phrase "an extensive monitoring exclusion zone." The scientist, who are contracted to do the monitoring work, are prevented, by DOE regulations, from collecting subsurface soil and water samples that lie close to the source of the potential contamination. Because many of the test cavities are relatively young and groundwater flow rates are quite low in the area, most of the potential contamination has not yet had a chance to migrate to the distant monitoring wells. As a result, the monitoring scientist are still coming up with mostly, completely clean samples. The environmental monitoring technical reports, produced under DOE/NV contract, show scores of clean samples collected during the past couple of decades. These same technical reports rarely provide any detailed information concerning the positional relationship of the monitoring points to the sources of potential contamination.
I have come to believe, that much of this monitoring and associated reporting, represent a perversion of fundamental scientific principles. These kinds of activities are not appropriate for an agency that promotes itself, to the American taxpayers and elected representatives, as a responsible scientific organization. This organization is now embarking on their "Science Based Stockpile Stewardship program" which will cost, us, and future generations, many tens of billions of dollars. I do not believe our nation or our nuclear weapons arsenal can afford this kind of perverted science.

Tonopah Test Range and Nellis Air Force Range Complex
All Alternatives
"Minimal impacts would occur at the Tonopah Test Range..."

118 080. Major clean-up efforts are being planned for at the TTR and NAFR Complex. This involves the removal of several inches of plutonium-329 soil from dozens of acres, where Plutonium dispersal experiments were performed. These activities are likely to disturb the existing drainage paths. Remove the term "minimal."

119 Under Alternative 2 and 4, the DOE is likely to transfer some of its Defense Program activities to the Tonopah Test Range. This kind of action would be likely to increase impacts on this range, therefore all the Alternatives should indicate an impact for this range

Visual Resources

p. S-35, (p.5)

Alternative 2
"Deterioration of facilities would occur over time.

PRIVATE CITIZEN 53 (CONTINUED)

120 081. Remove this statement since as mentioned in comment no. 077. the site will have a caretaker workforce. Again, an explaination of the purpose of this workforce is in order.

==

UNAVOIDABLE ADVERSE EFFECTS (continued)

Alternative 1 -Continue Current Operations (No Action) (continued)

p. S-38, line 1, "At the Project Shoal Area and Central Nevada Test Area, geologic media that were contaminated by radionuclides would remain contaminated and unavailable for use. If groundwater were contaminated and could not be remediated, it would be unavailable for use as well."

121 082. The above passage should read, ""At the Project Shoal Area and Central Nevada Test Area, geologic media that was contaminated with DOE radionuclides will remain permanently contaminated and unavailable for use. The groundwater that is contaminated and can not be remediated and will be unavailable for use as well."

122 The term "remain" refers to a period of time of about a quarter million years. The Final NTS EIS should clearly explain why the geologic media and groundwater will be unavailable for use and the mechanisms that are being used and will be used, during the next quarter million years, to keep it unavailable. The DOE has admitted that the underground nuclear test areas can not be remediated, therefore DOE/NV should cease giving, the general public and the public's elected representatives, the impression that these facilities are fixable. Its time to stop pouring tax moneys into rat-holes that go nowhere.

Alternative 2 - Discontinue Operations

p. S-38, line 7, "Past nuclear testing has resulted in the release of radioactivity into the surface and the subsurface, and in the formation of subsidence craters. These conditions would persist if the NTS were closed."

123 083. Place the word "giant" ahead of the word "subsidence." Replace the word "would" with the word "will." Precede the word "if" with the word "even." Replace the word "were" with the word "is."

These conditions will persist for hundreds of thousands of years, no matter which Alternative is chosen or will be chosen.

The DOE has admitted that the underground nuclear test areas can not be remediated, therefore DOE/NV should cease giving, the general public and the public's elected representatives, the impression that these facilities are fixable. Its time to stop pouring tax moneys into rat-holes that go nowhere.

p. S-38, line 15, "Although the rates of desert tortoise or habitat loss would likely decline relative to Alternative 1, there could be some loss because of security and monitoring vehicular activities."

PRIVATE CITIZEN 53 (CONTINUED)

124 084. The rate of loss of desert tortoise and habitat would be minuscule, when compared with all the other Alternatives, therefore this sentence should be removed. An increased level of security and monitoring will probably exist under all the other Alternatives, therefore this statement is not appropriate here.

p. S-38, line 20, "Because no environmental restoration projects would occur under Alternative 2, contaminated areas of the Tonopah Test Range would remain contaminated."

125 085. Follow the phrase "Alternative 2," with the word "extensive." End the sentence with the phrase "with kilograms of plutonium-239 particles. Perhaps the status of the plutonium-239 dispersal experiment sites on the Nellis Air Force Range Complex should also be mentioned.

126 Actually, I believe the quoted statement is deceptive, if not blatantly false, due to the existing laws that require federal agencies to cleanup their facilities before they leave, otherwise it appears that there is a serious breach in accountability.

p. S-38, line 24, "At the Project Shoal Area and Central Nevada Test Area, geologic media and groundwater contaminated by radionuclides would remain contaminated and unavailable for use."

127 086. Replace the phrase "geologic media" with the phrase "subsurface soil and rock." Replace the phrase "by radionuclides would" with the phrase "DOE's massive quantities of radionuclides will."

128 DOE/NV should explain, in the Final NTS EIS, what it means when it says the geologic media and groundwater would be "unavailable for use." It should explain, why the availability would be restricted, who the restrictions would be applied to, what techniques would be used to provide the restrictions, and how many hundreds of thousands of years these restrictions would need to be applied.

These, and the other 800+ underground nuclear explosion sites, that lie in Nevada, Mississippi, Alaska, Colorado, and in New Mexico, will not be remediated under any of the presently proposed Alternatives or under any new proposals. The DOE has admitted that the underground nuclear test areas can not be remediated, therefore DOE/NV should cease giving, the general public and the public's elected representatives, the impression that these facilities are fixable. Its time to stop pouring tax moneys into rat-holes that go nowhere.

Alternative 2 - Expanded Use

p. S-38, line , "At the NTS and NAFR Complex, the unavoidable adverse impacts of Alternative 3 would be similar to Alternative 1. Construction of new facilities would affect presently undisturbed habitat and eliminate those areas from other land uses."

129 087. Replace the phrase "similar to" with the phrase "much greater than."

130 This Draft NTS EIS and especially the draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management - February 1996 (DOE/EIS-0236) (draft PEIS SSM), suggest that major expansions of

130 cont. activities are envisioned for the NTS. Such an expansion of activities will further impact this site which has already experienced horrendous permanent damage from past activities. The rest of this expanded use section deals with the unavoidable adverse effects of peripheral issues such as the proposed renewable solar energy projects. Here, 90% of the space is taken up with descriptions of projects that will result in less than 10% of expanded use impacts. Clearly, DOE/NV remains primarily committed to expanding the secret work, associated with weapons of mass destruction, rather than work which promotes the conversion to renewable solar energy technologies.

p. S-38, line 29, "If the solar energy projects are implemented at the NTS, up to 2,400 acres of desert tortoise habitat could be lost from construction activities."

131 088. Remove this since a decision was made, over a year ago to not site these facilities at the NTS. DOE/NV seems to be far more interested in promoting nuclear power than renewable energy development. Also, refer to comment no. 075.

p. S-39, line 4, "At the Project Shoal Area and Central Nevada Test Area, geologic media and groundwater that may be contaminated by radionuclides would remain contaminated and unavailable for use." If groundwater were contaminated and could not be remediated, it would be unavailable for use as well."
089. Refer to comments no. 082.

p. S-39, lines 8 thru 20, This extensive section contains numerous references to the negative impacts of the proposed renewable solar energy projects.
090. Refer to comment no. 075.

Alternative 4 - Alternative Use of Withdrawn Lands

p. S-39, line 29, "The unavoidable adverse impacts to the Tonopah Test Range from DOE/NV activities associated with Alternative 4 would be similar to those for Alternative 1."

132 091. Replace the phrase "similar to" with the phrase "greater than." Because, some of the Defense Programs may be transfered to the TTR, impacts may increase.

==

Table S-4. Summary cumulative impacts (3 pages)

p. S-42
Hydrology
NTS Program Alternatives
"Withdrawals are within the perennial yield amounts except in the cases of Yucca Flat and Dry Lake Valley, where extractions exceed replenishment."

133 092. Recent findings by the Desert Research Institute suggest that much of the water that underlies Nevada is quite old and resulted from a much wetter historical period near the last ice age. As a result, many existing estimates of recharge rates may be in error. This, in turn, could mean

PRIVATE CITIZEN 53 (CONTINUED)

133 cont. that, in some cases, when withdrawals are thought to be within the perennial yield amounts, they may not be.

==

MITIGATION MEASURES

p. S-44, line 1, "Geology--Under Alternatives 1 and 3, the DOE would continue to adhere to siting criteria to ensure radioactive contaminants from underground testing are contained."

134 093. Replace the phrase "to ensure" with the phrase "that reduce the likelihood that."
Replace the term "contained" with the phrase "not promptly vented into the atmosphere."

135 Because of the highly secret nature of nuclear weapons research, the DOE has been provided with a great deal of power to self-regulate itself. As a result, the DOE and its predecessor agencies, have explosively dispersed tens of billions of curies of radioactive materials in to the earth's atmosphere, the oceans and into the underground environment in five states of our country. The estimated cost of $230 billion, that will be required to restore and stabilize some of the DOE's nuclear weapons facilities, is another example of cost that we and future generations will pay in return for DOE's self-regulation. This cost estimate did not include the underground test areas at the NTS due to fact that DOE Headquarters knows that the form of containment, specified by the "siting criteria," is not fixable.
The containment standards, that are set by the Environmental Protection Agency and the Nuclear Regulatory Agency, in regards to the final geologic disposal of nuclear power reactor produced waste products, have no effect upon the way in which the DOE disposes the waste generated by its underground nuclear explosions.
For further information refer to comment no. 044.

p. S-44, line 12, "Groundwater--Under Alternatives 1, 3, and 4, institutional controls would be used to maintain water quality."

136 094. Replace the word "institutional" with the word "questionable."
Replace the phrase "maintain water quality" with the phrase "prevent access to contaminated and potentially contaminated groundwaters, and the wells that access such areas.
In other words, what the DOE/NV is saying, is that they intend to maintain water quality by prventing access to the resources they have destroyed through contamination.

137 How generous! In the Final NTS EIS the DOE/NV should provide a detailed description of the history of the institutional control program that has been in place at the ten offsite underground nuclear explosion sites which are located in Mississippi, Alaska, Colorado, New Mexico and Nevada.

PRIVATE CITIZEN 53 (CONTINUED)

READER'S GUIDE
TO THE
U.S. DEPARTMENT OF ENERGY
DRAFT
ENVIRONMENTAL IMPACT STATEMENT
FOR THE NEVADA TEST SITE AND
OFF-SITE LOCATIONS IN THE STATE
OF NEVADA

p. RG-2, Section 2, Specific Topics, Middle of page.
"Classified Supplement: Project-specific Environmental Impact Analysis (Lyner Complex)....Appendix J."

138 095. The vast majority of this document should be declassified in the spirit of Secretary O'Leary's most recent "Openness Initiative" requirements. This means, that unless the information could directly lead to an understanding of the equation-of-state-codes, then it should be declassified and provided to the public so they can evaluate the environmental consequences of the planned experiments at the Lyner Complex. I seriously doubt that a description of the explosive dispersal of plutonium-239 in underground rooms is going to reveal basic research data involving the equation-of-state codes.

139 For any information that remains "Classified," provide in the Final NTS EIS, a full accounting of the authority under which this document was classified. The DOE should cite, all the applicable DOE Orders and Regulations under which it was classified, the identity of the classifier, the level of the classification, any special handling requirements, such as LIMDIS (Limited Dissemination), the date or event for automatic declassification - classification review - or downgrading of classification level, and if applicable, the reason for extended classification.

140 In addition, Appendix J should be listed in the Table of Contents in both Volume 1, Part A and Part B. It should appear under Appendix I.

p. RG-4, Where Are the Sites in Nevada, Fifth bullet
"Central Nevada Test Area..."

141 096. Like the Project Shoal description above, mention the real purpose of first series of tests that were to be performed at the Central Nevada Test Area.

MAP

142 097. Show the portion of the NTS which was once labeled "Area 51." Explain, in the sidebar why the DOE/NV does not acknowledge its existence and why it is not mentioned or covered in this Draft NTS EIS. Also show the locations of other DOE/NV facilities, in the Las Vegas area, which are not covered in this Draft NTS EIS.

143 098. The boundary of the Nellis Air Force Range Complex which lies just east of the Area 13 block was changed about seven years ago. Up-dating your map will not give away the family secret concerning Area 51.

PRIVATE CITIZEN 53 (CONTINUED)

Back Page -- "About NEPA" "The DOE EIS process follows these steps:" "Implementation Plan, which gives the results of the public scoping and provides a "roadmap" of how the EIS will be prepared."

144 099. Mention that this once provided a means for public input into the planning of the Draft EIS, but under a recent proposal, by the DOE, the Implementation Plan will no longer be provided as a means of public input.

This ends my comments on the Draft NTS EIS January 1996, Summary
(DOE/EIS 0243)

Draft Environmental Impact Statement for the Nevada Test Site
and Off-site Locations in the State of Nevada - January 1996
DOE/EIS 0243
Volume 2
Framework for Resource Management Plan

PUBLIC COMMENTS

1.0 INTRODUCTION
1.3 Policy and Procedures
p.1-2, line 15.
"The DOE/NV has developed and refined its technical site information (DOE/NV,1994a) to the point where it accurately depicts existing conditions and planned improvements."

145 100. Replace the term "accurately" with the term "approximately." Replace the term "existing" with the term "past."
Replace the term "improvements" with the term "alterations."

146 The NTS has a massive, ongoing, characterization program which is attempting to better understand a great number of unknown factors at the site. Why are tens of millions of tax dollars being spent on these characterization programs if the existing conditions are accurately depicted?
DOE Headquarters released a Document titled "Estimating the Cold War Mortgage: The 1995 Baseline Environmental Management Report - March 1995." A major portion of the NTS, the underground nuclear explosion test areas, were excluded from this study due to great uncertainties associated with these severely damaged areas.

Refer to p. 3-9, line 32.
"Monitoring is a crucial step in the RMP because the predictions of impacts and selection of suitable land uses that will result from the plan will be based on an incomplete understanding of the ecosystem on the NTS."

Refer to p. 2-5, line 24.
"Some of the decisions the DOE/NV will make during development of management actions will be based on a limited understanding of the interactions between natural and manmade systems on the NTS."

147 How is it possible to accurately depict planned improvements when the DOE weapons complex is undergoing major changes that involve many decision that are yet to be made?

Refer to p. 1-3, line 5.
"The RMP will not be used to identify or select future missions for the NTS; those task are the subject of other strategic planning efforts."

p. 1-3, line 3.
"The RMP will use the technical site information as a starting point and will ultimately gather other ongoing management and planning activities under one comprehensive plan."

148 101. My experience, with the technical site information, is that it reflects the highly secret, self-regulating nature of this institution. The majority of decisions are based upon information contained in internal documents rather than on the concerns of the surrounding communities.

p. 1-3, line 5.
"The RMP will not be used to identify or select future missions for the NTS; those task are the subject of other strategic planning efforts."

149 102. If this is true, then why does the example goal reflect a business as usual attitude, with a major emphasis on supporting the ongoing missions. Perhaps the ongoing missions are the future missions that are desired by DOE/NV.

p. 1-3, line 14.
"Some important principles of this approach considered in the plan are... consideration of ecological units and timeframes,..."
103. I hope the managers are looking forward for at least a quarter million years.

p. 1-4, line 5.
"The DOE/NV will use these procedures and planning systems to select and design land uses that are consistent with the goals identified by the RMP."

150 104. Remove the phrase "and design."
Perhaps a god can design land uses but I doubt that mere managers can do a better job.

p. 1-4, line 8.
"Land-use planning and resource management are the responsibility of the landlord program office at each DOE site. At the NTS, the Defense program performs these functions..."
105. Perhaps you ought to rename the landlord program the warlord program.
Seriously, its time for a radical change. Move the landlord program office functions over to the Environmental Protection Division. You can do it. "The times, they are a changing." Show the public and DOE HQ that you can change. The Cold War is over, priorities are changing and NTS may be facing some serious suit challenges.

1.4 Relation to the Nevada Test Site Environmental Impact Statement
p. 1-5, line 13
"This review will evaluate any potential conflicts between the RMP and the existing EIS and will be the basis for determining whether (1) the existing EIS should be supplemented, (2) a new EIS should be prepared, or (3) no further National Environmental Policy Act documentation is required."

151 106. The National Environmental Policy Act (NEPA) was enacted by Congress to ensure that Federal decisionmakers considered the effects of proposed actions on the human environment and to lay their decisionmaking process open for public scrutiny. The NTS RMP should provide the public and other stakeholders with a means to keep track of whether or not DOE/NV is fullfilling its promices in regards to the numerous sites it is responsible for. In order to do this the RMP needs to spell out, in detail, the various ways in which the stakeholders will be allowed to participate in the decision making process and in gaining full and complete access to the raw data that will form the basis of the decisions. For starters, DOE/NV needs to start utilizing is

151 cont. internet World WIde Web Home Page to openly publish a full listing of all the documents, both internal and external, that deal with the environmental studies of its various sites. This should include planning documents which may have an impact on the existing conditions of the sites. For environmental reports which were performed under DOE/NV contract, the full documents should be downloadable using commonly used file transfer techniques. Whenever a contract report is listed it should also include a summary abstract of one page or less. These documents should be made available, on the internet, as soon as the contractors have written and submitted their reports to the DOE. They should include the contract number, the submission date, the name and contact information for the original writers of the reports. The reports should be made available, to the public, before the DOE has reviewed and edited the contents of the reports, even if the DOE considers the report to be in a draft state. As it is now, some of the DOE/NV's site environmental reports such as the "Nevada Test Site Annual Site Environmental Report-1994" (DOE/NV/11432-175) are released, internally, almost a year after the raw data is collected. All to often, the public doesn't become aware of such documents until years after internal decisions have been made that are based upon the findings in such documents.

1.5 Relation to Other Agency Resource Management Plans

p. 1-6, line 7
"In contrast, natural resources are not the primary management focus of the DOE's NTS missions. The primary resources required by the DOE NTS missions are the site support activities and large, remote areas found on the NTS. Existing site support activities and their relation to land-use on the NTS are an important consideration; therefore, these manmade resources will constitute a siginificant aspect of the RMP"

107. Obviously, "site support activities" are regarded as a "primary resource." I would like to suggest that the remoteness and the tight security, at the site, has functioned as a convenient resource that has allowed the local management to engage in activities that have devastated the environment of some areas of the test site. DOE HQ has indicated that the enormous clean-up cost, of the DOE's weapons labs, resulted from putting the defense mission ahead of the environment. Despite the DOE's "Lessons Learned" program, it appears that some segments of DOE's empire have not yet gotten the message. The statement that "manmade resources will constitute a significant aspect of the RMP" indicates to me that the writer has an extremely poor understanding of fundamental ecological principles and therefore is not qualified to be part of the RMP guidance team. There are many people who tend to believe that humans are like Gods who have the capacity to create resources. Such folks usually have a rather shallow understanding of the ultimate sources of the resources that man uses.

4.0 DRAFT RESOURCE MANAGEMENT GOALS

p.4-1, line 8
"They (draft goals) will be used to evaluate the effects of the DOE/NV activities on resource issues and to identify management actions needed for wise resource use and sound ecosystem management."

152 108. The wise use of resources should be based upon the judgment of environmental scientist, the public and the indigenous communities who hold the original titles and claims to the land. The wise use should not be based upon the precedence of relatively recent activities. Sound ecosystem management is often incompatible with what DOE Defense Program managers consider to be a wise use of resources.

p. 4-1, line 10
"Also included are brief explainations of why the DOE chose these goals;...and, when available, map products documenting the DOE's knowledge of NTS resources and constraints."

109. Many of the map products, that are provided in the rear of this document, are quite impressive but they do not document the the DOE's knowledge. The elements of a map need to be carefully analyzed to derive knowledge from them. The discussions in the EIS text shows little evidence that such maps have undergone a through analysis. It is a simple matter for contracted services to provide DOE/NV with slick map products. It is a wholly different matter for useful information to be derived from the maps. Plate 7 shows land which could rate as some of the most severely damaged land in the world. The readers of this NTS DEIS are not likely

153 to see that value expressed in the text. Maps can also be used to deceive and manipulate knowledge. DOE/NV has performed this function as well with most of their map products. The removal of Area 51 is a deliberate, unlawful act which serves to deceive the general public, state and federal officials that hold executive office positions, Congressional representatives and their oversight bodies. It even serves to deceive DOE/NV contractors, DOE/NV managers, as well as the high-level analysts and decision makers at DOE HQ.

p. 4-1, line 18
"Possible solutions that may be considered include modifying a proposed mission to reduce impacts on a resource, modifying existing missions, or not achieving a goal."

154 110. After the word "include" insert the phrase "canceling the mission."

4.1 Existing Missions

P. 4-2, line 6
"Ensure new uses of the NTS do not interfere with critical operations of existing missions or create additional cost for those missions."
"Manage existing missions in a way that most effectively and efficiently uses the resources of the NTS."

155 111. Eliminate the proposed draft goal of supporting the existing missions and replace with the goal of closing down the the test site in one year. The business-as-usual option should not be the only option provided. In return, for the attempt to manipulate the "Framwork" document's draft goal proposal, the writers of the document should be required to substitute the close-down option as the draft goal.

112. The NTS resources that are important to me are the underground nuclear test areas, the areas where plutonium-239 dispersal tests were conducted and the off-site test areas in the States of Mississippi, Alaska, Colorado, New Mexico, and Nevada. These sites should be preserved by closing down the test site and then each individual test location should be placed on the National Registry of Historic Places. Public tours should be implemented so that future generations can learn that a person does not have to be an ogre in order to create massive environmental problems.

This ends my comments on the Draft NTS EIS January 1996, Volume 2 Framework for Resource Management Plan (DOE/EIS 0243)

This page received blank.

PRIVATE CITIZEN 53 (CONTINUED)

COMMENTS ON THE DRAFT NTS EIS - January 1996, (DOE/EIS 0243)
Volume 1

TABLE OF CONTENTS
(Part A) and (Part B)
Appendices
p. ix, line 17
156 113. Add, "Appendix J Classified Supplement: Project-Specific Environmental Impact Analysis (Lyner Complex) J-1"
157 The vast majority of this document should be declassified before it appears in the Final NTS EIS.

p. ix, line 6
"Appendix A Detailed Project and Activity Information A-1"
158 114. Mention here the Lyner Complex and the fact that it has a classified component.

Chapter 2 PURPOSE AND NEED FOR DOE ACTION
2.1 Background
P. 2-1, 30
159 115. Mention here the legal processes that the State of Nevada took that precipitated this EIS process. Include this history in the side box. This study was not voluntarily initiated by the DOE, because of new world events.

2.4 Nevada Test Site Programs
2.4.2 Waste Management Program
"Waste Definitions" sidebar
p. 2-9, line 31
"Classified Waste"
160 116. Provide a more detailed definition and cite the specific rules that govern this catagory of waste.

p. 2-10, line 16
"Specifically, these waste types include...and some classified waste."
161 117. The word "some" is to vague. Provide more specifics such as [illegible]me, mass and radioactive curie level. Provide a general [illegible]kdown of components including that portion which is Mixed-Waste due to hazardous components and describe where this waste is located.

Chapter 3 DESCRIPTION OF ALTERNATIVES
3.2 Alternatives Eliminated from Further Consideration
3.2.1 Site Uses Defined by Program
p. 3-26, line 28
"The NTS has historically been a multipurpose facility because of its remote location, arid climate, controlled access, and size. Fore these reasons, this alternative (single program) fails to meet the DOE's need for a site that can support evolving DOE missions."
118. Many of the stakeholders comments were ignored because they did not "meet the DOE's need." DOE needs to be reminded that they are supposed to be serving the public's needs.
162 The recent historical uses of the test site should not be used as a tool for locking in the future uses.

PRIVATE CITIZEN 53 (CONTINUED)

3.2.2 Site Closure with Complete Environmental Restoration
P. 3-27, line 3
"The DOE considered, but dismissed as too speculative, the alternative to fully remediate and close the NTS in the next 10-year period. In accordance with the DOE National Environmental Policy Act EIS policy, the NTS EIS evaluates site uses for the next 5- to 10-year period and because of the unique nature of past NTS activities (nuclear weapons test), complete site characterization and subsequent remediation activities could not be completed before the year 2030. Additionally, technologies to fully characterize and remediate certain areas of the NTS (such as the underground testing areas) do not currently exist and are not anticipated to be available in the next 10-year period."
119. The American people and Congress need to hear the DOE directly admit that it has permanently ruined lands upon which it was given stewardship responsibilities. It has has created "national sacrifice zones." Its time the DOE take responsibility for its actions rather than continue to suggest that some, currently unknown, future miracle technology will allow the remediation of all the public lands over which it has domain. This blind faith, that a future technology will be developed, is misleading. It is like dangling a carrot in front of a mule in order to get it to move. This suggested promise, of a future technological cure, has resulted in a vast waste of public funds on many technologies that failed to produce results. We and future generations should not be forced to pay for DOE's inability to admit guilt.

3.2.3 Site Closure with Direct Relinquishment of Surplus Lands to the Sovereign Nations, the Public, Nye County, or the State of Nevada following Remediation.
p. 3-27, line 14
"The DOE considered, but dismissed as unreasonable, the alternative of relinquishing the withdrawn NTS land directly to the sovereign nations, the State of Nevada, Nye County, or the public. This alternative would require a redirection of the policies of the U.S. Bureau of Land Management, which administers the federal lands that are withdrawn for use by the DOE. Current U.S. Bureau of Land Management policies and regulations require lands that were formerly withdrawn from the public domain, and are no longer needed, to be relinquished back to the U.S. Bureau of Land Management. For this reason, this alternative was considered too speculative and outside the scope of the NTS EIS."
163 120. In this last sentence, it starts out by saying "For this reason..." DOE/NV needs to expound further and clarify what it is referring to when it says "this."
I understand that the BLM is not interested in taking on the the responsibility for such seriously contaminated land.
164 This section should also mention the pending legal actions, between the State of Nevada and the DOE, concerning the charge that DOE/NV is out of compliance with the original purpose for which the land was withdrawn.
The federal government would be setting a bad precedent if it allowed the DOE to retain control of public property, into the distant future, because this agency permanently

contaminated the property with plutonium isotopes that have a 24,000 year half life. U.S. Federal agencies should not be allowed to gain permanent control of the public's lands.

Chapter 4 AFFECTED ENVIRONMENTS
4.1 Nevada Test Site and Surrounding Areas
4.1.1 Land Use
4.1.1.1 Public Land Orders and Withdrawals.
p. 4-9, line 11
"Under Public Land Order 1662 (June 20, 1958), approximately 38,400 acres were reserved for the use of the Atomic Energy Commission in connection with the NTS. Management of this land area has since been delegated to the U.S. Air Force."

121. The DOE should provide an historical listing of documents
165 which cover this delegation of authority to the U.S. Air Force. The latest document should be cited and included in an unclassified NTS EIS Appendix.
This Appendix should also include copies of P.L.O 1662 and the other public land orders and related special use
166 documents which cover the land withdrawals at the off-site undreground nuclear explosion sites in Mississippi, Alaska, Colorado, New Mexico and in Nevada.
I understand that this draft document contained inaccurate references to the present legal status of the the lands at
167 the off-site test areas. For example, the Project Shoal site was not returned to the BLM as stated in this Draft EIS.

p. 4-10, MAP
"Figure 4-3. NTS land withdrawals and Memorandum of Understanding"

122. Retitle this as "NTS lands covered by P.L.O.s and Memorandum of Understandings"
168 Label the area, covered by P.L.O. 1662, with the number designation "51." Also include the special land withdrawals that are associated with the Yucca Mountain Project.
NOTE: Of the scores of NTS maps, which are presented in this eight volume Draft NTS EIS document, the one map on page 4-10 is the only one that includes the area that
169 was withdrawn under P.L.O. 1662 (Area 51). A small number of maps show open border lines where Area 51 is attached but the vast majority of maps show no indication that part of the test site extends from the northeastern border region. For almost 40 years, DOE/NV has created and distributed hundreds of tons of public and internal documents containing deliberately deceptive maps of the region that is assigned to them. This enormous mass of documents has been distributed to the general public, the public's elected representatives, oversight committees federal agencies such as the Environmental Protection Agency and the Nuclear Regulatory Commission, state, county, and city governments and the Sovereign Native American Nations and communities. These inaccurate maps have also been seen, utilized and redistributed by the upper-level managers at DOE Headquarters in Washington, DC. These maps have even been incorporated into the reports of

the Inspector General. DOE HQ's recent Openness Initiative program and its expanded declassification program, seem to have no effect upon this big lie.

4.1.1.2 Land-Use Designations.
Area 1
p. 4-13, line 28
"The Lyner Complex is a mined underground complex in Area 1 that is available for dynamic experiments and hydrodynamic tests that cannot be conducted aboveground because they may contain hazardous materials."

123. Replace the word "available" with the phrase "is used for."
170 Replace the word "dynamic" with the phrase "subcritical hydronuclear."
Provide a detailed explanation as to why these tests
171 cannot be conducted aboveground like other tests that contain hazardous materials.
Replace the word "may" with the word "will."
172 Replace the phrase "hazardous materials" with the phrase substantial quantities of plutonium-239 and high-explosive compounds. Since the official use of the term "hazardous" does not include radioactive materials, the Final NTS EIS should make it perfectly clear what these experiments will
173 involve. The description should describe the up-coming experiments which will explosively disperse plutonium-239 particles in bare underground rooms which will then be abandoned. Indicate an upperbound figure for the mass of plutonium-239 that will be used in the experiments.

4.1.5 Hydrology
4.1.5.2 Groundwater
RADIOLOGIC SOURCES IN GROUNDWATER
Table 4-27. Remaining isotopic inventory under or within 100 m (330 ft) of the water table
p. 4-160 and 4-161

124. Describe in detail why this table is broken into two parts, the isotopes that are "Not On Pahute Mesa" and the isotopes which are "On Pahute Mesa." Provide a detailed, legal description of the boundaries that enclose the tests on Pahute Mesa. Describe if the "Not On Pahute Mesa" tests include the underground nuclear explosion tests in central Nevada and other states. Provide the quantities, of the isotopes in terms of their mass in grams as well as in curies. Provide a total figure for the mass of plutonium-239. I figure it to be around 0.7 metric tons.
174 State the number of underground nuclear explosions that were considered in the formulation of this table.
Provide the same kind of data for all underground nuclear explosions and declassify the existing source-term data for the 800+ individual tests.
Describe, in detail, the various regions of the underground environment that may be potentially effected by radioactive contamination. Describe the total volume, in terms of, cubic kilometers that may be potentially involved.
Better yet, computer model the potentially affected area around each of the 800+ nuclear tests.

PRIVATE CITIZEN 53 (CONTINUED)

Volume 1, Part B
GLOSSARY
p. GL-1
Add the following terms:
Big Explosives Facility, BEEF
Corrective Action Unit
Cut and Cover
Deep subsurface
Dipole Hail
Fission Product
Geologic
Geologic media
Indefinite
Neutron Activation Product
Operable Unit
175 Protective levels
Radioactive Source-Term
Render-safe mission
Source Material
Source-Term
Special Nuclear Material
Subcritical Test
Subsidence
Surface subsidence
Surfical soils
Subsurface
Threat-nuclear-device simulants
Unavailable
Work for Others Program
Zero Yield

176 For "Classified waste" on p. GL-4, line 18, cite the specific rules and regulations that describe and define this material as well as describe how information on it will be handled.

Volume 1, Part B
INDEX
p. Ind-1
Add the following terms:
Area 27 Complex
Big Explosive Experiment Facility (BEEF)
Central Nevada Test Area (CNTA)
Cut and Cover
DAF (Device Assembly Facility)
Device Assembly Facility (DAF)
177 Dipole Hail
Double Tracks
Faultless
Fission Products
Geologic media
Indefinite
Low-Yield Nuclear Explosive Research (Lyner site)
Lyner site (Low-Yield Nuclear Explosive Research)
Media
Nevada Environmental Restoration Project (NV ERP)
Neutron Activation Products

PRIVATE CITIZEN 53 (CONTINUED)

177 cont.
Operation Roller Coaster
Plutonium
Project Faultless
Project Shoal
Project 57
Radioactive Source-Term
Render-safe
Shoal
Source-Term
Subprojects, (NV ERP)
Threat-nuclear-device simulants
Work for Others Program

178 A great many of the page numbers in the index point to pages that contain no reference to the index term. For example:
For the term "Device Assembly Facility," 14 of the 23 pages listed, were incorrect pointers.

This ends my comments on the Draft NTS EIS January 1996,
(DOE/EIS 0243) Volume 1, Parts A and B

++

Vernon J. Brechin
May 3, 1996

PRIVATE CITIZEN 54

May 2, 1996

DEPARTMENT OF ENERGY
P. O. Box 14459
Las Vegas, Nevada 89114

TO WHOM IT MAY CONCERN:

This is in reference to your article in the Salt Lake Tribune on March 6. 1996, "Bitter S. Utahns Tell DOE to Close Nevada Test Site".

In December 1987, My Dear Mom, Afton Starley Law - Delta, Utah passed away from cancer due to the downwinds from the atomic blast. She was diagnosed with breast cancer in 1986 followed with a mastectomy, then in the summer of 1987 she traveled to Provo daily for radiation treatments for 7 weeks.

We still have family that live in Millard County and are concerned about the downwind. I am very concerned about my father, my children and their spouses, my grandchildren, my husband and myself.

There are lots of people from Millard County that have been diagnosed with different types of cancer. I had two very dear friends that are deceased now, because of the downwinders.

1 PLEASE SHUT THE NEVADE TEST SITE DOWN.

We have had enough heartache from the loved ones and friends that have been diagnosed with cancer and enough suffering from the patients. Plus the expense and hardships the families have to endure. PLEASE SHUT THE NEVADA TEST SITE DOWN.

Sincerely,
Linda Mabbutt
LINDA MABBUTT
P. O. Box 37
Delta, Utah 84624

PRIVATE CITIZEN 55

Dated: 4/29/96

Donald R. Elle
Director Environmental Protection Division
U. S. Department of Energy
Nevada Operations Office
PO Box 14459
Las Vegas, NV 89114

Dear Mr. Donald Elle:

I write to submit my comments on the draft environmental impact statement, for the Nevada Test Site (NTS) and off-site locations in the state of Nevada, for the continued operations of the NTS and other activities of the US Department of Energy (DOE).

The Draft EIS in general is very comprehensive regarding its coverage of the environmental aspects. This comprehensivness has also resulted in complexity. It is rather difficult for a viewer to understand the sequence of information provided.

The nature of this EIS is very different from most EIS's. It covers a number of sites scattered in the state of Nevada. Every alternative also has different sites. Alternative 1 and 2 are proposed on the same sites but Alternative 3 and 4 have additional sites of Eldorado Valley, Dry Lake Valley and Coyote Spring Valley.

The complex description of the environment and the environmental effects is hard to follow. Chapter 4 deals with a description of the related environment in great detail, for example, in the section covering Socio-Economics, employment rates in the US, in State of Nevada and in the respective areas are discussed. However, to compare these figures, one has to page over to the next chapter.

1 Although details are necessary and provide an in-depth view of the situation, the EIS should be more understandable. NEPA has set the page limitation requirements for the EIS's and in my view this EIS does not comply with this requirement.

2 The comprehensivness of the document also leads one to believe that most of the critics of this EIS will view only the summary and receive a general idea of the proposed project. This being the case, the summary for this EIS should provide all the necessary information to fully understand the situation. It should introduce all the aspects of various sections, which are detailed later in the document.

PRIVATE CITIZEN 55 (CONTINUED)

3 The socio-economics section of the EIS summary, only discusses the work force residing in each county, the population of Lincoln County and the unemployment rate. A more detailed description of the socio-economics section should be included in the summary.

4 For example the average annual earnings per job in Nye county tells one more of the socio-economic conditions than just its population. There is no description of economic indicators of any sort in the summary. It is absolutely impossible for a person to get any feeling of socio-economic conditions in these areas.

The summary does not have to be too comprehensive, but it should serve its purpose, it should summarize. In this case where the EIS is very lengthy and difficult for the public to digest, a very through summary is needed. In many cases the summary is the only part the public will read and it should include all the necessary information. After reading the socio-economic summary, the average reader should have a through understanding of the conditions on the sites of the proposed action.

I hope my comments are positive and can be used in the process of improving this Environmental Impact Statement. Thank you for your time.

Sincerely,

Saima

Saima Qureshy.

PRIVATE CITIZEN 56

April 30, 1996

Mr. Donald R. Elle, Director
Environmental Protection Division
U.S. Department of Energy
P.O. Box 14459
Las Vegas, Nevada 89114

Re DEIS for the Nevada Test Site and Off-site Locations in the State of Nevada

Dear Mr. Elle,

1 The information contained in the DEIS for the Nevada Test Site and Off-site Locations in the State of Nevada is not adequate to allow a reasonable judgment on the relative merits of the Alternatives. This applies in particular to the Waste Management and Environmental Restoration Programs. In view of the inadequacy of data, described below, an acceptable Alternative would combine Alternative 2 for the Waste Management Program and Alternative 4 for the Environmental Restoration Program. I do not see in the data base any justification for disposal of radioactive and hazardous wastes because of the primitive nature of the monitoring. A feasible solution while the monitoring is brought up to an acceptable standard, is disposal only of nonhazardous wastes and storage of all others in monitored above-ground retrievable structures.

2 The DEIS fails to provide even the most elementary site-specific characterization of the vadose zone in which most contaminants now exist, by virtue of underground tests and waste disposal. There appear to be no adequate monitoring systems in place to assess the distribution and transport of contaminants in the vadose zone. The nearest thing to data is the casual mention in the Summary (p. S-28) of field studies in support of assessment models, "which include monitoring of soil moisture and chloride ion concentrations." The conclusion reached (p. S-28) that "These studies and the absence of contamination support the conclusion that no groundwater pathway exists beneath the Area 5 Radioactive Waste Management Site" is like the conclusion reached for the Beatty, Nevada LLRW site, which recently has been shown to have contaminated the entire vadose zone laterally from and below the disposal trenches. The groundwater, sampled when the boring was completed in 1993, also is said to have shown no contamination. This suggests, since both at Beatty and NTS, groundwater is moving and volumes are large, the need to thoroughly monitor the vadose zone through which most contaminants will have to move to get to groundwater.

3 The report p. 4-168, Affected Environment, that 5 of 8 borings show evidence of transport of radionuclides in groundwater plus three additional USGS-monitored wells showing low levels of tritium contamination (p. 4-168-169) do not support the conclusion reached in the summary. Rather, this information attests to the inadequacy of the information—admitted on p. 4-168—on groundwater contamination. The virtual absence of information on contaminant distribution in the vadose zone indicates that much more thorough study of site-specific characteristics and mechanisms of transport is needed before further disposal of low-level radioactive and hazardous wastes is contemplated.

4 The discussion (p. 4-161) of leaching of radionuclides from rubble and glass appears to be incorrect. The statement "Depending on solubility of the radionuclides, the groundwater dissolves the residues until chemical equilibrium is reached" appears to assume that the groundwater is static.

The statement (p. 4-161) that, with time, "a better understanding of the true hydrologic source term could be had, like that on p. 4-168 that "evidence for transport of

PRIVATE CITIZEN 56 (CONTINUED)

radionuclides produced by underground nuclear testing is scarce," indicate the need for substantial upgrading of monitoring and actual distribution studies before contemplating further radioactive and hazardous waste disposal.

4 cont. Knowledge that radionuclides were dispersed into fractures reopened or created by underground tests (p. 4-162, 163) is not sufficient. Actual magnitudes magnitudes and 3-dimensional distributions of specific radionuclide contaminants should be goals of thorough characterization to allow establishment of a base line for determining redistribution rates and mechanisms.

From the statement on p. 4-163, there appears to be no information available on the quantities, types, or distributions of nonradioactive contaminants remaining in the subsurface. This knowledge would seem to be an essential item in thorough characterization for remedial restoration operations.

5 In view of the frequent citations of on-going USGS studies relevant to DOE's mission for the NTS and off-site test areas in Nevada, why is the USGS not a Cooperating Agency?

6 The state of ignorance about the nature, level, and distribution of contamination of the vadose zone at the Waste Management sites indicates the need for a fifth Alternative focused on thorough site characterization, comprehensive monitoring, thorough evaluation of mechanisms and rates of movement of contaminants in the vadose and saturated zones, and accelerated Environmental Remediation. Because the data presented in the DEIS are inadequate to allow respondents to reasonably decide among the Alternatives presented, I recommend revision that allows this fifth Alternative to be reviewed.

Sincerely,

Howard G. Wilshire Ph.D.
1348 Isabelle Ave.
Mtn. View, CA 94040

PRIVATE CITIZEN 57

May 1, 1996

CERTIFIED MAIL - RETURN RECEIPT

Donald Elle, Director
Environmental Protection Division
U.S. Department of Energy
P.O. Box 14459
Las Vegas, NV 89114

Subject: additional comments on the NTS EIS process

Dear Mr. Elle:

You may recall that I was the person who pointed out the connections between the DOE's Nevada Test Site, and the Air Force's secret airbase at Groom Lake (also known as Area 51), at the Las Vegas NTS EIS hearing.

The Nevada Operations Office appears to be delaying the handling of my Freedom of Information Act (FOIA) case NV96031101, dated March 6, 1996, until after the EIS public comment period. In my FOIA case, I sought the classified appendix to the NTS EIS (on the Lyner complex), and all memorandums of understanding between the DOE and the Air Force concerning the Groom Lake facility. Another activist has found a U.S. Geological Survey document that clearly shows Area 51 being adjacent to Area 15. Area 51 is what is obliquely referred to as land withdrawn under Public Land Order 1662 in Volume 1, Chapter 4, Part A of the NTS EIS. We can not provide additional information at this time identifying this document, until it has been used as evidence in the lawsuit against the Air Force, on behalf of the Area 51 workers who were exposed to toxic chemicals at the base (some of the workers have died since the lawsuit was filed several years ago.)

1 Another item that is not discussed in the NTS EIS is Sandia National Laboratory's FALCON nuclear pumped laser program [1], that evolved from work on the Strategic Defense Initiative (SDI or "Star Wars") [2] and a program code-named Centaurus for a reactor driven laser weapons [3]. Sandia's Public Affairs Office has not returned our call seeking the current status of the FALCON program. Is FALCON going to be based at the Nevada Test Site, as planned by Sandia? If so, why was this not mentioned in the EIS?

Sincerely,

Paul McGinnis
P.O. Box 28084
Santa Ana, CA 92799

5151 McFadden Avenue
Huntington Beach, CA 92649
phone: (714) 753-7864 x294
Internet: TRADER@cup.portal.com
http://www.portal.com/~trader/secrecy.html

References

[1] Dept. of Energy, Sandia National Laboratory. Ronald Lipinski. Reactor-pumped laser facility at DOE's Nevada Test Site. SAND 94-0074C. January 1994.
[2] Vincent Kiernan. Tests to verify if nuclear powered laser suits civilian use. Space News, September 17-23, 1990. Page 12.
[3] Dept. of Energy, Lawrence Livermore National Laboratory. Victor George. Centaurus Program: Reactor-Driven Laser Weapon. [censored and declassified document]

Private Citizen 58

Dr. Donald R. Elle Director
Environmental Protection Division
U.S. Department of Energy
Nevada Operations Office
P.O. Box 14459
Las Vegas NV 89114

May 1, 1996

Dear Dr. Elle,

Thank you for the opportunity to comment on the Draft Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada, January 1996. The following are my comments on the NTS EIS.

1) The overall layout of the document is very good.

1 2) There seems to be undue reliance on the 1977 Environmental Impact Statement.

2 3) Which is the Preferred Alternative?

3 4) The Resource Mgt. Plan in concept, is good. However, the goals will be difficult to accomplish.

4 5) It is difficult to make decisions when studies that would enhance decisions have just begun or are only in the early stages.

Private Citizen 58 (continued)

Page 2 Comments to NTS EIS

5 6) When comparing impacts of Alternative 1 and Alternative 3, referring to impacts of Alt. 3 as "similar" to Alt 1 is unacceptable. How can they be similar when activities are increased, scaled upward, etc.

6 7) In Vol 1, Appendix A, pg A-59 it is stated that a Solar Enterprise Zone has been established. How did this project proceed from no mention at all in the Notice of Intent to feasibility study in the Implementation Plan (Feb & June 1995) to utility-scale-solar-generating facility? I do not believe that this is ~~not~~ the proper format for this type of analysis. By inclusion in the EIS this implies acceptance as a viable project. This and the other projects are proposed only.

8) It is stated several times that various projects may require its own EIS. Any program of significance will require an EIS. (40 CFR 1508.27)

7 9) On pg A-74, line 14, Vol 1, Appendix A, it is stated there is an extensive radiation monitoring network in areas ~~in~~ surrounding the test site. Several of these stations have been taken off-line. Four air sampling stations have been reassigned to the Yucca

PRIVATE CITIZEN 58 (CONTINUED)

Page 3 Comments to NTS EIS

7 Mountain Project and several wells are now called inactive (pg 4-30, Vol. 1 Part B). These stations should remain part of the historical monitoring system to maintain continuity of data. The four air monitoring stations dedicated to the YMP and Well UE-19c should remain on line because they are located where they are needed most.

8 10) The Table on pg 4-8, Vol 1 Part A indicates underground estimated activity. A table similar to this should be created to indicate contamination in areas 11 & 13.

9 11) There should be a chart created for radioactivity in wells on & offsite similar to that on pg 4-145, Vol 1, Part A, for surface waters.

10 12) The Environmental Restoration Program, pg 5-7, Vol 1 Part B, raises inappropriate expectations that land clean up will allow a future use in the near future. This is unrealistic in light of ongoing studies such as Basic Environmental Compliance and Monitoring Project and others.

11 13) In regard to the Solar Enterprise Zone
a) as in comment #7, designation in Alt 1 & 3 as a foregone conclusion

PRIVATE CITIZEN 58 (CONTINUED)

Page 4 Comments on NTS EIS

11 cont. is inappropriate for the EIS (in my opinion).

b) Isn't this "project" something private industry should be doing?

c) Who pays for this? What is purpose?

d) Who are the customers? Who benefits?

e) Who retains profits? Who gets power?

f) On page A-76, Vol 1, Part A it is stated that a 138 kV power line proposal was withdrawn by Nevada Power. Why then is this solar power plant being proposed? Has "need" been demonstrated?

12 g) There is a discrepancy in statements on pg 5-165 and 5-37, Vol 1 Part B. "Recognition" of Devils Hole National Monument (pg 5-37) conflicts with "no impact" (pg 5-165). I strongly disagree that no impacts will occur with increased pumping for this project. The amount as stated has never been pumped before

13 h) Regarding your statement on pg 5-164, line 33 Vol 1 Part B, using applicable laws, the alternative energy project

PRIVATE CITIZEN 58 (CONTINUED)

Page 5 Comments on NTS EIS

13 cont. viability would be vulnerable (I believe you have it backwards)

14 2) On pg 5-160, lines 18-24 Vol 1, Part B, recharge is included in the 8,100 ac-ft/yr calculation. (R=2100; U-5,800; total 8,100) If Solar Enterprise Zone is built, the assumption is 1-3,000 ac-ft/yr above recharge. I believe it is incorrect to state the recharge value within the underflow value when claiming to "tap" underflow.

15 3) If water is withdrawn at a greater rate than the recharge rate then mining of water occurs. Mining of underground water has not been addressed.

Thank you for taking the time to read my comments.

Respectfully,

Becky Surka

5303 Stampa Ave
LV, NV 89102

PRIVATE CITIZEN 59

Comments to
The Environmental Impact Statement
for the
Nevada Test Site and Off-site
Locations in the State of Nevada

First issue: Government to Government
President William J. Clinton's Executive Order regarding Government to Government
DOE's own American Indian Policy
1 ***Government to Government is not being met, meeting with people from the tribes is not Government to Government and should not be considered as Government to Government. This Executive Order and Policy can only be followed when the DOE personnel and contractors meet with the governing bodies of the tribes, and meaningful information can be exchanged. This can not happen if the DOE does not inform the governing bodies on the actions that may affect the tribe and tribal lands. An information meeting will not be considered Government to Government.***

Second issue: NEPA
2 ***NEPA states that the tribes that may be impacted be consulted with. An informational meeting is not consultation. Consultation is much like communications, there needs to be knowledgeable and meaningful two-way dialogue. If one of the parties does not know what the other party is talking about, a knowledgeable and meaningful two-way dialogue can not exist.***

Third issue: Transportation
3 ***No transportation study has been conducted on reservation lands. Since the reservation is located in the transportation corridor, studies should have been conducted by DOE.***

Fourth issue: omitted subjects
4 ***The transportation section omitted the Moapa Band of Paiutes reservation lands.***
5 ***The president's Executive Order regarding Government to Government.***
6 ***The DOE's own American Indian Policy.***
7 ***Studies that should have been conducted on reservation lands, i.e. transportation.***

Fifth issue: Appendix G
I do not see the historical and cultural ties that the Las Vegas Indian
Center claims to have, to the Nevada Test Site. The Las Vegas Indian
Center serves the American Indians from other parts of this country. The
Board of Directors is made up of people, not necessarily from this area.
Also the there is no membership, in the Las Vegas Indian Center.
Therefore it is hard for me to make the connection of the Las Vegas
Indian Center having ties to the Nevada Test Site, Historical or Cultural.
There are no comments about; socio-economics, transportation, possible
health effects, and Environmental Justice. In Appendix G it is stated that
8 ***the tribes and tribal people could have input, but input was received with***
a fight. In my opinion Appendix G is the writings of eight people, and I as
a member of a Federally Recognized Tribe can not accept this writing.
Some members of this writing team are not from this area, the
coordinator and a member of BARA acted as though they were doing the
actual writing. It was with these two individuals that I had to argue my
points with. Also Appendix G is written as being from a non-native
stance, it seems as though someone on the outside looking in has written
Appendix G. Statements made were very soft and should have been made
stronger, Appendix G seems to have been written to satisfy DOE's needs.

Sixth issue: culture
This land that I walk on was put here for us to manage and take care of, the plants and animals were put here for our use. In order for us to continue to exist on this land we must protect what has been placed here for us. The land, water, air, animals, and plants are all part of my culture and my culture is what makes me who I am.

Calvin Meyers, tribal member
Moapa Band of Paiutes

This Page Intentionally Left Blank

This Page Intentionally Left Blank

PRESENTATION 1

THIS VERBATIM TRANSCRIPT CONSTITUTES

THE OFFICIAL RECORD OF THE

NEVADA TEST SITE ENVIRONMENTAL IMPACT STATEMENT PUBLIC HEARING

(EIS PRESENTATION - DON ELLE)

Held at the

CASHMAN FIELD CENTER
850 Las Vegas Boulevard North
Las Vegas, Nevada 89101

on

March 26, 1996
Beginning at
6:10 p.m.

TRANSCRIBED BY: Lana Stewart
Senior Verbatim Reporter

Bechtel Nevada
Reporting Services

KEY to Transcript Symbols and/or Abbreviations

Webster's New Collegiate Dictionary: "Verbatim -- in the exact words; word for word."

Dash: [--] Indicates a sentence not completed by speaker.

Dots: [...] Indicates something was said by the speaker, which, as spoken, is neither audible nor decipherable to the reporter or from the taped cassette recording.

(ph) Indicates phonetic.

(sic) Represents exactly as said by the speaker and is used to alert the speaker/reader to an error in the record.

Parentheses: ( ) Words within parentheses are reporter's explanatory comments.

VOICE: Indicates an unknown speaker.

Uh-huh: Indicates affirmative answer.

Huh-uh: Indicates negative answer.

LAS VEGAS, NEVADA, MARCH 26, 1996, 6:10 P.M.

ENVIRONMENTAL IMPACT STATEMENT PRESENTATION

CONDUCTED BY

DON ELLE, DIR. OF THE ENVIRONMENTAL PROTECTION DIVISION

ELLE: Welcome to the Nevada Test Site Environmental Impact Statement. My name is Don Elle. I'm Director of the Environmental Protection Division of the Department of Energy's Nevada Operations Office. And what I'm going to do is give you some information about what this document is and what it contains; and give you an opportunity to ask some questions, hopefully that I'll be able to answer in the general sense. And then we'll take a break. And then we'll have an opportunity for you to give us comments on what you've read and what you think about what we've done. And we have a Court Reporter that will be recording those comments so we can formally address them in the Final EIS.

And before I get started, I want to introduce the Manager of the Nevada Operations Office, Terry Vaeth; and the Acting Deputy Manager,

Joe Fiore, as interested observers in how this process works and the outcome.

The legitimate title of this document is a Draft Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada. We're talking not only about the Nevada Test Site, but some of the other locations in the state where we have conducted activities in the past and where we think we want to conduct some activities in the future. This Environmental Impact Statement is unlike other impact statements that you may be familiar with. It is not a project specific document. We're not talking about a building or a facility we want to build. It is a site-wide EIS. It talks about the Nevada Test Site; some areas in the state of Nevada. It talks about them in terms of land use; how we plan for the future, how we define the resources that we're going to use, and how they will fit within the future of the Nevada Test Site.

There are two other documents that are going to be having public meetings this week; the Stockpile Storage and Disposition Document and the Usable Fissile Material Disposition Document. Their meetings are on Thursday and Friday. Those are programmatic documents. They contain information and

they will define, for the Department, the programmatic direction and decisions. Those decisions that they make may influence the Nevada Test Site. And to the extent that this is a site-wide document we're talking about tonight, those alternatives and those decisions will be addressed in our Record of Decision. One of the things I want to try and stay clear on tonight is we're talking about our EIS, we're not trying to collect comments on those other two documents. You'll have an opportunity later in the week, Thursday night and Friday morning, to do that at the Sands Exposition Center.

So what we want to talk about is how DOE proposes to continue managing the Nevada Test Site and its resources in a manner that meets stakeholder concerns in the interest of affected and interested individuals and agencies.

We began this process in August of '94. We issued a Notice of Intent at that time. There was a 90-day scoping period where we had scoping meetings. We collected comments and information about what the public, what the stakeholders thought we should be doing in this document, the kind of decisions we should be looking at. We issued a Draft Implementation Plan in February of 1995. DOE, unlike other federal agencies, issues an Implementation Plan to relate to the public how we have treated the comments during the scoping period. We took another step, because the public asked to see this Implementation Plan before it was finalized, to see if we did a good enough job in their view. We issued it in draft form and we issued the Final Implementation Plan in July. Since that time, we've been working on the EIS itself, collecting information and putting the document together. And we issued the Draft EIS in February of this year. It's that big pile of paper with the pretty purple cover on it.

We're now in the public comment period. We have a 90-day comment period. It ends on May 3rd. After the 3rd of May, we will address the comments. We'll revise the document. We'll define a preferred alternative, and we'll issue a Final EIS. We do have four public hearings, this is the fourth. We have three workshops scheduled in the rural communities in April. So we are in the process of collecting comments to help us finalize this document.

I mentioned the scoping meetings that we have. In that process, there were many issues and questions that people had about what we are doing, primarily related to the alternatives that we

proposed. Initially, we proposed two alternatives; the no-action alternative, continued operations; and then kind of a fuzzy alternative that talked about expanded use and some other activities. The comments we received indicated that we weren't complete enough in that analysis, so we have four alternatives in this document; and I'll be talking about those in a minute. There was some questions about DOE policies; in terms of the NEPA process itself, the length of the comment period, whether we could look at a Draft Implementation Plan. So we addressed those comments by issuing the plan in draft.

There was questions also, from a policy point of view, about "why should we continue to conduct or be ready to conduct nuclear testing?" That's an issue that we've addressed in this document in the sense that it's not our decision to do that. It is a presidential directive that we maintain the Test Site for that capability. Transportation was an issue in the sense that people became aware before we started this EIS process about low-level waste and transport to the Nevada Test Site for disposal. We have a Transportation Study that has become part of this process in the EIS. There is an appendix that contains the Transportation Study that has had a lot

of stakeholder input and involvement in terms of what it contains.

Health and safety was an issue for people. We have put together a Health Risk Study and Analysis. It's also part of an appendix. And we use the information in putting together the impact analysis in this document. Resource management was of interest to a lot of people. "How can we manage the resources on the Nevada Test Site keeping in mind the principles of Ecosystem Management, the holistic view of how you manage a complex set of resources and activities on the Nevada Test Site?" So we have a framework for a Resource Management Plan as part of this document as well.

And then there were a number of comments that we considered out of scope. When we started this process, we tried to be clear that this is not a document that addresses Yucca Mountain, the suitability of the repository location. That's a process and there will be an impact statement at the end of the Yucca Mountain Site Characterization activity. We did address, as we addressed the cumulative impacts, we did address the impacts of their Site Characterization activities within our EIS.

So I've talked about some of the

issues that we had to deal with in this document. What does it look like, in general? There is a Summary. It's a fairly skinny little document that contains the essence of the rest of the document. Volume I contains nine chapters and a bunch of appendices. Volume II is the framework for the Resource Management Plan. And Volume III will be issued with the Final EIS and will contain the comments and how we addressed the comments.

I mentioned a number of chapters in this EIS. If you look at that list, it's a fairly standard list of information the way EISs are put together. There are a couple unique features of this. One is Chapter 4 which talks about affected environments. I mentioned earlier that we're talking about not just the Nevada Test Site, but several places in the state of Nevada where we have done and will propose to continue doing activities. The Nevada Test Site and Tonopah Test Range is addressed in this document. There are two areas on the Nellis Air Force Range where we have conducted activities in the past. And we're going to have to do some remediation activities. The Central Nevada test area and the shoal area are places we have, in the past, conducted underground nuclear tests.

10

One of the things we talk about in this document are Solar Enterprise Zones. We're proposing -- we've analyzed three sites in Southern Nevada and a site on the Test Site, the talks about the potential for placement of solar power production facilities. And in terms of the complexity of this document, if we talk about eight environmental settings, that is a piece of why this document is so big.

Chapter 8 talks about consultation and coordination. We have cooperating agencies with the Fish and Wildlife Service, with Bureau and Land Management, Defense Nuclear Agency, and the Air Force. We've taken the additional step of adding Nye County as a cooperating agency. It's not something that is usually done by the Department. But Nye County is a site of the location of the Nevada Test Site and they have information that has been useful to us in putting this document together.

Chapter 9 talks about preparers and contributors. There's a long list of people that helped write this document. One of the unique contributors to the document has been the Native Americans. We have a Native American Writing Group that was created out of the coordinated group we have

Bechtel Nevada
Reporting Services

11

with 17 Native American tribes. They've actually written an appendix to the document. We've taken information from their appendix as their cultural view of some of the alternatives and information we have in our EIS. So you can see the contrasting views based on their culture and their religion.

I mentioned the appendices to the document. That again, is a fairly standard list of appendices except for two of them. We have two project specific appendices that talk about research facilities that we have on the Nevada Test Site. Appendix F talks about the big explosive experimental facility. That's Lawrence Livermore's facility where they can do explosive testing. Appendix J is a classified appendix, the Los Alamos National Laboratory's Lyner facility. It's classified in the sense that the activities we talk about are classified. We've taken the information, the environmental impact assessment out of that appendix and included it in Chapter 5, so you can see what we're talking about from that point of view.

I mentioned that we have four alternatives. The first alternative is continued current operations, the no-action alternative in the EIS sense. We have a second alternative where we talk

Bechtel Nevada
Reporting Services

12

about discontinue operations; essentially closing the gates at the Nevada Test Site, maintaining security, and doing some environmental monitoring to make sure it stays the way we leave it. We've analyzed the impacts of doing that. Alternative 3 is the expanded-use alternative where we've tried to look at and collect information about everything that people can think about using the Test Site for in the sense of it being a national resource. We've analyzed those activities and the impacts and talk about them in the document. Alternative 4 is an alternate use of withdrawn land. We had -- during the scoping period, people asked why we couldn't return some of the land to the public domain. So we've analyzed activities and things that we could do on the Nevada Test Site, either returning some land to BLM, or do some educational, other kinds of research activities that have not been done in the past. I want to point out, and the note on this viewgraph says, "When we issue the Final EIS, we will identify a preferred alternative." That preferred alternative may not be any one of those alternatives but it may represent pieces or activities out of each one of them. So we will create an alternative that represents what we think is the best use of the resources that we have.

Bechtel Nevada
Reporting Services

13

In addition to the eight environmental settings we talk about, we have five program areas that bring money and research and activities to the Test Site. So we've analyzed and put information in this document within those five categories. The defense program, the underground nuclear testing, the stockpile stewardship and management activities is a category of activities we analyzed. Waste management, disposal of both low-level waste that we generate on the Nevada Test Site from our own operations, as well as disposal of low-level waste from a number of DOE generators across the country, we've analyzed that category of activities. Environmental restoration is a category activity that is devoted to cleaning up past contamination or removing industrial sites that we no longer use. Non-defense research and development is a category of activities. For example, the Spill Test Facility is used to test hazardous chemicals, either spills and how you clean them up. And it is a non-defense research and development activity. Environmental technology development is another category that's in this one. And people have talked about, or proposed, using the Test Site as a place to launch commercial rockets for putting satellites into

Bechtel Nevada
Reporting Services

14

orbit. That is a kind of activity that we can talk about in that area. Work for others is primarily a defense-related category of work where defense agencies need a secure, large remote location for doing some training activities. Those kinds of activities are in there. And if you look at those five program areas, you need to have an infrastructure that would support whatever it is that's being done. So in addition, we've analyzed site support activities, maintenance of power of roads and water, and facilities for people to conduct their activities.

I talked about the eight environmental settings, the five program areas. There are 12 resource elements that we also analyzed in terms of the impacts of those activities or those programs on the resources that we have to deal with. The land use, transportation, geology in soils, cultural resources, each one of these are analyzed across the four alternatives and the eight environmental settings, and the five programs. So if you've listened to me talk about the way this document is put together, it ends up being a very complex document. You are able to take an activity in an alternative, in an environmental setting by resource and look at what that activity is, what it represents

Bechtel Nevada
Reporting Services

15

in terms of a potential environmental impact. When people ask me what part of this document to read, my answer is, if you can read the summary and understand its content pretty well, then you don't need to read the rest of it unless you're very interested in a lot of detail.

Let me talk for a minute about some of the issues that we have analyzed in this document and have influenced its content on how it's put together. As I mentioned, waste management is a big issue. We looked at environmental restoration waste. We've looked at defense surplus material waste as a category. And we've analyzed the impacts of disposal of those materials on the Test Site. If people would look at the Waste Management Programmatic EIS and some other documents, you may see differences in numbers that exist between the two documents. And primarily, they're differences in time frames and waste content that were analyzed in the two documents. And we believe our document has the best information possible to gather at the present time.

The state of Nevada filed a lawsuit some time ago and they have information needs that need to address that lawsuit. There is information in this document that will go a long ways

Bechtel Nevada
Reporting Services

16

to answering some of the questions that the state has raised. Consistency has been a problem because -- or an issue or a challenge -- in the sense that as DOE makes decisions about future activities, they create programmatic EISs. They create different alternatives that influence what may happen at the Nevada Test Site in the future. The Stockpile Document and the Material Disposition Document come into town this week. Those two documents have influenced how we deal with what we've put in our EIS. We believe we've looked at, in the best way we can, as much information as we can put in a document. And we think we are as current as those documents can be.

The transportation risk was a problem. People had a lot of questions about how you will assess transportation risk. One of the things they were uncomfortable with was just using a computer module where you put information in and you get information out without knowing what it was or what happened to the information. So we've created what is a RAD/TRAN (ph) like model. RAD/TRAN is a classic computer model. We've opened up the process so people can look at the content of the analytical work to see what happened and how those assumptions got handled in the model itself. The transportation risk, as it is

Bechtel Nevada
Reporting Services

17

in the document now, focuses largely on low-level waste shipments. It contains a lot of information. It addresses the maximum case that we can identify in the sense that one of the alternatives DOE is considering for the Test Site is a receipt of all the low-level waste generated by DOE. That analysis is in this document as well.

Health risk is a question people have. We've analyzed routine operations. We've looked at the maximum reasonably foreseeable accident that we could picture on the Test Site. We've analyzed that. And we've done a groundwater model and a groundwater assessment in terms of we know there's a lot of radioactivity in the groundwater. What happens to that into the future? We conduct a lot of monitoring around and on the Nevada Test Site and we have not identified radioactivity in the off-site environment. And we make the statement in this document that we don't believe we'll see radioactivity off the Nevada Test Site or the Nellis Air Force Range at all.

People have questions about underground nuclear testing. President Clinton is trying to, or is very interested in negotiating and achieving a comprehensive Test Ban Treaty where we

Bechtel Nevada
Reporting Services

don't do any underground testing. So trying to be consistent with his objective, we've created two scenarios for this document. The first is a no-testing scenario where we just maintain the capability to do that. The second scenario is, if the President directs for whatever national security reason that we do a test, we have analyzed the conduct of an underground nuclear test, we've identified the impacts. And that information is also in the document. And then the Secretary some time ago identified the fact that we're going to conduct subcritical zero-yield tests. She issued a press release to that effect. Those tests are also analyzed in this document. I mentioned the classified appendix and the environmental impact information that's contained in Chapter 5.

One of the things we've tried to do in this document, is in Chapter 4, lay out the environmental baseline. What is the baseline for environmental impacts on the Nevada Test Site today? And we've tried to present information in a way that people can look at historic activities in the context of an environmental baseline and what we have today. We know we've conducted atmospheric tests. There is some residual radioactivity on the Test Site. We've

done safety tests where we've conducted tests on the surface. There is some residual radioactivity remaining from those activities. We've done shallow borehole tests. When we did the plousure (ph) activities, we produced SEDAN crater and a couple of other craters like that. And we've done low-level waste disposal activities on the Test Site in several different ways. We have shallow trench disposals where we've excavated a trench and we put material in it and cover it up. We've done shallow boreholes where more highly radioactive material needs better containment, so we have that kind of activity. And when we conduct an underground nuclear test and it creates a crater, we've used some of those craters for disposal of low-level waste as well. And then, of course, we've conducted underground nuclear tests. We've done that above the groundwater. We've done it below the groundwater. In a number of cases, we've conducted tests in the groundwater. So we've created information in this document that summarizes the quantity of radioactivity that remains within about 300 feet of the groundwater, either above it or below it.

There are tables in this document that summarize those categories of tests, how close

they are to the surface, and the kind of radioactivity that remains. The framework we're trying to -- or the picture we're trying to build here, is that people are concerned about low-level waste disposal. There is a large volume of that material being disposed of. But in terms of the radioactive content, it does not compare to the remainder of the radioactivity that's in the ground from underground nuclear testing.

I've mentioned that we've put information in this EIS that talks about radioactivity in the groundwater. We've never before published information by identifying the isotopes, the radioactive material itself, and the quantity. We have declassified this information. It's in tables in the document. People can look at that information and analyze for themselves what it is or what it represents.

As you walk around and look at the displays that we have here, we've tried to create other ways to see data and information. This is a 3-D computer-generated picture of the Test Site, of Yucca Flat actually. And this kind of greenish thing is the surface of the groundwater as we understand it to look. This is the surface of the Test Site, the mountain ranges. And then the blue dots represent

underground tests that have been conducted above the groundwater. The red dots represent those tests conducted in or below it.

So we've put together all this information and we have a lot of words and a lot of data. What does it represent in terms of adverse impacts? Now, we summarized the results of these analyses by an alternative. We identify programs with unavoidable adverse effects. And we summarized the impacts in terms of what is going to be the impact into the future. Certainly, underground nuclear testing for each of the alternatives, the historic impact is something that's going to be there for a long time. And we've identified that and put information in the document about it. If we did conduct an underground nuclear test, which we have the analysis for both Alternative 1 and Alternative 3, that would be another addition to the impact. Training activities in the sense that they use large areas, there is a land disturbance and associated impacts related to that. That's a category of activities that happens under work for others.

In Alternative 2, the underground nuclear testing, the historic impact remains. Alternative 2, if you remember, is that one where we close the Test Site. We don't do any cleanup of what we know needs to be cleaned up, so that the impact remains of those contaminated conditions would persist into the future.

Alternative 3. There are a lot of activities that we address in Alternative 3 and a lot of programs. Again, if we conduct an underground nuclear test, that would be a significant impact. The training activities, as we talked about in Alternative 1. When we talk about construction of a solar power facility at any of these Solar Enterprise Zone sites, we've identified the land disturbance and associated impacts would be significant in the sense that they require large areas of land. The land use would be modified and there probably would be visual impacts as well from the facilities that were constructed.

For Alternative 4, it does not include any defense-related activities, although it does include the Solar Enterprise Zone activities. And you end up in the same place with the impacts in terms of land disturbance and alteration of land use and visual resources.

We've also analyzed and summarized the cumulative impacts in this document. The

cumulative impacts not just of what we've, or the Department proposes to do, but the impacts of our activities in concert or in addition to those activities that are conducted in Southern Nevada or around our facilities. When you look at cumulative impacts from that point of view, the things we're proposing don't result in a significant contribution to the larger impacts, resulting from the expanding economy and growth in Southern Nevada.

So I've summarized in general what this document is, what it contains, and how it's built. What are the next steps for us in this process? We're going to collect your comments, we're going to look at them. We're going to modify the document. We're going to issue a Final EIS. It will include how we address your comments. Thirty days after that or some time longer than 30 days, we'll issue a Record of Decision. The Secretary will define what it is out of this document, define those activities that we are going to conduct on the Nevada Test Site. If those activities have an environmental impact and we can mitigate it, we'll issue a Mitigation Action Plan following a Record of Decision. That lays out a process that commits the Department to activities that will mitigate whatever impacts are

defined. I should point out, that at the same time that this document is finished, the Resource Management Plan will be an on-going process where the public can have an input into how we manage the Nevada Test Site and its resources in terms of Ecosystem Management and consistent use of resources and facilities.

And I started out this discussion by saying that we're very interested in public comments. And we've had four meetings, this is the fourth public meeting. We have 18 public reading rooms. The information in this document is in those reading rooms. We have opportunities for people to give us comments in a lot of ways. Not only do we have these four public meetings that we've already conducted, we've scheduled three workshops; one in Tonopah, one in Caliente, and one in Boulder City during the month of April, where we hope to collect additional comments and feedback on the content of the document.

I mentioned that we can receive comments in a lot of ways. We can get oral comments. We can get them tonight as you present your comments. We have an 800 number. We have a regular number. You can write your comments to me. You can FAX them to

us. We have an E-Mail address. If you want to do that electronically, you can get on the Internet and send us information. In the short term, we will have on the Nevada Home Page, the Summary Document, so people can look at it from a computer point of view and be able to give us input from that point of view.

This slide is a little old and out-of-date, but it shows you where we've been and when we were there. We're in Las Vegas tonight. The other meeting I mentioned Thursday and Friday of this week, the Disposition of Fissile Material EIS and the Stockpile Stewardship and Management documents, we will be presenting joint meetings where you can listen to them talk about their documents and talk about the alternatives that may or may not impact the Nevada Test Site.

And as I said at the beginning, the purpose of this document and the purpose of these meetings, is to help us put together the information that we need so we can continue to manage the Nevada Test Site and its resources in the manner that addresses your concerns and those of the affected and interested individuals and agencies.

And that's the information I have to tell you about what this document is. And the way we've structured this process tonight, we have a few moments for some general questions about what I have said, then we're going to take a break for a few minutes. And then we're going to have an opportunity for people that want to give us comments, to come to the microphone and give us your name and then give us your comment. So I'm open for some simple questions. Give us your name, too, when you do that.

* * * * * *

Bechtel Nevada
Reporting Services

This Page Intentionally Left Blank

This Page Intentionally Left Blank

This Page Intentionally Left Blank

PUBLIC HEARING TRANSCRIPT 1

THIS VERBATIM TRANSCRIPT CONSTITUTES

THE OFFICIAL RECORD OF THE

NEVADA TEST SITE ENVIRONMENTAL IMPACT STATEMENT
PUBLIC HEARING

(Public Comments)

Held at the

DIXIE CENTER CONVENTION FACILITIES
425 South 700 East
St. George, Utah 84770

on

March 5, 1996
Beginning at
7:00 p.m.

REPORTED BY: Lana Stewart
Senior Verbatim Reporter

Bechtel Nevada
Reporting Services

KEY to Transcript Symbols and/or Abbreviations

Webster's New Collegiate Dictionary: "Verbatim -- in the exact words; word for word."

Dash: [--] Indicates a sentence not completed by speaker.

Dots: [...] Indicates something was said by the speaker, which, as spoken, is neither audible nor decipherable to the reporter or from the taped cassette recording.

(ph) Indicates phonetic.

(sic) Represents exactly as said by the speaker and is used to alert the speaker/reader to an error in the record.

Parentheses: ( ) Words within parentheses are reporter's explanatory comments.

VOICE: Indicates an unknown speaker.

Uh-huh: Indicates affirmative answer.

Huh-uh: Indicates negative answer.

LIST OF SPEAKERS

ST. GEORGE, UTAH, MARCH 5, 1996, 7:00 P.M.

PUBLIC COMMENT PERIOD

BARBARA HOLT PRESTWICH

PRESTWICH: I'm Barbara Prestwich. I'm here as a private citizen, but I'm also in a group in the Cedar City area that is concerned with -- we call

1 ourselves Citizens for Safe Utah Roads. We're concerned with impact of additional trucking on our roads through our community. And we are concerned

2 with specifically the proposed Antelex (ph) Mine Site that's going to bring a lot of additional trucks

3 through our towns and down I-15. I think one of the big concerns that we have is concern with transportation of any waste. And as you said, you're not talking about the high-level waste at this point. But as I've looked at these alternatives -- and we haven't had much of a chance to really look these over

4 before tonight -- it appears to me that I would like to speak in favor of a combination of Alternative 3 and Alternative 4. But going through the impacts of these, I think that I would like to state that I think it's really important that we don't do any activities

5 there that will generate more of the kinds of nuclear waste problems that we've already got.

Now, I recognize the fact that presidential decisions could impact what would take place there. But I think that short of an extremely serious, and hopefully never to come about national

6 security situation, I think that we should be really careful that we don't do anything there that generates more waste of the kind that we've had problems with.

7 And I have some concerns with specifically an Alternative 3: Approximately 900,000 cubic meters of low-level waste and 250,000 cubic meters of mixed waste would be generated on and off the site in a ten-year period. This is a technical document and I'm not clear where that's coming from. But that concerns me a lot. I'd like to know where it's coming from, and why we have to have it, and is there any way to avoid it?

8 I'm also concerned with Alternative 4's impacts in geology and soils where it says soil contamination and an increase in erosion potential. And particularly, the soil contamination, what kind of activities are we going to do that does soil contamination? In other words, this environment has already been beat to pieces. I think that

9 whatever we do that takes place there must consider the fact that we've got to stop destroying the earth and we've got to stop destroying that place,

10 specifically. It's a little hard to decide if we think that Alternative 3 or 4 would be good in terms of this solar development you described, because we haven't heard enough specifics about what it really is, so how can we speak in favor or against it? But I think we have to be really careful of that big picture, that we don't cause ourselves more problems;

11 and especially if we have -- if this study has any impact on future decisions about high-level nuclear waste being brought through this area or brought near there, I plead and I hope that we can do something to stop that from happening.

Thank you.

ELLE: We can talk about some of your comments or questions later. And I guess I -- at some level, I'm uncomfortable just hearing a comment without responding, but I'd rather just collect the comments and then we'll figure out what to do next.

Scott Prisbrey.

SCOTT PRISBREY

12 PRISBREY: My main concern is the transportation end of the waste products through our Southern Utah area and through the Northern parts of Nevada. And I know that they're working on something to seal the material in a type of a cask that is indestructible but probably would solve the problem. But what you see with our train accidents continually happening and truck accidents, but the trains -- all those trains have been burning now. And I hope that whatever they're providing to cause -- to take care of the problem needs to be really a good product.

Thank you.

ELLE: Appreciate your comment. Dave Timothy.

DAVE TIMOTHY

TIMOTHY: I have had extensive experience with the Department of Energy's Testing Program and how they work. I believe that I'm as qualified as anybody to have a concern about what happened. One of my interests with the DOE is, you started these tests in the '50s. Don't you think that it would be fair to

13 finish the first test that you started? You were not very concerned about the effects on people. And I'm kind of concerned that you may be more concerned about the turtles and their habitat then what us people had before. We were drafted, in effect, into the Military's Testing Program; many of us as children, without our knowledge or consent. We have, many of us, yet to even be acknowledged as being victims of this testing program.

I grew up in an area out in Northeastern Utah, a place called Alta. Dr. Robert Penalton (ph) had three monitors set up within three miles of my dad's dairy. Those were consistently the three hottest monitors in the state. The amounts that those monitors were reading was absolutely unbelievable. While this was being done, the Department of Energy was telling people, "This is safe. This won't hurt you. No reason to be concerned or worried." And yet, after a ten-year incubation period, I have thyroid cancer. I lost my thyroid, parathyroid. I lost most of my lymph nodes. I lost all of my muscles from here to here; (Indicating) many, many operations; many, many thousands and thousands of dollars of surgical bills. I have been disabled. The government refuses to even acknowledge

14 that I might have been damaged. What about disability? What about compensation along with finishing tests? And we have a lot of doctors, physicists, Ph.Ds that can tell us what's going to go on and what's going to happen. We have government officials that's been telling us, "This won't bother you. This won't hurt you. Here's what we're going to do." And then years later, we find out that isn't what was done, and it did hurt us, and it did damage us. And it damaged the land. It had a lot of effect on a lot of people. Now, we're here to do a new program when the old one isn't even finished. Don't you think it would be fair to finish some of the old things first?

ELLE: Well, to the extent that I can answer that question, I think we have tried to define what the existing baseline is. I can't answer your question about finishing tests that were done in the past.

TIMOTHY: I'm concerned about these imaginary fences the fallout doesn't go over, and that contamination can't escape from. We live in an area where there's winds. We have a lot of things. How many people do you think are aware that each of those underground tests had a great big huge vent to it;

and when they set these blasts off, this radioactive fallout is belched out on the ground to be blown any way the wind blows? Are you aware that this is how the underground -- the safe testing was done?

ELLE: We have tried to summarize in this document the results or the consequences of past tests.

TIMOTHY: Okay. I believe that there
15 should be no further testing of any type relating to nuclear at that Test Site. I believe that that Test Site should be permanently closed as to any military nuclear-type testing. Okay? I believe that it should be returned back to the people whom it was given to.
16 That is sacred grounds for the Indians that was taken from them. Part of that is their sacred burial grounds. I think that there's been a lot of injustice done. I think that this should be returned back. We
17 don't need a disposal facility like up in Northern Utah where the gases or the biological can escape. We don't need any further damage to us or this country.
18 I believe that this should be returned back to public use as much as safe to be. And I am absolutely,
19 totally against any storage or disbandment or supposedly elimination of future problems there.

Thank you.

ELLE: The next person was Paul Bevan.

PAUL BEVAN

BEVAN: My name is Paul Bevan from St. George, Utah. My subject is addressed mainly to the transportation of the heavily impacted area that we live. And to be concise and brief, I'd just like to read this statement which I'll then submit to you.
20 "A safe highway route around St. George, Utah, for nuclear waste shipments on Interstate 66 and it could even be Antelex (ph) type of heavy truck traffic. The attached map of the USA shows the proposed interstate highway routes for shipping nuclear waste to the Southern Nevada proposed nuclear waste repository as printed in the Salt Lake Tribune. More than one-half of all North American nuclear waste is to be shipped through the center of Cedar City and St. George, Utah. Interstate 15 is overcrowded in these cities and there is a high rate of heavy-truck and semi-truck wrecks, especially in the Virgin River gorge portion of Interstate 15. The state of Nevada and Las Vegas City is planning to build railroad systems to divert the rail shipments of nuclear waste completely around the north of the Las Vegas region to diminish the

possibility of shipping incidents. Their proposed highway shipments of nuclear waste can be completely diverted around St. George City, Washington County, and Southern Utah on the newly proposed Interstate 66 and Southern Corridor Highway and delivered to the Nevada Test Site on Interstate 66 and completely avoiding the Las Vegas Metropolitan region. Interstate 66 is the proposed 21st Century, six-lane, high-speed freeway to cross the Transcontinental United States from coast-to-coast and not to cross or enter any metropolitan areas. This new Interstate 66 will be built on the spine concept with traffic connecting to the mainline of the freeway with connector freeways from the metropolitan areas.

The most physically challenging and critical section of the Interstate 66 is between the Virgin River gorge of I-15 and St. George, Utah
21 and Page, Arizona. If this section is built first, then the nuclear waste shipments would be routed around St. George to the south and avoid the St. George City area altogether. If the nuclear depository (sic) is created in Southern Nevada, then the highway to transport the waste through Washington County should be built first.

Our -- my main position is of the

very attractive life-style that the mountain states and especially Southern Utah offers to people. I believe with good planning and execution, we can preserve that a-way-of-life and still accommodate the necessary activities of modern civilization.

Thank you.

ELLE: Thanks. The next person is Phil Peterson.

PHIL PETERSON

PETERSON: My main concerns are, as I listen to you tonight, I hear much of what I read that went on in the past; that being that decisions have somewhat already been made. I find it interesting of your comment in regards to best judgment. I find it interesting in your comment that, number two, closing the Test Site is basically a nonalternative. I think
22 also that is somewhat of a misstated alternative in the fact that what many of the comments were in the prior meetings here was to close the Test Site and to clean it up. Your Number 2 is talking about closing it, leaving as is. I don't think that was the alternative that we presented at that time.

I, like the other gentleman, find

14

23 it quite interesting that there is still in Alternative #1, a nonrecognition of the factor that the underground testing is still a risk to the people here, not just the turtles. I find it interesting that your only other al -- bad scenario is turtles. I

24 also am offended by the recognition -- or nonrecognition of the government to the legitimate rights of the Native Americans of that area. As to the fact that ground was stolen from them for that, and now your comment's being that even though they have made items within your EIS, you don't know how you're going to reconcile them; which to me says we're not. Those Native Indians have been totally ignored, and I see in the comments that are made tonight, they still will be.

Thank you.

ELLE: Thank you. Laurie Wilkinson. Richard Cuthrell.

RICHARD CUTHRELL

CUTHRELL: First of all, may I ask a couple of questions? Where are you from, sir?

ELLE: Las Vegas.

CUTHRELL: Las Vegas. You live in Las

Bechtel Nevada
Reporting Services

15

Vegas?

ELLE: Yes.

CUTHRELL: Well, that would be all right if we could keep the thing in Las Vegas, but unfortunately, it has spilled over here. Have you ever been in an atomic bomb blast?

ELLE: No.

CUTHRELL: I have. You ought to try it some time. I'll tell you, I find it most objectionable. In fact, I find the whole Department of Energy objectionable in the things that they have done in the past. People are -- there's graveyards full of people that they have -- I'm sorry, this makes me a little nervous. But there's graveyards full of people; that for no reason at all, other than the fact that they happen to be out at the time, that they were not warned that those tests were going to occur, are there. In Nuremberg, the Nazis were tried and for war crimes. And yet, you have genocide here and all throughout the United States and elsewhere. I was -- my -- I happen to be on a ship at the time out in the South Pacific.

Now, you're wanting to -- I understand you're wanting to transport this radiation through this area. My proposal is, sir, that you

Bechtel Nevada
Reporting Services

16

25 downsize the whole Department of Energy and turn it to oblivion. And I'm trying to hold back my disgust, sir.

ELLE: Thank you. Lloyd Cannon.

LLOYD CANNON

CANNON: I'm Lloyd Cannon. I was born and raised here in Southern Utah. I was a young man when I come back from the Korean War. I took up the job of driving CAT (ph). And there's a lot of guys going around with the Geiger counters and hot spots, and mine was right in the middle of the radiation from where the bombs set off. And we one time was working out above Pioche, Nevada, and there was eight of us at one time; and they set a bomb off 11 o'clock in the morning and the sun was so bright. And there were only three of us left from out there. My son was born with a decayed hip. Bone was decaying but he's doing fine now. And the woman who was out there, she was pregnant when this bomb went off. I'm telling you, it's hard to see this little child, she's still -- this has been -- this was in '55 and the baby is still growing. It's deformed and it makes your heart ache to see what this has done.

Bechtel Nevada
Reporting Services

17

Another brother out there with us, he lost a child. His wife was pregnant and was born. I buried my youngest brother from radiation, from lung cancer. And I buried my wife in '85 of cancer. From driving CAT, I've got burns here on my neck to prove it. And I've got a spot here that has been checked by the Mayo Clinic in University of Utah. There's a lump there, and once in a while it gets so bad that I can't touch my face. They can't do nothin' about it and won't let them. So it's a sad situation when you see what we have, this radiation and stuff we're kind of throwing on to people here in the Southern part of Utah. Like I say, there -- they say there's a distinction of the turtle stuff, I guess the bomb stuff killed more turtles than -- our animals and stuff rather than anything else.

And also, we had a farm down where the Bloomington is that was called Price Banks (ph), we had a dairy herd down there. And we'd get up in the morning and watch this cloud of dust come in. And I've seen the cattle that we've had literally out in the pasture, their hair has been eaten and come up clear up to their knees from radiation stuff. And they've told us not to ship the milk, to dump the milk for a month and stuff. This is what we had to contend

Bechtel Nevada
Reporting Services

with. If they had come out and told us the truth, it would have been okay, but they'd never tell us this. And a lot of us would come out, and we thought it was great to get up early in the morning to see the big flash. It's heart-breaking to see friends that we've lost here in the Southern part of Utah.

Thank you.

ELLE: The last one I have is Claudia Peterson.

(NO COMMENT FROM CLAUDIA PETERSON)

ELLE: Well, does anyone else want to make a final comment?

LLOYD LEAVITT

LEAVITT: I wasn't here for your introduction. My name is Lloyd Leavitt. I'm a native here of St. George. I haven't been here too many years, retired, but I have been out in Nevada for 40 years working in a large ammunition depo north of Hugh (ph) at the Hawthorne (ph) for 40 years. And I think I did the first experimental bombing with live bombs to test to see what effects that would have on the dam, Boulder Dam at that time; two years prior to '51 before they started the actual testing.

But anyway, my main purpose here or my thoughts are, I have made many trips to the Nevada Test Site. I have been down in the mine. I've been down in the tunnels. I've seen where they've made the blasts. I have seen the subsidant craters and the other blasts and the contaminated areas. And I realize this is a highly controversial and emotional thing that we're dealing with here at this time. However, my personal opinion, and I realize and I think that many injustices possibly may have taken place earlier. I knew of Barnsley, your Director, a few years ago. And he said to me one time, he said, "If we knew what we know now, we wouldn't have done the things that we did early in the program, that we learned from from our mistakes." Rather than going on too long with this, my point is this: This is 1996. Whatever damage that has been done, has been done. And for many people, it's very sad. However, I think we should pick up and stand up and realize where we are today. In other words, what I've been hearing, and I came in late, all I've heard was, you know, the past and all the bad things we've done. But what are we going to do in the future? This is the thing I think we have to look at. We all know -- we pretty well know what the history is of the past. And we

know all the allocations and the things that have been said. So what can we do March 5th, whatever, 1996, from this point on? We've already had our problems, now what can we do to solve them? And I think this needs to be examined as to find out what contamination
26 we do have left on the site, what might be returned maybe to the states or other areas.

But my -- now this is -- and I understand you're going to take up a different issue -- that you didn't want to take up the storage issue tonight, that's a separate issue. But I'd like to just express an opinion concerning that, if I might. Inasmuch as the government already has a -- owns the so-called -- has the property now, it's already been contamination. It's already contaminated. And there's many acres that will probably never be of any use to anybody of any great
27 significance as far as recreation and things of this nature. So inasmuch as you already have it, inasmuch as it's already isolated, inasmuch as it's in the capacity that it is, I think it would be ideal, in my opinion, for a storage area. And I have several reasons for saying that. I've seen the studies, the geological studies that you've made there, which I don't suppose there's any acres of ground that have

had more intensive geological studies then what the Department of DoD has put out in that area. And the water table is so low and moves so slow, that it's worse contamination from anything from a storage area. I don't see where this would be a problem, because the lack of rain fall and the surface water would never get to a point where it would get beyond the valid. From that standpoint. And also, it's isolated. It's one of the most isolated points in the United States. And in that condition, inasmuch as we're putting this waste into the swimming pools and keep building them bigger and bigger and bigger at every energy station that we have throughout the United States, it's getting almost impossible. We've got to do something soon to do something with this material. And I think that would be a good place to deposit it and put it in there. I realize, politically, that you're going to get hit from every side.

I've also seen some of your experiments concerning transportation. I hear a lot of words about transportation and the hazards in transportation. I -- all I've seen is what you people have shown me, so all I have seen is trains being rushed into a solid wall with tanks and the trucks;

radio controls going at 70 miles-an-hour, hitting a solid rock wall with these containers. And from the evidence that you showed me, and of course, that's the only evidence we have, that it hasn't been done by, as far as I know, from an outside agency. It may have been done, I don't know, but I haven't seen that. So the only evidence I have seen, it shows that it would be safe with transportation. Now, you go to great extents in moving this material through the area; however, I think a lot of suggestions here were wise. I think there are some routes through Nevada that has concerned many people, that it could be routed down through Pioche or Ely or something down in that area, where it could come down from the north and enter the area without going through any great metropolitan area. I think there are routes throughout the United States that that could be achieved.

I guess basically that's all I have to say. I'm taking a group down this weekend. I'm taking a history class here. We just got through studying this in quite detail. This will include both college students and adults, who have experienced the bomb during that bombing period, and the young people who are going to school now just learning it from

ordering the text books. So from that standpoint, I think they'll find it very interesting this weekend.

ELLE: Any other formal comments people want to make?

(NO OTHER COMMENTS WERE ADDRESSED)

ELLE: Well, unless my staff decides to object, I think we can entertain some more questions, if we want to do that.

(QUESTION AND ANSWER PERIOD - OFF THE RECORD)

(PUBLIC COMMENT PERIOD - BACK ON THE RECORD)

BARBARA HOLT PRESTWICH

PRESTWICH: I really believe that the idea of bringing even the low-level waste across our highways, and bringing more and more contamination to
28 that area, is unconscionable. And I want to add that to my comments about that. It is absolutely unacceptable.

ELLE: We'll do that.

LOUIS STEVENSON

STEVENSON: This is the first time I have had the opportunity to be present in an open meeting

such as this, and I find it very discomforting to hear the stories that some of the people have related. I, for one, if I could vote on it, I would vote to shut the unit down. And I think that in the prospect of
29 life that should go on, when we begin jeopardizing it with elements that we really don't know the fullest extent of, and haven't known for the last 45 years, I think it would be better off to be left alone. Thank you.

ELLE: Thank you.

(QUESTION AND ANSWER PERIOD - OFF THE RECORD)

ELLE: We'd be happy to stay around and answer individual questions, we're committed to do that. And if there are no other questions people want to ask, I thank you very much for being here. And we will address your comments in the process of putting together the final EIS on the Nevada Test Site. Thank you very much.

(FORMAL MEETING ADJOURNED AT 8:00 P.M.)

* * * * * *

This Page Intentionally Left Blank

This Page Intentionally Left Blank

RECEIVED MAR 2 1996

PUBLIC HEARING TRANSCRIPT 2

THIS VERBATIM TRANSCRIPT CONSTITUTES

THE OFFICIAL RECORD OF THE

NEVADA TEST SITE ENVIRONMENTAL IMPACT STATEMENT PUBLIC HEARING

(QUESTION AND ANSWER PERIOD)
and
(PUBLIC COMMENTS)

Held at the

BOB RUUD COMMUNITY CENTER
Pahrump, Nevada

on

March 13, 1996
Beginning at
6:40 p.m.

REPORTED BY: Lana Stewart
Senior Verbatim Reporter

Bechtel Nevada
Reporting Services

KEY to Transcript Symbols and/or Abbreviations

Webster's New Collegiate Dictionary: "Verbatim -- in the exact words; word for word."

Dash: [--] Indicates a sentence not completed by speaker.

Dots: [...] Indicates something was said by the speaker, which, as spoken, is neither audible nor decipherable to the reporter or from the taped cassette recording.

(ph) Indicates phonetic.

(sic) Represents exactly as said by the speaker and is used to alert the speaker/reader to an error in the record.

Parentheses: ( ) Words within parentheses are reporter's explanatory comments.

VOICE: Indicates an unknown speaker.

Uh-huh: Indicates affirmative answer.

Huh-uh: Indicates negative answer.

ENVIRONMENTAL IMPACT STATEMENT

MEETING AGENDA

Page

PAHRUMP NEVADA, MARCH 13, 1996, 6:40 P.M.

QUESTION AND ANSWER PERIOD

SALLY DEVLIN

DEVLIN: My name is Sally Devlin. And I'd like very much if you'd put the map, the one corresponding to that, up again. I want everybody in the room to take a good look at that, because if you'll notice, Pahrump is not on it. And this is what I'm going to speak about, because three of your plans on the NTS EIS are on bringing the waste through Pahrump. And you have, and I say it over and over 1 again, that you do not tell the public that all of this is in Nye County, Nevada. So I am reprimanding you.

The other one is, I want the ones with the numbers of the radiation risk. Dr. Elle knows that they've taught me, all these years, how to read these numbers. And I am referring to Number Plutonium 241 on Pahute Mesa. And you see that 9.00 times 10 to the 4. That means you're dead. When you see numbers like 1 to the 18, that's not so bad; but the 7 to the 16, and so on. My friend, Dr. Chesnut

from Livermore, who did the wonderful mathematics on bringing up the oil from Texas, taught me how to read these things. And I read 36 books on them and seen these numbers a hundred times. So for those of you that don't understand these numbers, just you see 8, 9; and 10 you never see, because you're already dead. Remember what they mean, the lower the number, the safer. And most people don't know it. I just gave a friend my periodic table and found out there are three more elements added to it. I just had 103 and now there are 106. Quit it, guys.

ELLE: One of the things I tried to say, is that those are big numbers. There is a lot of radioactivity in the subsurface environment. One of the things that we've tried to characterize in this document, is that it's going to stay there. It's not accessible to people. And the groundwater transport processes that we think we understand would indicate that it's going to stay there. We monitor the groundwater around the Test Site, around the Nellis Air Force Range, we have never seen any radioactivity connected with activities on the Test Site. And we've tried to make the statement in this document in a way that people can understand it, that we expect it to stay that way.

DEVLIN: We'll get into monitoring later.

ELLE: Okay. I also do want to say that Nye County is a cooperating agency, so to the extent that that is a unique step for the Department, we do recognize Nye County's role both historically and today in the future of the Nevada Test Site. And we're very interested in making sure that the residents and the people in Nye County are aware of what we're doing. That's why we're here.

GRANT HUDLOW

HUDLOW: I got a kick out of using the term groundwater transport. I'm a chemical engineer. I'm Grant Hudlow. And the transport mechanism for radionuclides has only been known for the last 12 years. And the discovery was made by a Canadian. I read his paper two years ago and it took me 30 minutes to figure out what he was saying at all. Those of us that are in chemistry seem to have a problem with that sort of thing. The transport mechanism is colloids. And we had an example of it at Cochiti Lake several years ago where Los Alamos buried some radioactivity to see what it would do. And the next time they saw it, it was in the fish on Cochiti

Lake and very, very quickly. It may be true the tritium won't get off of the Test Site because of its short half-life, but everything else will. The Yucca Mountain studies, they finally admitted that it would take about 1,000 years to get all that stuff off the Test Site. And that was before they found the ponds. That assumed a dry mountain. When they found the ponds, they shut the operation down and didn't complete the analysis. So I don't know what their opinion is on that now. But the monitoring is critical because all that stuff is going into our
2 groundwater, and it may take 1,000 years, as they said, or it may be somewhat less than that.

ELLE: Well, I agree the monitoring is critical and it is one of the activities that we'll continue into the future.

PUBLIC COMMENTS

FRED DEXTER

DEXTER: My name is Fred Dexter. My concern is with the employment opportunities at the Nevada Test Site proper. And I speak of the Nevada Test Site proper to separate it from the three other

areas which are being mentioned for the Solar Power Plant. I don't know if employment is generally part of an Environmental Impact Statement, but it is in this one, so that's why I'm bringing up the question. It seems to me that Las Vegas right now is having a mega job explosion, probably doesn't need anymore jobs. I would include, in Las Vegas, the Eldorado Valley near Boulder City. I think that jobs should be
3 directed into Nye County, that's where the real Test Site is. It's not some place out by Boulder City. I don't know why those three other areas -- I think one
4 of is Coyote Springs and some other place -- were even mentioned in this. That's a question which I have about the process.

And I think the Test Site is what everyone is really concerned about. You put a solar plant at the Test Site, you generate power. The Test Site can use the power. You don't need to export the power, I would not think. That's going to be one step in putting a nonnuclear industry out there and creating what I would consider to be more clean industry. And the more clean industry that's out there, I think will be the greater the imperative to have a good and thorough remediation of the entire site. I think I've read, it's about the same size as

the state of Rhode Island. I also think that cleaning up of the site itself is an industry. Maybe there's going to be 16,000 jobs generated in Las Vegas by a few casinos. If you generated 1,600 jobs, which I
5 don't think is improbable; that's just a guess, hiring people to clean up that site, I think that would benefit Nye County and Pahrump. And I don't think Las Vegas needs any more jobs.

Thank you.

ELLE: Appreciate your comment. But you were right at the beginning of your comment, that we have analyzed the economic conditions based on those four alternatives and the workers, the kinds of workload that would be there for people to look at. That information is in there.

SALLY DEVLIN

DEVLIN: Thank you very much, Dr. Elle and everybody for coming down to Pahrump. I'm sorry that some of our politicians aren't here to greet you. And we have some other friends from Amargosa here who are interested. And we want to welcome you, and be happy that it didn't snow over the pass, because it was closed last night.

10

My name is Sally Devlin. And I just want to answer this gentleman. They had the maximum 9,200 employed at the Test Site, and it is down to 1,600 now, and it will go down lower. Except, that my friends that work out there are working six days a week, ten-hour shifts, so something is going on. And I think it's interesting for you to know

6 that. I don't know what they're doing. As far as the solar goes, I hope they do some solar out there. But

that's the numbers. And Dr. Burns was at the NWTR meeting and he said they're going to fire another 400. So who knows what's going on.

My name is Sally Devlin and I live in Pahrump, Nevada. My home is 30 miles from the Test Site and 50 miles from Yucca Mountain. Both are located totally in Nye County, Nevada. The federal government owns approximately 93 percent of Nye County. And we are the third largest county in the United States. It's not in my report, but the Feds own 87 percent of the state of Nevada. Years ago, when I became interested in the transportation studies, it was because there was a planned railroad to come through Pahrump.

On Page S-2 of the Draft EIS on NTS and off-site locations in the state of Nevada, is

11

a map of the state and the NTS. Deleted is Highway 160, which goes from Las Vegas, Clark County, through Pahrump, Nye county. This highway parallels Highway 95, which goes from Clark County, Nye County where NTS is located. Somehow, in this Draft EIS, Volume 1, Appendix 1, Transportation Study, on Pages 3-18, 3-20, and 3-22, are maps using Highway 160 to transport waste. These routes are mapped on Page 3-25. The risks are on NV-5, NV-7, and NV-9, and others. Coming over from I-15 to 160, Clark County, is two lanes. Over the pass at Mountain Springs, which is approximately 5,500 feet and alternates three lanes for a distance. Another 40 miles, 16 of which are in Nye County, are all two lanes, except for 16 miles through the center of town; which will be short-lane once construction is completed. Another 40 miles on 160 is two lanes, and then the highway connects with 95, which has four lanes to the NTS. The 90 or so miles on 160 has no auxiliary roads. We have a few paid firemen and our 55-member volunteer

7 group. We desperately need FEMA funds to train and equip our firemen. Las Vegas recently had 70 to 75 trained in Maryland for a week. We were totally ignored.

Liquid nitrogen, as well as liquid

12

cyanide, propane, gasoline, and other hazardous materials travel this congested Road 160 at all

8 times. I gave a worst case scenario on a spill at Indian Springs Prison. That's on 95 with the hazardous waste spill. Listen to the tape and read the transcript from the NWTRB Sociological Meeting last spring. It could be a real prophetic tragedy.

Under Alternate 3, Page 3-32 of the summary, is at 90,000 cubic meters of LLW and LLMW, would be stored at the Test Site. The Transportation Study on 2-14 states that it will be one million, a hundred and fifty-four, nine sixty-three cubic yards of the waste. And it would come through with a potential; and these are your numbers, 24 million, 264 thousand, 796 cubic yards over in the next 75 years. I didn't put in for five years, you do want to pay Nye County 38 million. That's a pittance.

On pages 3 through 30 through 40 of the Transportation EIS, there are bar graphs; NV-6

9 which parallel 160. Among the highest of every fatality risk from traffic fatalities to radiation-induced cancer risks, and the highest on hazardous index risk. If an accident happened on 95, the only access would be on 160 through Pahrump.

NTS currently stores 1,500

13

55-gallon drums of NRW, of transuranic waste. That

10 may or may not go to WIPP. If there is no WIPP, will NTS get another 5,000-gallon drums of transuranic waste?

From the recently declassified DoD report, the missing numbers are filled in to make up the 300 metric tons of high-level waste that might be

11 stored at NTS. If Yucca Mountain and the secondary repository total 60 billion are not built, would the extra 150 metric tons be stored at NTS? 150 at Yucca

12 Mountain and 150 at NTS. There seem to be no viable plans for railroads coming to the Test Site from three directions.

13 The federal government seems to have absolutely no interest in our demographics. Our unincorporated town with no map of the boundaries, as they have never been surveyed by a licensed surveyor with a stamp, is as large as five eastern states.

Our county commissioners have allocated 48,000 parcels ranging in size from single parcels to 100 acres. This means that our 20,000 people today could become the third most populated town in Nevada. We have one of the largest and purest aquifers in the whole nation. My questions are not only directed towards DOE and DoD and DOT, but -- and everybody knows I yell out every acronym at every meeting -- but to everyone in this country who

14 is interested in the plans for NTS. How can we take a stand against the government's total disregard for people, especially the people of Pahrump and Nye County, who will be impacted by these poisons? Take the expendable people of Hanford, Washington who have been living with 55 million gallons of highly radioactive waste currently stored in 177 underground

15 tanks. And what would happen if the Plutonium and Uranium 235 were really to go critical, what would happen? This has been going on for 50 years and the characterization for 10. Clean-up would be 36 billion dollars. The government has allowed this mess to go on for almost 50 years. And I shudder what they have

16 in mind for us in Nye County. Nationwide transport of this LLW, LLMV, TRW, HLW will destroy our pristine county, and what about the rest of the 43 states involved? We do not want what happened from a radioactive spill from Los Alamos that ended up at

17 Cochiti Lake that polluted it with radioactive colloids. Why are there no colloidal studies being made when I have heard that there is a real need and that it is being ignored?

Why don't we go to new science and reprocess and reactivate -- and this will come up again at the ones on the 28th and 29th -- on-site

these dangerous elements? Nevada produces no radioactive waste; and yet, the federal government wants to put it all here. The government knows, as do all of us who have been studying radiobiology, that radiation can destroy our future generations. We must stop this nonsense for the preservation of the nation. As a stakeholder, and everybody that's here is a stakeholder, should know this, we/I have absolutely no say about any of this. Information must get to all the people of this nation and the world about how dangerous these plans are. Please, Mr. President, stop it. And thank you for your time.

GRANT HUDLOW

HUDLOW: I'm Grant Hudlow, also from Pahrump. I'm the CEO of Allied Science, Incorporated. What we do, is we clean up environmental messes and we try to prevent environmental messes. So far, our work has been in the biomass; trash, tires, that sort of thing. About 15 years ago, I got involved with Sandia in the reaction that can clean up the actinides, the long-lived radioactive waste. And as I mentioned a little while ago, I built a small one of these reactors in my backyard and the neighbors were not

amused. But it didn't go any place. The bureaucracy finally has admitted that these processes exist. They've also said that the government scientists cannot put them into production. And of course not, they are not designed to put things into production; scientists discover things. There are very few of us that know how to put things into production, and I'm one of those people.

The thing that I would like to suggest in your study, is that you shift your emphasis. There is no such thing anymore as waste

18 disposal. It's an impossibility. The colloids that I mentioned earlier make that impossible to dispose of waste. We have to do something to react the waste, transform it in some way or another, so that it either becomes useful or it becomes benign; one or the other. So that makes the whole transportation issue that

19 Sally was talking about really a moot question. Why would you transport something all over the country when you have to deactivate it, transform it, some way

20 anyway; why would you take the risk to transport something like that all across the country?

Sally also mentioned Hanford, and we need to learn from what went on up there. I have a friend who came within a few minutes of getting killed

in the explosion up there. And I'm not sure that that explosion has been declassified yet, but it needs to be. The problem at Hanford came from violating two nuclear engineering rules that were developed by Rick Overt. And, of course, when he was gone, why, his rules went with him. One of them is, that for the waste material, you absolutely do not dilute it, period. Hanford has God knows how much high-level radioactivity; plutonium, uranium, so forth, in 55 million gallons of water. That was a totally insane move. They're getting ready to build another one at SRS. And as I understand it, the secret pipeline that's being built out at the Test Site right now is to ship that material down here and so we'll have that nightmare on the Test Site. And in fact, it's mentioned as one of the alternatives in your

21 report. So I just wanted to point out that that needs to be clarified that that kind of a thing should not exist at Hanford and it needs to be remediated and it does not need to be transported here.

The second rule that they violated up there is that you never put plutonium, uranium, those kinds of things in a critical mass, unless you want an explosion or a reaction. Now, they violated that rule up there too. So now they're forced to keep pumping things from tank to tank to tank, which is extremely dangerous. Because if they ever allow it to settle out, it will go critical, go through the bottom of the tank and down into the earth. And that's the reason that they have that kind of a mess up there now. So we need to learn from what's gone on before and bring that stuff out in the open and set up systems so that we don't have to go through all of that again.

And one of the terms you used was current practices and best procedures. And the current practices have been covered up. And because of the Cold War, they were all classified and they could be hidden; whether they had anything to do with the military or not. And we need to open that up, and I applaud the little bit that's been opened up here so far.

The other facts that are missing in here, as I mentioned, Yucca Mountain. The studies at Yucca Mountain were quite a zoo for quite a while.
22 And finally, there is some really important facts that came out about how stuff moves underground, even in solid rock, supposedly solid rock. And that all needs to be in your report in the form of facts and figures. Having, what is it, 300 million curies underground in

the groundwater and everything else, and then stating that it's not going to move, you know, don't you have
23 children, don't you have grandchildren? Don't you expect anybody to live within a few thousand miles of that place? You know, that kind of thing needs to be addressed. And I'm not criticizing any underground explosions or even the aboveground explosions. The aboveground explosions killed my father and my sister, and my step-mother, and a good many of my classmates; and I was radiated in one of them. But I understand, at the time, we had serious problems and we had to -- it was the kind of thing to do something even if it's wrong, so I don't have any problem with that. We don't have that situation now and let's get this mess cleaned up.

The thing that I want to emphasize is there's no such thing as waste disposal on this planet. The colloids that's demonstrated in Cochiti Lake that we mentioned earlier indicate that that is not possible. That's not something that we can even consider. It's totally unacceptable. And that needs to be in that report so that we get the information out of how we can handle this material, and instead of keeping our head in the sand and continue with killing people like we have in the past.

ELLE: Thank you for those comments.

JEFF JENNINGS

JENNINGS: I'm a senior and I am from Pahrump, and among the group of houses buffering or closest in this Pahrump area to the Test Site. I think that my wife has some kind of a radiation situation. And I have talked to Dr. Lavazara (ph) about it and she's under medication. So this is very personal to me because morning, noon, and night, I'm thinking of Test Site or private -- this possible private source of radiation emanating from that direction. I'm a member of a press group, Personal Publishers, and a former official editor of a group which enrolled Thomas Edison, whose name in the sciences is well fixed. And I also happened to be at Columbia College, a Science A student, among a group of a half a dozen who were privileged by Dr. John R. Dunning to conduct the cyclotron in the basement of Bufene (ph) Laboratories of Columbia University; the tests that led to the Manhattan Project. And in fact, why Manhattan got its name attached to it was because of the pioneer work being done there. And I also had, in background, the photographs of the building of the

Hoover Dam showing me as a youngster in church school. And the mother of the chief honcho building the dam, Frank Crow, had supplied her with these blown-up photographs of the progress as it became along rather rapidly. In fact, I think they were a year or so ahead of schedule in finishing there. And it was notable work in developing our desert here. And I certainly hope that Nye County, as Sally Devlin has pointed out, it's not only larger than many states, our area of county, but it is also close to California which is the chief port nearby for the Pacific rimming in having a world view of the situation. And of course, of an interest to our economy, the matter of attracting people to the Las Vegas area.

We do have the possibility of a good science museum, and that is a key note of the county Commissioner Chairman Cameron McRae in his reporting on his dealings with the government on the land situation in general, that there has been an indication that a good science museum will be part of the tourist attraction that we can make here. And I believe that the matter should be addressed by the authorities of the Department for the general understanding of the public, and I think the world was mentioned. But I take exception. I was going to say just briefly, amen to Sally here. But I know the previous speaker said something about impossible, to go 10,000 years into the future, as some of the studies are. I think that we should have some expectation that on the upward curve, we are going to find that there is a development, human potential can realize great things. We have great things in the past and it won't stop. I think we're on the up. So I'm hoping that the studies, without any rabble rousing to put them down, it may be pursued and we can make it possible. And I come immediately. I've been here six years from the -- where there's a tug of war, our two possible presidential candidates. The Arkansas River is on the South. And up in the North, we have Mr. Dole in the area of Wichita. They call it the Kansas River. So I think with that disagreement, we're going to have a lot of further developments of the personalities of it. But if on the socioeconomic point, which I chose to make a comment on, we can address the larger view of the problem. My best -- I challenge you, my paper that I edited, is called the Counter Design. We hold the challenge of a mighty line, God grant us grace to give the counter sign. And may you be privileged to offer it to us.

Thank you.

ELLE: Thank you very much.

THOMAS JOHN

JOHN: I'm Thomas John, I'm a geologist out of Beatty, Nevada. And I'd like to make a comment on alternate use at the Nevada Test Site. Most of the recent discussion has to deal with the Solar Enterprise Zone. In the Nevada Test Site, there are at least three known areas of mineralization that had been worked prior to the Nevada Test Site in the 1800s all the way up through the 1930s. And I would like to see some more investigation done towards mineral
24 exploration and possibly the mining activity within the Test Site.

Thank you.

JAMES QUIRK

QUIRK: I am James Quirk from Amargosa Valley. And I didn't get prepared completely for what I wanted to say tonight, but I'll wing it. There's
25 about 1,200 people in Amargosa that's very concerned about the impact of the waste dump on the environment,

and they're speaking of themselves; the people of Amargosa Valley and the people of Nye County and the people anywhere on the route. The people of Amargosa themselves are anywhere from 10 to 30 miles away from Yucca Mountain; and that's downhill, down floodplain, downstream. And our first concerns aren't with how many jobs it's going to create or how much money it's going to bring to our valley, as our county is very concerned about how much money it's going to bring
26 them. Our concerns are more for human lives and our health. And we don't trust the federal government, we don't trust the state government, and we definitely don't trust the county government to give us an honest evaluation of the Test Site or of the nuclear waste
27 dump. And that's our biggest concern, is our trust for the government in all its forms.

So speaking from the experience in the past that we've had with the federal government and the state on different circumstances surrounding the Test Site and the waste dumps, the low-level nuclear waste dump. In the '70s, they had a problem with personnel. The personnel took the cement mixer and the cement that they were supposed to solidify the nuclear waste with before they put it in the ground, to make it more safe so it doesn't kind of flow out

into the soil. And they decided to contract it out to local citizens of Beatty. And they took the cement over there and built slabs and other things. And they just poured the liquid waste into the ground. So
28 right now, the liquid waste is leaching out into the soil and into the water supply, and it will soon be flowing through Amargosa and we'll have to contend with that. Now, we might get the story from the government that it's moving an inch per every 30 years and we may never see it until the year 2070 or 3099, but I don't believe it.

The same thing happened at the Test Site. They thought -- the scientists believed that when those explosions underground happened, that they would form this big glass ball around everything and keep all the waste contained inside this glass ball. Well, the glass ball broke and stuff is leaching out now into the soil, then it will be
29 hundreds and hundreds of years before it gets to any humans is the story; but it's out there. So anyway, that's our concern, so thank you.

(FORMAL MEETING ADJOURNED AT 7:30 P.M.)

* * * * * *

This Page Intentionally Left Blank

PUBLIC HEARING TRANSCRIPT 3

THIS VERBATIM TRANSCRIPT CONSTITUTES

THE OFFICIAL RECORD OF THE

NEVADA TEST SITE ENVIRONMENTAL IMPACT STATEMENT PUBLIC HEARING

(QUESTION AND ANSWER PERIOD)
and
(PUBLIC COMMENTS)

Held at the

RENO STUDENT UNION HALL
Reno, Nevada

on

March 19, 1996
Beginning at
6:40 p.m.

REPORTED BY: Lana Stewart
Senior Verbatim Reporter

Bechtel Nevada
Reporting Services

KEY to Transcript Symbols and/or Abbreviations

Webster's New Collegiate Dictionary: "Verbatim -- in the exact words; word for word."

Dash: [--] Indicates a sentence not completed by speaker.

Dots: [...] Indicates something was said by the speaker, which, as spoken, is neither audible nor decipherable to the reporter or from the taped cassette recording.

(ph) Indicates phonetic.

(sic) Represents exactly as said by the speaker and is used to alert the speaker/reader to an error in the record.

Parentheses: ( ) Words within parentheses are reporter's explanatory comments.

VOICE: Indicates an unknown speaker.

Uh-huh: Indicates affirmative answer.

Huh-uh: Indicates negative answer.

ENVIRONMENTAL IMPACT STATEMENT

PUBLIC HEARING AGENDA

Page

RENO, NEVADA, MARCH 19, 1996, 6:40 P.M.

QUESTION AND ANSWER PERIOD

VERNON BRECHIN

BRECHIN: You listed the radioactive isotopes left from underground testing close to the water table. Why is it segmented into those on Pahute Mesa and those that are off Pahute Mesa? And can you describe specifically what is defined as Pahute Mesa; which boundaries, what area?

ELLE: Pahute Mesa is the north end of the Test Site, and the secondary is Yucca Flats where we've conducted most of the underground nuclear tests. So the reason they are presented that way, is that the source terms are different.

BRECHIN: Does it have anything to do with the Air Force Memorandum of Understanding or the withdrawal of a certain segment of the Pahute Mesa?

ELLE: No, it does not.

ART JOHNSTON

JOHNSTON: Could you describe the techniques you use for low-level radiation, the disposition of those products that you will be taking there. How deep will you put them? What type of containers do you put it in? How does that work?

ELLE: The low-level waste is transported in DOT-approved containers. And we take the containers off the trucks and put them in what we characterize as shallow trenches, and those trenches are probably 100-feet deep. And then we stack the stuff up and then cover it with probably 30 feet of dirt.

JOHNSTON: It's there then at 100-foot deep. How long does it take for that type of material to become no problem to the environment, and what happens to the materials themselves if we're talking about 1,000 years, for instance?

ELLE: From a radioactive point of view, the half-life of the radioactivity defines how long it's going to be there. For some radionuclides, it's going to be there for a long time; forever. Clearly, the nonradioactive elements, they will also be there forever because they don't go anywhere.

6

JOHNSTON: But what I'm saying is, if you put something like iron or dirt that has radioactivity in it and you put it down there, what happens to -- doesn't that iron in 1,000 years, for example, disintegrate into dust or something? How long does it sit there like that?

ELLE: It will sit there forever.

JOHNSTON: It won't turn into ferric oxide or anything and slough off and --

ELLE: It may do that in the package that it sits in, but it will stay in that environment.

JOHNSTON: But is the package that it's in sufficiently sturdy that it would stay intact for this long period of time?

ELLE: No. The way we characterize low-level waste disposal from a performance point of view, you look at the environment at the Nevada Test Site and how radioactivity may move from where we put it in the low-level waste facilities. And because of its arid environment and because there is no groundwater transport through the waste itself, the analysis indicates it will sit there forever, until it either decays and is not a radioactive problem; and then it becomes like any other element in the ground. The risk from a modeling point of view, if

Bechtel Nevada
Reporting Services

7

somebody 10,000 years from now going in and either drilling into it, or doing some other activity that may get into that waste, is the limiting condition under how we can dispose of that low-level waste.

JOHNSTON: But you rely on the nonremovability of this stuff as the secret of your successfully putting it there.

ELLE: That's right. That's essentially the basis for any land disposal of waste, whether it's sanitary or hazardous or radioactive. If you put it some place, and you expect it to stay there.

ADAMS: Steve Adams. Just one comment on the gentleman's questions on low-level waste. There is many categories of waste that are generated in nuclear and nonnuclear operations. The most benign category is low-level waste. Both the Department of Energy and the NRC; and to an extent, the Europeans, that in defining what the concentrations of the radionuclides in the low-level waste it's based, that after 100 years, that concentration is not going to be any greater than the radioactivity in normal dirt. And so essentially, after 100 years, the radioactivity in low-level waste is at the same activity as dirt. And insofar as the way it's packaging, the Environmental Impact Statement that was used in

Bechtel Nevada
Reporting Services

8

developing 10 CFR 61, the regulations for the -- the federal regulations for operating and shutting down the low-level waste site take absolutely no considerations of the protection for the packaging. It was assumed in that EIS and the analysis of the performance that supported that EIS, that the package disappeared and the waste was right out there, or it can be contacted by shallow land water. For instance, not here in Nevada where that's not of any concern, but also in the very humid and wet Southeastern United States.

So insofar as any concerns you may have on the risk of low-level waste, it's good to remember that again after 100 years, it's no more radioactive in soil that the closure for low-level waste site has to be designed to ensure that it's not going to be distributed within 300 years. Then like Dr. Elle mentioned, that also the design of the closure mechanisms, whether it's a cap or the waste like that's happened in the Midwest and the Eastern United States, is disposed of in a more highly engineered facility; that the extreme model that was used to determine the risk was somebody coming in and intruding right into the waste disposal units and digging right down to the units. So to be able to be

Bechtel Nevada
Reporting Services

9

classified as low-level waste, relatively speaking, especially compared to say high-level waste or transuranic waste, or other waste forms, low-level waste is very benign.

LEE DAZEY

DAZEY: I would just like to make a comment on Mr. Adams' comment. Are you neglecting the particles within low-level waste such as plutonium, which is a half-life?

ADAMS: But to be able to have plutonium in your low-level waste, the concentration has to be very low. And so if you look at the total risk from all of the contributing radionuclides, they were defined so the risk of all the radionuclides are allowed to have, cannot exceed that normal background soil after 100 years of decay. And so essentially what that means, is radionuclides, like plutonium, like uranium, are only allowed to have very, very low concentrations or the material generated would not be low-level waste. It would be, you know, transuranic waste. For instance, in the case of --

DAZEY: But still, they remain in the soil, even in small quantities.

Bechtel Nevada
Reporting Services

ADAMS: Oh, yeah, they're in the container. But you also have to remember, if once the plutonium gets up above a certain concentration, the waste has to be stabilized and solidified to meet certain quality, control and quality assurance; which means they have to take the waste form in. They have to put it under certain conditions of heat and pressure for a long period of time without any of that leaching out. And until the regulatory agencies have gone in and audit the waste generators to assure themselves that the waste form is meeting those criteria, they cannot dispose of it as low-level waste. And that's federal regulations throughout the entire United States. And that's a good question and it's a concern. I mean, if you hear things like plutonium, you know, all the flags and bells and whistles go off in your mind and that's very hazardous material; in most people's minds. And that's why the lab concentration of plutonium and low-level waste is very, very low in the comparison to other radioactive material, like tritium or cobalt, or the isotope of your choice.

ABBY JOHNSON

JOHNSON: Abby Johnson with Eureka County. I have a couple questions. I haven't read the document yet, and I've arrived late, so I apologize if you already covered this. Does the document address the use of the Nevada Test Site for air space?

ELLE: Yes, there is a discussion in there about air space use, both by the Department of Energy and other organizations.

JOHNSON: What does it say, like you can do it or you can't?

ELLE: We do. I mean, we do use the air space today and we would continue to do that under Alternative 1.

JOHNSON: For the Air Force?

ELLE: Right.

JOHNSON: Only?

ELLE: No. The Department uses the air space as well for some of its own activities.

JOHNSON: Is there a contemplation of increased use of air space to promote the operation among the branch services and to minimize the impacts of air space on other parts of Nevada?

ELLE: I don't think we analyzed it in terms of minimizing the impacts on other air space in Nevada. We did analyze it for increased use of the air space on the Test Site.

JOHNSON: Okay. My second question concerns your statement about cumula -- that the cumulative impacts, that you define that as no impact on Southern Nevada economy and growth. My understanding of cumulative impacts, if we had been doing this 30 or 40 years ago, given there was no NEPA at that point, the impact of those activities would have exceeded Southern Nevada.

ELLE: (NODDING OF HEAD)

JOHNSON: Why have you limited it this time to Southern Nevada?

ELLE: The analysis of cumulative impacts is more than just Southern Nevada. I was trying to summarize a piece of the information. But the cumulative impact analysis includes everything around the Test Site as well.

JOHNSON: Including transportation effects in Northern Nevada?

ELLE: Yes.

JOHNSON: Okay.

ELLE: The Transportation Risk Study

includes that information.

JOHNSON: Okay, thank you.

VERNON BRECHIN

BRECHIN: I just went through the Waste Management PEIS and it defines the various waste categories.

ELLE: Uh-huh.

BRECHIN: Low-level, high-level, transuranic, mixed waste; combinations of some of these in the forms of mixed waste. I've never seen a description of the waste left by underground explosions as one of those waste categories. I've never seen those 600 million curies listed as part of the inventory of nuclear waste. Why is that?

ELLE: Well, we consider it part of the inventory of waste that is generated from activities, either restoration or other waste disposal processes, in terms of the inventory that needs to be treated or disposed of. I think that's the simple answer.

BRECHIN: I have another question. In the first Implementation Plan, the draft, it had a mention of classified transuranic waste in there. The final Implementation Plan eliminated that, it didn't have that in there at the same areas. It simply didn't mention it anymore. This EIS, Draft EIS, does mention classified waste. I think the EIS should be a little more specific about what it is and why it is classified. 1

ELLE: Okay. That's probably a legitimate comment.

BRECHIN: At the DOUBLE TRACKS site, has any site restoration started there yet, and what do they plan to do as far as site restoration there?

ELLE: Restoration has not actually started. They've done site characterization. There is another NEPA document, Environmental Assessment, that's been issued talking about the alternatives for what it is they want to do. One of the things they propose to do is actually scrape about six inches of dirt off the surface containing plutonium or contaminants, packaging it and moving it to the Test Site.

BRECHIN: What happened to the Lockheed Martin Plan for separating the soil and creating concentrated versus nonconcentrated stuff?

ELLE: I think the cost got in the way of what they were trying to do with that and that's not part of the project that's being considered. If you

want a copy of that EA, we can make sure that you get one.

BRECHIN: Yeah, I'd like that.

ELLE: Okay.

BRECHIN: And on the Project 57, was there any previous effort to clean it up, to scrape soil off of it? That's Area 13.

ELLE: Yeah, that area has had restoration -- different kinds of restoration activities done. The original scope of that included some soil mediation in terms of stabilization and natural grasses. But again, that's a site that we're considering for future remediation and clean-up.

GARY GRAY

GRAY: What was the time frame for the final draft, just out of curiosity? I think you might have mentioned it and I might have missed that.

ELLE: I think the time frame I have on the viewgraph is July for the final.

GRAY: Okay, thank you.

PUBLIC COMMENTS

VERNON BRECHIN

BRECHIN: My name is Vernon Brechin. I've been -- I'm with Tri-Valley Cares, an organization in Livermore, California. One thing we know about the Nevada Test Site, is it functions largely as an adjunct to the other national labs; Lawrence Livermore National Lab, Los Alamos National Lab, and Sandia National lab. These labs all have remote areas in which they test various things. At Livermore, they have Site 300 for certain explosive tests and things like that. Sandia has large areas and remote areas within and outside their normal property where they do tests. Los Alamos also has remote areas around the lab where it does tests. In some cases, the tests are so dangerous or represent such a potential impact to humans, that a much more remote area has to be found to do those tests. In this case, oftentimes it's the Nevada Test Site. And this is one of the resources that's advertised about the Nevada Test Site, its remoteness from generally human populations. It's largely oriented about human populations. I prefer to look at the earth as a

sacred place, all parts of it, including the underground areas; the animals, the plants, everything. But I noticed these Environmental Impact Statements are generally oriented around the impacts upon man. They do consider plants and animals, but that's largely because of the way the laws have been positioned because of scientific studies. Anyway, it's a little off the subject.

First of all, I'd like to mention about the withdrawal of the Nevada Test Site. It was withdrawn from -- it's in the Draft EIS. And it was withdrawn in four sections. The first section was withdrawn as Public Land Order 805. Originally, this land belonged to the Native Americans. Later on, the white man came into the territory and a thing called the Bureau of Land Management was established. And they made certain areas in the West, large areas in the West public land, public property. Certain of these lands were withdrawn for certain purposes, such as for weapons testing and other things. Some of that land was withdrawn for the Atomic Energy Commission. And the first withdrawal was specifically for reserve for use of the U.S. AEC as a weapons testing site. Now, we all have to judge whether it is still being used for its intended purpose. This land was temporarily withdrawn. It was originally intended to be returned back to the American people.

If you read the Draft EIS, you will realize that there's -- except in Alternative #4 -- there's little talk of returning the land back to the people. In fact, some areas of the property, the DOE admits, will never be returned back to the American people. In fact, the DOE seems to expect that they will receive funding to guard these lands to prevent the public from getting hurt on these permanently destroyed properties; that guardianship -- which I must remind you about the Nuclear Stockpile Stewardship Program, it's related to it -- that guardianship will have to be probably at least a half-life of plutonium, which is 24,000 years, or extend that out to about a quarter million years.

This is going to be hit-and-miss because I haven't prepared too well, but I have read through the document. As far as site restoration activities. Here's a document produced in December of 1974, a Summary Report, Central Nevada Test Area Demobilization and Restoration Activities. This talks about the restoration of the Central Nevada test area back in 1974. The environmental reports out of the Nevada Test Site have been mentioning since at least

1990, about plans to restore the area and other things

2 like that. I should also mention that there is quite a few other sites that aren't mentioned in the report.

There's the test site in Mississippi. There's two underground test sites in New Mexico. There are two nuclear test sites in Colorado. There are two nuclear test sites in Central Nevada which are addressed in this. Three test sites on Amchitka Island in Alaska. Anyway, these should be addressed. Also, other sites that weren't addressed in this Draft EIS, but which are being addressed somewhat, one site in the Stockpile Stewardship, is the North Las Vegas facilities where the contractors are. There are also a number of sites in California and scattered around the country.

One thing I've noticed in researching this stuff, is that there appears to be a certain set of documents that are like internal documents that are utilized, and then another set of documents that are like available rather freely to the

3 public, and oftentimes by law. I think much more of the information contained in the internal document should appear in the public documents. Such as these sites at the Nevada Test Site, there's like two sites in the Santa Barbara area, one site in Pleasonton, and

3 cont. other things. I think you should explain what these sites are about and other things like that.

And before my time ends, I want to mention the Lyner facility. I just read in the classification things, that the codes associated with state of equation experiment are considered

4 classified, they are not to be released. The tests to take place in the Lyner facility are supposed to deal with these state of equation codes, supposedly for the safety and reliability of our weapons and to understand better the aging properties of the plutonium, which very few people seem to understand why these tests need to take place. But anyway, the tests will scatter a substantial amount of plutonium

5 in these rooms. The explanation in the Draft EIS says very little about anything close to where the tests

6 are to be performed. I don't see how describing the scattering of plutonium in an underground room a few miles -- about 20 miles from Yucca Mountain is going to expose the classified information of the equation of state equations, and give any kind of information about the design of nuclear weapons or anything like that. This is one of the major things that should be in the EIS. Secretary O'Leary and the Waste Management Department at DOE Headquarters is very

strong on this; that when information impeded environmental restoration or awareness, that information should be made public, unless there is absolute proof that the exposure of that information would compromise classified information.

So I would say that in the initial thing where they described the Lyner complex, when they're describing the areas at the Nevada Test Site,

7 it says, three lines here: "The Lyner complex is a mined underground complex in Area 1 that is available for dynamic experiments and hydrodynamic tests that cannot be conducted aboveground, because they may contain hazardous materials." I consider that a gross understatement.

8 Also, one last item, the maps in here of the Nevada Test Site. There's one map that's accurate and that deals with the land withdrawals. It does show an area that was once labeled Area 51. All the rest of the maps do not show the area. Some of the maps show the borderline terminating and opened up in the area where Area 51 takes off. Most of the maps just have a closed border there, they don't show anything. This is still on the books. It's still part of the Nevada Test Site. I have been trying to find out who is responsible for it and can't seem to

get any information. Why does this compromise national security?

ELLE: Appreciate your comments, Vern. And we look forward to -- I presume you're going to provide more comments in writing.

BRECHIN: Yes, written comments.

LEE DAZEY

DAZEY: My name is Lee Dazey. I work with the Northern office of Citizen Alert. For those of you who don't know who we are, we're a statewide nonprofit environmental group. Our issues have been the nuclear waste issue, Yucca Mountain being foremost, which is on the Test Site; even though it's not included in the Nevada Test Site EIS. First of all, I'd like to make the comments for my son. This is his comment on the whole project. (Indicating) (Laughter) "A little smiley face."

And then the comments that I'm prepared to make -- I also haven't reviewed the whole -- that whole draft. I've looked through the summary and the Resource Management Plan and a few other of the documents. And I've made some just general comments on it. And our comments, formal

written comments, will follow later at the May 2nd deadline. But let me just read my comments. While the Draft EIS refers to a primary mission of the DOE NTS as maintaining a readiness to conduct tests, and if directed to do so by the President to conduct these tests, the draft consistently refers to missions; that's plural, to include activities related to waste management that it has been involved with for over 30 years, but for which the land was not withdrawn for. With this said, there is really no true action
9 alternative, because a true no-action alternative would be to only maintain a testing readiness. And the DOE's no-action alternative states that operations in all the five mission categories would continue in the same manner and degree as they have during the past three to five years. Now, as part of NEPA, I don't know -- I'm sure everyone here knows, but I'll reiterate this point, that NEPA requires a true no-action alternative.

Of the nuclear testing scenarios that are outlined in Alternative 1, and I'm referring
10 to the summary which is something that we can all read pretty easily, it's only the second that is a true no-action alternative. Because the first, the Stockpile Stewardship experiments and operations,

10 cont. would construct new facilities in order to conduct the hydrodynamic tests that Vern was referring to. The alternative in Alternative 3, or the expanded-use
11 option, includes all of the programs in Alternative 1, and adds all the new programs such as solar; but fails to include the Yucca Mountain Project or the potential interim storage facility in the expanded-use version.

During the implementation phase of this EIS, we were told that Yucca Mountain wasn't included because a separate EIS was to be done on the Yucca Mountain Project. The fact that that data though from other NEPA programs, such as the Waste
12 Management PEIS and the Disposition PEIS are included in this draft, no longer really excuses the data from the Yucca Mountain Project, we feel to not be included. Instead of supporting one alternative in its entirety, we encourage, as the DOE states in the draft, that participants can suggest hybrids; and we think that's a good idea, with the intent of the true no-action alternative only maintaining a readiness to test and not engaging in the Stockpile Stewardship
13 Program. And this would be because of the concerns that the Stockpile Stewardship Program could jeopardize the U.S. position in the Nonproliferation Treaty that the international world body is trying to

13 cont. get towards.

Alternative 4 leans towards a no-action alternative, and we think this alternative is probably one of the best in its entirety. And that
14 the fact that it doesn't allow waste management activities to go on, except for the waste that's generated from environmental restoration and the Nevada Test Site, is a pretty good thing. We would like to see that the environmental restoration be coordinated with the goal of certain portions of the
15 NTS returned back to the public domain for a purpose which could include the return of land to the Western Shoshone, because after all, the Treaty was not abrogated.

As far as we can tell, under the unavoidable adverse effects in the summary section, no alternatives describes clean-up at either NTS or
16 off-site locations, because presumably -- and I'm referring to the testing, I guess I missed that here -- because it cannot be cleaned up. This needs to be explained. Therefore, the statement under Alternative 4 under unavoidable adverse effects, it
17 states: "The unavoidable adverse impacts of past underground nuclear testing activities would remain," really should be under each alternative because it

17 cont. can't be cleaned up under any of them. So we felt that that was a little misleading.

18 Hydronuclear testing should not be embraced, because the DOE acknowledges in Alternative 1 that a hydronuclear testing has its impacts. And I quote: "Other testing and experimental activity in support of Stockpile Stewardship Programs, would have smaller impacts in relation to standard nuclear tests with lower yields but with chain reactions."

And then we feel that the Resource Management Plan is a very important document. And we understand, from reading through it, that it's fairly -- it's at its infancy stage. But I did want to make a few comments on that. We applaud the DOE's commitment to including Ecosystem Management and a Resource Management Plan. 19 We are concerned that an emphasis though -- in this Resource Management Plan, there's an emphasis which we see on manmade resources. And we feel that we don't want these to prevail over the natural resources at the Test Site. And I quote: "Natural resources are not the primary management focus of the DOE's NTS missions affecting the potential for clean-up of NTS."

Stakeholder involvement is going

to be crucial for the success of the RMP, especially with the Native communities in Nevada; as the RMP focuses on the inventory of parts that make up the NTS, while people whose lives are intertwined with the land, will be able to give the holistic perspective and social value that is at the heart of Ecosystem's Management. 20 Because the long-term impacts of some DOE Nevada activities on the Ecosystems are not well understood, as is stated in the RMP, we think it's important to embrace a mission that acknowledges this fact. The goal-oriented approach for the RMP is good, but goal-oriented approaches often are toothless watchdogs, especially if NTS mission decisions are made that give priority to manmade structures over natural resources of the Test Site.

21 Would the DOE be willing to amend its mission if the goals of the RMP cannot be met under the DOE's land use decision at NTS? 22 We think it's paramount that the RMP or the Resource Management Plan address NTS for the long-term and not just adhere to the ten-year period which the NTS DEIS is addressing. We would like to see the RMP referred to stakeholders in regard to the use of models. 23 We find that models are expensive, and since models only predict often to the detriment of protection of our

23 cont. natural resources, monitoring as described under adaptive management should be relied upon to assess impacts to resources over the expensive and unreliable models.

Citizen Alert is concerned with this statement under the Draft Resource Management Goals: "There will be times when mission requirements and/or goals for resources conflict and cannot be achieved simultaneously." 24 Of the possible solutions to conflict resolution identified in the draft, we would prefer to see flexibility with regard to modifying existing or proposed missions rather than not achieve the RMP goals.

And then under the RMP goals, I made a few comments under the section of existing missions. 25 We would like you guys to identify which new uses of NTS may interfere with critical operations of existing missions or create extra costs for these missions. 26 Under site support activities and facilities and health and safety, which I combined goals, goals of these two need to be integrated in order that sites for new facilities take maximum advantage of existing site support activities and in areas that comply with applicable safety regulations with minimal radiation and other safety risks. So we

just combined those two goals. We think that that's important to combine them; that not just should we look for the easiest cost, but also for reducing the safety risks.

27 Land. We support the goal that facilities be designed and constructed to fit the site in terms of suitable slope drainage and other natural features, even if there are additional construction costs. Water. The second goal of maintaining the quality of NTS waters, that are presently clean enough to be in compliance with state and federal standards, seems more achievable that the first -- it seems more achievable than the first goal, which is maintain an adequate water supply -- sorry about that, I think I botched up a line here. 28 How much water is available at NTS? Do we really know how much subsurface and surface waters? And if we do know, we'd like to see that included in the Resource Management Plan. And as the desert has a very low recharge rate, when will the water supplies run out? That needs to be asked.

Cultural and American Indian resources. 29 We think it's important to identify and protect not only the resources and cultural values of American Indians in order to comply with all the appropriate laws and regulations, but those resources

29 cont. not protected by laws with the west -- which with the Western Shoshone and Pahute people have identified. So again, it's really important to include the Native Americans in the area.

Biological resources. While the previous goal, the Cultural American Indian resources, has a disclaimer stating that the ability to achieve this goal will be constrained by the requirements of on-going missions and safety considerations on the NTS, can we also expect this goal to be restrained by

30 mission? Is the biological goals, can they be impeded by a mission?

31 Air quality. How is the air quality deemed superior at NTS enough to warrant a goal on maintaining it when radionuclides in the soil can blow about in the winds? I'm not sure exactly what particulates you're looking at or which parts of the air quality, but we think that -- you know,

32 certainly the plutonium that exists in the soil needs to be factored in, because it states that we have superior air quality at NTS. And I would like to know how that is arrived at.

Geological and mineral resources.

33 The issue of how exploration of minerals at NTS might create more contamination needs to be addressed for

33 cont. this goal to be a goal that we would support. I guess under one of the alternatives, it's possible that the NTS could now be opened up for mineral exploration; but to what extent should it be if contamination is going to be introduced into the environment?

And then finally, I didn't have a chance to really look through the Transportation Document. But one thing I noticed that has to do with the number of shipments related to low-level waste.

34 The identified number of shipments of low-level waste in the Nevada Test Site EIS needs to be coordinated with the Waste Management PEIS, which comes up with a whole different number of shipments.

35 And then the NTS EIS needs to address routing requirements, because as it is right now, low-level waste routes are pretty much up to the carrier; the routing decisions and routing requirements. So we think that that needs to be delineated in the transportation portion of the EIS.

So anyway, thank you. And we'll be submitting some more comments.

ELLE: Well, I thank you very much for coming and I appreciate your comments. And if you want to send us written comments or give us other information, we'd be very happy to have it. Thank you very much.

(FORMAL MEETING ADJOURNED AT 7:30 P.M.)

* * * * * * *

This Page Intentionally Left Blank

This Page Intentionally Left Blank

PUBLIC HEARING TRANSCRIPT 4

THIS VERBATIM TRANSCRIPT CONSTITUTES

THE OFFICIAL RECORD OF THE

NEVADA TEST SITE ENVIRONMENTAL IMPACT STATEMENT PUBLIC HEARING

(QUESTION AND ANSWER PERIOD)
and
(PUBLIC COMMENTS)

Held at the

CASHMAN FIELD CENTER
850 Las Vegas Boulevard North
Las Vegas, Nevada 89101

on

March 26, 1996
Beginning at
6:40 p.m.

REPORTED BY: Lana Stewart
Senior Verbatim Reporter

Bechtel Nevada
Reporting Services

KEY to Transcript Symbols and/or Abbreviations

Webster's New Collegiate Dictionary: "Verbatim -- in the exact words; word for word."

Dash: [--] Indicates a sentence not completed by speaker.

Dots: [...] Indicates something was said by the speaker, which, as spoken, is neither audible nor decipherable to the reporter or from the taped cassette recording.

(ph) Indicates phonetic.

(sic) Represents exactly as said by the speaker and is used to alert the speaker/reader to an error in the record.

Parentheses: ( ) Words within parentheses are reporter's explanatory comments.

VOICE: Indicates an unknown speaker.

Uh-huh: Indicates affirmative answer.

Huh-uh: Indicates negative answer.

ENVIRONMENTAL IMPACT STATEMENT

PUBLIC HEARING AGENDA

Page

QUESTION AND ANSWER PERIOD - LIST OF SPEAKERS

PUBLIC COMMENTS - LIST OF SPEAKERS

PUBLIC COMMENTS (Cont.)

Page

LAS VEGAS, NEVADA, MARCH 26, 1996, 6:40 P.M.

QUESTION AND ANSWER PERIOD

MICHAEL DEFLORIA

DEFLORIA: Michael Defloria. We have been making this most deadly poison known to man. When are we going to stop making it? We still don't know how to dispose of it. It's going to cost us billions and trillions of dollars to dispose of it. When are we going to quit making it?

(APPLAUDING FROM THE AUDIENCE)

DEFLORIA: Have you had anything in the future when you're going to stop making it? You know, the sun has been burning there for trillions of years, all the energy you want for free. You know it's there, they know it's there.

ELLE: I don't believe we have a simple answer for that question. If you --

DEFLORIA: Well, you have all the most brainy people in the world, you should have an answer for that.

ELLE: Well, I don't have an answer for it tonight. And if you want to give us that as a comment, we'll be able to look at it and try and give you an answer.

DEFLORIA: I have a standing offer to any local, state, or federal politician. I will give them $5,000 cash for every problem they solve, and they pay me for every problem they don't solve. I see you don't have an answer to a simple problem. With all the brainy people we have in this country, and we can't solve simple problems? Come on folks, you're all government employees. Do you --

ELLE: Let me be clear, that when you get ready to make your comments, we have the process in place to do that after we take a break. But I do want to answer some general questions.

LEWIS GARY

GARY: My interest is in what is meant by fissile materials?

ELLE: Fissile materials in the sense of the document that they're going to be talking about in the next couple of days, is material that you can use in the manufacture of nuclear weapons. It's material that fissions that creates energy.

GARY: Okay. And that is separate from

the waste it comes from?

ELLE: Yes.

TOM MC GOWAN

MC GOWAN: My name is Tom McGowan. There's a two-part here. Will the gentleman who offered the $5,000, see me right after the meeting; I'll give him the solution he's asking for. It's called eliminations. It's been quite well-known for several decades. My question to Dr. Elle is -- is it Dr. Elle?

ELLE: Yes.

MC GOWAN: There was some high-explosive testing completed out at the Test Site, I believe a year or so ago.

ELLE: Uh-huh.

MC GOWAN: And what were the results of that and how does that correlate with the testing -- the High-Explosive Testing Program recently announced by Bechtel as innovative in some way? The third part to that, of course, is what are the expectations from the Bechtel operation? Is that simply a make-work to get the place on the back burner open, or is there some realistic, anticipated, positive benefit in the

broader horizon of alternatives ensuing forthcoming from that? I would like additional alternatives, but if you will make the time allotted for the recommendations, I'll be happy to provide you with some. Thank you.

ELLE: Okay. I think the simple answer is, the Bechtel Proposal is clearly one that they believe they have an opportunity to bring projects and activities to the Test Site. The explosive work that was done by Livermore is not connected necessarily with what Bechtel is proposing. They are consistent activities that can be looked at within the framework of the EIS and the Resource Management Plan.

WILLIAM VASCONI

VASCONI: Bill Vasconi here. Early on, you mentioned a fact that some of these alternatives could be intermingled.

ELLE: Uh-huh.

VASCONI: In looking over the EIS, Alternative 4 which is withdrawn lands, you had quite an extensive mass of land north of the Yucca Mountain Site Characterization Facility. That was in Alternative 4. As you look at the map on

Alternative 3, that same section of land is left unused. And would it be permissive to utilize that land, just as it was going to be used in Alternative 4, for recreational use because of the timber and the Indian cultural areas? And one of the other things included in it, was the fact that with the game we now have there, it would be advantageous to include that in Alternative 3, which is the maximum use of the Test Site.

DEFLORIA: That land belongs to the Shosone Indians, sir.

ELLE: The answer to that question is, as we put together the preferred alternative, return of that piece of the land out of Alternative 4, is certainly one we can look at; but in concert with other activities and other proposals that we have in this document. And it's comments like that that influence how this preferred alternative gets put together.

DAVE TIMOTHY

TIMOTHY: I'm Dave Timothy. Wasn't the boundaries of the Test Site just expanded just recently again?

ELLE: I don't believe so. The land withdrawals that we identify in this document are probably in the 1960, 1950 age.

TIMOTHY: I think you will find, if you check, that the boundaries that border Area 51 were just expanded, and more of that area has been placed under government's supervision and control and even was up until recently. This expansion seems to keep getting larger and larger. And even the public lands that were accessible to the public, are now not as accessible as they were.

ELLE: Right.

TIMOTHY: My question is, with the DOE's past history with what's taken place, how do we know that they're even interested in finding out what we want or that we can know that what we're being told is the truth? There's many of us who experienced grave lives from the DOE on dosimetry and many other things as far as the radioactivity and the effects. How can we know that what you're telling us is the truth?

ELLE: Well, in simple terms, whether you believe me or not, the broad experience of the people that put this document together, and the broad experience as the public that has an opportunity to read it, and the resources and the references that we

use in putting it together, that's the reliance that we put on making sure that the information is correct. And there is an opportunity to check the numbers, to check the process. That's why we have a public comment period. And we invite people to look at and challenge the information that we've put in our document. And we are here and have been here collecting comments from people, and we do have an interest in people's comments and how they view the work that we've done.

LATHIA MC DANIELS

MC DANIELS: Don, I have a general question for you. My name is Lathia McDaniels. And this is in regards to the EIS process. When you generate the Final EIS, will it follow the same format as this Draft EIS? Because my concern is, once you identify and detail the preferred alternative, will you also do a cumulative impact assessment on the preferred alternative, and will you also have the unavoidable assessment, impact assessments?

ELLE: The answer is, yes. When we put together the preferred alternative, we'll go through the same analytical process that we have done with

each of the four alternatives. We'll identify the impacts of that preferred alternative.

MC DANIELS: And my last question is -- and I asked you this a couple of months ago -- will we, "the public," have an opportunity to review that preferred alternative and make comments to that through another public hearing? And I think your answer before was "no." So what opportunity will we have to make comments to the preferred alternative if we have some?

ELLE: We'll issue the Final EIS and then we'll wait 30 days before we issue a Record of Decision.

MC DANIELS: Okay. And that's our time for making comments?

ELLE: If in fact we've not done the right job, or people don't think that we've analyzed it properly, that's the place where people can question what we have done.

MC DANIELS: Okay.

MICHAEL DEFLORIA

DEFLORIA: Can I ask another simple question?

ELLE: Sure.

DEFLORIA: Who is paying for the disposal of this high-level nuclear waste?

ELLE: For high-level waste, the electric utilities have contributed to a fund that's managed by Congress.

DEFLORIA: Yeah, but I read in the paper just about everyday how many millions of dollars is being spent up there. Is that taxpayer's money? Who pays for the wages?

ELLE: It is money that comes out of that nuclear waste fund.

DEFLORIA: All of it?

ELLE: Yes.

DEFLORIA: Wages?

ELLE: Uh-huh.

DEFLORIA: Thank you.

LARRY KRENZIEN

KRENZIEN: Larry Krenzien. I've got a question on the water usage. In particular, the water usage increases under the Solar Proposal by a factor of 3 or 3 1/2. I was wondering why, even though Mercury already is fairly high?

ELLE: It's primarily for cooling, I believe, in that solar category of activities.

KRENZIEN: Okay. Just a comment. On Page 614, you have an error in the annual usage of Las Vegas water by a factor of 1,000.

ELLE: Okay.

JOE BACA

BACA: I worked at the Nevada Test Site from 1962 to 1970, and I worked in Area 51. And you can't trust DOE because they lost all my records. And I worked out there when the BANEBERY blowed (sic) out. And now they claim I never worked over there. They lost all my papers. But here's the key and my badge number right there, (Indicating) and I'll prove it to DOE. And they still refuse. I worked out there when BANEBERY blowed (sic) out; in G-Tunnel, D-Tunnel, K-Tunnel, even waste in Mercury where you build those buildings for the people to stay, some of the employees. But you can't trust DOE because I went over there and proved that I worked there. And a lot of people died. And when BANEBERY blowed (sic) up, they send us in there and they had us like regular electricity matches on our body. We are only few

living right now. I can't work anymore and they never helped me. But I proved to DOE they're wrong and don't trust them.

ELLE: Okay.

BACA: Wait a second. And we worked out there, we did all the cleaning up. And some of the vehicles were full of radiation; when the people, like Reynolds Electric and DOE sold them to the public here in the state of Nevada and different states. And I can prove it to you. Thank you.

LEWIS SKERRY

SKERRY: This is Lewis Skerry. Something I was uncomfortable with in the report was the climate. A lot of your models used current climate, but yet we're talking about storing waste for 10,000 years. And I believe the climate has changed considerably in the last 10,000 years, and I believe it will change considerably in the next 10,000 years. And I just wanted to raise an objection using today's climate for what we can expect in the next 10,000 years.

1

ELLE: Okay.

SKERRY: Also, there was the closure of

some of the waste disposal pits. There was mention of the Integrated Closure Plan and Program. I am interested in the information that is in the Integrated Closure Plan, but it's not available to me in the EIS.

ELLE: I'll point out to you the technical people that are with us tonight, and they can get you the information or tell you how to get it.

SKERRY: I appreciate that. Thank you.

REINARD KNUTSEN

KNUTSEN: My name is Reinard Knutsen. And my question involves the low-level nuclear waste dump in Area 5, which has been described as the most productive waste dump in the country. And I'd like to specifically know what the DOE's proposed action, how that affects the on-going transportation of nuclear waste into Nevada from around the country; specifically through Las Vegas, if there is any EIS studies being done specifically on transportation through populated areas, and also the continued use of that low-level nuclear waste facility?

ELLE: Well, as I mentioned, the Transportation Study that was an appendix to this

document contains the risk assessment for low-level waste transport, the information that you're looking for. And we can talk to you later about how that's reflected in the document, if you wish.

KNUTSEN: Can you say what risk assessment means, the risk assessment of transportation of nuclear waste through Las Vegas?

ELLE: It's risk assessment or risk in terms of the probability of an accident and the risk of a routine truck accident, as well as the radiation risk related to the material that's being shipped. So those risk numbers are in that document and they're summarized.

KNUTSEN: What are the current ways that DOE lets the neighborhood that these waste transportations pass through, what is the current way that DOE incorporates -- you know, let's the neighborhood know that this waste is going through their neighborhood?

ELLE: That happens both at the state level and at the county level. So the government agencies have information about transportation that we provide them.

KNUTSEN: Okay. Could you just say, if this low-level waste dump in Area 5 is indeed the busiest waste dump in the country at the moment?

COLARUSSO: I'm Angela Colarusso and I work for DOE in the Waste Management Division. And currently, the waste shipments that we're receiving are at a lesser volume then we have in the past. Overall, based on past history, our levels are usually -- the amounts of waste that we receive are usually in greater quantities then are received across the country within the DOE complex. We are the largest receiver of low-level waste within the DOE Complex.

JOLIE LONNER

LONNER: At present, how many shipments of nuclear waste come through Las Vegas? Jolie Lonner.

DI SANZA: I'm Frank DiSanza with the Department of Energy. The answer to that, is that it varies from year to year. For example, last year, there was 916 shipments of low-level waste to the Nevada Test Site. This year, that amount, the number of shipments is probably no more than 400 shipments; and that's projected throughout the rest of this fiscal year.

TROY JONES

JONES: Hi, my name is Troy Jones. And along those same lines, if the HR-1020 Bill, which proposes the shipment of nuclear waste from all around the country to this Test Site goes through, and that's pending in Congress or in the house right now, how many shipments ever can we expect through this place?

ELLE: I don't think we have the answer to that. And until that legislation is passed, I'm not sure what it represents for us.

JONES: Will that increase the amount of shipments coming through?

ELLE: Yes, it probably would.

REINARD KNUTSEN

KNUTSEN: Just one final question. Is this the same dump in Area 5, is this the same design of dump that is in Beatty which has currently leaked radioactivity in the groundwater there? Is that buried in underlying low-level trenches?

ELLE: Yes.

KNUTSEN: And just the waste comes in, in metal barrels, and is placed in these underlying

trenches?

ELLE: Right.

PUBLIC COMMENTS

DENNIS BECHTEL

BECHTEL: My name is Dennis Bechtel and I'm employed by the Clark County Department of Comprehensive Planning, Nuclear Waste Division. But my comments tonight are not the official position of the County, but more my personal interests and concerns. I -- in going through the EISs, I've worked on a lot of EISs and I've commented on a lot of that. And I would like to applaud you, in the sense that the number of topics that have been treated, that I think are too often ignored in EISs. And I speak to things like transportation and public safety and resource management. And I think these are -- I have some concerns about things in the documents, but I applaud DOE for the effort of bringing these issues out.

Just a couple of comments, and Clark County will make a more formal statement prior

2 to the May 3rd deadline. The EIS mentions a number of related EISs that will be considered. They are

2 cont. considering things at the Test Site. And I think the document needs to be a little stronger on just stating how the decisions that will come out of EISs and other areas will be treated, either within the NEPA process

3 for the NTS or if there's some conflict in recommendations, how the public is able to comment on that. I think it's important to maybe discuss a

4 little more about the process. Because as you're aware, with the waste management option, Alternate 3, the Test Site is being considered by a number of other sites for say the final, either storage disposal or treatment of waste. So I think that needs to be a little clearer in your final document. And the fact, that hopefully, the public will have a chance to comment on that. I'm a little confused about the --

5 could you speak to when the actual -- the final Record of Decision will be released for the Test Site. I had heard that this whole thing is kind of on a fast track. And my concern is that a number of people are going to be commenting on the documents and that there's ample opportunity for consideration of the concerns of the public, and that actually reaches the Final EIS.

So do you have a date in mind for the ROD?

ELLE: We don't have a clear date in mind for the ROD yet. Clearly, it will be issued 30 days after the Final EIS or later than that. We do have an interest in getting this document done in as reasonable a time frame as we can. The Secretary's interest in getting these kinds of documents issued in 15 months, we've already not met her objective by a few months.

BECHTEL: Okay. A couple of other comments. There are sections about environmental justice in the EIS. And I noticed there's a pretty comprehensive description of minorities, low income groups within the Las Vegas Valley. But I think where it kind of breaks down, transportation is an important issue for Clark County, government, and citizens. And
6 I think you need to recognize that some of the routes that are considered in the Transportation Study actually go through areas where you have high proportions of minority or low income groups. So I think the document needs to discuss that and does not do so.

The main issue that Clark County has been concerned about and is of interest to me is the transport of the waste. And I note in the Transportation Study, that ten routings are examined,

and eight of those seem to be in Clark County. And four of them actually go through areas that I think we would consider as dangerous, potentially dangerous. And I'm talking about the Spaghetti Bowl, I-15, US Highway, Hoover Dam, Craig Road; is an urbanizing area. So I think -- I'd be interested to hear from
7 you, what will actually come out in the way of a decision on transportation with regard to either the Final EIS or the Record of Decision. Will there be -- how will the EIS or ROD treat transportation issues?

ELLE: The EIS is treating transportation issues in a way that assess the risk of each route. Currently, it's not within the Department's authority to direct shippers on a specific route. Route selection is left up to the shipper. We can recommend which route is best and that may be the way the document ends up looking.

BECHTEL: You know, it seems as if -- on one of the pages in the comments to a question at an
8 earlier meeting, it was noted DOE -- that they could take what I consider a more proactive stance with regard to carriers and contractually defined; things like routes, safehavens, and things like that. And I would encourage you to go with your own recommendation and do that, and to avoid potentially dangerous areas.

9 I realize there's some debate about just the hazard of the material, but the public is concerned about things radioactive and there is a potential for greater number of accidents to occur in the urban area. And I would encourage you to consider more rural routings.

That's all I have.

ELLE: Thank you.

REINARD KNUTSEN

KNUTSEN: I'd like to thank the DOE for giving me this opportunity to speak my mind. I'm not sure if I totally feel like these public hearings actually -- if we are really represented in the decision-making, but at least it gives us a chance to see everybody and to see who supports what and who is against what. I don't have a prepared statement, but I will put that in before the March (sic) 3rd
10 deadline. I would like to suggest that we do look very closely at the option of discontinuing all operations at the Test Site and working specifically on cleaning up what is already happened -- occurred
11 there since 1951. And specifically look at the transportation, even -- regardless of whether Yucca Mountain goes in or not. Nevada is targeted as the

12 storage site of this nuclear waste. And the gentleman earlier who talked about the transportation of nuclear waste through dangerous areas, this is a very big concern for me. And I think that this needs to be
13 looked at very closely. And the fact that you say that you leave it up to the shippers to decide which route they take, shows that there is no oversight or preparedness in terms of emergency response to an accident through an urban area. I read one DOE report that said that if an accident occurred in a rural area, 42 square miles could be contaminated, and it could take over a year to clean up and cost four point something billion dollars. But an accident in an urban area could take over four years to clean up and be ten times as expensive. And the report that I read
14 also said that the DOE expected -- and if we are transporting waste to Yucca Mountain, we would be looking at 15,000 shipments of nuclear waste. -- DOE expected at least 70 to 300 accidents to occur during that time period. And so these concerns weigh really heavily when thinking about the future of the Test Site.

15 I'd also like to say that I do consider the Test Site to be Western Shoshone
16 territory. And that I think all operations need to

16 cont. cease at the Test Site and that cleanup needs to occur. And that's the only operation that should continue is cleanup and restoration and returning the 17 lands to Western Shoshone sovereignty. Thank you.

ELLE: Thank you.

TOM MC GOWAN

MC GOWAN: Good evening. I apologize if I'm out of sequence. I understand so far, my perception is that we're primarily on the defensive. I say change that attitude immediately. There's no reason to be on the defensive. You are holding the aces. I speak to the people, whether they're with or beyond the agency in some aspect. I still call we the people of the United States. And it depends on what you want to do with the Test Site. It is your Test Site. Indians incidentally have a policy longstanding. They don't own land, they are the stewards of land. That's why they can't sell it and won't sell it, probably. But they have every right to live on it and benefit from it. And I think I could support the person's -- the previous speaker's viewpoint to that extent, and convince some of my Native American sovereign tribal people to do the

same.

Your Test Site is not too big, it's not big enough. Your vision doesn't begin to scratch the surface of the attainable scope. You look -- some people look at it and see a vacant lot. Others look at it and see a potential income, some kind of a job. I look at it and I see the world headquarters for the age of transition from the toxic radioactive risk inherent nuclear age to the age of an abundance of safe, clean, inexpensive neo-energy to the third millennium profitable domestically, locally, nationally, tribally, and worldwide, intergenerationally. That's a little bit, but it's what we're made of and that's what we can do; and it's what we should be doing. And who would like to begin, and when? Because you can do it even as we speak. The key determinate is the decision-making process, which in my experience can take anywhere from a fraction of a microsecond to the rest of human time. We are already several million years late, might as well begin, don't you think? Well, here's what you can do with the Test Site. Practically anything. But I don't want to sound so general about it. Your first 18 key crucial and central activity should be the elimination of toxic radioactivity, completely and

18 cont. permanently, and the explosion of it from the terrestrial, geophysical domain. There are other places in this universe besides this particular enlightened planet. And the way you eliminate it is what people are calling today triple-play. They're a little late and they picked out the wrong name, because triple-play means simultaneous, not sequential; or the other way around. Beg your pardon. Triple-play is simply the drastic reduction of the volume of toxic radioactivity. The transportation pursuant to elimination of all but the nominal volume of residual toxic byproducts, they're extremely toxic; but they're also short-lived. And we can get that down from this to this, and get this over here like that pretty easily. All you have to do is do it. You're Americans. I assume you're able to do it, but forgot a way how.

And that's the key central activity. All their activities that revolve around that and are expressly contingent and interrelatable to it. One is the nuclear weapons arsenal requisite ready-reserve storage and disposition. Somebody's calling that FM, fissile materials, and SSM. For some reason, they're not here because they think you're in some other activity. Severable somehow. I don't see

it severable. I see it as one big integer, just like this audience. We may not know each other's name, but you're all Americans and you all are concerned about this Test Site.

The other point to make, that you have environmental restoration, waste management, low-level mixed waste, TRU, and decline the state; which is out there ready to bury, try to recover process, compacted, and incinerated via biomass to create electricity. Incidentally, in the triple-play item, you've got the elimination of toxic radioactive radionuclides; and concurrent therewith, you have the production of tritium which can also be processed. You have also the generation of an abundance of electrical energy. You can take that and combine it competitively interfaced with solar, natural gas, hydrogen. Do you want to know what to do with the 19 tunnel? Put hydrogen in the tunnel, in case anybody's afraid of hydrogen.

But the point is, just don't sit here, do it. Don't talk to them, talk to each other. You are the people and you are the boss. Believe it or not, you are the President and the Congress of the United States. They are soldiers, good ones. And they will do what they're told. And it's up to you to

30

tell your Congress and your President what you want them to do. Not just for you, but for all humanity and all the environment for the rest of human time. That's about 4 1/2 to 5 billion years. Can you do that? I think you can. And I'm waiting.

JOE BACA

BACA: I would like to suggest one thing to DOE or the persons who are clearing these people for Q clearances from now on. When I was out there at the Nevada Test Site, like I told you before, there were people out there over Safety, alcoholics with Q clearances, you couldn't believe. You had managers drunk every day. And that's the truth. Thank you.

JOLIE LONNER

LONNER: I just want to point out that as we give our names and we have our addresses on the card, this person is coming around taking photographs of everyone who is speaking, as well as having our testimony written down; and it makes me kind of nervous.

HENDERSON: Do you not want me to take

Bechtel Nevada
Reporting Services

31

photographs?

LONNER: No, I don't.

HENDERSON: Okay.

(NO PHOTOGRAPHS WERE TAKEN AT THIS TIME)

LONNER: But just think about that when we think about the DOE and their new and friendly terms and how they've turned a new face, because I don't believe it. Speaking in public makes me nervous, so let me calm down here.

Just glancing over the EIS today,
20 I realized that the DOE had a lot of greenwash, a lot of talk about Ecosystem Management. And I'm afraid that the DOE does not understand what Ecosystem Management means. When I learn about Ecosystem Management, I learn about how everything is interconnected. How when we do something to one planet, it may affect the soil. When we do something to the soil, it may affect the rain. When we do something to whatever, it may affect something out. And it may ripple out and ripple out and ripple out for many, many years to come. When the DOE talks about Ecosystem Management, and how that's what they're going to apply to the Nevada Test Site, it's crap. Because if they really believed in Ecosystem Management, they would err on the side of this could

Bechtel Nevada
Reporting Services

32

have an effect; because that's what people do when they think about the Ecosystem. They say this Ecosystem is way more complex then we can ever imagine, so we're going to err on the side that we don't know what we're talking about and try to figure out some other way. Because that's what people do when they understand how the earth works, because they understand that they can never understand how the earth works. If that makes any sense, but in my mind it does.

So I would just like to point out that the DOE keeps saying that they've turned a new face and they're being honest, but it's just PR; it's just crap. It's just greenwashing. It's not real.
21 They don't know anything about Ecosystem Management. They don't understand how when they dump lots of radioactivity in the soil, it's going to affect the water, it's going to affect the soil microbes. It's going to affect the vegetation. We have no idea what it's going to do in 10,000 years. That's one of the comments that I have.

I don't know if you want to reply to that first and then I can go on to my second one.

ELLE: One of the things I would invite you to do is participate with us in the Resource

Bechtel Nevada
Reporting Services

33

Management Planning process that we have. One of the reasons that we issued Volume II of this EIS is to invite the public to help us define the content of the Resource Management Plan. And if you are concerned about whether or not we know what we're doing, then one way you can help us is to participate with us in the development of that activity. And your comments help us do that.

LONNER: I would just really question as to whether the DOE really wants anybody's impact or they would just rather hire a PR for them to say, "Oh, yeah, Ecosystem Management, that's what you would say, that's what the '90's term is. Yeah, yeah, say that. They'll believe you and that will be great."

ELLE: Is Tim here? Did Tim leave?

KILLAN: (STOOD UP) Right here.

ELLE: Tim Killan is the DOE person that's managing this Resource Management Plan. If you talk to him and give him your name, he'll make sure that you get involved in the process, if you want to do that.

LONNER: Yeah, I would. My second
22 comment: In the EIS, I was reading under the unavoidable adverse effects. And it says, quote: "Because of low groundwater velocities, migration of

Bechtel Nevada
Reporting Services

22 cont. radionuclides to the nearest water will take about 750 years. The calculations indicate that tritium with a half-life of 12.5 years would decay to negligible levels long before reaching potential water." Now, right under that in the EIS, a few paragraphs in, it says: "Recent field studies revealed a higher probability for contamination migration then previously assumed." So my question is, how can we be sure that the never undisclosed migration rates are not going to render the EIS inaccurate causing health hazards to the public?

ELLE: One of the ways we do that, is as we get new information and we look at the impact analysis that we've done in this document, if there is changes, if there are questions, then they would be raised again in another Environmental Impact Statement like this.

LONNER: Okay. It's just the same game. You have Beatty that has been leaking radiation. And the scientists knew about it and they said, "Oh, you know, this can't be right because the radiation is leaking way more then we ever assumed it would; so we must be wrong. Okay, we're going to wait a year and study it again." So they study it again, and a year later, boom, they realize, "Oh, well, we were right,

sorry." You know? And now you have a whole huge disaster in Beatty. And now we're looking at the same thing saying we just -- you did your EIS with this information saying that radiation wouldn't leak, and now you have this new information that radiation

23 leaks. So you're going to study it again while you're still dumping nuclear waste out there. It makes no sense. Studying it while it's still leaking is stupid. I mean, we can probably match back and forth, but I'm done.

ELLE: Thank you very much.

DAVE TIMOTHY

TIMOTHY: I'm Dave Timothy. I'm one of the guinea pigs -- you wanted to qualify who we were. I'm one of the guinea pigs of the government's nuclear test program. I was drafted into the service, or maybe I should say I feel like I was drafted into the service, into the military at the age of 18 after being exposed repeatedly to low-level fallout for a number of years. By the time I was 18, I had thyroid cancer. If you'd like a better picture, I'll give you a good one with the government's records.

(INDICATING TO JIM HENDERSON BY OPENING HIS SHIRT)

(LAUGHTER)

TIMOTHY: We found out that we cannot trust what the DOE says about the fallout. If you're familiar with the Tristate Congressional Hearings that went on in '79 and '80, they misrepresented the dosimeters or the amounts of fallouts in their own documents by a factor of 1,000. So we were receiving up to 1,000 times more radiation then what they were recording that we were getting. Dr. Robert Penelton was the one who conducted those studies. That information is also in the court records that were taken and subpoenaed and deposition by the United States Attorney General. They took his and mine at the same time, so I know these facts to be true. The factor of 1,000 seems to come up quite consistently with the errors of the DOE.

My proposal and my question to the DOE at this time, is why are they not finishing the first test before they want to start doing new things? There has not been any effort made to find out what the effects are on low-level radiation or on people. There's one page in all those papers that talk about

24 the effects on people, one page. There's probably 5,000 pages in that material. When do we get to tell the effects? Why isn't the DOE interested in the

24 cont. effects on people? Do they really want to know? There's some of us here that can tell you the effects of radiation on people. There's some of us here that's had first-hand experience with how honest and how truthful the DOE has been. We have experienced it first-hand. And these flowery meetings don't cut it as far as us being able to tell what we need to, to the other people and to what's really going on. I don't believe that we even have scratched the surface on what their intent is at that Test Site. And as you are probably aware, there's been vast amounts of storage placed there already. This was kept from us until just recently.

I think the Test Site should be

25 closed permanent and cleaned up. We don't need any more potential hazards then we've already had. We live here. We can't just drive away and not have exposure to these materials. It's about time that we, the people, were heard. Did you not tell me personally that you would contact me within a week with the information that I requested, Don?

ELLE: Yes, I did.

TIMOTHY: Did you contact me within the week?

ELLE: I asked somebody to do that for

38

me, yes.

TIMOTHY: You said you would. I asked if you would personally, did I not?

ELLE: Yes.

TIMOTHY: Did you?

ELLE: I have not done that, no.

TIMOTHY: Okay. There's a classic example. We asked for information, it doesn't come. Now, if you believe that these proposals are what's going to happen, think again, it won't. They're going to do whatever they've decided unless we stop them. And we're going to have to unite. We're going to have to do as the gentleman previous to me stated, we're going to have to get to our congressmen, senators. And we've got to be vocal. This has got to get to our friends and neighbors and into the media or we'll never get this stopped. They have already decided to
26 use this for a waste disposal site for the whole nation. If you're familiar with what's going on up in Twilla or Dougway, have you heard the news on that lately at their site there? They have massive illnesses, cancers. The government says there are this many. (Indicating) The people have done their surveys and they found out that there's this many. (Indicating) The same discrepancies seem to follow

Bechtel Nevada
Reporting Services

39

through in about the same proportions. I think a factor of 1,000 comes pretty close.

We, the people, want that Site
27 closed permanent. No more storage, no more dispersant of any types of material there. We feel very strongly about this. Some of us feel like that it's our survival, our lives that's at stake here. So far, we've had no effort to find out what the effects are. I propose that we do some more study on what the effects on the people are, real studies. Not DOE studies, real honest studies. Number two, let's get some serious medical interest in here to find out what the long-term effects of this radiation are. Third, let's get some decent compensation and disability to those that have been damaged by this. This imaginary fence around the Test Site, that the fallout and the radiation doesn't go passed, is bunk. It's not so.

Please, if you want to survive this mess that's being set up and created, do something or they'll do it, they'll run over us. And they will eventually destroy us if we allow them. Thank you.

RICK NIELSEN

Bechtel Nevada
Reporting Services

40

NIELSEN: Thank you. I have some concerns, some of the similar concerns that were already mentioned. And maybe you could elaborate a little more; specifically, on the time frames and the
28 integration of decisions being made in other EISs and the impacts that they'll have at the Test Site. For example, I think one of the decisions pending in another EIS is the possible storage of plutonium at
29 the Test Site. Is that decision going to be made prior to the Final Record of Decision for the Nevada Test Site or would that come afterwards, or how are
30 those decisions integrated?

ELLE: I believe in terms of that decision-making process, our EIS will be done before that decision is made. If in fact a decision is made to place plutonium for long-term storage at the Test Site, then there would be another EIS or a NEPA document written to support that decision. So the programmatic decision may be made. There will be another public process to fully assess the impacts of that activity.

NIELSEN: Well, given some of the public discussion about the mishandling of the Waste Management PEIS and the fact that this is being -- the Nevada Test Site is being done internally, I just

Bechtel Nevada
Reporting Services

41

wonder what type of integration in these decisions --
31 is it really going to take place?

ELLE: Well, one of the things I tried to point out is that we have made a significant effort trying to be consistent with other documents as they've been developed. To the extent that we have an alternative in our document that would include storage of plutonium, the same alternative that's in the Material Disposition Document; we are consistent.

NIELSEN: Another question I have along the same lines, is in regards to the decisions for the Nevada Test Site Site-wide EIS specifically. In the Resource Management Plan, it lists a chart here that shows that the Record of Decision will be made and then after that's made, then the commitment to complete the Resource Management Plan and complete the Transportation Plan will be done after you've made the decisions and select the alternatives and propose projects. It would seem to me that it would make more sense to complete the Resource Management Plan and
32 have the goals established for your Resource Management Plan before you go ahead and make selections for your proposed activities.

ELLE: I think the process we have established in the sense of having a framework for a

Bechtel Nevada
Reporting Services

Resource Management Plan with a proposed set of goals and asking the public to help us define better the full content of that document, allows us to engage in resource management planning in a realistic way. It is not, at least in our expectation, possible to finish that plan in the short time left before we finish the EIS. But it will be a committed process that we undertake.

33 NIELSEN: Can I ask you why you're in such a hurry to finish the EIS?

ELLE: As I tried to say before, the Secretary's objective in having these documents written and produced and finished is 15 months. Her objective is both in terms of getting realistic information out to the public in a rapid way, as much as to save money. Because the longer we take to do this, the more it costs to get it done.

NIELSEN: Okay. I had one more question with regards to the Resource Management Plan. You make specific reference to soliciting outside input and public input into the plan. And specifically, you mentioned the Community Reuse Organization. And correct me if I'm wrong, but I think they are now called the Nevada Test Site Development Corporation. And I think they're operating under a grant from the

34 DOE. I'm wondering if it's appropriate for a private organization being funded by the DOE to be solicited for comments to make recommendations to establish resource management goals at the Nevada Test Site?

ELLE: Well, we've also asked the state of Nevada to help us in this plan and we've asked the public, so there is a broad spectrum.

NIELSEN: Are they operating on a grant from the DOE?

ELLE: The state?

NIELSEN: Yes.

ELLE: No.

NIELSEN: Okay. Well, I would recommend

35 that any private venture, or public private partnership which proposes the use of the NTS as an operating site, be opened to further review under NEPA for environmental impacts and allow for sufficient public input. Thank you.

BILL FLANGAS

FLANGAS: My name is Bill Flangas and I'm here to make a couple of comments in support of continuing the activity for the Nevada Test Site. I've been to a great number of these meetings and we

tend to repeat and repeat, you know, many of the same concerns and much of the same dialogue. So I think sometimes it's important to kind of point out what are the real needs and what are the real problems. Now, in terms of that, you know, this 1,360-square-mile Test Site serves as this nation's outdoor laboratory. And every great nation needs an outdoor laboratory in pursuit of its national security. The Test Site has admirably done that for a great number of years.

The Cold War was a fearful effort on the part of the Soviets to gain nuclear supremacy. And in that process, they literally raped three generations of their people. And ultimately, they lost. And thank God, that Cold War basically is over. Most of us hope and pray that the need for full-scale testing will never again to arrive. And I respectfully suggest that the best way to prevent full-scale resumption of nuclear testing is to maintain a readiness capability that would serve as a deterrence to anybody whoever wants to embark on a venture like that again. In my lifetime, we have fought four wars in this country. And we've lost three pieces. And the last one is still kind of shaky. And that bothers me.

The Test Site is uniquely suited

to serve as a nation's outdoor laboratory. And again, you've heard this before, but I think we need to remind ourselves, the Nevada Test Site is not crossed by any major rivers. It does not have any big canyons and whatnot that prevent large-scale projects. It's not crossed by any transcontinental highways or transcontinental railroads. It has a benign year-round climate that enables year-round activity and major projects. It has a superbly skilled work force that has served this nation well. It has a work force that is dedicated to public safety, personal safety, have become highly conditioned to the environmental needs, has imposed a discipline to

36 accomplish that. I respectfully suggest that that skilled work force that was so successful in bringing the Cold War to an end, it's absolutely the best work force now to deal with the remaining problems.

Now, we're here collectively to solve problems, not aggravate them. We have a great opportunity in our hands right now to go to future uses for the Test Site, in terms of dealing with big national problems that can't be resolved any place else. If you tried to create another Test Site in this country today, there are very few places left. There are some places in Montana. I guess there are

46

some places in Western Colarado. There's a few areas in New Mexico and whatnot. But none of them has the superior qualities the Nevada Test Site has, with its national security, with its deep water table, the fact it's not on the -- it has not been encroached by population and so on.

I urge -- you know, in these meetings, we all have our agendas and we all have our viewpoints. And I respectfully urge everyone here to exercise common courtesy, respect for other people's opinions. And dedicate each and every one of us to meeting our mutual responsibilities. Thank you.

WILLIAM VASCONI

VASCONI: Jim Henderson, if you want to take my picture, feel free to do so. Jim does not work for DOE, by the way. I have been around Jim for approximately the last 2 1/2 years. He's on the NTS Site Specific Advisory Board; better known as CAB, Community Advisory Board. That involves some 20 people that are well diversified within the community of Southern Nevada. And we meet once a month, the first Wednesday. We air our views. We go through and discuss issues. We broke an EIS down into

Bechtel Nevada
Reporting Services

47

four parts. And naturally, we kind of drift towards the ones we like. Jim has been a member of that committee, like I say, for 2 1/2 years and I appreciate his efforts. Again, he does not work for DOE.

DOE, AEC, now we all know that they did have a place in our lives. The older you get, the more you realize they probably did -- not getting off into the wars and all. But the work that was done out there did secure our future for our younger people, regardless of what you think. Now, folks, there was 928 devices exploded out there. Some of them above the surface, the vast majority of them underground. You're going to be hardpressed to convince an old country boy like me that you're going to go out there and plant corn in ten years. It's not going to happen. But there can be cosmetic cleanup. You keep the areas secured. At the present time, you've got a number of individuals and organizations that want to come on board and utilize the futures that exist at the Nevada Test Site.

Yes, we are the NTS Development Corporation made up of a good many businessmen here in Southern Nevada that want to bring in new technologies, offer businesses an opportunity to

Bechtel Nevada
Reporting Services

48

produce things out of the ordinary. Well, I think it's time we let them in. We've got a lot of kids graduating from college in this town. As far as technologies, they've got to go to another state. Now, believe me, we've produced all the people we need to change sheets in hotels or be bartenders in casinos. What you need to do is make it possible for the young people graduating from UNLV and Reno to come down here and get involved with these businesses and new technologies. Come down and get a piece of the action. There's nothing wrong with the diversified economy of Southern Nevada.

Now, we can stand here and bad-rap DOE, but name another country where the people get to sit and talk and find their faults with what they're doing. Hell, was it so long ago that you thought that Russia was going to collapse in any number of countries? It wasn't that long ago where I thought they could close the front gate of the Test Site and do any damn thing they wanted to.

I started working out there in 1964. I worked off and on out there probably some 17, 18 years. I've been a construction worker 32. That Test Site paid for a lot of college educations, built a lot of houses. It meant a lot to Nye County and

Bechtel Nevada
Reporting Services

49

some of the other communities that you don't hear about. Those people would like to see the diversified economy of Southern Nevada. They'd like to get involved with those technologies. You ought to give them the chance. Now, this valley has grown from some 85,000, when I first got here, to a million. They say in 16 more years, there's going to be two million people here. Well, maybe we ought to give it back to Arizona or Northern California or Southern California or something, because it's damn sure Northern LA.

Now, these folks are telling you they don't want that waste to come through Las Vegas,
37 they don't want it to come through Nye County. I agree. By God, we got -- we can go right there to Carlin, come on down Carlin and toward the Smoky Valley. Put your rail system dead center, geographical center of Nevada and go on to that Test
38 Site. When you folks get done using it, we can use it for mining. We can use it for cattle. We can use it for recreation. But long after you get that Test Site taken care of, we may have a system that may last hundreds of years.

Well, that's just about all I had to say, except I want you folks in DOE to know that people like me appreciate the fact that we're doing

Bechtel Nevada
Reporting Services

something about the waste. We are involved in environmental restoration. You're giving us an opportunity to express our views. And I appreciate it. Thank you.

ELLE: Thank you.

ALLAN CHAMBERLAIN

CHAMBERLAIN: I'm Allan Chamberlain. I'm a geologist up in Lincoln County. I don't have any great sweeping statements to make other than just right to the document itself. I just want to make a short comment. And there's a lot of comments I'd like to make. I spent a few hours last night reading it and it was a lot of fun to read, especially the geologic parts of this, since I am a geologist. But those of you who have your document, if you want to open it up to Volume I, Chapter 4 on Page 4-97, Line 16 and 17. It says the Nevada Test Site is
39 probably the geologically best known large area within the United States. That's really an absurd statement. The best known geologic area? And I've never had the opportunity to go out there and look at the rocks and all the geologic community.

A question I have is, you know,

Bechtel Nevada
Reporting Services

will we ever have an opportunity to go out and look at that? Will it be opened up to the geologic community
40 so we can go out and look at those outcrops and verify some of the geology; can we do that? That's a question I have.

ELLE: If you want a tour of the Test Site, we can arrange that at any time. And I think in geological siting, when we had a meeting here in Las Vegas, did spend some time at the Test Site.

CHAMBERLAIN: What about going out and studying and measuring sections and taking samples of the outcrops and things like that? Is that going to be opened up to the general geologic community?

ELLE: As far as I know, some of that information is available in published documents. And we can probably put you in contact with some geologists to help you answer that question.

CHAMBERLAIN: Okay. But I'd like to go verify it myself. Having worked just north of the Test Site, I find that 95 percent of the public documents are wrong. But I'd like to go out there and verify some of the geology. So anyway, that's just a comment I'd like to add to it. Or take the statement
41 out, it's not the geologically best known area, it's just not. So thank you.

Bechtel Nevada
Reporting Services

LARRY KRENZIEN

KRENZIEN: Larry Krenzien. I believe that the Alternatives 2 and 4 cannot be considered at this time. The Congressional moratorium of September '92 and extended by President Clinton directed the DOE to maintain their capability to resume nuclear testing, if required. Even if the Zero Yield
42 Comprehensive Test Ban Treaty is signed in the future, the safeguards that the United States would insist upon in the CTBT, would require that the Nevada Test Site be available for testing. Alternatives 2 and 4 would completely do away with the infrastructure required to conduct the underground nuclear tests.

FRED DEXTER

DEXTER: I have a statement from the Sierra Club. My name is Fred Dexter. Some of our findings to this point include a strong encouragement to the DOE to emphasize a comprehensive environmental
43 cleanup of the Test Site. This should be a broad base cleanup not limited to the nuclear hot spots, such as Areas 3 and 5; but rigorously include chemical

Bechtel Nevada
Reporting Services

43 cont. pollution such as the PCBs, and Section 3 and any other hazards. This is a huge task and we believe that new environmental cleanup technologies will resolve from this massive effort. The proper environmental restoration of the Nevada Test Site will employ many workers and will itself qualify as a new industry at the Test Site.

The Sierra Club supports the siting of the Solar Enterprise Zone at the Test Site proper and any other nonnuclear industrial activities which will not create further environmental degradation. The greater the economic activity at the Test Site, the greater will be the impetus for a thorough cleanup of the site. The Sierra Club will be submitting a final written opinion of this Draft EIS before the May 3rd deadline. However, at this point, we strongly feel that a second revised Draft EIS for the Test Site is needed that will address the many
44 concerns of the general public, both in Nevada and in Utah that have arisen based on the content of this first Draft EIS. Also, plans for the interim storage of nuclear waste, such as the Site U.S. Senate is
45 currently considering, and not addressed in this Draft EIS.

The Sierra Club specifically

Bechtel Nevada
Reporting Services

54

objects to this Draft Environmental Impact Statement for the Nevada Test Site for the following reasons: Although, one of the most important objection, the

46 inclusion of Coyote Spring Valley, Eldorado Valley, and Dry Lake Valley in this Draft EIS, is inappropriate. The inclusion for consideration in this Draft EIS of land not within the Test Site serves only to confuse the purpose of this document. Furthermore, the DOE does not even have jurisdiction over these unrelated parcels.

47 Of the four alternatives, the DOE has not clearly indicated in this Draft EIS which of the four alternatives is closest to the final plan I would like to have implemented. As this final decision will be made by the DOE, the Sierra Club would like the DOE to be much more forthcoming in informing the general public of what it really wants. A March 6th, 1996 Las Vegas Sun article covering the DOE public meeting in St. George, Utah, reported that Mr. Elle -- and I quote from the Sun: "I acknowledge that the DOE is reluctant to consider outright closure." The Sierra Club does not

48 recommend outright closure, but the DOE is obviously already discounting one of its four alternatives. If this is true, what is the DOE's actual preference? These very important departmental policies should be

Bechtel Nevada
Reporting Services

55

48 cont. clearly evident in the Draft EIS. And the mission thereof renders this document incomplete, hollow, and misleading.

49 We object to the fast-track approach which the DOE is taking to speed this Draft Environmental Impact Statement to a final version without a more meaningful public opinion input on any proposed revisions before the issuance of a Record of Decision for the Test Site. Just because Secretary O'Leary has directed that this Draft EIS be completed in about 15 months does not mean that this is an adequate amount of time to complete the necessary public two-way dialogues on an issue of this

50 importance. The Sierra Club would like to see the issuance of a second revised Draft Environmental Impact Statement for the Nevada Test Site which will address fully the concerns and criticisms brought to the attention of the DOE through the series of public meetings.

51 And we would like the DOE to present a much clearer statement of the actual DOE preferred alternative use for the Site.

Thank you.

Bechtel Nevada
Reporting Services

56

MICHAEL DEFLORIA

DEFLORIA: I want to make one little statement about the labor unions. We do not want to keep that Test Site open just to make work. NAFTA and GATT -- the labor unions stood back and watched NAFTA and GATT move all our factories overseas using taxpayer's money. You understand that? And just today, I heard that labor unions are going to give Clinton 35 more million dollars for his campaign contributions, which means to say we want four more years of corruption. The United States federal government is claiming that 86 percent of Nevada land belongs to the U.S. government. Several other Western states in Alaska also have been victimized by the U.S. government. The U.S. government also tried to claim the Alaska oil deposits. If they would have, the people in Alaska would not be getting the $1,000-a-year bonus from the oil profits. The former present governors and Nevada politicians could care less who owns the land. All they seem to worry about is how much their pension is going to be. The casinos could care less. Judges and lawyers don't care. In fact, nobody cares except the American Indians. So who does this land belong to, which is made up of

Bechtel Nevada
Reporting Services

57

parts of Western states? Who does it really belong to?

The following information was taken from a newsletter several years ago. The purpose of the newsletter was to outline the current status of the ongoing dialogue and negotiations between the Western Shoshone Nations and the United States government. The Western Shoshone National Council is committed and dedicated to the preservation of ancestral lands, culture and traditions. There has always been a Western Shoshone Council for the Western Shoshone Nations. From facts available today, this council dates back to the time immortal. The United States recognizes Shoshone title to this ancestral land at Ruby Valley in 1863 when they solemnly signed a Treaty of Peace and Friendship known as this Treaty of Ruby Valley. This treaty has never been modified or abrogated. It still stands as a form of domestic and international law just like other treaties of the United States and other nations. What began as an act of Western Shoshone goodwill to facilitate travel to California, is being perverted by the federal government to swindle the Western Shoshone people out of their land and therefore their livelihood.

The government's legal

Bechtel Nevada
Reporting Services

manipulations over the years have been complicity and confusing. The most shameless attempt to defraud the Western Shoshone people occurred in 1979 when the government tried to pay the Western Shoshone 25 million dollars for just 15 cents per acre for land that has never been for sale. This one says, "Transaction proves without a shadow of a doubt that the Treaty of 1863 was and still is a legal document." But the government claiming to be a trustee put the money into a government account and called it transaction completed. And Jack Anderson wrote in the Washington Post 18 April 1984, "The government argued somewhat absurdly that just by its offer of payment, it become the owner of Shoshone land, and thus the Indians were trespassing." This Godfather theory of real estate making an offer that can't be refused should strike fear in the hearts of every homeowner in the United States.

The U.S. taxpayers that help our Uncle Sam generously gave the state of Israel taxpayer's money, 84 billion dollar taxpayer's money for free since 1948; plus domestic and other foreign aid, to help Israel take back the land that they claim was theirs 5,000 years ago. Shouldn't the American Indians get equal treatment and be compensated for all

the pain and suffering?

Now, this is from a book by Russell Means (ph), a native American Indian. You will not see, read, or hear about this in the history books anywhere in the United States. On a knoll overlooking the Missouri River in a 14-foot square gray stone pillar reads: "To commemorate the Treaty between the United States of America and the ancient tribe of the Suersu (ph) Dokota Indians concluded at Washington DC April the 19th, 1858, ratified by the Senate February 16, 1859." The real story: Several Indian leaders were taken to Washington DC and kept in their hotel rooms for months, in-house arrest; penniless, homeless and confused by whiskey and grand promises. They ceded millions of acres of ancestral hunting ground to the U.S. Reserve reserving only 430,000 acres for themselves and descends. The Suersu to be paid 1.6 million during 50 years. Instead of cash, the government supplied them with food, clothing, farm equipment, livestock, and other necessities. The Indian population decreased slowly but payments in equipment. They would later be slaughtered like the 400 million buffalo, dozens of small epidemics reduced by the President's agents after they distributed blankets infected with the

smallpox virus or hundreds starved or froze to death because the agents had stolen their treaty goods. About two years after the 1858 Treaty, a Dr. Walter Berley (ph), a U.S. agent, was caught stealing many supplies set in payment of that year's annuity.

Boarding school for Indians were havens for pediophaliacs (sic). Generations of boys and girls of sadistic, sexual, violations for perverts. Many of them were priests and nuns. If the children complained, they were whipped for making trouble. In the 1970s, this was still going on. The most notorious Indian boarding school was the Intermountain School near Provo, Utah, run by the Mormon church. Hundreds of Indians died trying to escape to the mountains. The church remained silent on this subject. Today, in practice, the U.S. Bill of Rights does not apply to reservation Indians. They are not free to bear arms, not free to practice their religion. Unemployment is 80 percent. Are American Indians getting equal affirmative action benefits?

The Eisenhower Administration Plan was to depopulate the Indian population in 1950 and 1960, and integrate Indians into urban. And then the government could take the rest of the Indian's land so on one else could be left to object. The Eisenhower's

Program knows that the termination had grown out of the Bureau of Indian Affairs Policy from the Truman years; a plan dreamed up by Dewere (ph) Desmeyer (ph), the man who had run FDR's concentration camps to rid American Indians; the camps for American citizens of Japanese ancestry during World War II. This was designed to rid the American Indian nations by buying up Indian land for a lump sum paid at 1950 prices. Tribal councils often were nothing more than extensions of Bureau of Indian Affairs, rubber stamps, or policies created in Washington. Over 60 Indian nations had been terminated and was no longer recognized as a sovereign nation. Life expectancy is very low for Indians.

Teddy Roosevelt believed that Indian savages should have been exterminated because they had no right to land that they didn't know how to use properly. He represented the deep tone of manifest destiny, the doctrine popularized by Jefferson. It claimed, in essence, that God had intended all North American Indians for European men. The truth about Thanksgiving. After a colonial militia had returned from murdering men, how they slaughtered them. And that's how they celebrated Thanksgiving, they'd slaughter the Indians, then they

62

had a party.

My offer of $5,000 cash is still available if any government agency solves the problem. The way I look at it, the government employees who draws checks reminds me of Hitler's Gestapo. You know you're doing wrong. You know the country is in bad shape. It's up to you to straighten it out. Every man, woman, town, city, state must get involved and solve their own problems. Our federal government won't or can't solve problems, simple problems.

ELLE: Thank you for your comment.

PAUL MC GINNIS

MC GINNIS: Good evening. My name is Paul McGinnis. I'm a researcher. I do a lot of work with government documents. And what I'm going to talk about tonight are the things that I'm aware of that have been omitted from the Draft EIS. Some of the items I'm going to talk about have been the subject of a Freedom of Information Act case that the DOE has not responded to yet. What I'm basically going to talk about is some things that, I don't know, maybe it's for reasons of national security they can't tell you.

52 They mentioned tonight that there is a classified

Bechtel Nevada
Reporting Services

63

52 cont. appendix to the DEIS. I mean, it's counterproductive to say we're going to tell the public everything that could affect their safety and then have a classified appendix where vital information is concealed.

53 Another project that the DOE studied, and I know that the Air Force has studied, that is not in the Draft EIS. And I don't know the current status of it. There is a program operated under the code name of Timberwind (ph). It later became known as the Space Nuclear Thermal Propulsion Program. In this program, they were going to conduct nuclear rocket testing at Area 25 of the Nevada Test Site, near Saddle Mountain. And if you want to consider safety hazards, consider a chemical rocket explosion like that of the space shuttle challenger or the titan missiles, except with a nuclear reactor on board.

54 Another thing that they mentioned in the Draft EIS, but they don't give you any further details on, they mentioned the plutonium contamination in Area 13 of the Nellis Air Force Range Complex. The military knobs show that this box here, R48-08E on the Air Force map, is actually part of the secret Air Force Base in Groom Lake; the so-called Area 51. The Department of Defense has stated that this box here,

Bechtel Nevada
Reporting Services

64

this air space is under the control of the Nevada Operations Office. Even though it's an Air Force Base, it's on the Nellis Range.

I have some documents tonight I'm going to pass out, I have extra copies based on my work. But some of the files that have been released from the AEC days, clearly show the connection between the Department of Energy's predecessor and that base. For example, I have a copy of a 1957 press release from the Atomic Energy Commission that states that a Nevada Test Site installation known as Watertown Strip, which was the original name for this place, has an air field; and it's to the northeast of the Test Site and it is at Groom Lake. Another document that I have uncovered is this one here. This is a telex that clearly states that base, Watertown Strip, which was completed in 1956, and is a Nevada Test Site installation. This kind of thing still goes on. If you look at the military maps, you can see that the Department of Energy supplies electrical power to the base. Also, they provide road access on Valley Road and on Mercury Highway. And like I said before, there is plutonium contamination in Area 13. It's just I don't understand why they can't say that it's part of Groom Lake.

Bechtel Nevada
Reporting Services

65

So anyways, I have mentioned -- I'm trying to uncover some more things through the

55 Freedom of Information Act. I just don't feel that when the DOE conceals relevant information like that, that they're really making a good faith effort at this EIS. And like I say, I've got copies of material with the document references in case anybody needs it.

ELLE: Thank you. Paul, could you leave us a copy also for the record.

DAVID BUER

BUER: My name is David Buer, and I'm with the Nevada Desert Experience. For 15 years, we've been offering faith-based protest out at the Nevada Test Site trying to end nuclear weapons testing forever. There's several things I'd like to talk about this evening. I think what we try to do is plumb the depths of the spirit. We try to plumb the depths of morality. Not that we're experts in it, but that's kind of our work and our effort. I think that for our concern is the earth. Our concern is the native peoples who were here before we were and to try to do what's right. And so the concern for the Western Shoshone was raised. We've learned from our

Bechtel Nevada
Reporting Services

actions out at the Test Site over the years of the Western Shoshone and their Ruby Valley Treaty of 1863. We believe that that needs to be honored and respected. And so for whatever option is -- whatever course of the four options is set out upon, we would hope it would include the Western Shoshone.

Of the four actions, we believe in discontinuing all operations. We feel that there's a lot of work that does need to be done in cleaning up nuclear waste, but one of the first things to do is stop making more of it. There's enough work right now just to clean up the nuclear waste. I know that the Department of Energy is involved with creating energy for our country in a variety of ways. And we would like to see a cessation of nuclear energy immediately. We would like to see our best minds of our country put at the task instead of creating more nuclear energy, or design a new type of nuclear weapons like the experiments that are going to be conducted, the subcritical tests in the coming year. And I'd like to see those tests stopped.

But we would hope that our country's best minds will be put to use for solar energy, for wind energy, energy that is environmentally friendly. We believe that our country

has a capability of really being a truly great country, but there's many things in our actions that I think raise questions for us. We have the potential, I think, we have the minds in our country, we have the ability in our country to export solar energy around the world; to allow peoples around the world who have no access to electric energy. Try to develop ways,
56 high technology ways that could be exported around the world, so that people who are out in outlying areas in Australia, and other parts of the world that have no access to electricity, could get it from the sun. Perhaps the Nuclear Test Site in Nevada here can be used for that.

I have spoken with Chairman -- I'm sorry, I can't think of his name of the Western Shoshone. I'm sorry, his name escapes me right now. I asked him about his opinion -- Chief Raymond Yowl (ph). I have spoken with him. I asked his opinion about solar energy being developed at the Nevada Test Site. And he feels that there's a possibility there. That in conjunction using the expertise of the Department of Energy, perhaps in conjunction with the people of the Western Shoshone, to try to create more solar power there on the Test Site. They may not necessarily be opposed to that.

But we would like to see a cleanup of the Nevada Test Site beginning immediately, a cessation of any more
57 creation of nuclear waste. And we would like to see employment -- setting our best minds and talents to that task.

Sometimes we need to think -- kind of get ourselves out of the mold of what's possible and think beyond -- to dream a little bit about what could be. And I'll just say right now one example that comes to my mind, while I've been sitting here listening to people, is right now above us in space; the reality is, there's a spacecraft with American and Russian astronauts circling the globe together. And I think it's a very good -- that's the kind of symbolism that we need, the kind of thinking of what's possible in the future. Can we envision a world without nuclear energy? Can we envision a world without nuclear weapons? Can we envision a world that we include everybody? Can we envision the world where we respect other people and their various opinions and not resort to nuclear weapons? Let's try to find ways to eliminate the nuclear weapons. Let's not be conducting -- let's not be taking stands like with the
58 subcritical tests that can jeopardize international agreements right now. We're close to having a

Comprehensive Test Ban Treaty. But many nonnuclear states are questioning our motives when we're trying to develop other tests that could possibly create more technologies for nuclear weapons.

We should be getting rid of the whole idea of relying on nuclear weapons. We should be using our best minds right now to find out ways to get rid of them. And we should be taking the lead on that in the worldwide community. And then we will truly be a great nation if we can help create a world where nuclear weapons are outlawed and their use is
59 made unthinkable. So we would hope for a discontinuation of operations at the Test Site. We
60 hope for promotion of solar energy in conjunction with
61 the Western Shoshone. We would like to see the land turned over to the Western Shoshone. We would like to
62 see the Nevada Test Site cleaned up beginning immediately.

Thank you.

ELLE: Thank you.

70

ROBERT TITUS

TITUS: My name is Robert Titus. Dr. Elle, I thought we were here to discuss the EIS for the Nevada Test Site. Most of the comments I've heard have been on either Yucca Mountain or Area 51. Mr. Flangas and Mr. Krenzien have really stolen my thunder, so my comments will be quite short. 63 But in consideration of the four alternatives, prime consideration should be given to keeping Yucca Flats and Areas 19 and 20 up on the mesas, as are irreplaceable resource to start conducting nuclear weapons tests again if we ever have to. We live in a dangerous world and we don't know what it's going to be 5, 10, 15 years down the road. And you can't replace the Nevada Test Site anywhere else in the U.S.

ELLE: Thank you.

VIC SKAAR

SKAAR: Good evening, ladies and gentlemen. My name is Vic Skaar. I did not intend to speak when I came in here this evening but I have to. I absolutely have to. Because I have something to tell you that is not emotional, it is based on

Bechtel Nevada
Reporting Services

71

personal experience. And I've listened to some garbage out there that is really nonscientific garbage.

And I want to share with you a couple of things. I spent 27 years in the United States Air Force. For most of those years, for about 20 or 30 years, the Strategic Air Command flew around the world with these weapons that were tested out there in those aircrafts. And on the 17th of January of 1966, during a routine exercise over the Southern Spain, a B-52 and 135 collided. That night, I was out there with a bunch of other people to clean up that mess. Four of those weapons, those thermal nuclear weapons, four of them fell from 30,000 feet. One of them landed intact without no scars on it at all. Two of them landed in the HE, the high explosive, and exploded upon impact and broke the fission material and released that. That went downwind. That's called Plutonium 239. I ate that stuff. I drank that stuff. I breathed that stuff for 81 days. I was tested for follow-up urinalysis. For 13 months after I left that site, I urinated plutonium. Thirty years ago, folks, and I'm alive. Scientifically, I guess I should be dead because I heard some of you say that this is the most deadly known substance known to man.

Bechtel Nevada
Reporting Services

72

For you, sir, I respect the fact that you have had some problems. I lost a dear buddy of mine that spent the same amount of time there with me; night and day we were on that site. His cancer, however, was not related, not related to his exposure to plutonium. Now, why am I telling you this? If it hadn't been for the folks out there at the Test Site and what that has meant to the nation, those weapons would not have been able to fall from 30,000 feet and fall safe.

Fifty-four weeks in January of 1967, another B-52 with the similar 4 HE bombs crossed in Tulle, Greenland. Those four weapons likewise went into the drink and never exploded no fissionable release. Doesn't that mean something? Why are we picking on the Test Site that served its purpose. There is a need for that technology to continue. I get upset when I hear we're spending billions of dollars trying to clean up something that has no -- pardon me, "no" is not a right word. -- has suspect health-related problems. There isn't enough science out there to say that something is going to kill you unless you're exposed to it. Zero exposure still equals zero risk. I'm a public health supervisor at this day in my life. I'm happy to be employed. I

Bechtel Nevada
Reporting Services

73

understand a little bit of what I was exposed to. And I'm darn glad that I was there, because the folks that were there did a darn good job of cleaning up that part of Spain. And I've got to tell you something, that's not a desolate area out there today. That's a community of about 300 or 400 people. Now, I haven't seen it for 30 years; I do hope to go back some day. And they're still living in that area, folks. There's a heck of a lot more radiation plutonium specifically that we left behind in Spain then you'll find out here at any spot in that Test Site. And those people live there every day; raise their vegetables, and are to my knowledge, still doing all right.

Well, I guess I am finished. I do appreciate the opportunity. I sat here and said I've got a message to share and I'm going to share it. I'm going to share it as often as I can. Thank you.

ELLE: Thank you.

CHRIS BROWN

BROWN: Hi, my name is Chris Brown. I'm representing the Campaign for Nevada's Future. The campaign was organized of local folks who are 64 concerned about attempts by the Department of Energy

Bechtel Nevada
Reporting Services

64 cont. and the federal government to continue to use Nevada as the dumping ground for the nation's nuclear waste. Your Alternative 3 is one more example of that and so we're opposed to Alternative 3, the way it's written.

We also feel that some of the examples that are going on around the country, like in Fernald, they're showing that through waste minimization, you can do a lot better job at cleaning up and keeping the waste on site. And the Test Site should accelerate its own programs for environmental

65 restoration. In fact, we would suggest an Alternative 5 that isn't in the document, which would basically take the solar site and continue that as part of Alternative 5; accelerate the environmental restoration activities as part of Alternative 5. And then take what land has not been contaminated and turn it back to the Western Shoshone. And those should be

66 the three elements of Alternative 5. The expanded-use activities to continue the effects and the pursuit of

67 the Cold War are really not necessary. And we feel that it's important that in the expanded-use alternative where the continual development of new nuclear weapons is advocated through various means through the subcritical, as you call them, or hydrodynamic tests; that the risks from increased

67 cont. partners, if you will, in the arms race, as we will surely recruit by pursuing such a path, should be included in this document. That that is a risk and

68 it's a very real risk to everyone. In fact, the risk of a nuclear war will be increased by pursuing the paths that are explored in Alternative 3. And that that risk should be included in the document.

In addition, just one comment

69 about the document; nice purple cover. But the numbers in it constantly go back and forth from metric to English system. And you even use that wonderful measurement of the hectare. Who the heck knows what area it covers. But it would be great if you would be consistent, or at each place where you have a measurement, give us both measurements. So that those who are familiar with the English system can follow that, and those who are familiar with the metric can follow that. But this changing back and forth just makes for an unnecessarily confusing document.

Thank you.

ELLE: Thank you.

JOWANNA HOLLY

HOLLY: I'm Jowanna Holly and I represent Campaign for Nevada Future and also myself as just a citizen here. I don't understand a lot of this lingo and really don't even want to -- care to even learn about it, because it's -- to me, it's such the masculine in its negative form. It wants to play with its little toys and always have a gun. And you go through this town how it's changed dramatically and I see everybody building up higher walls, gated communities. Get the weapons. You know, everybody has their private little weapon because it's a dangerous community. And the DOE is constantly working on these things where we have all these things because of -- you know, we've got to protect ourselves from -- I think we need to protect ourselves from ourselves. That's where we're having problems, because we're totally poisoning ourselves. We're poisoning our nation, our plants, our animals, our people. And thank God, you're alive, but I sure as hell don't want a lot of plutonium so that I can wee-wee it out of my body every day. I think it's a sad thing when you say something like that.

I feel like it's very, very

important for us to learn to talk, talk to people and not have a gun in front of them and say we can talk with them. Because you can't talk with a gun. And just a small example is I do racewalking in the park in the morning. And it's kind of a so-called bad section and there's a lot of gang members there. And they were coming on to a lot of the people and giving them a lot of fear. And when they came toward me, they were coming pretty strong. And I decided to do the opposite of what they wanted me to do. And so I approached them in a really friendly way and I told them that they could learn -- they were teasing me about my racewalking because it looks kind of funny. And so I said, "Well, you know, I know you're razzing me, but you can do it. And if you -- because you have a good stroke and everything." And so I showed them how to do it and I became very friendly to them. And now in the park instead of harassing me, they say "There's our friend." It's just the simple little thing.

If we start to talk to people and start to work things out instead of putting all

70 this -- you call this talking but you've already made your minds up. But you have to have so many of these forums so that it looks legit. But I hope you really

70 cont. do listen to us because it's real important. We all need to love each other. I know it sounds funny for these rednecks to hear, country boys.

(LAUGHTER)

HOLLY: But you can do an awful lot by just touching.

BOB YENTEMA

YENTEMA: My name is Bob Yentema. I'm a retired Test Site employee.

71 I just wanted to say a word for the people who are still out there. I think they've been a little bit neglected, especially in the EIS. I noticed the socioeconomic impact there didn't really address how it would affect the people who would be most affected by this. It's very easy to make them the whipping boy for real or imagined sins that have happened in the past or to say, well, let's just shut the Test Site down or return it to the people who may or may not have a legal claim to it. It's easy to say that when it's not your mortgage payment, it's not your kid's braces that have to be paid for. And these are people just like you. They're just exactly the same, the same likes and desires and all this. And I just wanted to say a word

on their behalf. I hope they'll be considered when this decision is made.

ELLE: Thank you.

JOLIE LONNER

LONNER: My understanding is that the Test Site employs about as many people as Treasure Island does. We're not talking about a great percentage of the people in Las Vegas who are going to lose jobs. And that was something I wanted to clear up.

YENTEMA: But it's important to them.

LONNER: It is very important to them but it was also very important to, let's say, the SS people to have jobs, too. It was very important to many people who made weapons for war. It was very important for people who made DDT. But DDT is very dangerous and people don't make it anymore because it killed people and things and animals and the environment. But what I wanted to say, was to address the other man who said he was going to talk about science as opposed to the crap that he was hearing. Science talking about how bombs were falling out of the sky and they were exploding and radiation was

leaking, and I'm really glad that he didn't get sick. But the fact that bombs are exploding and that radiation is leaking, does not make me feel any safer; the fact that this man was able to live. But I'm sure other people were incredibly endangered by it.

And the fact that we've had all these accidents is even more reason to be scared, is even more reason to realize that the DOE and the people who have handled nuclear bombs and nuclear radiation have not known what they were doing. They've put on a persona of being safe and knowing what they were doing. But in reality, they didn't. They didn't plan for those accidents. Those accidents happened. And when they happened, they were like, oh, no, I guess we better do something about it. And I have a feeling that the DOE is still doing that. And it doesn't make me feel safer to hear that someone ate plutonium and that they were okay. That's pretty scary to me.

Thank you.

TOM MC GOWAN

MC GOWAN: Tom McGowan. This is my second time around. Just to comment on the previous closing statement. If they ingested plutonium, they may be okay in the instance that they had no intestinal blockage of any kind. Otherwise, they would be quite dead within three minutes, and that would typically be the case. To follow to Page 2 of my initial presentation. I'm just rounding it out. As I asserted, there is a broad range of activities possible and advisable for the Test Site; both nuclear and nonnuclear characterization. I mean by that official slash civilian context; dual aspect. There is indeed a potential for an entire community, dedicated intentional community to be constructed and operated, administered right there at the Test Site with an outreach to a neogreater community throughout all of Southern Nevada and conceivably beyond, well-beyond.

I would indicate that we are in the threshold of a new era. This is not the final chapter. It's Page 1 of an on-going multivolume work in progress. Nuclear is not the problem, you and nature is the problem. We are quality deficient adversed to ourselves and everything around us. Perhaps of human, spiritual, quality divisions, that would be at the expirality (ph) reason, integrity, responsible; and above all, conscience. And when we get to the point where we decide to change for the better, all of this will change for the better just like that. But first, you have to decide. And that can take a fraction of a microsecond or the rest of human time. And if you've decided, we can begin. But you must first decide. The rest of it is nuts and bolts routine, quite simply stated. Not difficult at all. You must first decide what it is you want to do and then go ahead and do it.

And incidentally, to the good soldiers, which is what they are, they don't formulate public policy. They carry out instructions handed down to them mandatorily directed by the Congress of the United States who we elect. If there's any fault-finding, it begins with us. We continue to elect people who are quite incompetent and act on the basis of political expediency and give these fellows orders to do things that are quite impossible, scientifically and technologically, absolutely impossible; and also unconscionable. They have no choice except to do it or give up eating. And I think

so far, they haven't given up eating just yet, have you? But in my view, you should. My view, you should tell the Congress, "Hey, look, guys, this is all wrong." So you're not going to do it, we have to do it. And when do you want to begin? Once again, make up your mind. What do you want to do? They're not going to do it for you. They can't. You have to do it. You decide you do it, the rest is history; and we change this world for the better. We've got one chance only. This is the last generation. We may be the generation that killed all mankind. Think about it.

TROY JONES

JONES: I know that you mentioned before that the HR-1020 really has nothing to do with this. Although, in this EIS Executive Summary that I was

72

reading, one of the current NTS missions was to provide the capability to respond to nuclear emergencies. And as such, I ask you, you know, a cask going 70 miles an hour down the road traveling full of nuclear waste, and these casks are hopefully able to withstand 30 miles an hour impacts. They just raised the speed limit to 70 miles an hour. What exactly are

72 cont.

you prepared to do when that impacts? You know, that's one question certainly.

The other question that I have, I'm hearing these four options of how to clean this up and get it environmentally safe again and go forward with the Nevada Test Site. But the other thing that I

73

was reading is that you've asked for a 244-million-dollar budget increase for the testing and whatnot, the experiments that you're doing; while cutting the environmental spending, an additional 205 million? And so, you know, just those figures, which are of course your request, lead me to believe that there's something fishy about this. That doesn't really make sense, that you're saying you want to clean things up but you want to cut spending on cleaning it up. Are you going to do it without money? You haven't even got the answer. And if you don't have the money, you don't have a chance. So these are two questions that I'd be interested in hearing on.

ELLE: Well, to answer the first question, the Department plays a large role in emergency response to radionuclides or radioactive kinds of accidents. And that is one of the missions that this office has. And we support the state and local agencies and emergency response programs in

responding to accidents like that.

JONES: In what way? Details.

ELLE: Well, I can give you people to talk to about that, if you want to. But I can't answer the question.

JONES: Uh-huh.

ELLE: And the second question, I'm not sure which budget numbers you're talking about. If it's the OMB's Submission to Congress for the '97 budget, I think part of that plan is we can do cleanups better and cheaper than we had originally planned. And the trade-off and lower costs on environmental restoration is based on that, I think.

JONES: Is there any place in particular that you know of that has been contaminated with nuclear waste that has now been cleaned up cheaply or otherwise?

ELLE: We've cleaned up several sites on the Nevada Test Site. Other DOE facilities across the country have also cleaned up specific sites. And we can get you that information if you're interested in it.

74

JONES: What are the standards for that cleanup? Cleanup being I could go plant my garden there and raise my two children there, or that I won't

74 cont. die the minute I step onto the earth?

ELLE: In some cases, cleaned up to a level where you could release it for public access. In other cases, because we're going to be there for a while longer, not clean it up quite that much.

JONES: I would be interested in that information. I think that not only I, but the public at large should have access to that information. I am doubtful that it's forthcoming.

ELLE: Okay. Well, as I tried to say at the beginning, we are interested in your comments. There are a lot of places you can get at us in terms of giving us comments or asking questions. I encourage you to do that. And we'll pay attention to the comments as we get them. And I thank you very much for coming tonight. We appreciate your attendance and your participation. Thank you.

* * * * * * *

Bechtel Nevada
Reporting Services

This Page Intentionally Left Blank

This Page Intentionally Left Blank

This Page Intentionally Left Blank

This Page Intentionally Left Blank

PUBLIC HEARING TRANSCRIPT 5

THIS VERBATIM TRANSCRIPT CONSTITUTES

THE OFFICIAL RECORD OF THE

**PROGRAMMATIC ENVIRONMENTAL
IMPACT STATEMENT
PUBLIC MEETING**

(PUBLIC COMMENTS)

Held at the

SANDS EXPOSITION AND CONVENTION CENTER
201 East Sands
Las Vegas, Nevada 89109

on

March 28, 1996
Beginning at
6:00 p.m.

REPORTED BY: Lana Stewart
Senior Verbatim Reporter

Bechtel Nevada
Reporting Services

KEY to Transcript Symbols and/or Abbreviations

Webster's New Collegiate Dictionary: "Verbatim -- in the exact words; word for word."

Dash: [--] Indicates a sentence not completed by speaker.

Dots: [...] Indicates something was said by the speaker, which, as spoken, is neither audible nor decipherable to the reporter or from the taped cassette recording.

(ph) Indicates phonetic.

(sic) Represents exactly as said by the speaker and is used to alert the speaker/reader to an error in the record.

Parentheses: ( ) Words within parentheses are reporter's explanatory comments.

VOICE: Indicates an unknown speaker.

Uh-huh: Indicates affirmative answer.

Huh-uh: Indicates negative answer.

PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

PUBLIC MEETING AGENDA

LAS VEGAS, NEVADA, MARCH 28, 1996, 6:00 P.M.

TOM MC GOWAN

MC GOWAN: Just a few salient points.
Number one: The underground storage and/or
disposition of nuclear pertinent materials of any kind
1 is not an option; either at Yucca Mountain, NTS,
anywhere nationally, or anywhere throughout the
terrestrial domain. Point number one.

Point number two: Aboveground
storage is a viable alternative for certain specific
purposes only; and only as altered redundancy ensured,
2 safe, secure, monitored, retrievable, and containment
integrity, quality-effective, and solely pursuant to
the final disposition via elimination. I should say
reduction transelimination. And is further pursuant
to final disposition via expulsion, completely,
permanently, and irretrievably from the terrestrial
domain.

Point number three: These
missions respectively combined for fissile material,
3 storage and disposition, and nuclear weapons of
arsenal stockpile stewardship management, need to be
clearly defined. We are not engaged in simply a

cost-reduction-based contraction and consolidation of a nuclear weapons complex. This is not a small or giant, this is a dwarf. It's an entirely unique serpent (ph) and distinct essence and requires thereto a coincident addressed and response paradigm. A totally unique historically unprecedented approach is required. So far, you don't have one. You're treating it like a contracted, or what you refer to as consolidated version, of a traditional antecedent regime. It is no such thing. And if you continue in that arbitrary and expedient mode, you are ensured failure-inherent and time and quality and cost-ineffective. In other words, net cost profit.

It is essential that the Department securely recognize the profound difference between a downsized antecedent regime and a neoregime, which I just referred to. The final point to make is just simplified; don't store it, don't preserve and perpetuate it, eliminate it. There's more but I can't just bring it up just like that. So I'll come back at a more appropriate time and complete my remarks. I appreciate everything you're doing, whatever it is you do. Okay? And I appreciate it even more so, if the punctuation and the grammar and everything is in the right place when I finally read it in that book. I'll tell you why I say that -- and it's not this young lady, she's doing a great job. Some other highly trained person who works for the Department in the past, put in a phrase attributed to me called "nuclear edge." What I had said was "nuclear age." I would anticipate that anybody who works in this regime automatically would have somewhat of an idea that I was probably saying "nuclear age," not "nuclear edge." It sounds like a razor blade. Thank you very much.

SALLY DEVLIN

DEVLIN: How to interpret the EIS on NTS. Do the 43 states and our Nevada that will be involved
4 in these enormous transport problems realize how the government feels and has demonstrated that they are graciously willing to destroy our quality of life? This could occur as soon as 1997 or 1998, if this is allowed to go through.

Would proper science make sense out of this problem? No colloidal studies or microbiological conversion studies, even though they
5 have been suggested, have been made. Why don't we transmute and destroy the LLW and LLMW? This process for destruction and transmutation was discovered and

developed by the National Laboratories. It is ready for commercialization.

Three railroad plans, that would cost billions of dollars, were proposed by DOE when I became interested in the transportation studies. One of these studies would have come through Pahrump. The
6 EIS weighs many pounds, but in all these pounds of paper there are many maps. None of these show Pahrump until one burrows into Volume I, Appendix I in the three pound Transportation Study. And there, on pages 3-18, 3-20, 3-22 are maps using 160 to transport waste through Pahrump.

The federal government is totally unaware of our demographics: We are an unincorporated town with unknown boundaries because we have never been properly surveyed. Our area encompasses the approximate size of 5 northeastern states. Our County
7 Commissioners have allocated 48,000 parcels ranging in size from single parcels to 100 acres in this enormous area. The 20,000 residents today could, over the next decade, become the third most populated town in Nevada with 100,000 people. We have one of the largest and
8 purest aquifers in the entire nation.

Highway 160, which goes through
9 Pahrump, parallels 95 which goes to NTS. If an

9 cont. accident occurred on 95, the only way for the HAZMAT trained firefighters from Las Vegas to get to it is through Pahrump. From I-15 in Las Vegas, Clark County, and the Blue Diamond cutoff over Mountain Springs at about 5,800 feet, and then another 46 miles to the Nye County line and 6 more miles to Pahrump. From there, it is 26 miles more to 160 and 8 miles down the road on 95, and 8 miles to the entrance of NTS at Mercury, all in Nye County. We have a few paid firemen, but our 40 volunteers take approximately ten hours of HAZMAT training and are updated ten hours yearly. Our sheriffs get 16 hours of HAZMAT training and are updated eight hours yearly.

Our two-lane Highway 160 is congested by traffic going back and forth to Las Vegas. Hazardous materials such as propane, gasoline, liquid cyanide, liquid nitrogen, are going through Pahrump all the time. Yet, on pages 3-30 through 40 of the Transportation EIS, the bar graph N.V.6 is among the highest for every fatality risk from traffic fatalities to radiation-induced cancer risks, and by far, the highest on the hazardous index risk. The risk of bringing the wastes through Pahrump are slightly lower, but not by much. If an accident happened on 95, the only access to it would be going

over the hump and through the middle of Pahrump on
10 160. What will this hazardous stream of trucks do to the huge economic engine of Las Vegas?

Alternate 3 in the summary states: that all radioactive waste will come to NTS and that there are 900,000 cubic yards of LLW and LLMW. Yet,
11 in the Transportation on Page 2-14, it states that 1,154,963 cubic yards would be coming through by truck with a potential of 24,276,796 cubic yards over the next 75 years.

There are 55 million gallons of highly radioactive waste stored in 177 underground
12 tanks in Hanford, Washington. If the plutonium and uranium were to go critical, what would happen? This mess has been going on for 50 years and the federal government has been characterizing it for 10. We, the taxpayers, might have to pay 36 billion dollars for the cleanup.

We know about the radioactive spill which occurred at Los Alamos. It ended up at Cocite Lake and polluted the fish with radioactive collides.

NTS presently stores 1,500
13 55-gallon drums of transuranic waste. If there is no WIPP, will NTS get another 5,000 or more 55-gallon

13 cont. drums of TRW in '98?

Adding together the recently declassified DoD report on their 312 metric tons of HLW to the either 30,000 metric tons or 126,000 metric
14 tons of nuclear power waste, and what do you get? Not one, but two repositories at Yucca Mountain. Cost 60 billion dollars. But again, if there is no repository, then it will all go to NTS?

We would be the world's largest MRS with no oversight compensation since the federal government owns 93 percent of Nye County. My home is 30 miles from the Test Site and 50 miles from Yucca Mountain. We are the third largest county in the USA.

My concerns are for our town and for the nation as a whole. Forty-four states are involved in transporting this waste. Does the county want the effects of this radiobiological exposure to destroy our future generations? Toxic waste in our drinking water from the landfills is causing sterility in all animals including us. This contamination is also causing birth defects and high incidents of cancer in all age groups. Our local plants and trees are suffering extra growth from the radioactivity splattered from the Nevada Test Site.

The nation as a whole must put a

stop to our government contaminating our air, water,
15 and land. The poisons from NTS will ruin the pristine Pahrump Valley and Nye County.

For those interested in the environmental aspects of this enormous EIS, let me leave you with this thought. Forty-three states
16 generate radioactive waste. Nevada does not generate any. If these deadly radioactive materials are put in our desert, there will be one desert tortoise that will survive after we are gone. Will the only creature left on our planet be the indestructible cockroach who has eaten our last tortoise?

Will you join with me to get this scientific transmutation process implemented?

* * * * * *

This Page Intentionally Left Blank

This Page Intentionally Left Blank

WORKSHOP NOTES 1

Nevada Test Site (NTS) Transportation Advisory Group
Protocol Working Group

Recommended Action Items to be Included by the U.S. Department of Energy in the Record of Decision Regarding the Nevada Test Site Environmental Impact Statement

11 April 1996

Introduction

These recommendations are the result of a series of discussions (by telephone conference and in person) among members of the Protocol Working Group, a subcommittee of the NTS Advisory Group (a.k.a., the Big Group). Representatives of the DOE/Nevada Operations Office were present at all such discussions and are already cognizant of the proposed action items presented in this document.

These recommendations do not reflect the official positions of any local government, participating group or individual. They are being put forth to (1) help the participants see the areas of most concern to Protocol Working Group members and (2) assist staff of governmental and private agencies prepare comments on the *Draft Environmental Impact Statement for the Nevada Test and Off-Site Locations in the State of Nevada (EIS)*. With this information, reviewers may incorporate specific recommendations into their own comments, or indicate where they disagree.
1 This will assist DOE/NV in understanding the importance of each recommendation to each individual commenter. In addition, we feel that DOE's perception of the importance of any recommendation will be enhanced by repetition of that recommendation in individual comment submissions. It is important to note that these recommendations may become part of the official record of the *EIS only* when they are submitted as comments.

2 Protocol Working Group members expect DOE/NV to evaluate each of these recommendations explicitly in the EIS. Further, we would like any recommendation that is accepted by DOE/NV to be addressed in the Record of Decision as a specific, rather than a planned or to-be-developed, mitigation measure.

For the reader's convenience, the following recommended action items are grouped into three major areas, including *(1) institutional interaction/communication, (2) mitigation, and (3) route selection and selection of parking areas. The mitigation* group is further subdivided into subareas of *communication, equipment, planning and training, and procedures and operations.* No consensus was reached regarding route selection, with some persons opting for the specification of certain routes, others calling for the development of a route-selection methodology, and still others suggesting compromise measures. Therefore, the section on routing and parking area selection contains a brief summary of the discussions rather than specific recommendations.

WORKSHOP NOTES 1 (CONTINUED)

RECOMMENDATIONS REGARDING THE NTS EIS TO BE CONSIDERED BY THE TRANSPORTATION PROTOCOL WORKING GROUP

11 April 1996

GROUP I. RECOMMENDATIONS REGARDING INSTITUTIONAL INTERACTION/COMMUNICATION DURING PLANNING AND OPERATIONS

3 1. DOE must specify shipment notification procedures, including [1] state, tribal and local jurisdiction notification, [2] estimates of materials and volumes to be shipped, and, [3] designations of points of contact for corridor jurisdictions.

4 2. There should be regular meetings among representatives of DOE, corridor jurisdictions and other stakeholders and interested entities. These meetings should be used to:

   a. provide updates regarding ongoing and planned shipment campaigns and reports and evaluations on past shipments [based on DOE monitoring program];
   b address issues that may arise when significant changes have occurred or are planned for the transportation system and in materials and/or volumes being shipped;
   c. identify and mitigate additional ir pact or concerns of local communities should transportation problems occur.

5 Interim information can be made available through postings to an Internet home page, or though other electronic, hard copy or oral communication. In addition, DOE should also provide:

   1. a mechanism for receiving and addressing concerns that may arise between regular meetings; and,
   2. annual reports to include, at the minimum, identification of carriers, sources and destinations of each shipment, the number and volume of shipments of each substance, highway and rail routes used, incidents/accident encountered and actions taken to address them, and evaluations of each shipment campaign.

GROUP II. RECOMMENDATIONS REGARDING MITIGATION

Communication

6 1. DOE must ensure that local emergency response agencies are able to identify low level waste shipments and provide immediate notification to federal and state agencies responsible for respooding to or supporting the handling of accidents.

Equipment

7 1 DOE/NV should provide responding juriadictions/agencies with at least two new detection instruments per jurisdiction and ongoing calibration services in conjunction with local training in corridor communities in emergency response to incidents involving radioactive materials.
8 2. DOE/NV should provide or facilitate the provision of in-vehicle radio repeaters, binoculars, cellular telephones and other equipment to corridor jurisdictions.
9 3. DOE should provide preference to local public safety and emergency response agencies for the free distribution of federal surplus emergency response equipment.

WORKSHOP NOTES 1 (CONTINUED)

Recommended DOE Transportation Action Items Regarding the NTS EIS, 11 April 1996, p. 2

GROUP II. *RECOMMENDATIONS REGARDING MITIGATION* (continued)

Planning and Training

10 1. DOE/NV should work with corridor communities to make training opportunities as effective as possible. Consideration should be given to direct funding of training programs to the corridor communities, providing training opportunities on weekends to accommodate volunteer responders, and providing stipends to participants. [See, also, Item 1 under *Equipment*]..

11 2. Communities which are not directly located on transportation routes should be provided the opportunity to participate in emergency response training courses offered to corridor communities.

12 3. DOE should provide financial and technical assistance as necessary to ensure that corridor communities have up-to-date emergency management and evacuation plans in place.

Procedures and Operations

13 1. Transported loads should be covered or contained to prevent possible aerosol disbursement. .

14 2. All shipments of [illegible] level waste arriving at NTS during off-hours should be [illegible] temporarily park loads at a secured area inside NTS gates.

15 3. Each truck carrying Class 7 materials should have two drivers present at all times.

16 4. Carriers should respond to all driver advisories and notifications of delays and make appropriate adjustments to primary routes.

17 5. All vehicles should be required to undergo quarterly CVSA inspections (based on enhanced North American standard) and should display appropriate safety inspection stickers.

GROUP III. *RECOMMENDATIONS REGARDING ROUTE SELECTION AND SELECTION OF PARKING AREAS*

Members of the group were unable to reach consensus on recommended action items regarding transportation. However, there were a number of discussions that brought out three definite positions. These were:

18 1. ***DOE should select specific primary routes***, usually interstates, U.S. and state highways, and direct carriers to use these routes through contracts or other means. Any exception to their use would occur when drivers may make adjustments to routes based upon official advisories and notifications of delays (See Group II, Mitigation, Procedures and Operations, Item 4).

19 2. ***DOE should avoid the use of certain routes, segments of routes and shipping at specific times.*** In this case, DOE/NV and affected parties would agree on routes and segments of routes that cannot be used for LLW shipments.
20 It was also suggested that DOE institute policies to avoid transporting materials during holidays, peak tourist travel periods, or during special events. Examples of areas to avoid are Hoover Dam and the Spaghetti Bowl. Carriers would be prohibited by contract or other means from using certain routes or route segments or shipping at certain times.

WORKSHOP NOTES 1 (CONTINUED)

Recommended DOE Transportation Action Items Regarding the NTS EIS, 11 April 1996, p. 3

GROUP III. *RECOMMENDATIONS REGARDING ROUTE SELECTION AND SELECTION OF PARKING AREAS* (continued)

21 3. ***DOE and stakeholders should agree on a methodology for route selection.*** Under this option, DOE must commit in the *Record of Decision* to a clearly articulated process for routing of LLW shipments and to a mechanism that binds the shipper to adhering to the identified routing alternative. Two members suggested specific language for a recommendation on route selection methodology and direction to carriers.

22 This suggested language and other discussion brought out the point that DOE and stakeholders should enter into a process to establish methodologies for selecting the safest and most acceptable routes. Some working group members recommended that U.S. DOT guidelines for routing of hazardous and radioactive materials be used to provide direction in this effort.
23 Within this context, it was also suggested that DOE should provide state and local jurisdictions with copies of the route and risk analyses for each carrier transporting Class 7 materials as defined in 49 CFR 172.403.

4. As a compromise between Options 2 and 3, above, some working group representatives thought that option 2 might be put into effect and used until a methodology is agreed upon

.Parking Areas

24 1. DOE/NV should work with the State and corridor jurisdictions to develop criteria for selection of safe parking areas to be used by carrier vehicles. This is related to the recommendation in *Group II, Mitigation, Procedures and Operations*, that all shipments of low level waste arriving
25 at NTS during off-hours be required to temporarily park loads at a secured area inside NTS gates.

WORKSHOP NOTES 2

THIS VERBATIM TRANSCRIPT CONSTITUTES

THE OFFICIAL RECORD OF THE

NEVADA TEST SITE ENVIRONMENTAL IMPACT STATEMENT
C.O.R.E WORKSHOP
(PUBLIC COMMENTS)

Held at the

CITY HALL BUILDING
Boulder City, Nevada

on

April 8, 1996
Beginning at
7:30 p.m.

REPORTED BY: Lana Stewart
Senior Verbatim Reporter

Bechtel Nevada
Reporting Services

WORKSHOP NOTES 2 (CONTINUED)

KEY to Transcript Symbols and/or Abbreviations

Webster's New Collegiate Dictionary: "Verbatim -- in the exact words; word for word."

Dash: [--] Indicates a sentence not completed by speaker.

Dots: [...] Indicates something was said by the speaker, which, as spoken, is neither audible nor decipherable to the reporter or from the taped cassette recording.

(ph) Indicates phonetic.

(sic) Represents exactly as said by the speaker and is used to alert the speaker/reader to an error in the record.

Parentheses: ( ) Words within parentheses are reporter's explanatory comments.

VOICE: Indicates an unknown speaker.

Uh-huh: Indicates affirmative answer.

Huh-uh: Indicates negative answer.

Bechtel Nevada
Reporting Services

NEVADA TEST SITE ENVIRONMENTAL IMPACT STATEMENT

C.O.R.E WORKSHOP AGENDA

WORKSHOP NOTES 2 (CONTINUED)

BOULDER CITY, NEVADA, APRIL 8, 1996, 7:30 P.M.

PUBLIC COMMENTS

IRIS BLETSCH

BLETSCH: I have visited with Dr. Elle before. I attended one of the first scoping meetings and I had lengthy comments then. I have also sent people to meetings to put the comments in. Tonight, I'm not going to repeat those same comments. I'm sure you don't want to hear them again. I just had two questions.

1 I would just like to know, and I think probably the people would like to know, what this process has cost in dollars up 'til now, and what you assume it might cost by the time we're finished?

ELLE: I think the budget we've been working on in the last couple of years has been about 4 or 5 million dollars a year. Our end expectations is about 10 million dollars.

BLETSCH: I got a copy of your big one. I couldn't lift it, much less read it. (Laughter)

ELLE: Well, I should comment, in comparison to other documents that DOE has produced like this, Idaho had a document that cost probably about 50 million. Some of the other big documents cost 20 or 30 million. So on a relative scale, though the 10 million sounds expensive, it is pretty cost-effective; at least the way we've tried to do this one.

BLETSCH: Okay. My other question is: I was looking at these alternatives we have over here. (Indicating) And I'd like to discontinue the use of transportation by requesting that all the states that
2 generate whatever it is they generate, they just keep it there. If it's so safe, that shouldn't be a problem.

ELLE: Okay.

BLETSCH: That's it.

DENNY HAAS

HAAS: I would like to request that the DOE investigate, through the Bureau of Reclamation,
3 whether or not hazardous truck traffic can be prohibited from using Hoover Dam to cross the Colorado River.

ELLE: Thank you.

BOBBI YOUNGBLOOD

YOUNGBLOOD: I really came to learn. And, of course, I am very much interested that we not
4 use any truck route through Boulder City with hazardous waste. And more recently, in the newspaper, I read where they're picketing perhaps for underground testing. That concerns me. And with young children, with the water level, and all these other concerns. Again, I don't feel qualified to speak though, because I did come late, and I didn't get to hear the presentation or the beginning of it. But I'm here as a concerned citizen and want to become involved, just for the safety of our children and our grandchildren. Thank you.

ELLE: Thank you. Again, I just want to thank everybody for coming and thank you for the opportunity to come and talk about the project that we've been working on for quite awhile. I think it has importance, not only today, but into the future of the Test Site and how we use this resource that we value in terms of its national capability. Thank you for your participation. And we will listen to your comments and incorporate them in our work. Thank you.

BENSON: Professor Richitt.

RICHITT: I just want to, again, thank you personally for coming in this evening and for participating. We'll be here for a little longer. So Bobbi, if you would like to ask questions or whatever, stay here as long as you'd like; and that's an invitation to everyone also. We want you to be involved in the process and we want you to be a part of this; to tell DOE what you want and what you think. If any of you have not turned in your survey forms, we would really appreciate getting them back. They will help us to better do more in the future. So thank you again very much.

* * * * * *

THIS VERBATIM TRANSCRIPT CONSTITUTES

THE OFFICIAL RECORD OF THE

**BIG GROUP MEETING
(PUBLIC COMMENTS)**

HELD IN

Building C-1 Auditorium
2621 Losee Road
North Las Vegas, NV 89030

on

April 11, 1996
Beginning at
2:30 p.m.

REPORTED BY: Lana Stewart
Senior Verbatim Reporter

KEY to Transcript Symbols and/or Abbreviations

Webster's New Collegiate Dictionary: "Verbatim -- in the exact words; word for word."

Dash: [--] Indicates a sentence not completed by speaker.

Dots: [...] Indicates something was said by the speaker, which, as spoken, is neither audible nor decipherable to the reporter or from the taped cassette recording.

(ph) Indicates phonetic.

(sic) Represents exactly as said by the speaker and is used to alert the speaker/reader to an error in the record.

Parentheses: ( ) Words within parentheses are reporter's explanatory comments.

VOICE: Indicates an unknown speaker.

Uh-huh: Indicates affirmative answer.

Huh-uh: Indicates negative answer.

WORKSHOP NOTES 3 (CONTINUED)

BIG GROUP MEETING AGENDA

Bechtel Nevada
Reporting Services

LAS VEGAS, NEVADA, APRIL 11, 1996, 2:30 P.M.

PUBLIC COMMENTS

THERON GOYNES

GOYNES: Good afternoon. I'm Theron Goynes, Councilman and Mayor Pro Temp for the City of North Las Vegas. And as I was talking to my coworkers or cohorts, or what have you -- I just left a Regional Transportation Commission Meeting, and I'm about up to here with acronyms today. RTC, EOB, NWACE, WESP, NDOT, and DOE, and Department of Transportation, and you name it. And I've got to get through with this and go prepare for a Planning Commission Meeting and the City Council this evening in North Las Vegas. So pardon me if I sound a little bit irrational, because my RTC Meeting, Regional Transportation Commission, deals with transportation and fixed routes, and what are we going to do with I-15 and the Spaghetti Bowl at I-95. But I want you to know that I'm not asking for your sympathy, I'm just asking for your understanding. The acronyms, I'm going to get a complete list of these before the end of my term.

But again, I want to express my concerns from the City of North Las Vegas. And certainly, I would offer my thanks to the Department of Energy at this time for the opportunity to comment on the Nevada Test Site Environmental Impact Statement. I would also like to express my appreciation on behalf of City of North Las Vegas staff for the opportunity to work with DOE staff, especially Frank Di Sanza and Kathleen Grassmeier, over the past several months through the Protocol Working Group, to discuss the transportation issues. Now, that was well put together by Nancy, wasn't it?

(LAUGHTER)

1

GOYNES: Okay. I would like to express my concerns today on the following points: Number one: The area covered by the EIS did not extend into North Las Vegas. And I believe that we were one of the first entities that became very, very concerned about the extenuating circumstances that was coming from the DOE area. Given that this area is the source of many of the workers and the focal points for most of the transportation alternatives, more analysis should have been done on the region.

Number two: The City has always maintained that their first responsibility is to

provide the highest level of safety for our residents,
workers, and drivers. In this respect, we feel it is
important to coordinate the Test Site activities with
2 the Yucca Mountain Project, since there is a strong
possibility that high-level and low-level nuclear
waste will use the same transportation corridors.

The City has, on several
3 occasions, expressed to DOE their opposition to
transporting any nuclear waste on Craig Road, and our
position has not changed. A hazards assessment of
Craig Road and the Union Pacific Railroad was
completed in 1995 by Russell Di Bartolo, Ph.D., funded
by the State of Nevada Waste Projects Office grant,
which compares development for one mile either side of
Craig Road in 1989 to development in 1995. This study
confirms the City's position that the Craig Road area
4 residential development makes it unsuitable as a
nuclear waste transportation route.

Although it is not required under
5 current DOT regulations, DOE should become proactive
in route selection. I think that was displayed a
moment ago on one of the graphs. It should be
6 possible to develop a route selection methodology
based on a comparative analysis that takes into
account our local concerns and conditions, including

WORKSHOP NOTES 3 (CONTINUED)

6 cont. population, potential risk for accidents, and various
other criteria. Again, I noticed some of that
displayed in the documents that we were focused on a
moment ago. The present process of considering mainly
time and distance is not adequate. The proposed use
7 of HIGHWAY -- and that's capitalized -- while it might
be good for macro scale planning, it is inadequate at
the local level. Low-level waste transport is too
closely allied with high-level waste transport to be
8 dismissed until the Yucca Mountain EIS is completed.
Any routes used for low-level waste transportation
will assuredly be used for high-level waste.

The economy of the Las Vegas
Valley depends upon perceptions. The valley's primary
industry and Nevada's primary source of income is
tourism. That, we all know, and you don't have to
wonder about that. The DOE may have an excellent
record in transporting nuclear waste, but a negative
9 perception caused by such shipments could result in
economic damage to the entire state of Nevada. Route
selection methodology must be explicit, transferable
10 to both high-level and low-level nuclear waste
transportation and account for local concerns and
conditions.

In the event of an incident

Bechtel Nevada
Reporting Services

involving nuclear waste materials, the DOE must be ready to respond quickly and appropriately. To this end, the EIS should include a recommendation to

11 maintain RAT team readiness at the Nevada Test Site. I believe that's Radiation Assistance Team. I recall some years ago during my tenure on the Council, I attended a workshop in Emmitsburg, Maryland involving the event that would take place. And we went through one of the action item plans on the event that something of this nature would take place. And I thought -- is there anybody here familiar with that process in Emmitsburg, Maryland?

GRASSMEIER: It's the National Fire Academy.

GOYNES: Right. It's the old college that they turned into that.

GRASSMEIER: It used to be St. Joseph College, and I am a graduate of that school.

GOYNES: Okay, then we're on the same wavelength.

12 Regular meetings should be scheduled with DOE, Carriers, and Affected Units of Government to discuss nuclear waste transportation issues.

13 Notification to local governments

WORKSHOP NOTES 3 (CONTINUED)

13 cont. should be provided by DOE indicating number of shipments, type, route, time of day and days of week. Again, we refer back to the slides that we saw.

The City of North Las Vegas will comment in writing regarding the entire Nevada Test Site Environmental Impact Statement by the May deadline. And I can assure you that we will be held to this commitment before the May deadline.

And it's been my pleasure. And again, I would like to thank you for the opportunity to provide comments on the Environmental Impact Statement transportation issues. And please note that we are an incremental part of the program and we're going to stay -- and being one of the first, we thank DOE, the Department of Energy, again, for allowing us to be part of it. Thank you.

ELLE: Thank you very much.

DENNIS BECHTEL

BECHTEL: My name is Dennis Bechtel. The comments I would like to offer today are from Commissioner Myrna Williams, the Commissioner of Clark County. She regretted that she would be unable to be here today, she had another meeting. So I'm going to

Bechtel Nevada
Reporting Services

convey her thoughts. First, she also wanted to thank the Department of Energy, individuals from the Transportation Protocol Working Group; and the Department of Energy, Katie and Frank for all your hard work. This has been unique in our experience. Transportation is a big issue to Clark County. And to see this as part of the EIS, I think it's kind of unique. And I also, with Bart, would like to see -- we'll be interested to see what really comes out of the exercise. But I think the dialogue of the work by DOE and a number of meetings, and I think some sensitivity of our concerns, is appreciated.

What I'd like to do is to read some comments from Commissioner Williams. We also will be providing some more detailed comments by the May 3rd deadline. She says: The issue of transporting radioactive waste through the Las Vegas Valley is an extreme concern to Clark County and citizens. Our involvement on this issue reflects our concern for the creation of potential precedence for future Yucca Mountain nuclear waste shipments. The resolution of issues such as the routing of the waste notably in urbanized areas will require considerable additional time and effort in working with local governments. From Clark County's perspective, the

WORKSHOP NOTES 3 (CONTINUED)

14 Final EIS and the Record of Decision should state unequivocally that further interactions are required of the affected communities on transportation issues such as routing.

15 To kind of echo some of the discussions of the Protocol Working Group. DOE should utilize the methodology of route selection that will minimize risks to the public; not just in Las Vegas, but anywhere.

16 The risk analysis presented in the study does not adequately consider potential local problem areas. While traditionally time and distance have been the key selection criteria of the transport of the waste, given the fact that a number of shipments may be increased dramatically through this program, other factors such as population density, areas of high potential accidents, location of sensitive facilities should be equally important determinates in route selection. As a side comment, the concerns that we express today are things that DOE are going to be faced with throughout the country, not just us. We're the focal point right now.

Ms. Williams finds it interesting that most of the routes examined in the Transportation Study travels through Clark County or the Las Vegas Valley. And I think there's a little bit of history

involved in that. The Las Vegas Valley currently is a
population that exceeds one million. It is estimated
that the population could go to almost two million by
the year 2005, the estimated period of the
Transportation Study. Given the continuing dramatic
growth and population and traffic congestion and
construction, it is difficult to understand why
potentially dangerous areas such as Hoover Dam and
17 so-called Spaghetti Bowl, which is the I-15, US-95
intersection, are being considered for routing. It is
also hard to believe that roads such as Craig Road and
Rancho, the rapid urbanization and residential
18 development occurring in the north and northwest
sections of Las Vegas Valley, are also considered as
viable routes. These locations offer high accident
potential. US-93 and Hoover Dam is experiencing
gridlock and these are the dangerous switchbacks on
both sides of the Arizona, Nevada sides. The
Spaghetti Bowl will be under new construction over the
19 next five or ten years, as you're aware. This creates
additional traffic hazards and potential for
accidents.

It is always noted that there are
thousands of shipments and other types of hazardous
materials of waste on the roads today; this being

radioactive, but it's no different and no more
dangerous. We're obviously concerned about all types
of material transported, given that it presents
hazards to the public. A tourist-based economy such
as ours must be sensitive to anything that would
20 enhance potential risk to the public or induce the
public's desire to visit our area. What would be the
public's reaction, for example, if there were an
accident with radioactive material at the Spaghetti
Bowl, considering that the major transportation routes
being considered through Las Vegas are adjacent to our
most densely placed casinos and hotels? Wouldn't it
21 be more prudent to avoid this in populated areas?

DOE, as we understand it, has
taken a more passive role in the past with respect to
radioactive waste shipments, essentially recommending
that the carriers adhere to DOT regulations and
relying on the carriers for compliance. We feel that
because the NTS is being considered for the extremely
large number of shipments for radioactive material,
DOE needs to take a more proactive role in issues such
as route selection. DOE can, for example, mandate by
22 contract, or at least exploring, on routing the
options for carriers; including perhaps the avoidance
of sensitive areas that was noted earlier, and

22 cont. consideration such as safe-havens and others.
Because of the potential for large
numbers of shipments, it is important to the local
23 communities and particularly public safety personnel
be notified about shipments in their timing. At a
minimum, this will provide the local public safety
personnel with the opportunity to prepare for the
shipments. It will enable local DOE officials to be
guided -- to guide carriers about potential problems
that may occur. I keep thinking that -- about a month
or two ago, there was an accident, I think it was a
beverage truck leaving Las Vegas on I-15 going south.
That coincides with the time where everybody is going
back to Los Angeles. And it was a gridlock for many
miles, believe me. And it would just take something
like that to happen. Under our current traffic
conditions, it would really create a chaotic
situation.

In addition to routing, local
communities should also be actively involved in
24 discussing issues such as how carriers would handle
the deviation from the established routes for fueling,
rest, mail stops, emergency breakdowns, and similar.
These are also important issues that would cause a --
let me just -- you know, someone traveling a highway

WORKSHOP NOTES 3 (CONTINUED)

needs to do these things. And we've had situations in
the past where the deviations have occurred where a
truck parked at Fremont Street, because someone had
not been to Las Vegas and decided that he needed to
visit the area and get a meal. And it turned out the
truck was actually leaking material at the time. And
I'm sure there's probably other instances of that,
that we don't even know about.

Finally, all facets of emergency
response and public safety are also important. And
availability of adequate emergency response resources
and having sufficiently trained personnel are
important. And notably, those areas could rely upon
the volunteered fire departments. In our case, Indian
Springs is like that. And, of course, the other rural
counties, many of them are all volunteered. Likewise,
DOE must be prepared to resolve potential risks
quickly. We're aware that DOE has had an excellent
record in the past responding to accidents. The
25 greater number of shipments will undoubtedly task
existing response teams. These will need to be
augmented to meet the future requirements.

And, again, Myrna Williams thanks
you for the opportunity to provide input to this. And
Clark County and the Commission are very interested in

Bechtel Nevada
Reporting Services

WORKSHOP NOTES 3 (CONTINUED)

this issue and will continue to be interested in it; and as well as the total EIS process. So thank you.

ELLE: Thank you.

* * * * * *

WORKSHOP NOTES 4

THIS VERBATIM TRANSCRIPT CONSTITUTES

THE OFFICIAL RECORD OF THE

NEVADA TEST SITE ENVIRONMENTAL IMPACT STATEMENT
C.O.R.E. WORKSHOP
(PUBLIC COMMENTS)

Held at the

TRAIN STATION FACILITIES
Caliente, Nevada

on

April 16, 1996
Beginning at
7:00 p.m.

REPORTED BY: Lana Stewart
Senior Verbatim Reporter

KEY to Transcript Symbols and/or Abbreviations

Webster's New Collegiate Dictionary: "Verbatim -- in the exact words; word for word."

Dash: [--] Indicates a sentence not completed by speaker.

Dots: [...] Indicates something was said by the speaker, which, as spoken, is neither audible nor decipherable to the reporter or from the taped cassette recording.

(ph) Indicates phonetic.

(sic) Represents exactly as said by the speaker and is used to alert the speaker/reader to an error in the record.

Parentheses: ( ) Words within parentheses are reporter's explanatory comments.

VOICE: Indicates an unknown speaker.

Uh-huh: Indicates affirmative answer.

Huh-uh: Indicates negative answer.

ENVIRONMENTAL IMPACT STATEMENT

C.O.R.E WORKSHOP AGENDA

Page

PUBLIC COMMENT PERIOD - LIST OF SPEAKERS

CALIENTE, NEVADA, APRIL 16, 1996, 7:00 P.M.

PUBLIC COMMENTS

ROBERT O'CONNOR

O'CONNOR: Let's see now if I can get together what I want to say and everything might be all right. My name is Robert O'Connor. I was born in Reno and raised in Lincoln County. And everybody knows where Lincoln County is. That's where Clark County ain't going to get any water.

(LAUGHTER)

O'CONNOR: I'm quite interested in what's going on here tonight. I might add that I'm also a candidate for the President of the United States. Now, I don't want you to worry about it because I might not make it. In fact, chances are slim. But I don't think I have to make it. What I need is a place to talk once in awhile. My own personal opinion is, that we have very, very serious problems in this country, and some of them have to do with that Nevada Test Site. What I'm wondering -- and I have been wondering it over a period of years -- who has gained anything for all the activities that have been going

WORKSHOP NOTES 4 (CONTINUED)

on out there; anybody, I mean, except those working there?

Now, this Environmental Impact Statement, that I guess is in the planning stage, what is it going to say that hundreds of other Environmental Impact Statements haven't said? It appears to me that we have about enough Environmental Impact Statements to sink a battleship. And after an Environmental Impact Statement is completed and put in book form, does anybody ever look at it again; or is it put in storage some place? I read an article one time on government documents and how many billions or millions of dollars are involved in printing information, that nobody really gives a damn about, I might say.

Now, this thing that's going on out at the Nevada Test Site or the proposals that are being proposed, who benefits, anybody except those working out there? Which is good, I'm not against anybody working anyplace, because jobs are becoming hard to find. But I hate to see every job in the United States of America funded by the government. Somebody's going to pay these bills, and I don't know who it is anymore. Now, this Environmental Impact Statement, I don't know what it's going to say, but I

Bechtel Nevada
Reporting Services

would like to have one of them whenever it's completed. I know for a fact that out there at that Nevada Test Site, there have been -- I think the last time I read in the paper, there was 700 and something underground tests. Now, on these underground tests underneath that ground, there is an atomic dust contamination. Is anybody concerned about that, that this contamination is not in a casket or any place else; it's just sitting there in the dirt? Is there any danger there?

And these proposals that -- I don't know what you're proposing to do out there now. But whatever they are -- I read in the paper where maybe they would resume atomic testing. Now, how much more do we need to know to find out that we can blow human beings off the face of the earth, and we don't seem to have any qualms about doing it? So I don't know whether I have any questions or whether I'm just talking through my mouth. But are we going any place? Are we spending money just because we have some money to spend? And is anybody gaining anything except those who are working out there? I think these are legitimate questions that the public ought to be asking one of these days, because money, to my way of thinking in American, is going to become harder and

harder to come by. Because under the guides of the democracy, all I see is government government everywhere, on every level. And it's quite apparent that those in the government are doing quite well, and those many out of the government are maybe not doing so good.

I don't know whether I've made any sense here today or not, but at least I said what I had to say. Thank you.

CHAMBERLAIN: Appreciate that. Thank you.

ALAN CHAMBERLAIN

CHAMBERLAIN: Who is your natural resource person here, is there someone here, geologist-type?

MAXWELL: Yes.

CHAMBERLAIN: Is that you? I just have a few questions.

O'CONNOR: I think I do have a question.

ROBERT O'CONNOR

O'CONNOR: What does the future hold for the Nevada Test Site? What does anybody want to do? Is anything contemplated or talking about doing something?

ELLE: I think the simplest answer is, that the primary mission of the Nevada Test Site has been conducting underground nuclear tests, providing the level of assurance that the nuclear defense capability of the United States has and continues to be viable. And that will be the maintenance of the capability, the ability to do an underground nuclear test. If the President, for whatever reason decides he has to do, that would still be done at the Nevada Test Site.

O'CONNOR: You mean more underground nuclear tests?

ELLE: I mean, that's the primary purpose of the Nevada Test Site. But there are a whole lot of other things that we do at the Nevada Test Site in terms of defense experimental work that requires an isolated location, other activities like the Spill Test Facility where we can do work for commercial operations that need a capability like we have.

WORKSHOP NOTES 4 (CONTINUED)

O'CONNOR: I read, I think one day in the paper where they planned on making sunscreens using sun rays to generate power. Is that true?

ELLE: That's one of the things that is being looked at.

O'CONNOR: I have a comment on that also. That procedure was already done in the state of Washington. Now, do we have so much money that we can do that in every state? Did we learn anything from that in Washington? They also had windmills up there.

ELLE: I think the premise on these proposals, the commercial industry is still interested. I believe they have a better opportunity to make commercially available solar power. They want a place, and the Test Site is a place they have looked at in trying to do that.

O'CONNOR: Well, there's lots of sunshine in Nevada. If it will work any place, it would work here.

ELLE: Right.

Bechtel Nevada
Reporting Services

ALAN CHAMBERLAIN

(MULTIPLE INAUDIBLE CONVERSATIONS)

CHAMBERLAIN: I'm Alan Chamberlain from
Hiko, Nevada. This is the kind comment I asked when I
was down in Las Vegas. The question I have is, I need
1 to follow-up on where can I obtain data on the west
faults? I haven't seen it anywhere in this document.
And that is the cutting edge of geologic technology.
Is that available? And can I get a hold of it? And
another comment is, and I don't know who told me this,
that a lot of geologic information in here is based on
peer review papers. Is there no independent persons
without any connection to government geology going out
and looking at this? And is that data available?
Where can I obtain it?

MAXWELL: There is a technical library at
the facility on Losee Road, and it's all computerized,
however you want it.

CHAMBERLAIN: Can you download it?

MAXWELL: They will run copies of the
documents for you.

CHAMBERLAIN: So it is available, great.
I'm just curious what the data is and what's
2 available. It talks about a generalized strat column

2 cont. on page 421, this column here. (Indicating) Has there
been any attempt to identify sequence to amend this
column, the water aquifers, the deep carbonate water
aquifer system? Is that done somewhere? Is that
available? Has there been no attempt done on that?
You know, there's sequences in here and some of them
will be better aquifer systems and some are aquitard
systems. Has that been identified in this
stratographic section?

MAXWELL: I'm guessing now. As part of
the containment, the primary purpose in this
stratigraphy in this case, is to make sure that the
test would be contained. And it also runs in the
water column. So I would imagine that the information
has been collected. And we're also with the
Environmental Restoration Program, we're
characterizing the groundwater of the Test Site. And
part of that is identifying those various
concentrations.

CHAMBERLAIN: Okay. Yeah, because I
3 didn't read anything in here about the deep water
carbonate aquifer system. And that seems to be the
most important natural resource water source in
Nevada, is the deep water carbonate aquifer system.
Because we're in the desert area and we get less

precipitation than we do actual production. So I didn't see that anywhere in the statement. Because they address the deep water carbonate aquifer system and how it's interconnected between beyond the mountain ranges. They talk about the superficial water table thing, and that's okay; but they don't talk about the real water system and how that might be contaminated.

MAXWELL: We are in the process of gathering that information now through the underground test area.

CHAMBERLAIN: And I'd be interested, who would I contact; what geologist specifically can I talk to, to see what they're doing on all this stuff? Is there a particular name? Can I get that name or do I have to call later?

ELLE: Why don't you give me your name and we'll have somebody call you back.

CHAMBERLAIN: Okay, that would be great. Maybe these are the kind of questions I need to just ask him specifically instead of asking you.

MAXWELL: Right, and get more learned answers.

CHAMBERLAIN: Okay. I don't mean to put anybody on the spot, but these are just some curious

questions and I'm just wondering if this would be a proper place to ask them. I didn't see a whole lot in
4 here about the mesozoic and how it's connected, how it's related to oil and gas. You know, how it's
5 related to the ore zone, the host rocks. How it's
6 related to the water aquifer systems. So I don't know, maybe that's another question to ask the geologist. Did anybody evaluate these stress values?

On this figure here, on Figure 4-24 on page 4 on 2, it shows a fault map. I
7 don't see any thrust faults in there. I guess the question I have, you know, why aren't they there?

MAXWELL: This identifies areas where we would have in fact on that resource in one of the proposals.

CHAMBERLAIN: Okay. I guess my comment is, is when we test the nuclear test or whatever, what structural plate are we in and what are the water aquifer systems within that structural plate; and how
8 does it go through the mountain ranges? We know there's normal faulting but there's big thrust faults in here that give you a lot more communications. I don't know if that's been addressed. And if it hasn't, I'd like to talk to somebody about that, because I think that's a real important issue.

My favorite part, the hydrocarbon resources. Who is the author for this particular part of the EIS? I'd like to know who that is.

HENDERSON: There's one or two people. Basically, I think the correct response is, is as you have comments -- and it sounds like most of them are valid -- we're obligated to address them in the Final and try to write an answer. And not only that, but to call you and give you the answer of these kinds of things that need to have written responses for them.

CHAMBERLAIN: Okay. My question is, you know, who were the -- were they certified petroleum geologists?

HENDERSON: It would have been one or two different Ph.D geologists. I know one was Bechtel and one was PAI.

CHAMBERLAIN: Okay. Then I guess the
question I'd have is, are they certified petroleum
9 geologists or are they just general geologists? I
think that's real important. And I'd like to know
10 what these previous investigations are. And do we
11 have petroleum geologists seeing those wells or is it
just normal geologists? Those kind of questions, I
would like to talk to your technical people, if they
would give me a call. I just want to make sure that

those things are addressed.

ELLE: Well, I think part of the answer is, is the details that you're asking for or asking questions about, this is a summary level document, it's not a detailed geological investigation. So in the sense of our trying to respond to your questions or comments, you may see in the comment response document an answer like that, and then an invitation to come and talk in more detail to the geologic people, if that's what you want to do.

CHAMBERLAIN: Okay. I guess I'm saying
is, you know, even on the general scale, some of these
general things I want to talk about, it should be
addressed. The sequence stratigraphy and the aquifer
systems, that's really important. And those haven't
12 been addressed, at least I haven't seen them. And
those are pretty general. So I'd like to see it in
the Final Draft. Anyway, that's my comments.

ELLE: Okay.

CHAMBERLAIN: Appreciate you all. Thank you.

* * * * * *

WORKSHOP NOTES 5

THIS VERBATIM TRANSCRIPT CONSTITUTES

THE OFFICIAL RECORD OF THE

NEVADA TEST SITE ENVIRONMENTAL IMPACT STATEMENT
C.O.R.E. WORKSHOP
(PUBLIC COMMENTS)

Held at the

TONOPAH COURTHOUSE
Tonopah, Nevada

on

April 23, 1996
Beginning at
7:30 p.m.

REPORTED BY: Lana Stewart
Senior Verbatim Reporter

Bechtel Nevada
Reporting Services

WORKSHOP NOTES 5 (CONTINUED)

KEY to Transcript Symbols and/or Abbreviations

Webster's New Collegiate Dictionary: "Verbatim -- in the exact words; word for word."

Dash: [--] Indicates a sentence not completed by speaker.

Dots: [...] Indicates something was said by the speaker, which, as spoken, is neither audible nor decipherable to the reporter or from the taped cassette recording.

(ph) Indicates phonetic.

(sic) Represents exactly as said by the speaker and is used to alert the speaker/reader to an error in the record.

Parentheses: ( ) Words within parentheses are reporter's explanatory comments.

VOICE: Indicates an unknown speaker.

Uh-huh: Indicates affirmative answer.

Huh-uh: Indicates negative answer.

Bechtel Nevada
Reporting Services

ENVIRONMENTAL IMPACT STATEMENT

C.O.R.E WORKSHOP AGENDA

Page

PUBLIC COMMENT PERIOD -- LIST OF SPEAKERS

WORKSHOP NOTES 5 (CONTINUED)

TONOPAH, NEVADA, APRIL 23, 1996, 7:30 P.M.

PUBLIC COMMENTS

VIOLA WHIPPERMAN

WHIPPERMAN: My name is Viola Whipperman. 1 How deeply involved does DOE plan on getting with the locals to develop some new activities on the Test Site; how deeply involved --

ELLE: Well, I think --

WHIPPERMAN: -- with the actual implement planning and implementing?

ELLE: I believe if you look at what's happening right now, the Community Reuse Organization, the Nevada Development Corporation, is a DOE-funded activity to do exactly that; is to help commercial kinds of people that have an interest in using the Nevada Test Site for, like rocket launching. I mean, that's an activity they're pushing and that's an activity that we're involved with them in and evaluating how it can happen. And I think there's a couple of other organizations. And I know Bechtel, the new contractor, has made a lot of proposals to bring in new kinds of things. So there's a lot of

Bechtel Nevada
Reporting Services

commitment to the future in trying to bring in different kind of activities at the Test Site.

The other half of that answer is, in the sense of the Resource Management Plan, if you looked at the framework, what we want is public involvement in the development of that plan and to make sure that as we go forward in all of these activities, that there is clear involvement in how that Resource Planning happens.

WHIPPERMAN: Okay.

WADE BARTON

BARTON: Thank you, and greetings from Esmeralda County. I am Wade Barton, the Chairman of the Esmeralda County Commission. And I would like to say I appreciate this opportunity to speak on behalf of Esmeralda County. My hat's off to the research and development out on the Nevada Test Site. I think that the Nevada Test Site has seen a great loss in jobs and it's been quite an asset to the state of Nevada for many years. And I'd like to see progress and development to continue out there.

I'm a member of the Community Reuse Organization, which has a title now, the NTS

Development Corporation. And we are behind any kind of progressive development out at NTS. I've seen presentations put on from Kissler Aerospace considering the reusable satellite system. I was a member of the South Central Nevada Federal Complex Advisory Board. And I take a lot of credit in getting the CRO developed for the state of Nevada.

I'd like to say that some of the

2 data -- well, I'd like to see some data in the document addressing employment issues for Esmeralda County. Some of the issues have been put forth for Nye County, but not necessarily Esmeralda.

3 And I'd like to see some of those numbers. And I'd also like to see Esmeralda County possibly defined as a cooperative agency. And again, I appreciate this opportunity.

ELLE: Thank you, Wade.

RAY SALISBARY

SALISBARY: I'm Ray Salisbary. I'm from Lander County. I'm on the Lander County Land Use Advisory Commission. I just put my "X" down there because I didn't know what was going to happen, so just in case. The only two things I can see that's really important out there, and that's to give private industry and the commercial people a chance to use the surplus lands. And any of the contaminated lands that can't be used should be turned back over to the BLM and let them manage them. Thank you.

(LAUGHTER)

ELLE: In relation to the last comment, we have talked to the BLM about that and they're not too excited about taking that land.

WAYNE PERKINS

PERKINS: I want to comment as a Commissioner for Nye County. And I too want to see things addressed and I know they have been. The question has been brought before you on economic development for Tonopah and more use of the businesses and the people available here in Nye County, Tonopah; and this is the same with Goldfield, because there's a road opened up into that Test Site from their side. There's people with skills and talents here that would like to see those people that are dealing up in this area, to leave some of that money here instead of flying it back to Las Vegas. I think it's very important.

ELLE: Okay.

PAM SIRI

SIRI: My name is Pam Siri. I'm just curious as to which alternative it is that you favor at this time?

ELLE: Well, as I said, we haven't defined a preferred alternative. But I think if you talk to people, Alternative 3 -- I mean, trying to maximize what we believe is the national resource that's represented by the Test Site is the kind of thing that we're looking at. I don't want people to believe that we're not interested in people's comments about the other alternatives or that we would not consider them in shaping the preferred alternative itself, because we will use those comments in that way. But I think everybody's -- I mean, the public is interested in jobs and economic activity, and I don't think people want to see the Test Site sit there with nothing happening on it.

LYNN KRETSCHMER

KRETSCHMER: My name is Lynn Kretschmer. I'm from Tonopah. I worked at the Test Site for 15 years and I retired in '93 as a laborer. I'd like to know what the activities that are going on out there now and if they're going to -- I mean, I know the union is gone, per se. And do you think there will be any union jobs back, and what is really going on out there now?

ELLE: Well, I don't think the union is gone. Bechtel is the new contractor, but the union contracts went with Bechtel when the other contractors went away. In the sense of jobs, certainly the number of people working on the Test Site is very much smaller than it was, you know, three or four or five years ago. And there is an effort -- as I've said, Bechtel is interested in increasing the scope of activities that they have on the Test Site. And a major part of their contract is to find new work and to bring new activities to the Test Site.

KRETSCHMER: But Bechtel is not the only contractor out there though.

PERKINS: She's talking about TTR.

KRETSCHMER: Yeah, TTR.

WORKSHOP NOTES 5 (CONTINUED)

ELLE: Sandia is still the contractor at TTR. And they're interested as well in whatever new activities they can do there. And I can't speak for the Air Force in terms of how they would use existing facilities.

KRETSCHMER: Thank you.

JUANITA HOFFMAN

HOFFMAN: Since I was a facilitator, I'm probably not supposed to speak, but Juanita Hoffman. And I would just like to say -- reiterate what the other folks have said about employment for the rural counties. Not only are we your closest neighbors, but I think that we've been the best neighbors; and Clark County is just nothing but trouble.

(LAUGHTER)

HOFFMAN: And employment of people in Clark County is just kind of a drop in the bucket to their economy and to Esmeralda or Nye County's or Lincoln County, for that matter; it's a big difference. And I don't know if this is even appropriate for EIS comments, but DOE ought to be able to have some influence on Bechtel to pressure them or suggest nicely that they look to the rural counties to

Bechtel Nevada
Reporting Services

WORKSHOP NOTES 5 (CONTINUED)

hire people.

ELLE: Okay.

WAYNE PERKINS

PERKINS: Don, there's another comment I'd like to make on that, and it's kind of what she touched on. You never hear the Test Site being 15 miles east of Amargosa or 40 miles south of Beatty, Nevada; Nye County. It's always 90 miles north of Las Vegas. It's not even in that county down there. So there's a PR thing that really ticks people off around here, "Why isn't it close to some of us?" It's just like we don't exist. A little PR in that way would help a little.

ELLE: Well, we did have one comment early-on, that we left Pahrump off the map. And Pahrump is on the map and it will be on the map. And we can add words in the document that reflect where other places are in relation to the Test Site.

WORKSHOP NOTES 5 (CONTINUED)

MASON HAYES

4 HAYES: My name is Mason Hayes. I'm from Goldfield. I just wanted to ask you, Dr. Elle, if some of these issues might be environmental justice issues because we are economically depressed areas; as I'm sure you know, and the Department is also aware of?

ELLE: We have addressed environmental justice in this document. The guidance that we have, even though environmental justice has an issue as the interest that the President has expressed, in that the guidance we have does not put rural communities like Goldfield in the category of environmental justice. Though, we have identified that infor -- put information in the document that talks about environmental justice from that point of view. I mean, environmental equity is a different issue.

HAYES: I suppose then my follow-up

5 question then would be, why were our areas that are economically depressed not considered suitable for environmental justice?

ELLE: Maybe Felicia can answer that question.

BRADFIELD: Well, actually, they were

addressed. Each area was considered discretely and in combination with the county it was in, so it was addressed. It is in the document. It should be in Section 12.

ELLE: Well, before you go home, point out to them where it is in the document. If it's not properly addressed or if there needs to be more information, then that's a comment that you could give us. Then we'll do some more work on putting it in there.

JUANITA HOFFMAN

HOFFMAN: I just have a following question about environmental justice. Is it not true that it's not strictly minorities that are looked at
6 or communities where they've all -- you know, they've already had like hazardous waste facilities or something like that? Is not one of the criteria an economically depressed area?

ELLE: It is.

HOFFMAN: Okay, thank you.

ELLE: But one comment I would make on environmental justice, is it's difficult for us, in writing this document the way we've written it, to

WORKSHOP NOTES 5 (CONTINUED)

address that issue clearly. And primarily, because there is no clear federal guidance on how to do it. I mean, the issue has been around for a couple of years and there still is no clear guidance on what it is you have to do or how it gets addressed.

VIOLA WHIPPERMAN

WHIPPERMAN: If there were new activities that were going to be starting up, on TTR in particular, say a completely new project, would they have to go under the regimen of going through the EIS all over again and with the horror of the desert
7 tortoise, you know, blooming over us, anything like that; so you can't move 50 feet in any direction for fear, or horror of the kangaroo/rat type thing? Is something going to be possible to be done out there or are we going to be trapped?

ELLE: I don't think we're trapped in any sense in trying to do new activities. Particularly with the desert tortoise or other endangered species, if you identify an impact, you figure out a way to mitigate that impact. But in terms of the way this document is written, it addresses high-level activities on TTR. If there are a new program or new activity that people are proposing, they wouldn't necessarily have to write a new EIS, but they could write an environmental assessment. It's a smaller document and it doesn't take as long to do.

RAY SALISBARY

SALISBARY: After this is all said and done, who would be in control of the Test Site, still the DOE?

ELLE: DOE would retain control of the Test Site.

SALISBARY: Okay.

PERKINS: I guess you've answered all the questions.

ELLE: Well, if people have more questions after we end this session, I'd be happy to try and answer them for you. And thank you for the opportunity to come and talk about the EIS and what it is we're doing. If you have written comments you want to get to us, May 3rd is the end of the comment period. If you postmark them May 3rd and we get them on Monday, we'll still look at them.

PERKINS: And we'll go ahead and breakdown. Thank you, Dr. Elle and the UNLV folks for

WORKSHOP NOTES 5 (CONTINUED)

coming up here and bringing this to us. I appreciate the assistance and the learning that I've got from it. Thank you.

* * * * * *

Bechtel Nevada
Reporting Services

WORKSHOP NOTES 6

THIS VERBATIM TRANSCRIPT CONSTITUTES

THE OFFICIAL RECORD OF THE

NEVADA TEST SITE ENVIRONMENTAL IMPACT STATEMENT
C.O.R.E. WORKSHOP
(PUBLIC COMMENTS)

Held at the

WEST LAS VEGAS ARTS CENTER
North Las Vegas, Nevada

on

April 25, 1996
Beginning at
7:00 p.m.

REPORTED BY: Lana Stewart
Senior Verbatim Reporter

Bechtel Nevada
Reporting Services

WORKSHOP NOTES 6 (CONTINUED)

KEY to Transcript Symbols and/or Abbreviations

Webster's New Collegiate Dictionary: "Verbatim -- in the exact words; word for word."

Dash: [--] Indicates a sentence not completed by speaker.

Dots: [...] Indicates something was said by the speaker, which, as spoken, is neither audible nor decipherable to the reporter or from the taped cassette recording.

(ph) Indicates phonetic.

(sic) Represents exactly as said by the speaker and is used to alert the speaker/reader to an error in the record.

Parentheses: ( ) Words within parentheses are reporter's explanatory comments.

VOICE: Indicates an unknown speaker.

Uh-huh: Indicates affirmative answer.

Huh-uh: Indicates negative answer.

Bechtel Nevada
Reporting Services

ENVIRONMENTAL IMPACT STATEMENT

C.O.R.E. WORKSHOP AGENDA

Page

PUBLIC COMMENT PERIOD -- LIST OF SPEAKERS

WORKSHOP NOTES 6 (CONTINUED)

NORTH LAS VEGAS, NEVADA, APRIL 25, 1996, 7:00 P.M.

<u>PUBLIC COMMENTS</u>

CAMILLE EDWARDS

EDWARDS: My name is Camille Edwards. My address is 2970 South Monte Cristo Way, Las Vegas, Nevada 89117. For several years, I have heard the term repeatedly low-level waste, low-level waste. I'm a layman. Can someone give me a clear and precise definition of exactly what is low-level waste?

ELLE: I had a simple answer for that and it may sound silly. Low-level waste is anything that's not high-level waste. High-level waste is spent nuclear fuel out of a power reactor. And it has a legal definition, and it's limited primarily to that kind of radioactive waste. Low-level waste is contaminated dirt, concrete, contaminated clothing, protective clothing that people might wear. It's essentially garbage that has radioactivity in it, that's not very radioactive in most cases. But that's what it is. It's a whole set of stuff that has radioactivity in it, but it's not high-level waste.

Bechtel Nevada
Reporting Services

CYNTHIA WATSON

WATSON: My name is Cynthia Watson. And my question -- you were talking about the response. And I guess my question is, since the Test Site at one point hired over 5,000 people, and now there is an opportunity to keep this open, are you getting overwhelmed response from people? I mean, I would think if people -- you know, if there's an opportunity to employ that many people to go back -- I mean, let's just say we just don't want to go back, how has the response been? That's just what I want to know. That's one question.

ELLE: Well, since we've had these eight public meetings, I'd categorize the responses not very good in terms of numbers of people that come and listen to us talk about the document or the process, or what we want to do. The number of people we have here tonight is probably -- except for the Las Vegas meeting we had where we had -- I think we had about 100 people. We had 20 people in Tonopah. We have more people here tonight then we have had at a lot of the other meetings. I guess on one hand, the struggle we always have is trying to present a document like this and get the public interested in it enough to

come and listen and talk about it. That's why we went to UNLV and asked them; but in a different way, have people get interested in what we're doing.

WATSON: Okay. Then my next question is off of what Ms. Edwards said on low-level waste. So it says here what are some of the low-level waste that are being considered. So from your explanation, it isn't different categories, it's just going to be low-level waste? So they could be burying jackets and anything -- it's all one category then; is that what you're saying?

ELLE: Right. It may look different in terms of -- from a place at Fernald in Ohio, they're digging up a lot of contaminated dirt that has radioactivity in it. And they put it in big containers and they ship it out here and we put it back in the ground. That's one kind of low-level waste. If they take down a building that they've used in the past that has radioactivity in it, you can't separate the radioactivity from some of the concrete or the beams or the other material in the buildings. So they take the building down and they put it in a package and bring it out here, and we put it in the ground.

WATSON: Okay, thank you.

ELLE: And then there's other sets of things. People that work with radioactivity, they wear protective clothing or they do other things. So if protective clothing gets contaminated and doesn't get cleaned up, they put it in a barrel and send it to us.

WATSON: Thank you.

CAMILLE EDWARDS

EDWARDS: I'm sorry, I need a further clarification. I understand now what is low-level waste. At what point, or what measuring tool is used to determine whether the low waste -- the waste is a low impact or high impact? And if it is high impact, is there a different storage place for that waste? Is there a different method of transporting it? Is there a different method of encasing it? How is that handled?

ELLE: The answer to the last three is yes. Let me say high-level waste again in a different way. When we generate electricity in a nuclear power plant, when the fuel gets burned-up, it ends up being radioactive. And by legal definition, that spent fuel is high-level waste. The reason they're working on

Yucca Mountain is they're trying to find out whether that place is suitable for disposal of that high-level waste. And there's a second piece to high-level waste. In the past, we used to take that spent nuclear fuel and chemically dissolve it and separate it, and get some radioactive material back out of it so we could use it again. And the waste material that resulted from that chemical process is also defined as high-level waste. So we have tanks of that liquid high-level waste around. And they are trying to create other processes to solidify it and bring it also to Yucca Mountain or a place like Yucca Mountain. So high-level waste is a very limited set of radioactive material that's different from the rest of the radioactive garbage that we generate.

WATSON: (Eddie) She wanted to know how it would be transported.

ELLE: The high-level waste will be transported in special casks, specially designed containers that are much more robust and have to meet a whole different standard in terms of how that material is packaged and contained.

EARL WHITE

WHITE: Good evening. For the record, my name is Earl White. I'm the President of a consulting firm called the Capital Group, 5000 West Oakey, Suite 1, 89102. My question, sir, is regarding, first of all, the alternatives expanded use. Would that provide more opportunities or -- expanded use would mean more people being hired and things of that nature? 1

ELLE: Yes.

WHITE: Okay. What -- I represent small minority and women-owned businesses. How would they become a player and become a vendor with this expansion process, if this was to take place? How would a small business -- and I'm not talking about a major -- you know, these are small women-owned minority businesses. And as you know, with the affirmative action being rolled back and things of that nature, how will these businesses be able to come to you -- come to your Department or your agency and try to do business without going through a whole bunch of red tape or going through stuff that they have been before?

ELLE: Well, I think that can be done two

ways. Both Bechtel as a contractor to the Department has, in their contract, requirements that they use that contracting vehicle to let people like that help them do their work. The Department also, as we issue are our own contracts, look at small disadvantage businesses or women-owned. For you to get information about that, I think you need to contact our contracts people and they can put you on a list. And as they issue contracts for competition, you would get that information.

WHITE: But as you know, the smaller businesses, they may not be able -- smaller businesses -- or is the Department of Energy looking to provide -- I'm not talking about set-asides. I'm talking about for the smaller type of companies, things that they can bid on; whereas a major company can just come in and outbid them with -- I mean, people are using the term set-asides, and I don't want to use that term because it's not politically correct now. When you use set-asides, people close the door and won't return your phone calls and all that nature. So how would a small -- how would I direct my clients to try to participate and be able to follow to make sure that there's a mandate for the services that they can provide?

ELLE: Well, again, the simple answer is, to get on the list of competitive announcements so you get that information. And I can give you the name or I can have people call you to let you know how to do that.

WHITE: Okay.

DEBORAH JACKSON

JACKSON: My name is Deborah Jackson. I live at 1213 North I Street. That's in Las Vegas 89106. I have really two questions. The one question still regarding the low-level waste and the high-level waste; I fully understand the difference between the two and how they're categorized. But I'd like to ask

2

also, since you're saying that low-level waste is certain items or perhaps clothing or whatever, do you also look at the level of radiation contamination that they would have? Some types of work perhaps that some people would do would cause them to become more contaminated, their clothing and so forth still may have high levels of radiation. Is that also a factor in determining whether it's still low-level?

And the other just statement, as

WORKSHOP NOTES 6 (CONTINUED)

when the gentleman was asking about the businesses being included; minorities, women, so forth. Even though it may seem simple to say just make that call or go and check with the contract department, we know how sometimes some people are not always as they should be. And I remember with the one company, TRW, I remember how black people and women who were qualified to participate, were given the run-around and told to go to this department and now you contact this person. And they never could get included. So I hope that we don't see that same thing, and it's not just a thing that people go and they get put on a list, but they never get contacted. So I hope that something is going to be put in place, because we definitely want to be included as African Americans, as women, Hispanics, whatever. I hope that there is something in place to make sure that this same type of thing doesn't happen, because of course, we get tired of that; we're taxpayers too. So that's what I wanted to say.

ELLE: Okay, I appreciate that comment. In answer to your question though, that's where it gets confusing, because low-level waste can be very radioactive. In fact, that does happen. I mean, that is true. So high-level waste is very radioactive and

Bechtel Nevada
Reporting Services

low-level waste, as a category of waste, can also be very radioactive. I didn't mean to confuse that.

JACKSON: I'm not confused at all. But that's why I asked that question. Because even though you're saying low-level waste, it could be highly radioactive. Even though because I was listening and I fully comprehended how you had broken down the categories, but there's a lot of different things that could still be with high levels of radiation; but they're classified as low-level because of the category it was put in. And that was my question. So there still may be some things that we're saying are low-level, but are really maybe high-level as far as radioactive waste.

ELLE: That's right.

JERRY HALL

HALL: My name is Jerry Hall. I've been a resident of Las Vegas 41 years. Twenty-three of those years, I have been working out at the Test Site. Don, your last slide brought question forward to my mind: "DOE wants to continue managing." You hear a lot of controversy on the radio, the papers, that they want to dissolve DOE. Is this going to happen, and

what department will take over the responsibilities? Or is it just going to phase into another government entity; Department of Defense, so forth? That was one of my questions.

ELLE: Well, let me answer that. I believe when you look at what Congress is trying to do -- what some Congressmen are trying to do with dissolving the Department, the thing you never hear about, that some of the functions of the Department have to continue; like management of the nuclear weapons that this nation relies on. And if you read their statements, that program, that responsibility goes to the defense department some place. Clearly, the contamination we've created in the past has to be cleaned up. Somebody's going to have to do that, whether it's DOE or another agency, or some other organization.

HALL: That's correct.

ELLE: So the simple answer is, if Congress dissolves DOE, a lot of that work is going to continue some place; and the place like the Test Site is going to be managed by somebody else.

HALL: Now, do you believe that the Final Draft will be completed before?

ELLE: Yes.

HALL: Okay. My main question was, as DOE and all these -- Bechtel and so forth coming up with all these ideas of different tests and so forth out at the Test Site, the LYNER, the BEEF, and all that, what types of experiments is DOE helping the labs so the labs have a handle on what's going on, so we can stay out there and work and do the tests; the overseer on the project? It seems like a lot of these projects are not laboratory-controlled or laboratory tests. Possibly Bechtel is taking it over and it would be Bechtel stuff. So how much of it is DOE helping the laboratory overseeing some of these projects? And what kind of projects are DOE going to bring out there for the lab personnel?

ELLE: Well, you have one lab guy sitting behind you. But I think the answer is, that the Department is very invested in maintaining the capability of the Test Site for the laboratories to do experimental work that they need to do in order to assure that the stockpile is safe. So DOE has, on one hand, that responsibility and that investment in the laboratories. And on the other hand, there are the Nevada Development Agency that was created out of the Community Reuse Process. It's a DOE-supported organization and its intent is to find other things to

do on the Test Site. So there is that separate kind of an organization that DOE is supporting as well.

HALL: Well, you mentioned solar, solar energy. I'm not sure, but that is not a lab function.

ELLE: That's right, it's not.

HALL: Okay. These are the kind of things that I'm wanting to know. Besides testing and stockpile and doing all this other type of testing, what other kind of projects could the lab do out there or what other kind of projects, should I say, is DOE helping or wanting the lab to oversee that doesn't have anything to do with testing or storage of -- you're talking about storage of low-level waste. The lab doesn't do any of that. They might create the low-level waste, but --

ELLE: Well, I'm not sure there's a good answer in the short-term. I do know that in the long-term, there are big experimental facilities that are on the drawing boards and people are thinking about, that the Test Site would be a good place for placing them. And those facilities would be managed by the labs.

HALL: Okay. And one other question was, you hear a lot of bad publicity about the Test Site all the time. It used to be years ago, wow, you worked out at the Test Site; great, good solid job and nobody put you down. Just like in business, when you get a business that's going downhill, both in maybe their management or their product or something, they change the name. Can we get rid of the NTS and call it Environmental Science Testing Laboratory, and get rid of NTS? Change the name and we all work under an umbrella type as a laboratory doing -- bringing people in from all different kinds of military, government facilities. Make it where they want to come out.

And it's just like Bechtel coming in now, shutting down bowling alleys and our rec -- it's not being a place where you would want to work anymore. If you want to bring outside people to come into the Test Site, these people come from far away, they need to have -- when they're off hours, they need to have a nice place to sleep, and then you have to maybe have a nice place to eat dinner. Now, we're talking about gettin' away with breakfast. They're shuttin' down breakfast. You're hearing rumors about dinner, the prices jacking up; our bus rides doubling going out to the Test Site. To me, it's not practical to try to sell the place. You have to try to sell the place as a great place to work and bring people in.

ELLE: That is the kind of a comment

that -- I mean, you have made that comment, it will be part of the record, and we will try to answer it. But I agree very much. And I think creating the Test Site, whether you change the name, and that has been proposed --

HALL: Well, DOE let Bechtel take the contract. You would think that there would be a little control in there on what's going on.

ELLE: Right. It is a struggle.

NIRA MC COY

MC COY: My name is Nira McCoy. 5805 Gordon Avenue, Las Vegas, Nevada 89108. And I would like to see the Test Site remain open, new business brought in and the Test Site kept open; and we stay in the readiness stage. Thank you.

GLORIA SMITH

SMITH: My name is Gloria Smith. I just want the Test Site to stay open so there will be more jobs for people. That's it.

SANDRA OSHINSKI

SHINSKI: Good afternoon, my name is Sandra Oshinski. My address is 9348 Red Rose Avenue, Las Vegas, Nevada 89129. The question I would like to ask, or the statement I would like to pose is a transportational issue. I would like to know, in terms of transporting this waste, how -- what route do 3 you plan? If this current plan that you're trying to get approved is approved, how would you transport the waste? Would it come over the Dam or through the loop at I-15 and 95? And the second part of the question is, if there was an accident, especially over the Dam, 4 what method would you use to try to retrieve this radioactive waste?

ELLE: Well, I think the discussions you'll see in the Transportation Document and what we've done with the local stakeholders, we try to tell the drivers, the carriers that are bringing waste to the Test Site, not to come over the Dam. We have analyzed the risk of doing that. And the risk numbers that you look at for transporting material across the Dam are very, very small; primarily because of the speeds the trucks go across there are pretty slow. So the likelihood of an accident are very small also.

WORKSHOP NOTES 6 (CONTINUED)

Going out to the Test Site, if you're coming from the east, you have to go through the Spaghetti Bowl. The safest routes that carriers use are on the interstate routes. In terms of an accident and the response to it, the emergency response plans of the local communities, the state, people would respond to an accident of radioactive material like they would to an accident of any other hazardous material. The first thing to do would be to keep people away from it, figure out what happened to it; what you had to do to clean it up. And then you'd clean it up and you'd take it to where it was going. And we do have a recent example of some of the waste material coming from Fernald to the Test Site. I think in Ohio some place, the driver went off the interstate into the median. The truck turned over and the package of waste also turned over, but nothing happened to it. They were able to come out in a couple of days and pick it up and put it back on a truck and send it on to the Test Site. So we have discussions with the local communities. We do have emergency response capability. We do have communication with them, so that process is in place.

WATSON: (Eddie) Also, on that same line, 5 that DOE has one of the best safety records as far as

Bechtel Nevada
Reporting Services

5 cont.

transporting waste anywhere in the world. Is that correct?

ELLE: I think if you look at the historical numbers in terms of accidents with low-level waste, they're almost infinitesimally small.

WATSON: (Eddie) And a lot of people have concerns about the Spaghetti Bowl. But you would be surprised at the number of very dangerous material that is transported through there every day. The trucks are simply not marked. They have numbers on them and the police and the fire department know what's in there, but the normal public can be right behind it. And it would be very dangerous material and have no idea how dangerous it is, simply 'cause they took the markings off the truck.

GRASSMEIER: The containerization is very important. And there have been accidents of low-level waste, such as Don referred to. But the container was strong enough so it didn't open; therefore, it didn't release the radioactive contents to the environment. And all the emergency responders had to do was pick up the container, put it back on the truck, and keep on trucking.

CYNTHIA WATSON

WATSON: Cynthia Watson, 2451 North Rainbow, Las Vegas, Nevada 89108. I would like to read a statement from some personnel that are working at the Test Site: Richard Fletcher, Joseph Smith, Lucy Ano (ph), Salon Font (ph), Daniel Romero, Jimmy Decker, Vicki Decker, Fanny L. White, Donald R. Fletcher, Kathy Franklin, and Elton Richard. The statement goes as follows: "Mr. Watson has explained all the options that DOE have made available to us. We would like to see the Nevada Test Site remain open and would like to take the options that are available to us. We would like to see the Site be used to store low-level waste, and by all means continue to stay in the mode to start-up underground testing, if needed. We would also like to be made the designated area to dissemble weapons that we no longer have use for.

Mr. Watson has our full cooperation and support. We do apologize that we were unable to attend tonight's meeting, but this was due to our work schedule."

ELLE: Thank you again, Eddie, for giving us the opportunity.

WATSON: (Eddie) I'll turn it back over to

Paul.

RICHITT: Thank you very much for this evening. We have until May the 3rd. Eddie knows how to get a hold of me. He's also got the numbers if he needed to get a hold of anyone in DOE. So just because tonight we're finishing up, we'll be here for a little longer, if you have any questions. But we can still get comments in on this EIS through May the 3rd. If you'd like, and you have a comment tonight, you can go ahead and talk to the Stenographer; give it to her, and she'll take it down verbatim and it will become part of the record. If you'd like to write something down as a written comment, you can write it down and then turn it into her. And then Eddie can get a hold of me any time and we'll go through whatever we have to and put the comment into the record. And that's all I have.

Again, thank you very much for coming by this evening. Thank you, Eddie.

* * * * * *

C.O.R.E. Workshop

Name: Earl H. White/Capital Group
Address: 5000 W. Oakey Blvd Ste A-1
City, State: Las Vegas, NV Zip: 89102
Phone: (702) 870-1589
Date: 4/24/96
Comments:

How will DOE address small and women owned business as far as them doing business w/ DOE & obtaining contracts from especially as set forth in the alternatives described in the EIS.

If you only wish to record this as a written comment to DOE, please give to the stenographer.

☐ Check here if you wish to make a formal statement.

This Page Intentionally Left Blank

*U.S. GOVERNMENT PRINTING OFFICE: 1996-785-718

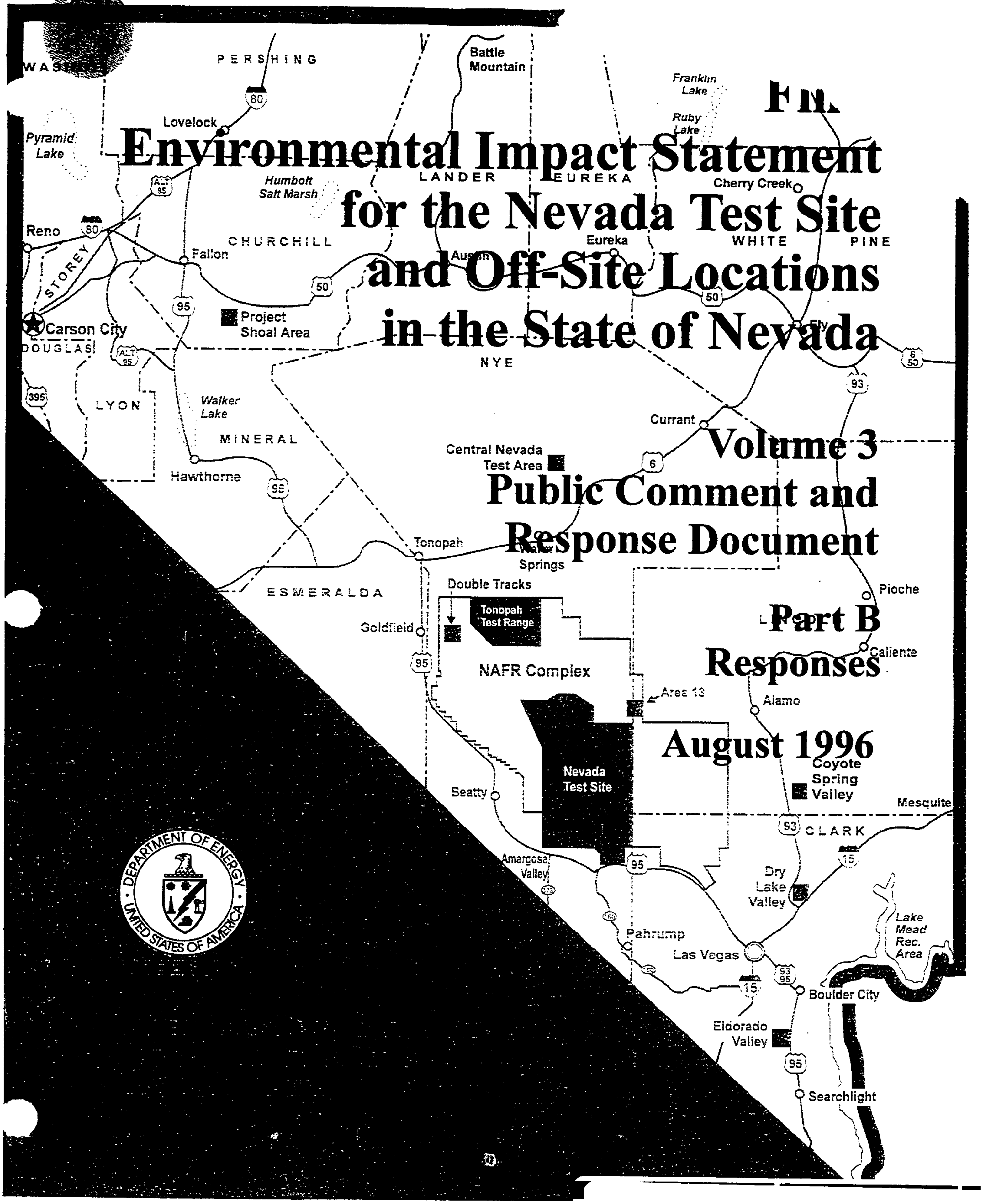
Final

Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada

Volume 3
Public Comment and Response Document

Part B
Responses

August 1996



NEPA TEAM

Final
Environmental Impact Statement

for
the Nevada Test Site and Off-Site Locations
in the State of Nevada

Volume 3

Part B

U.S. Department of Energy
Nevada Operations Office
Las Vegas, Nevada

TABLE OF CONTENTS
Part B

COMPANIES

ORGANIZATIONS

PRIVATE CITIZENS

PUBLIC HEARING TRANSCRIPTS

CHAPTER 3
COMMENT RESPONSES

This Page Intentionally Left Blank

Federal Agency

Comment Code: Federal Agency 1-1

Location of EIS Revision(s): None required

Response: Should a Solar Enterprise Zone facility be sited in Eldorado Valley, the facility would use existing utilities and rights-of-way as much as practical. However, should the facility require power line rights-of-way or other infrastructure improvements that would cross federally withdrawn lands, the appropriate National Environmental Policy Act review, such as an environmental assessment, would be conducted prior to a decision to construct. New power lines would be routed using pathways of existing lines wherever possible. Any actions requiring the use of previously withdrawn lands and unused lands would be coordinated through appropriate agencies. The Bureau of Reclamation's Lower Colorado Regional Office, as well as other interested parties, would be invited to participate in the early phases of planning and development of new Solar Enterprise Zone facilities.

Comment Code: Federal Agency 1-2

Location of EIS Revision(s): None required

Response: Because sufficient water supplies are available on the NTS, as described in Appendix A, it is not anticipated that the water supplies of Lake Mead would be used as a source of water for the NTS, even under Alternative 3, which reflects the most intensive use of water considered under any of the alternatives. Electrical power can be supplied to the NTS from either the Valley Electric Association, Inc., or the Nevada Power Company. Approximately 16 percent of Valley Electric's power is currently generated at Hoover Dam. In addition, the Nevada Power Company has historically provided most of the electrical power for the NTS. This utility company could possibly provide additional power if the demand increases beyond Valley Electric's capabilities. Therefore, the electrical power and water demands of the NTS should not have a significant impact on Hoover Dam and/or the Southern Nevada Water Project.

The location of a Solar Enterprise Zone facility in Eldorado Valley might require the use of water from Lake Mead. If this is proposed, a National Environmental Policy Act review would be required to evaluate the impact on water withdrawal.

Comment Code: Federal Agency 2-1

Location of EIS Revision(s): None required

Response: Note: The Department of the Interior incorporated this set of comments into the larger set of comments noted Comment Code Federal Agency 3. Each of these comments has been addressed in the responses to Federal Agency 3.

Comment Code: Federal Agency 3-1

Location of EIS Revision(s): Volume 1, Section 4.1.1.1

Response: The purpose of the NTS EIS is to address the impacts of the proposed activities, and not to address the terms of the land withdrawal agreements. Please refer to Section 1.4 of Volume 3 for a discussion of the use of lands withdrawn from the public domain.

Comment Code: Federal Agency 3-2

Location of EIS Revision(s): None required

Response: An EIS can be prepared for a specific project, but it may also be prepared at a program or broader level (Council on Environmental Quality, 40 CFR 1502.4). The DOE further defines this broad-level Programmatic EIS as a sitewide EIS for its large, multiple-facility sites (10 CFR 1021.104[b]). This EIS is such a site-wide document. The purpose of this document is described both in the Summary and in Sections 1.2, and 2.1 of the EIS. It is intended to identify and update the environmental analyses from the entire site as well as from reasonably foreseeable future actions. It is also intended to support decisionmaking at the NTS and at locations in southern Nevada now and into the future. Please refer to Volume 3, Section 1.4, Use of Lands Withdrawn from the Public Domain.

Comment Code: Federal Agency 3-3

Location of EIS Revision(s): None required

Response: Because the U.S. Bureau of Land Management retains certain management responsibilities on withdrawn lands and because of the proximity of some of these lands to public domain lands, the DOE invites Bureau participation in its remediation programs.

The DOE will notify the Bureau upon discovery of any contamination on DOE/DoD withdrawn lands which threatens to affect the U.S. Bureau of Land Management land or resources.

Comment Code: Federal Agency 3-4

Location of EIS Revision(s): Volume 1, Section 4.4.11

Response: The text of this EIS has been changed to make clear that the Central Nevada Test Area is currently being investigated as part of the DOE's Environmental Restoration Program. The DOE will evaluate the site in consultation with the state regulatory authority to determine what investigations may be required and what responses are appropriate.

Comment Code: Federal Agency 3-5

Location of EIS Revision(s): None required

Response: If groundwater monitoring detects the potential for contaminant plumes to migrate beyond the boundaries of DOE-controlled lands in Nevada, the adjoining land owner and the appropriate regulatory agencies would be alerted immediately of this potential. If technically and economically feasible, the DOE would mitigate the impacts. Expansion of the withdrawn area to include the area impacted by migration of the contaminants may be reevaluated by the DOE. For additional information refer to Volume 2 and Section 1.11 of Volume 3.

Comment Code: Federal Agency 3-6

Location of EIS Revision(s): None required

Response: The conditions regarding soil gas plumes at the Beatty facility are unrelated to conditions resulting from deep underground nuclear tests. Monitoring programs conducted at the NTS and other locations where underground nuclear tests have taken place have not identified soil gas plumes as a problem. Monitoring programs are focused on the groundwater as the most likely pathway for movement of radioactive material from an underground test.

Comment Code: Federal Agency 3-7

Location of EIS Revision(s): None required

Response: Monitoring programs are in place at locations where underground tests have been conducted. The results are published annually and the adequacy of monitoring programs are reviewed periodically. As the need for mitigation measures, such as modifications to withdrawal boundaries, are identified, the U.S. Bureau of Land Management would be notified.

Comment Code: Federal Agency 3-8

Location of EIS Revision(s): Summary

Response: The text has been modified to read that the U.S. Bureau of Land Management manages several wilderness study areas in this region.

Comment Code: Federal Agency 3-9

Location of EIS Revision(s): Volume 1, Section 4.1.1.1

Response: As depicted on Figure 4-3 of the NTS EIS the lands described under Public Land Order 1662 are withdrawn by the DOE. As stated, the lands withdrawn under this Public Land Order are used by the Department of Defense for ongoing operations and are not considered in the EIS for any alternative use by the DOE. The "delegation of management" is an inaccurate statement and has been deleted. The sentence has been changed to read, "The lands described under this Public Land Order are not considered in any alternative use by the DOE and are therefore not addressed in this EIS." Refer to Section 4.1.1.1 of Volume 1 and Section 1.5 of Volume 3.

Comment Code: Federal Agency 3-10

Location of EIS Revision(s): None required

Response: The comment concerning the U.S. Bureau of Land Management's 1983 review of NTS land withdrawals has been noted. Please refer to the discussion in Section 1.4, Use of Lands Withdrawn from the Public Domain, in Volume 3, Chapter 1.

Comment Code: Federal Agency 3-11

Location of EIS Revision(s:) None required

Response: The comment concerning the need for the U.S. Bureau of Land Management to update its 1983 review of land withdrawals for the NTS has been noted. Please refer to the discussion in Volume 3, Section 1.4, Use of Lands Withdrawn from the Public Domain, in Chapter 1 of Volume 3.

Comment Code: Federal Agency 3-12

Location of EIS Revision(s): Volume 1, Section 4.2

Response: The text has been corrected to read 1616 km^2 (624 mi^2).

Comment Code: Federal Agency 3-13

Location of EIS Revision(s): Volume 1, Section 4.2.1.1

Response: The text has been revised to clarify that the Tonopah Test Range is part of the NAFR Complex.

Comment Code: Federal Agency 3-14

Location of EIS Revision(s): Volume 1, Section 4.3.1.1

Response: The sentence stating that the Project Shoal Area has been released by the Atomic Energy Commission to the U.S. Bureau of Land Management was in error and has been deleted from the text.

Comment Code: Federal Agency 3-15

Location of EIS Revision(s): Volume 1, Section 4.3

Response: The EIS has been revised to clarify the fact that access roads are located on the Project Shoal Area.

Comment Code: Federal Agency 3-16

Location of EIS Revision(s): Volume 1, Section 4.3.1.1

Response: Information provided previously by the U.S. Bureau of Land Management for the Special Nevada Report indicated that 2,560 acres for the Project Shoal Area were withdrawn by Public Land Order 2771 and corrected by Public Land Order 2834. The EIS has been revised to reflect the correct withdrawal information.

Comment Code: Federal Agency 3-17

Location of EIS Revision(s): Volume 1, Section 4.3.1.1

Response: The comment has been noted, and the EIS has been revised accordingly. See response to Comment Code Federal Agency 3-16.

Comment Code: Federal Agency 3-18

Location of EIS Revision(s): Volume 1, Section 4.3.1.1

Response: As noted in the response of the two previous related comments, the EIS has been revised to delete reference to the land use permits; see response to Comment Code Federal Agency 3-16.

Comment Code: Federal Agency 3-19

Location of EIS Revision(s): Volume 1, Section 4.3.1.2

Response: The EIS has been revised to delete reference to the Navy's use of this area.

Comment Code: Federal Agency 3-20

Location of EIS Revision(s): Volume 1, Section 4.3.10

Response: The EIS has been revised to correctly indicate 2,560 acres.

Comment Code: Federal Agency 3-21

Location of EIS Revision(s): Volume 1, Section 4.4.1.1

Response: The EIS has been revised to reflect the Public Land Orders for these three Central Nevada Test Areas.

Comment Code: Federal Agency 3-22

Location of EIS Revision(s): Volume 1, Section 4.4.1

Response: The EIS has been revised. The DOE agrees that both Public Land Orders are still in effect.

Comment Code: Federal Agency 3-23

Location of EIS Revision(s): Volume 1, Section 4.5

Response: The EIS has been revised to reflect the current status of acreage that has been transferred in Eldorado Valley to Boulder City.

Comment Code: Federal Agency 3-24

Location of EIS Revision(s): None required

Response: Please refer to the discussion in Volume 3, Section 1.4, Use of Lands Withdrawn from the Public Domain.

Comment Code: Federal Agency 3-25

Location of EIS Revision(s): None required

Response: If additional lands are required, the DOE would take all necessary steps to obtain the necessary access.

Comment Code: Federal Agency 3-26

Location of EIS Revision(s): None required

Response: Please see the response to Comment Code Federal Agency 3-25.

Comment Code: Federal Agency 3-27

Location of EIS Revision(s): None required

Response: Some aspects of Alternative 2 may cause non-compliance with state agreements, and with state and federal law. The Council on Environmental Quality regulations do not require the dismissal of alternatives which contain potential legal issues. The DOE decided to evaluate this alternative in order to look at the full range of use alternatives for the NTS.

Comment Code: Federal Agency 3-28

Location of EIS Revision(s): None required

Response: The return of any DOE lands to the Bureau of Land Management or other land-management agencies would be contingent upon the verification that these lands are suitable for public use. For additional information refer to the discussion in Volume 3, Sections 1.4 and 1.8.

Comment Code: Federal Agency 3-29

Location of EIS Revision(s): None required

Response: Under Alternative 2, the Project Shoal Area and the Central Nevada Test Area would remain under DOE control.

Comment Code: Federal Agency 3-30

Location of EIS Revision(s): Volume 1, Section 4.3.1

Response: The comment concerning the Navy's use of the Project Shoal Area is noted. The DOE has not authorized the Navy to use any lands within this area, but the Navy does use the airspace. The EIS has been modified to reflect this.

Comment Code: Federal Agency 3-31

Location of EIS Revision(s): None required

Response: As noted in the response to Comment Code Federal Agency 3-2, this broad-level or sitewide EIS is a program-level document. As such, there will not be an additional programmatic-level EIS for the NTS following this Final EIS, although the DOE is currently preparing other programmatic EISs that affect the NTS, as discussed in Volume 1, Section 1.4. As noted, there may be additional National Environmental Policy Act documents prepared for specific projects or actions which are not analyzed, but will reference or tier from this EIS.

Comment Code: Federal Agency 3-32

Location of EIS Revision(s): None required

Response: As noted in the response to Comment Code Federal Agency 3-2 and 3-31, this is a broad-level or site-wide EIS. As such, there may be additional National Environmental Policy Act documents prepared for specific projects or actions which will reference or tier from this EIS. This process is discussed in Volume 1, Section 2.1 of the EIS.

Comment Code: Federal Agency 3-33

Location of EIS Revision(s): Volume 1 Glossary

Response: The EIS has been reviewed for terminology with which the public may not be familiar. As a result of the review, the Glossary has been modified for clarity and updated with additional definitions for previously undefined terms.

Comment Code: Federal Agency 3-34

Location of EIS Revision(s): None required

Response: Detailed descriptions of radiological dose, effects, and radioactive decay and fission are discussed in Volume 1, Appendix H (e.g., Section 2.1, "General Risk Assessment Concepts"), which includes a Glossary of Terms. Effects of radiation on biological resources at the NTS have been studied extensively in the past, but because of the complex nature of the ecosystems at the NTS, effects have not been identified for all species exposed to a variety of radioactive substances. Results of some of the more comprehensive studies that may be helpful in explaining radiological implications are discussed in Volume 1, Section 4.1.6 and Section 5.1.1.6.

Comment Code: Federal Agency 3-35

Location of EIS Revision(s): None required

Response: Because of a lack of information about the effects of all types of radiation on the biological resources at the NTS, a comprehensive table cannot be readily developed to show critical exposure for plants and key wildlife species or groups found on the NTS. However, effects of radiation on biological resources at the NTS have been studied extensively in the past and results of some of the more comprehensive studies that may be helpful in describing critical exposures are discussed in Volume 1, Section 4.1.6 and Section 5.1.1.6.

Comment Code: Federal Agency 3-36

Location of EIS Revision(s): Volume 1, Glossary

Response: With the exception of the word "significant," the words specified are general and do not have specialized or technical meanings. The Glossary provided in the Final NTS EIS is meant to aid the reader by defining technical and specialized terms. A definition for the word "significant," as used in the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act context, has been added to the Glossary.

Comment Code: Federal Agency 3-37

Location of EIS Revision(s): None required

Response: Chapter 2, Section 2.4.2 of the NTS EIS provides the transuranic waste definition and management requirements. This chapter references 40 CFR 191, which is listed in the Chapter 2 references. The actual regulations and standards are maintained in the EIS Administrative Record.

Comment Code: Federal Agency 3-38

Location of EIS Revision(s): None required

Response: As noted in the response to Comment Code Federal Agency 3-2, 3-31, and 3-32, this is a broad-level or sitewide EIS.

The NTS is a large area where a number of projects and activities are currently undertaken simultaneously or are proposed for future implementation. For proper management and analyses purposes, these projects and activities have been categorized into five programs: Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. The analyses of projects and activities under each of these programs have not been presented individually but are included in the analysis at the program level to the extent project information was available. Some projects have not yet been fully defined to conduct project-specific analysis but they were determined to be essential for a full and open disclosure of the potential effects of an alternative. The demonstration project for disposal/destruction of rocket motors, cited in the comment, falls under this category. The information developed so far and presented in Appendix A indicates that the existing underground tunnels at the NTS would be used to demonstrate the disposal/destruction of solid rocket motors by a contained static burning method that scrubs the gaseous combustion products prior to atmospheric release and provide for in-situ containment/treatment of residual debris. The demonstration project, therefore, is not expected to result in significant air quality emissions. Still, the description of this project in Appendix A clearly states that an environmental plan would be prepared and air quality permits would be obtained from the State of Nevada prior to the implementation of the project.

Comment Code: Federal Agency 3-39

Location of EIS Revision(s): None required

Response: Please refer to the response in Comment Code Federal Agency 3-38. As noted in the response to Comment Code Federal Agency 3-2, 3-31, 3-32, and 3-38, this is a broad-level or sitewide EIS.

Comment Code: Federal Agency 3-40

Location of EIS Revision(s): None required

Response: As stated in the text, Volume 1, Section 2 is intended to provide a brief summary of each of the five programs at the NTS. Volume 1, Chapter 4, *The Affected Environments*, describes each of these programs in more detail. Volume 1, Section 4.1.1.5 presents information on the requirements for waste acceptance and Appendix A presents further detail.

Low-level waste must be containerized, and is subject to specific acceptance criteria prior to being approved for shipment to the NTS. The waste form has strict requirements for stabilization; i.e., liquids shall be absorbed or solidified; the waste may contain no infectious agents, pressurized containers, hazardous constituents regulated by the EPA, polychlorinated biphenyls, or explosives. In addition, there are strict requirements for the size and strength of the disposal container.

A performance assessment describes the disposal sites' capability to isolate the waste from the environment and takes no credit for the protection provided by the container to mitigate radionuclide migration. A disposal site meeting the performance objective under this scenario is capable of containing waste under more stringent conditions than it would be subjected to.

Comment Code: Federal Agency 3-41

Location of EIS Revision(s): None required

Response: This EIS is a programmatic-type EIS, and as such, it evaluates the impacts of potential actions as well as ongoing and reasonably foreseeable specific activities. Actions considered in this EIS may at a later time be more explicitly analyzed in an environmental assessment which could address only the narrower proposal being considered without restating information contained in this EIS. Activities proposed after this Final EIS is published would receive a case-by-case evaluation and additional National Environmental Policy Act documents would be prepared, as necessary. In the case of a proposal for a major program, a separate EIS may be warranted.

The heavy industrial facility is conceptual. The specific nature of the facility, acreage requirements, water and power consumption, and other resource impacts have not been fully defined. This facility was originally intended as a tritium production facility, but the NTS was not selected as the site for this project. However, the footprint and resource requirements have been retained in the impact analysis for Alternative 3 as that of a large, heavy industrial facility. The NTS may at some future time be considered for siting of a mixed oxide fuel facility, one of the alternative technologies evaluated in the Storage and Disposition of Weapons-Usable Fissile Materials Programmatic EIS (a Defense Program), and also for a commercial satellite launch and recovery facility (a Nondefense Research and Development Program). These contemplated activities are bounded by the general evaluation of the large, heavy industrial facility identified in Alternative 3. Once these or other proposals become more defined, additional National Environmental Policy Act reviews will be conducted in the context of the programmatic heavy industrial facility analysis, and further refined as necessary.

Comment Code: Federal Agency 3-42

Location of EIS Revision(s): Appendix A, Section A.1.3.1.3

Response: Rocket motor destruction is not part of Defense Program activities and should not have been mentioned in Volume 1, Section A.1.3.1.3. The program is described in Volume 1, Section A.5.1.4, Conventional Weapons Demilitarization. The paragraph that appears as part of Volume 1, Section A.1.3.1.3 has been deleted from the Final NTS EIS.

Comment Code: Federal Agency 3-43

Location of EIS Revision(s): None required

Response: These activities represent potential defense and related research-and-development activities, and are not well defined, thus detailed discussion of the impacts cannot be accomplished. The DOE will conduct appropriate project-specific National Environmental Policy Act reviews as projects become better defined.

Comment Code: Federal Agency 3-44

Location of EIS Revision(s): None required

Response: While the EIS is lengthy and very complex due to its wide scope, the DOE attempted to present information as clearly as possible. Appendix A provides details on each known activity, project, and program.

Comment Code: Federal Agency 3-45

Location of EIS Revision(s): Volume 1, Sections 1.6.2, and 3.6

Response: Pursuant to 40 CFR 1502.14(e), the DOE did not identify a Preferred Alternative in the Draft NTS EIS. As the public comment process has progressed, the DOE decisionmaking process on other issues has advanced as well. The evaluation of the alternatives and the identification of the future direction of the NTS have become clearer, and a Preferred Alternative was drafted and proposed to DOE Headquarters organizations for review. This process has included an assessment of public and agency comments. The Preferred Alternative identified in this Final EIS is a result of that process. The process of defining the Preferred Alternative is described in the EIS in Section 3.6. of Volume 1.

Comment Code: Federal Agency 3-46

Location of EIS Revision(s): Volume 1, Sections 1.6.2, and 3.6

Response: Section 3.6 in Volume 1 of the EIS describes how the DOE determined the Preferred Alternative.

Comment Code: Federal Agency 3-47

Location of EIS Revision(s): Volume 1, Section 4.1.6, and Section 5.1.1.6

Response: Changes have been made in Volume 1, Sections 4.1.6 and 5.1.1.6 to provide information and citations describing impacts to biota from past, present, and future activities.

Comment Code: Federal Agency 3-48

Location of EIS Revision(s): Volume 1, Section 4.1.6 and Section 5.1.1.6

Response: Volume 1, Sections 4.1.6 and 5.1.1.6 were revised to include what is known about impacts to biological resources related to past and current activities, and to discuss potential impacts of future activities.

Comment Code: Federal Agency 3-49

Location of EIS Revision(s): Volume 1, Section 4.1.6 and Section 5.1.1.6

Response: Volume 1, Sections 4.1.6 and 5.1.1.6 were revised to include what is known about impacts to wildlife and to discuss potential impacts of future activities. Impacts resulting from nonradiological contaminants projected for each alternative were also discussed in Volume 1, Section 5.3.1.6, Section 5.5.1.1, and Section 5.5.4.1.

Comment Code: Federal Agency 3-50

Location of EIS Revision(s): None required

Response: Information regarding the number of acres of each plant community that occurs on the NTS was unavailable for this EIS. Existing information included a generalized map of major vegetation associations taken from Beatley (1976) (referenced in Volume 1, Section 4.1.6 of the EIS) which could not be used to quantify the aerial extent of each association. A reliable estimate of the number of acres of each vegetation association that would be affected by the various alternatives was also unavailable, because the exact location of many program activities within each alternative are not currently known (but will be determined during subsequent project-specific National Environmental Policy Act reviews). In lieu of this, the DOE was able to identify the total amount of acres, sitewide, which could be disturbed under each alternative. (See Table S-3 of the Summary and Table 3-5 of Chapter 3.)

The DOE acknowledges that the requested information will be needed to manage the natural resources of the NTS in the manner described in Volume 2 of the EIS. Future siting of many activities will be guided by the goals of the *Resource Management Plan* to use existing infrastructures whenever possible and minimize habitat loss within each vegetation association. Monitoring changes in the aerial extent of each dominant plant association on the NTS may be necessary to assess ecological sustainability. In anticipation of this need, the DOE began to compile a Geographic Information System-based, sitewide vegetation map in October 1995 using existing and new multispectral aerial photography and satellite imagery and ground truthing. The NTS vegetation map is expected to be completed by the summer of 1997. For additional information, refer to Section 1.7 of Volume 3 and Volume 2.

Comment Code: Federal Agency 3-51

Location of EIS Revision(s): Volume 1, Section 4.1.6

Response: A paragraph was added to Volume 1, Section 4.1.6 to provide the requested information.

Comment Code: Federal Agency 3-52

Location of EIS Revision(s): Volume 1, Section 4.1.6

Response: The text in Volume 1, Section 4.1.6 has been changed to acknowledge that springs occurring at the NTS do support wetland (hydrophytic) vegetation, which likely constitute wetlands as defined by the U.S. Army Corps of Engineers (Corps) pursuant to Section 404 of the Clean Water Act. Because no activities were identified that would modify these springs, studies to characterize them to determine whether they are "jurisdictional wetlands" have been deferred. Although no activities have been identified at this time by any of the alternatives that potentially affect wetlands at the NTS (see Section 4.1.6, Biological Resources), it is acknowledged that activities which would impact wetlands would be subject to acceptable wetland mitigation and permitting as regulated by the Corps. Section 4.1.6 has been revised to provide more information about potential wetlands.

Detailed descriptions of wetlands resources at the NTS are brief to nonexistent. A few photographs have been taken historically to document site foundations. Specimens of a few wetland plants are contained in the herbarium at the NTS. The NTS wetlands are generally very small in size. Water supplies at some springs and seeps have been historically developed by miners and ranchers by enlarging the mouth of the spring to create pools or by directing outflows into small, localized adjacent areas. Wetlands associated with springs that are more remotely located are relatively free of introduced species such as tamarisk and other weedy species. Wetlands vegetation at many springs, especially Captain Jack Spring shows signs of continued and heavy use by horses and other wildlife (Hunter, 1994; 1995).

During the summer of 1996, the DOE will be conducting surveys of wetland areas at the NTS to characterize them and determine their potential as "jurisdictional wetlands." Vegetation and wildlife will be identified, and site characteristics described. A policy of protecting wetland areas will be developed as part of the *Resource Management Plan* which will incorporate findings from the NTS wetland surveys and recommendations from interested stakeholders and regional land-use managers. Refer to Volume 2 and Section 1.7 of Volume 3.

Comment Code: Federal Agency 3-53

Location of EIS Revision(s): None required

Response: No activities have been identified in any of the alternatives that would impact wetlands or springs on the NTS. Please refer to the response to Comment Code Federal Agency 3-52.

Comment Code: Federal Agency 3-54

Location of EIS Revision(s): None required

Response: Management of NTS wetland resources will be developed as part of the *Resource Management Plan*. The process of developing management practices for the *Resource Management Plan* includes opportunities for public and agency input and suggestions as to how these resources and their associated biota, such as endemic invertebrates, could best be managed while conducting programs that require groundwater as described under Alternative 3. Because it is not anticipated that groundwater discharge rates or quantities at any of the NTS springs will be impacted by proposed activities (Volume 1, Section 5.3.1.5.2, Groundwater), the DOE has no current plans to identify the invertebrate species at NTS springs.

Comment Code: Federal Agency 3-55

Location of EIS Revision(s): Volume 1, Sections 5.3.1.6, 5.3.5.6, 5.3.6.6, 5.3.7.6, 5.4.1.6, 5.5.1.1, and 7.6

Response: Surface-disturbing activities may cause the irretrievable loss of many individual small mammals, reptiles, and soil-dwelling invertebrates. The destruction of nests and eggs of ground-nesting birds that are protected under the Migratory Bird Treaty Act will be mitigated by conducting pre-activity surveys at proposed project sites prior to the start of construction. The presence of these and other protected or sensitive species will be determined, and construction activities will be altered to avoid harm to these resources. For example, construction may be scheduled to occur during the non-breeding seasons, or individuals of a proposed or candidate plant species or of a plant species of concern may be avoided. Text has been added to Volume 1, Chapters 5 and 7 to reflect these impacts and proposed mitigation measures.

Comment Code: Federal Agency 3-56

Location of EIS Revision(s): None required

Response: The impact of exposure of birds to fluids contained in drilling sumps is identified in Volume 1, Section 5.1.1.6 of the EIS. The most severe impact to individual birds which was considered in this EIS was immediate drowning. The proposed mitigation is to place flag lines across all open drill sumps and containment sumps that contain contaminants. This mitigation action is identified in Volume 1, Section 7.6, of the EIS.

The DOE has flagged active drill sumps and no bird mortalities have been reported at these sumps. The DOE initiated a monitoring program in 1995 to survey all active ponds and document any wildlife mortalities. The efficacy of using flag lines to prevent bird drownings will be evaluated as part of the monitoring program. If mortalities are documented at flagged ponds, then the DOE will evaluate other mitigation measures, such as netting the sumps during the migratory season.

Comment Code: Federal Agency 3-57

Location of EIS Revision(s): None required

Response: The effects of activities on viability were evaluated at the level of the population, as described in Volume 1, Appendix E, Section E.2.6.1. Populations were defined as in Krebs (1985, *Ecology: The Experimental Analysis of Distribution and Abundance*, Third Edition, Harper and Row, New York) as a group of organisms of the same species that can potentially interbreed. Because there are few natural barriers to most widely distributed plants and animals found on the NTS, the range of these populations generally are quite large, extend beyond the NTS, and will not experience long-term negative effects from proposed activities. In contrast, there are some species, primarily plants, that have small, isolated populations, the viability of which could be negatively impacted if they are disturbed. Impacts on the viability of those populations are pointed out in Volume 1, Section 5.3.1.6.

Comment Code: Federal Agency 3-58

Location of EIS Revision(s): Volume 1, Section 5.1.1.4

Response: In response to this comment, text has been added to Volume 1, Section 5.1.1.4 to clarify reclamation considerations, which include size of the area, future use, nature of soils, annual precipitation, slope aspect, and site location. Following the removal of the soils and vegetation, the site would be immediately stabilized using commercially available chemical soil stabilizers which would control erosion until the next step in the reclamation process. Options to be considered include natural revegetation, gravel armoring, chemical stabilization, seeding, planting, and irrigating. When highly intensive revegetation techniques are necessary, subsoils could be amended and irrigation could be used. At drier sites, irrigation could be used to encourage germination and plant establishment. Because the site would be stabilized (except during removal of the soils), no sediments are expected to reach the playas. The soil removal process at all contaminated sites will be designed so as to prevent sediment flow to surrounding uncontaminated soil, including playas. Therefore, no adverse effects are anticipated for the playa. Volume 1, Section 4.1.6 provides additional discussion of variables that influence natural plant succession rates, revegetation techniques, and revegetation successes.

Comment Code: Federal Agency 3-59

Location of EIS Revision(s): Volume 1, Section 4.1.6

Response: See Volume 1, Section 4.1.6 of the Final NTS EIS for a discussion of revegetation problems, techniques, and success.

Comment Code: Federal Agency 3-60

Location of EIS Revision(s): Volume 1, Chapter 4

Response: The DOE has revised all Biological Resources Sections in Volume 1, Chapter 4 of the Final NTS EIS to reflect this new Notice of Review.

Comment Code: Federal Agency 3-61

Location of EIS Revision(s): Volume 1, Chapter 4

Response: The DOE has revised all biological resource sections in Volume 1, Chapter 4 of the Final NTS EIS to reflect the fact that there are currently no Category 2 candidate species as a result of the February 28, 1996, Notice of Review (61 F.R. 7596).

Comment Code: Federal Agency 3-62

Location of EIS Revision(s): None required

Response: All of the former Category 2 plants that were discussed in the Draft NTS EIS were removed from detailed discussion in the Final NTS EIS because of the change in their status. Information regarding the known range of each of these plant species known to occur on the NTS, the Tonopah Test Range, and Area 13 are discussed in the following document, which is referenced in both Volume 1 and Volume 2 of the Final NTS EIS: *Current Distribution, Habitat, and Status of Category 2 Candidate Plant Species On and Near the U.S. Department of Energy's Nevada Test Site* (Blomquist et al., 1995). A copy of this document has been sent to the Nevada State Office of the U.S. Fish and Wildlife Service.

Comment Code: Federal Agency 3-63

Location of EIS Revision(s): Volume 1, Section 7.6

Response: Information concerning the range of those plant species formerly classified as Category 2 species, but now called Species of Concern, is presented in the reference Blomquist et al., 1995. This document is referenced in Volumes 1 and 2 of the Final NTS EIS. The conclusion is that DOE activities both now and in the future are unlikely to impact the survival of these species based on their known ranges and population locations on the NTS. Text has been added, however, to Volume 1, Section 7.6, "Mitigation Measures for Biology," to indicate that pre-activity surveys will be conducted and will identify the presence of important biological resources, such as Species of Concern, at proposed project sites. The DOE would modify a project if this project would eliminate a local population of a Species of Concern and that population represented a significant portion of the species' range.

Comment Code: Federal Agency 3-64

Location of EIS Revision(s): Volume 1, Section 4.1.6

Response: The concern that National Wildlife Refuge impacts were not fully addressed is noted. Additional information has been added to the EIS to expand the discussion, but sufficient information may not be available to fully address a specific issue. As projects are defined that may have wide-reaching impacts or there are impacts identified which may affect a component of the National Wildlife Refuge, that information will be discussed with appropriate agencies.

Comment Code: Federal Agency 3-65

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: The following text was added to the EIS:

As part of the groundwater investigations being conducted through their Environmental Restoration Program, the DOE is developing regional groundwater flow and tritium transport models that include the NTS and the Ash Meadows area. These models will be of use in evaluating the effects of past DOE actions and future DOE groundwater withdrawals on the NTS. The DOE is also working with the National Park Service in evaluating observed water level fluctuations at Devils Hole.

Comment Code: Federal Agency 3-66

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: The following text was added to the EIS:

The Department of the Interior has expressed concern that groundwater withdrawals in Yucca Flat in excess of the perennial yield may affect Ash Meadows, Devils Hole, and Death Valley. Preliminary groundwater modeling was performed as part of this EIS (GeoTrans, 1995a), and additional, detailed modeling is underway. As part of the groundwater investigations being conducted through the Environmental Restoration Program, the DOE is developing regional groundwater flow and tritium transport models that include the NTS and these environmentally sensitive areas. These models will be of use in evaluating the effects of past DOE actions and future DOE groundwater withdrawals on the NTS. The results of these models are not yet available, but they will be available for future National Environmental Policy Act reviews prior to the construction of any projects that are expected to result in significant adverse impacts. The DOE is also working with the National Park Service in evaluating observed water level fluctuations at Devils Hole.

Comment Code: Federal Agency 3-67

Location of EIS Revision(s): None required

Response: As described in Volume 1, Section 7.6, the DOE has consulted with the U. S. Fish and Wildlife Service, as required by the Endangered Species Act, to assess the impacts of proposed activities on threatened and endangered species and their critical habitats. During this process, mitigation and monitoring programs designed to conserve the species have been discussed, and appropriate measures will be implemented.

Comment Code: Federal Agency 3-68

Location of EIS Revision(s): Volume 1, Section 5.1.1.6

Response: Text has been added to Volume 1, Section 5.1.1.6 which discusses the likelihood of impacts near the west boundary of the Desert National Wildlife Range. The DOE recently prepared a biological resources monitoring plan for the Spill Test Facility and sent it to the U.S. Fish and Wildlife Service in January 1996 for review. This plan establishes a protocol of monitoring spills that will create chemical plumes expected to extend beyond the boundaries of the Frenchman Lake Playa. The plan concludes that approved tests do not result in downwind air concentration of toxic chemicals that could harm biota on the Desert National Wildlife Range.

Comment Code: Federal Agency 3-69

Location of EIS Revision(s): None required

Response: The routes evaluated in the transportation risk analysis are not proposed routes; they were chosen as a sample of representative routes only. Route selection is the responsibility of the carrier, who is chosen by the shipper (generator). Routes selected must comply with the U.S. Department of Transportation regulations [49 CFR 397.101(a)]. In addition, local concerns, such as congested roadways and proximity to critical habitats, may be shared with the carrier. Routing constraints, however, will not be specified in the NTS EIS. Please refer to the discussion in Section 1.6 of Volume 3.

Comment Code: Federal Agency 3-70

Location of EIS Revision(s): None required

Response: No adverse impacts are anticipated to occur near the west boundary of the Desert National Wildlife range as a result of testing at the Spill Test Facility. See response to Comment Code Federal Agency 3-68.

Comment Code: Federal Agency 3-71

Location of EIS Revision(s): Volume 1, Chapter 6

Response: The cumulative impact analysis has been rewritten and updated.

Comment Code: Federal Agency 3-72

Location of EIS Revision(s): Volume 1, Section 6.4.6

Response: The text of Volume 1, Section 6.4 dealing with cumulative effects to biological resources has been rewritten to include a discussion of wildlife other than desert tortoises. Since the information in this document indicated few direct impacts to most species of wildlife, the focus of the analysis was on indirect impacts due to possible disturbances to about 15,600 acres of habitat. The projected disturbances, except for the Solar Enterprise Zone, would be relatively small in size and widely distributed within the remaining undisturbed habitat. Because the NTS is surrounded by federal lands that are managed, in part, for wildlife, it is unlikely that the small amount of disturbed habitat would result in cumulative, negative effects to biological resources in the region.

Comment Code: Federal Agency 3-73

Location of EIS Revision(s): Reference sections for each chapter.

Response: Sources were added to the text and many of the tables appearing in the Final NTS EIS; they were also included in the reference sections that follow each chapter.

Comment Code: Federal Agency 3-74

Location of EIS Revision(s): Volume 1, Section 4.1.6

Response: Volume 1, Section 4.1.6 was revised to include bibliographic references and a summary of significant findings related to the uptake of radionuclides by plants.

Comment Code: Federal Agency 3-75

Location of EIS Revision(s): Reference sections for each chapter

Response: The DOE concurs that the author and title of each reference used in a chapter needs to be cited in the chapter's reference section. These sections have been updated.

Details regarding time and location of research and the validity of the data are contained in the referenced documents. Copies of the documents are available in DOE reading rooms throughout the state. Most references are also available through the public library.

Comment Code: Federal Agency 3-76

Location of EIS Revision(s): Reference sections for each chapter.

Response: Reference lists appearing at the end of each chapter were revised to include sources cited in the Final NTS EIS.

Comment Code: Federal Agency 3-77

Location of EIS Revision(s): None required

Response: It is understood that the programmatic Section 7 consultation will cover the program activities of the DOE Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs. No other programs or activities are anticipated to be included in the preferred action alternative; therefore, it is not expected that another programmatic Section 7 consultation will be required.

Comment Code: Federal Agency 3-78

Location of EIS Revision(s): None required

Response: Existing standards are based on effective dose equivalent to humans. The reasonable assumption is that by protecting any member of the public adequately, protection would be provided to the native flora and fauna. However, monitoring programs do include measurement of environmental media as a part of the modeling effort to determine exposures to people.

Comment Code: Federal Agency 3-79

Location of EIS Revision(s): None required

Response: The term "as low as reasonably achievable" (ALARA) is the process of reducing radiation exposures and a definition has been added to the Glossary. This is a fundamental requirement of every radiological control program.

The ALARA Committee at the NTS reviews all operations where a radiation exposure is possible and evaluates whether the operations are necessary and, if so, the precautions that are to be taken to reduce the individual's radiation dose to a minimum before approving the operation and issuing a radiation work permit. If additional precautions are needed, the committee returns the request with recommended changes. The request must then be revised and resubmitted for approval.

Comment Code: Federal Agency 3-80

Location of EIS Revision(s): None required

Response: Adverse impacts associated with previous testing have occurred in specific locations on the NTS to a number of environmental resources including soils, geological media, and groundwater, as identified in Volume 1, Chapters 4 and 5. Certain further activities (e.g., underground nuclear device tests) would add to these adverse impacts. Nuclear weapons testing programs at the NTS did not impact all portions of the NTS but did substantially impact some localized areas.

Comment Code: Federal Agency 3-81

Location of EIS Revision(s): Volume 1, Section 4.1.6

Response: Volume 1, Section 4.1.6 was revised to include a discussion about the uptake of radionuclides by flora and fauna.

Comment Code: Federal Agency 3-82

Location of EIS Revision(s): Volume 1, Section 4.1.6

Response: Volume 1, Section 4.1.6 was revised to include information on the uptake of radionuclides by plants and animals and studies of cytological and chromosomal effects and their significance.

Comment Code: Federal Agency 3-83

Location of EIS Revision(s): Volume 1, Section 4.1.6

Response: Volume 1, Section 4.1.6 was revised to include a discussion of reproduction and recruitment in mammalian populations occupying habitats containing varying concentrations of radionuclides.

Comment Code: Federal Agency 3-84

Location of EIS Revision(s): None required

Response: For additional information, the reader is referred to the reference list included in McArthur, 1991, which is formally cited in Volume 1, Section 4.8 of the EIS. The DOE has conducted dozens of surveys and studies; the results of these surveys are provided in the soil contamination maps presented in the EIS. A discussion of each soil-mapping survey and all of the research projects that have been conducted is too detailed and voluminous for inclusion in the EIS. Summary information is, however, provided in Volume 1, Section 4.1.4.3.

Comment Code: Federal Agency 3-85

Location of EIS Revision(s): None required

Response: The DOE, through its technology development program, has developed several methods for cleaning soils contaminated with plutonium and, to date, has found none that worked satisfactorily. Any promising technologies will be evaluated in the future.

Trials are ongoing to determine methods for reclamation of disturbed areas. Reclamation plans, when appropriate, are tailored to the individual sites and would be evaluated in the site-specific Corrective Action Plans and National Environmental Policy Act documents. These plans may include soil salvage. The importance and re-establishment potential of cryptogamic crusts will be addressed in these plans when appropriate.

Comment Code: Federal Agency 3-86

Location of EIS Revision(s): None required

Response: A discussion of organisms of special concern is included in Volume 1, Sections 4.1.6, 5.1.1.6, and 7.6. Section 5.1.1.5.1 indicates that, "No significant change in surface water quality or quantity is anticipated and, thus, the impacts would be negligible." Since changes to the surface run-off beyond the NTS boundaries are not anticipated, no impacts to organisms of concern are anticipated.

Comment Code: Federal Agency 3-87

Location of EIS Revision(s): Volume 1, Section 4.1.5.1

Response: The other two springs, Tub Spring and Gold Meadows, are sampled when the discharge is large enough to allow sampling, which is infrequent. The text has been modified accordingly.

Comment Code: Federal Agency 3-88

Location of EIS Revision(s): None required

Response: Volume 1, Table 4-21, provides gross beta concentrations measured at seven of the nine springs. The text in Volume 1, Section 4.1.5.1 indicates that none of the results exceeded the strontium-90 Derived Concentration Guide for drinking water; therefore, no potential effects to species which consume water at the springs can be reasonably anticipated.

Comment Code: Federal Agency 3-89

Location of EIS Revision(s): Volume 1, Section 4.1.5.1

Response: The text has been modified to reflect the results of spring discharge sampling.

Comment Code: Federal Agency 3-90

Location of EIS Revision(s): Volume 1, Section 4.1.5.1

Response: All of the containment ponds discussed in Volume 1, Section 4.1.5 of the EIS are either on Pahute Mesa or Yucca Flat, outside the desert tortoise habitat. Only 2 of the 11 ponds are currently active (E Tunnel ponds) and there is no fencing surrounding them which would prevent access by wildlife. No flagging has been placed on these ponds to prevent migratory birds from landing on them. Over the past 30 years the DOE has monitored the uptake of radionuclides in game species (deer, bighorn sheep, chukar) which may periodically drink from these ponds. In 1994, four deer samples collected quarterly and analyzed for contamination contained a median value of 40 pCi/L of tritium in the blood (DOE/NV, 1995a). No tritium was found in the chukar although samples were taken in Area 25 some distance from the containment ponds. Current histopathological analyses of the four deer collected in 1994 showed no tissue abnormalities due to radiation exposure (DOE/NV, 1995a). In October 1995 the DOE initiated a monitoring program aimed at quantifying wildlife species use of man-made water sources on the NTS.

Comment Code: Federal Agency 3-91

Location of EIS Revision(s): None required

Response: The annual average of gross beta analyses, a measurement of radioactivity, is the arithmetic average of all gross beta analyses for a given sampling location in the given calendar year. The last column in Table 4-22 provides the reader with a basis for evaluating these figures with the drinking water standards for humans. Although the exact levels of exposure that are safe for the various groups of wildlife that were using these ponds are not known, it is assumed that levels would be safe if drinking water standards are maintained. The DOE has implemented a monitoring program to evaluate the use of these ponds by wildlife.

Comment Code: Federal Agency 3-92

Location of EIS Revision(s): None required

Response: The risk to the various groups of wildlife that may be using these ponds will vary among groups and among species within groups. Although the exact levels of exposure that are safe for each group are not known, the DOE assumes that if levels are maintained within safe drinking water standards, wildlife would not be impacted. The DOE has implemented a biomonitoring program to evaluate radiation uptake and accumulation by game species. See response to Comment Code Federal Agency 3-90.

Comment Code: Federal Agency 3-93

Location of EIS Revision(s): Chapter 4, Section 4.1.5.2

Response: As part of their Wellhead Protection Program for the NTS, the DOE recently completed capture zone models for each water supply well and mapped the area of influence for each well. These models used a very conservative approach that assumed that each well was run continuously for a period of 10 years. The results of these analyses indicate that for each well, the area of influence is restricted. Only at Army Well 1 does the capture zone extend beyond the NTS boundaries. No impacts on springs or biological resources are anticipated as a result of the operation of these wells. Revisions have been made in Volume 1, Section 4.1.5 to incorporate this information.

Comment Code: Federal Agency 3-94

Location of EIS Revision(s): None required

Response: Volume 1, Section 4.1.5.2 of the EIS describes the status of groundwater in Yucca Flat and Frenchman Flat. Because development of most plant roots is restricted to within 1 m of the soil surface and no groundwater reaches the surface at springs or seeps in these areas (no springs are found at Yucca Flat or Frenchman Flat, Figure 4-40 of the EIS), there is no known effect of deep groundwater on the biological resources of these area. No reports of impacts to biological resources from fluctuating water tables or decreased down gradient subsurface drainage in Frenchman Flat have been identified.

Comment Code: Federal Agency 3-95

Location of EIS Revision(s): None required

Response: The referenced text is merely a major topical overview of one of the specific Hydrologic Resources Management Program studies. For detailed information, the commentor is referred to the cited references in the Final NTS EIS.

Comment Code: Federal Agency 3-96

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: For additional information concerning the DOE's Hydrologic Resources Management Program, the commentor is referred to the new text in Volume 1, Section 4.1.5.2 and the references which have been added to this section.

Comment Code: Federal Agency 3-97

Location of EIS Revision(s): None required

Response: Table 4-28 lists materials used in underground nuclear testing. However, the fate of many of these materials as a result of underground testing is not fully understood, and no estimates are available concerning the total quantity or form of these materials that may still remain in the subsurface at the NTS.

The main concern with regard to any hazardous or toxic materials that may remain in the subsurface after an underground test is their mobility (i.e., ability to travel into and within groundwater). The Environmental Restoration Program, through the Underground Test Area Subproject at the NTS, is in the process of assessing the occurrence, distribution, and mobility of contaminants in the vicinity of the expended nuclear tests. Once the data from the Underground Test Area Subproject has reduced the level of uncertainty in the groundwater model to an acceptable level, then the impact of any of these remaining materials that may be mobilized along the groundwater pathway can be assessed.

Comment Code: Federal Agency 3-98

Location of EIS Revision(s): Volume 1, Table 4-30

Response: The status of the bald eagle has been changed to threatened in the Final NTS EIS.

Comment Code: Federal Agency 3-99

Location of EIS Revision(s): Volume 1, Table 4-30

Response: This change in status of *Astragalus beatleyae* has been noted in the Final NTS EIS.

Comment Code: Federal Agency 3-100

Location of EIS Revision(s): Volume 1, Section 4.1.6

Response: The following text was added for clarification: There are no springs in the valley bottom areas.

Comment Code: Federal Agency 3-101

Location of EIS Revision(s): Volume 1, Section 4.1.6

Response: A paragraph was added to Volume 1, Section 4.1.6 to provide the requested information.

Comment Code: Federal Agency 3-102

Location of EIS Revision(s): Volume 1, Section 4.1.6

Response: Volume 1, Section 4.1.6 was revised to provide a summary of the results of past ecological studies that included monitoring plants and animals on the NTS, and references to relevant documents. Results of the studies indicated that ecological impacts resulting from DOE programs on the NTS did not differ in type or magnitude from those resulting from other human activities that disturb desert ecosystems.

Comment Code: Federal Agency 3-103

Location of EIS Revision(s): None required

Response: The DOE acknowledges that the U.S. Fish and Wildlife Service has determined that the desert tortoises in the Rock Valley study enclosures are considered "pre-Act" (U.S. Fish and Wildlife, 1996). Modification of the document to clarify their status under the Endangered Species Act would only be appropriate if the DOE were proposing activities that would impact these tortoises. Under Alternative 2, no continued monitoring of the enclosed desert tortoises would occur and no impacts would occur. Under the other alternatives, continued annual monitoring would continue but would have little likelihood of adverse effects since none have been documented over the past 30 years of monitoring.

Comment Code: Federal Agency 3-104

Location of EIS Revision(s): None required

Response: Marking and measuring free-roaming tortoises on the NTS was authorized by a Section 10 Permit PRT-744522 issued on March 13, 1990, to Reynolds Electrical and Engineering Co., Inc. The permit has expired and the DOE has no plans to mark or measure any additional free-roaming tortoises.

Comment Code: Federal Agency 3-105

Location of EIS Revision(s): Volume 1, Section 4.5

Response: Information provided regarding the land transferrals and conservation easement has been incorporated into the Final NTS EIS.

Comment Code: Federal Agency 3-106

Location of EIS Revision(s): Volume 1, Section 4.5.6, Section 4.6.6

Response: The text in Volume 1, Section 4.5.6 of the Final NTS EIS concerning biological resources of Eldorado Valley has been modified to indicate that although the Solar Enterprise Zone does not occur in a critical habitat, it is adjacent to the Paiute-Eldorado Critical Habitat Unit. The text in Volume 1, Section 4.6.6 of the Final NTS EIS concerning biological resources of the Dry Lake Valley has been modified to indicate that the Solar Enterprise Zone occurs adjacent to the Mormon Mesa Critical Habitat Unit. It is understood that when a site is selected, further evaluation of project environmental impacts will be conducted according to the National Environmental Policy Act, and a Section 7 Consultation with Fish and Wildlife Service will be initiated.

Comment Code: Federal Agency 3-107

Location of EIS Revision(s): None required

Response: Large-scale groundwater withdrawals are not anticipated under the proposed action of Alternative 1 and localized water-level declines in areas adjacent to operating water supply wells are not considered significant impacts (Volume 1, Section 5.1.1.5.2). Data and records for monitoring wells in the region do not show any effects that might be attributed to water withdrawals on the NTS. Furthermore, results of past investigations have not found any impacts resulting from DOE operations on key environmentally sensitive areas of Devils Hole National Monument and Ash Meadows (Volume 1, Section 5.1.1.5.2). Should monitoring data or simulation models indicate any adverse impacts to water quantity or quality at springs at the NTS or offsite and these impacts could affect threatened, endangered, proposed, or candidate species at the spring, then Section 7 consultation with the U.S. Fish and Wildlife Service would be initiated by the DOE as per the requirements of the Endangered Species Act.

Potential large-scale groundwater withdrawals under Alternative 3 are primarily associated with the Solar Enterprise Zone. Quantities of water required would depend on the desired power generation levels, technology to be used, location, aquifer, perennial yield, and other water use in the area. The photovoltaic technology would not require water and would have no impact on groundwater. The remaining three technologies may require contributions of groundwater that are estimated not to exceed about 6,850,000 m^3 (Volume 1, Section 5.3.1.5.2). It is considered very unlikely that such withdrawals would have any significant adverse impact on downgradient water levels or spring discharge rates (Volume 1, Section 5.3.1.5.2). Potential impacts from the Solar Enterprise Zone on the biological resources would be addressed in a future site-specific National Environmental Policy Act review if there is a federal nexus.

Comment Code: Federal Agency 3-108

Location of EIS Revision(s): None required

Response: Under the discussion of groundwater (Volume 1, Section 5.1.1.5.2) the statement is made that "grading of soils and other construction actions could alter slightly the quantity and quality of run-off." No plans have been identified to significantly alter drainages, including alluvial fans. Alterations in areas to be revegetated would consist primarily of mixing surface soils and subsoils and alteration of erosion pavement in localized areas. It is recognized that there will be changes in the vegetation on the disturbed areas consistent with revegetation efforts used at the site, and there may be slight effects on downgradient plant species composition, although such effects have only rarely been observed down-slope of previous disturbance in the past, perhaps because of the relatively permeable nature of most soils on the NTS. Mitigation used as part of the final revegetation will be to restore, as far as is feasible, slope gradients and drainage patterns to those encountered prior to disturbance to minimize impacts to down-slope vegetation.

Comment Code: Federal Agency 3-109

Location of EIS Revision(s): None required

Response: Impacts to biological resources for the Solar Enterprise Zone are found in Volume 1, Section 5.3.1.6, "Nondefense Research and Development Program." Descriptions of impacts associated with each technology were not included, because the base facility for each technology would likely disturb about the same acreage (2,400 acres) and have similar biological impacts. Impacts associated with the solar thermal parabolic-trough technology would have the largest impact to biological resources, and would disturb 2,182 of additional acreage due to construction of a gas pipeline, but would likely be confined to previously disturbed rights-of-way. Upgrades in transmission facilities would be about the same for each technology. All technologies except the photovoltaic technology, the technology with the least impact to biological resources, would also require various amounts of water, although water use from deep groundwater sources would have little or no impact on springs on the NTS or biological resources.

Comment Code: Federal Agency 3-110

Location of EIS Revision(s): None required

Response: If the Coyote Spring Valley site were selected for this project, further analysis would be conducted concerning the pumping and use of groundwater upgradient from the Muddy River warm springs system. This analysis would be necessary for inclusion both in required National Environmental Policy Act evaluations of the proposed project as well as in the Section 7 Consultation with the Fish and Wildlife Service. It is understood that groundwater pumping which alters the discharge of groundwater at Muddy Spring may significantly impact the Moapa dace and other plant and animal species of concern which rely on the spring.

Comment Code: Federal Agency 3-111

Location of EIS Revision(s): None required

Response: Please refer to the response to Comment Code Federal Agency 3-69 for the response to this comment.

Comment Code: Federal Agency 3-112

Location of EIS Revision(s): None required

Response: Please refer to the response to Comment Code Federal Agency 3-69 for the response to this comment.

Comment Code: Federal Agency 3-113

Location of EIS Revision(s): Volume 1, Appendix C

Response: The text in Volume 1, Appendix C of the Final NTS EIS has been amended to incorporate the recommended addition concerning the intent of the National Wildlife Refuge System Administration Act.

Comment Code: Federal Agency 3-114

Location of EIS Revision(s): Volume 1, Appendix C

Response: The text in Volume 1, Appendix C of the Final NTS EIS concerning the Bald and Golden Eagle Protection Act has been amended to incorporate the recommended addition concerning the intent of the Migratory Bird Treaty Act.

Comment Code: Federal Agency 3-115

Location of EIS Revision(s): Volume 1, Appendix C

Response: The text in Volume 1, Appendix C of the Final NTS EIS has been amended to incorporate the recommended addition concerning the intent of the Bald Eagle Protection Act.

Comment Code: Federal Agency 3-116

Location of EIS Revision(s): Volume 1, Appendix E, Section E.2.6

Response: The text for Volume 1, Appendix E, Section E.2.6, was amended to include a description of how the DOE evaluated potential impacts of various activities on species protected under the Migratory Bird Treaty Act and the Bald Eagle Protection Act.

Comment Code: Federal Agency 3-117

Location of EIS Revision(s): None required

Response: The policy for conservation and management of candidate species is cited in Volume 1, Section 4.7. This is a more appropriate location to discuss the policy for management of biological resources than Volume 1, Section 1.3, which is concerned with the DOE's policies for planning and development on the NTS. Refer also to Section 1.7 of Volume 3.

Comment Code: Federal Agency 3-118

Location of EIS Revision(s): None required

Response: Volume 2, Table 2-1 lists all natural resources on the NTS of which the DOE is aware. If the Department of the Interior informs the DOE of other natural resources on the NTS that should be included in the *Resource Management Plan*, they will be added. A request for such information was made in Volume 2, Section 2.1, Step 2.

Chapter 4 contains the goals the DOE has proposed to guide the management of resources. As noted in Volume 2, Section 2.1, Step 3, the DOE will strive to coordinate the development of management actions needed to achieve its goals with the Department of the Interior.

Comment Code: Federal Agency 3-119

Location of EIS Revision(s): Volume 2, Section 2.2

Response: The text has been changed to correct this typographical error.

Comment Code: Federal Agency 3-120

Location of EIS Revision(s): None required

Response: The only proposed action that could result in an impact on Black Canyon and Aztec Springs would be the location of a Solar Enterprise Zone facility in Eldorado Valley. Any impact is considered highly unlikely insofar as water for such a facility would probably be supplied from the existing Lake Mead surface water allocations. In the event that groundwater withdrawals would be required, the impacts of developing the water would be evaluated during the preparation of a separate National Environmental Policy Act document.

Comment Code: Federal Agency 3-121

Location of EIS Revision(s): None required

Response: The DOE agrees that the National Park Service is faced with considerable uncertainty in protecting its water rights and water-related resources. The DOE has taken the lead in addressing uncertainty with respect to the NTS and downgradient areas between the NTS and Death Valley through its many hydrologic investigations and data collection efforts. The DOE will continue these efforts, but recognizes that some level of uncertainty will remain. See Section 1.11 of Volume 3.

Comment Code: Federal Agency 3-122

Location of EIS Revision(s): None required

Response: No mining or milling operations are anticipated as a result of DOE operations.

Comment Code: Federal Agency 3-123

Location of EIS Revision(s): None required

Response: The level of scrutiny that a particular action receives should be proportional to the degree of groundwater withdrawals and its relative location to environmental sensitive areas. The DOE's proposed actions on the Tonopah Test Range and Nellis Air Force Range require only small quantities of water for site remediation activities, and these sites are located much farther from environmentally sensitive areas of concern at the National Park Service. Therefore, increased scrutiny to a level commensurate with the NTS is not necessary.

Comment Code: Federal Agency 3-124

Location of EIS Revision(s): None required

Response: In an April 1994 letter report to the National Park Service (Lehman and Associates, 1994), Brown and Lehman stated:

"We also conclude that this analysis provides little or no evidence of impact on Devils Hole from recent historical levels of pumping at Army Well #1 near Mercury."

Given this conclusion with respect to the nearest NTS well, it is considered extremely unlikely that well J-12, located even more distant and in a separate subsystem of the Death Valley flow system, could be the cause of historic fluctuations in water levels in Devils Hole. As such, a discussion in the text of the EIS is not considered to be warranted.

Comment Code: Federal Agency 3-125

Location of EIS Revision(s): None required

Response: The DOE believes that references to the study in question are valid. The National Park Service is encouraged to conduct whatever additional studies that they consider warranted, and the DOE will continue to be an active participant in any National Park Service activities that crosscut with NTS issues.

Comment Code: Federal Agency 3-126

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: The following text has been inserted into the EIS:

The National Park Service continues to implement projects, collect data, support research, and conduct studies investigating the probable cause of the decline of the Devils Hole pool level.

Comment Code: Federal Agency 3-127

Location of EIS Revision(s): Volume 1, Section 3.3

Response: The text has been modified to update the status of the modeling being conducted by the Nevada Environmental Restoration Program. The level of detail requested is not necessary to support the analysis in the EIS.

Comment Code: Federal Agency 3-128

Location of EIS Revision(s): Summary

Response: The Summary has been modified to reflect that the stated value is in recoverable storage and not underflow.

Comment Code: Federal Agency 3-129

Location of EIS Revision(s): None required

Response: The table lists summary presentations of impacts for each alternative. The impacts are discussed in a semiquantitative manner with respect to the perennial yields. The specific effects are discussed in the appropriate technical sections of Volume 1, Chapters 4 and 5. For the sake of brevity, it is not possible to provide more than summary information in Table 3-5.

Comment Code: Federal Agency 3-130

Location of EIS Revision(s): Volume 1, Section 4.1.5.1

Response: The discussion concerning Ash Meadows has been clarified and corrected in the Final NTS EIS.

Comment Code: Federal Agency 3-131

Location of EIS Revision(s): Volume 1, Section 4.1.5.1

Response: The information provided by the Department of the Interior that Texas, Nevares, and Travertine Springs in Death Valley (located downgradient of the NTS) provide a potable water supply for park visitors and a privately owned resort that includes restaurants, motels, hotels, and a golf course has been added to the Final NTS EIS.

Comment Code: Federal Agency 3-132

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: Although no such implication was intended, the discussion has been modified to clarify that the referenced areas are two, separate discharge areas.

Comment Code: Federal Agency 3-133

Location of EIS Revision(s): None required

Response: The discussion in the EIS is consistent with Harrill et al. (1988) which shows an extensive area of discharge in Sarcobatus Flat.

Comment Code: Federal Agency 3-134

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: The discussion in the EIS has been modified to clarify that flow continues onward to Death Valley.

Comment Code: Federal Agency 3-135

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: The following text was added to the EIS:

The perennial yield values could also be smaller if one-half of the underflow between some basins is not considered part of the perennial yield of specific basins, e.g., Frenchman Flat.

Comment Code: Federal Agency 3-136

Location of EIS Revision(s): None required

Response: The studies completed to date have shown no adverse impacts beyond the NTS boundaries including current and pending appropriations in Amargosa Valley and Ash Meadows as a result of DOE's groundwater withdrawals. Water availability for the hydrographic basins where localized impacts occur is summarized in Volume 1, Chapter 4, Table 4-23. Future actions that might impact these areas will be reviewed, additional evaluations performed, and National Environmental Policy Act documentation prepared, as necessary, before the water would actually be withdrawn. The process for conducting these reviews is provided in Volume 2 of the EIS *(Framework for Resource Management Plan)*.

Comment Code: Federal Agency 3-137

Location of EIS Revision(s): None required

Response: The referenced section in the Site Characterization Plan for Yucca Mountain (DOE, 1988) was used in the preparation of this section. More recent water use data was used and is presented in the hydrology baseline report prepared for this EIS. This report is included in the Administrative Record and details DOE's groundwater withdrawals since 1988.

Comment Code: Federal Agency 3-138

Location of EIS Revision(s): Section 4, Volume 1, Section 4.1.5.2

Response: The reference to Seaber et al. has been deleted from the text.

Comment Code: Federal Agency 3-139

Location of EIS Revision(s): None required

Response: As stated in the discussion, flow rates are variable and could be much lower or higher than the ranges given.

Comment Code: Federal Agency 3-140

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: The following text was inserted into the EIS:

According to information provided by the U.S. Department of the Interior, flow rates may increase in the vicinity of Ash Meadows. The National Park Service is concerned that contaminant transport may be accelerated toward Devils Hole and Ash Meadows. Because contaminants that remain in the underground testing areas are almost exclusively contained in the alluvial and volcanic aquifers, they must first migrate out of these aquifers and into the carbonates. Therefore, DOE's efforts to model these contaminants has concentrated on the rate of transport between the aquifers, currently thought to be significantly slower than in the carbonates. The DOE will continue to participate in cooperative investigations with the National Park Service concerning environmentally sensitive areas downgradient of the NTS.

Comment Code: Federal Agency 3-141

Location of EIS Revision(s): None required

Response: The values are consistent with the cited reference which served as the basis for the perennial yield estimates of the basins of the NTS. Because of the uncertainty in the estimates for individual basins, as noted in other Department of the Interior comments, it was not considered appropriate to present discharge estimates at the basin level; rather they are presented for the recognized subsystems of the Death Valley flow system.

Comment Code: Federal Agency 3-142

Location of EIS Revision(s): None required

Response: A number of values have been published concerning flow from Amargosa Valley into Death Valley. The cited value of 6.17 x 10^6 cubic meter per year (m^3/yr) (5,000 acre feet per year [ac ft/yr]) is consistent with two sources: ERDA (1977) and Burbey and Prudic (1991) who state:

> "Geochemical data for springs at this locality [Furnace Creek Ranch] suggest that the 6.17 x 10^6 m^3 (5,000 ac ft) of water discharging each year is isotopically similar to the water discharging at Ash Meadows."

Harrill et al. (1988) indicate that 3.70 x 10^6 m^3/yr (3,000 ac ft/yr) discharge from Amargosa Valley into Death Valley, and this value is based upon an estimate made by Walker and Eakin (1963) in the original reconnaissance report for Amargosa Valley. The value of 19,000 appears to be based upon Scott et al. (1971), and the derivation of this number could not be corroborated. Therefore, the DOE chose to use the more recent values presented by the U.S. Geological Survey. It should be noted that variations of this type are not uncommon, and a wide range of estimated values may have been published for a number of interbasin flows.

Comment Code: Federal Agency 3-143

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: A reference citation has been added, and the text has been modified to indicate that this flow may be occurring rather than stating that it does occur.

Comment Code: Federal Agency 3-144

Location of EIS Revision(s): None required

Response: The comment is correct in stating that the water rights for the NTS have not been decreed through a court action. It is DOE's understanding that a federal reservation of water rights is implied when the land withdrawal is established. If the implied water right is contested, then a court may recognize the priority and quantify the right accordingly. See Section 1.11 of Volume 3.

Comment Code: Federal Agency 3-145

Location of EIS Revision(s): None required

Response: The DOE agrees that the reserved right is only for water not previously appropriated by others as of the date of the reservation, and for the quantity of water necessary to accomplish the purpose of the land withdrawal. See Section 1.11 of Volume 3.

Comment Code: Federal Agency 3-146

Location of EIS Revision(s): None required

Response: The comment is noted. The DOE is currently unaware of any determination that Death Valley water rights are senior to those of the NTS.

Comment Code: Federal Agency 3-147

Location of EIS Revision(s): None required

Response: The comment is noted that some portion of the flow from the springs flows through the NTS. In response to another comment by the National Park Service, the specific springs in Death Valley have been added to the text of the EIS.

Comment Code: Federal Agency 3-148

Location of EIS Revision(s): None required

Response: The DOE is aware that the reserved water rights for Devils Hole must not be adversely affected by a water withdrawal associated with a junior water right.

Comment Code: Federal Agency 3-149

Location of EIS Revision(s): None required

Response: As stated in Volume 1, Section 4.1.5.2 under the subheading water supply, the water resources of the Akali Flat-Furnace Creek Ranch basin are fully appropriated. This section goes on to state that groundwater in the Ash Meadows basin is subject to the rights of the senior water rights holders.

The DOE does not agree that there are any water right issues associated with the proposed actions on the Tonopah Test Range. The proposed actions include the characterization and possible cleanup of contaminated soils during which some small quantities of water may be used for dust abatement.

Comment Code: Federal Agency 3-150

Location of EIS Revision(s): Volume 1, Section 4.5.5.2

Response: The text has been modified to indicate the more recent data presented by Harrill et al., 1988.

Comment Code: Federal Agency 3-151

Location of EIS Revision(s): None required

Response: Given the location available for a Solar Enterprise Zone in Eldorado Valley and the configuration of the water table, areas to the east, including the Colorado River Valley are not within the potentially affected environment. Therefore, a discussion of springs and unquantified water rights in these areas is not included in the EIS.

Comment Code: Federal Agency 3-152

Location of EIS Revision(s): Volume 1, Section 4.6.5.2

Response: The text has been modified accordingly.

Comment Code: Federal Agency 3-153

Location of EIS Revision(s): None required

Response: The DOE is aware that surface water in the Muddy River is fully appropriated. The State Engineer interprets what groundwater may or may not be considered tributary and whether or not that water is available for appropriation and application to a beneficial use.

Comment Code: Federal Agency 3-154

Location of EIS Revision(s): Volume 1, Section 4.7.5.2

Response: The correction has been made to the first sentence in Section 4.7.5.2.

Comment Code: Federal Agency 3-155

Location of EIS Revision(s): None required

Response: Comment noted; however, the Nevada State Engineer's determination (Turnipseed, 1995) concerning recent water right permit applications in that area, granted additional water appropriations, subject to applicable conditions contained in the permit.

Comment Code: Federal Agency 3-156

Location of EIS Revision(s): None required

Response: Please refer to response for Comment Code Federal Agency 3-155.

Comment Code: Federal Agency 3-157

Location of EIS Revision(s): None required

Response: A calibrated groundwater flow model is, in fact, under development by the DOE. However, it may be some time before the model is refined enough to allow such an application. The use of regional models is hampered by the ability of the numerical codes to simulate water levels and spring discharge rates closely enough to accurately simulate the response of an aquifer to distant water withdrawals.

Comment Code: Federal Agency 3-158

Location of EIS Revision(s): None required

Response: Please refer to the response for Comment Code Federal Agency 3-136.

Comment Code: Federal Agency 3-159

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: The National Park Service's concern is noted and was specifically added to the text of the EIS in Volume 1, Section 4.1.5.2 in response to a previous comment (Federal Agency 3-65). As stated in that response, "DOE is also working with the National Park Service in evaluating observed water level fluctuations at Devils Hole."

Comment Code: Federal Agency 3-160

Location of EIS Revision(s): None required

Response: The DOE is aware that surface water in the Muddy River is fully appropriated. As noted in the EIS, the lack of a water supply in the Dry Lake Valley is a serious limitation on the location of a Solar Enterprise Zone at that location. The DOE is aware of the National Park Service's concerns related to the Muddy River and the springs.

Comment Code: Federal Agency 3-161

Location of EIS Revision(s): None required

Response: Please refer to Comment Code Federal Agency 3-153.

Comment Code: Federal Agency 3-162

Location of EIS Revision(s): None required

Response: The DOE is aware that surface water in the Muddy River is fully appropriated. As noted in the EIS, the water supply problems associated with Coyote Spring Valley are a serious limitation on the location of a Solar Enterprise Zone at that location. The DOE is aware of the National Park Service's concerns related to the Muddy River and the springs.

Comment Code: Federal Agency 3-163

Location of EIS Revision(s): None required

Response: To the extent that purchase of senior water rights is legally permissible, it should be noted that such an approach would not mitigate the overall environmental impacts; they would simply move the impacts. Given that the Amargosa Valley is the only area where such water rights could be obtained, the water withdrawals would be moved closer to environmentally sensitive areas, and the resulting impacts of such an action are expected to be not only larger, but sooner as well.

Comment Code: Federal Agency 3-164

Location of EIS Revision(s): None required

Response: Should large-scale water withdrawals be required to mitigate contaminant transport, significant study and agency concurrence would be required. The mitigation activities would be implemented within the conditions of the *Resource Management Plan* to ensure that any actions taken are consistent with the objectives of the plan and are in compliance with all applicable laws and regulations. Refer to Volume 2 and Section 1.7 of Volume 3.

Comment Code: Federal Agency 3-165

Location of EIS Revision(s): None required

Response: Changes in water levels, discharge rates, and spring discharges were considered for all areas, including Devils Hole, Ash Meadows, and Death Valley.

Comment Code: Federal Agency 3-166

Location of EIS Revision(s): Volume 1, Section 2.1, and 3.2.3

Response: Concur. The National Park Service has been added to the list of Federal Land Managers.

Comment Code: Federal Agency 4-1

Location of EIS Revision(s): Volume 1, Section 7.6

Response: Mitigation measures are discussed in Volume 1, Chapter 7 of the NTS EIS. While the discussion is general in nature, detailed measures would be defined for a specific project or activity either in the planning process, or through the resource management planning process. With regard to habitat loss or fragmentation, Section 4.7 of Volume 2, *The Framework for the Resource Management Plan* contains a discussion of habitat preservation and the process that will be implemented to ensure habitat protection and preservation. Volume 1, Section 7.6 of the EIS has been revised to reference the use of the *Resource Management Plan.*

Comment Code: Federal Agency 4-2

Location of EIS Revision(s): None required

Response: For the purpose of bounding the environmental impacts in this EIS, the DOE has taken a very conservative approach in determining impacts to resources by assuming that the land resource requirements for new facilities would require 100 percent disturbance of land. Realistically, development on-site would be located on previously cleared land or near existing infrastructures. Prospective locations of proposed facilities would be chosen based upon acreage requirements, proximity to utilities, proximity to the workforce, and the need for security or a buffer zone. The prospective NTS site of the National Ignition Facility is on the north side of Jackass Flats Road adjacent to the existing sanitary sewage system and landfill. Also evaluated is a potential National Ignition Facility location on previously disturbed DOE-owned land in North Las Vegas. Neither the NTS nor the North Las Vegas location are the DOE's preferred location. If either were to be selected, subsequent tiered National Environmental Policy Act documentation would evaluate the proposed sites in greater detail. Minimization of the use of undisturbed areas would be used as a criterion for evaluation.

Comment Code: Federal Agency 4-3

Location of EIS Revision(s): None required

Response: This site-wide EIS is a type of programmatic EIS and as such, it evaluates the impacts of potential actions as well as ongoing and reasonably foreseeable specific activities. Actions considered in this EIS may at a later time be more explicitly analyzed in more detail in a tiered National Environmental Policy Act document which could address only the narrower proposal being considered without restating information contained in this EIS. Likewise, activities proposed after this Final EIS is published would receive a case-by-case evaluation and a tiered National Environmental Policy Act document would be prepared, as necessary. In the case of a proposal for a major project, a separate EIS may be warranted.

The solar and heavy industrial facilities are conceptual. The specific nature of the facility, acreage requirements, water and power consumption, and other resource impacts have not been fully defined. The heavy industrial facility was originally intended as a tritium production facility, but the NTS was not selected as the site for this project. However, the footprint and resource requirements have been retained in the impact analysis for Alternative 3 as that of a large, heavy industrial facility. The NTS may at some future time be considered for siting of a mixed oxide fuel facility, one of the alternative technologies evaluated in the *Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic EIS (DOE, 1996b)* (a Defense Program), and also for a commercial satellite launch and recovery facility (a Non-Defense Research and

Development Program). These contemplated activities are bounded by the general evaluation of the large, heavy industrial facility identified in Alternative 3. Once these or other proposals become more defined, additional National Environmental Policy Act reviews will be conducted in the context of the programmatic heavy industrial facility analysis or solar facility analysis.

Comment Code: Federal Agency 4-4

Location of Text Revision(s): Volume 1, Section 2.4.2; Volume 1, Section 3.1.1.2; Volume 1, Section 4.1.1.5; Volume 1, Section 5.1; Volume 1, Section 7; and Appendix C.6

Response: The DOE has a Waste Minimization/Pollution Prevention Program in place and will continue to maintain this program. A description of the DOE/NV Waste Minimization/Pollution Prevention Program has been added to the Final NTS EIS as Volume 1, Appendix C.6. The description of this program includes the Council on Environmental Quality requirements and the specific elements of the program. In addition, a summary of the Waste Minimization/Pollution Prevention Program has been added to the description of alternatives and to the Mitigation Measures (Volume 1, Chapter 7).

Comment Code: Federal Agency 4-5

Location of EIS Revision(s): None required

Response: Please refer to the response to Comment Code Federal Agency 4-3, which discusses how the Programmatic EIS addresses potential actions.

The solar energy project is conceptual. The specific nature of the facility, acreage requirements, water and power consumption, and other resource impacts have not been fully defined, and the analysis is based on very conservative assumptions. Once a proposal becomes more defined, additional National Environmental Policy Act reviews will be conducted.

Comment Code: Federal Agency 4-6

Location of EIS Revision(s): Volume 1, Section 5.3.1.7

Response: Please refer to the response to Comment Code Federal Agency 4-3 for a discussion of how the Programmatic EIS addresses potential actions. Specific information on the nature and probability of gaseous releases is not known. Statements previously included in the text were based on the formerly-proposed tritium supply and recycling facilities. The referenced statement has been deleted from the Final NTS EIS.

Comment Code: Federal Agency 4-7

Location of EIS Revision(s): Volume 1, Section 7.3

Response: Additional information has been added to the text of the EIS to more clearly describe specific impacts and mitigation measures. It should be noted that this is a site-wide EIS and, in that sense, addresses projects at programmatic level with the intention to conduct, if required, project-specific National

Environmental Policy Act analyses as projects are formally proposed. This is the case with both the solar and heavy industrial facilities, since project-specific details are as yet not available.

Comment Code: Federal Agency 4-8

Location of EIS Revision(s): Volume 2, Section 4.4

Response: The DOE agrees that the protection of undisturbed habitat is important for reducing impacts on the environment. Therefore, a goal has been added to the *Framework for Resource Management Plan* (Volume 2, Section 4.4) stating that new facilities (such as the Solar Enterprise Zone facility and the National Ignition facility) would be located in previously disturbed areas when possible. See also the response to Comment Code Federal Agency 4-2.

Comment Code: Federal Agency 4-9

Location of EIS Revision(s): None required

Response: The recommendation for referencing items from the checklists in the Final NTS EIS and the commitment in the Record of Decision is noted. Information in the EIS and the *Framework for Resource Management Plan* contain elements of the checklists, though not in explicit form. The DOE will ensure that the checklists are incorporated into the National Environmental Policy Act review process as new proposals and projects are evaluated. Also, note the responses to Comment Code Federal Agency 4-4 and 4-7.

Comment Code: Federal Agency 4-10

Location of EIS Revision(s): None required

Response: The only regulated polychlorinated biphenyls (PCBs) items remaining on the NTS are capacitors in Area 27 under the control of Lawrence Livermore National Laboratory. These items are maintained as part of the NTS mission of test readiness. Although they are not currently in service, they are considered active and are managed in accordance with Nevada Administrative Code 444 (NAC, 1992) (40 CFR 761). As part of the ongoing quality checks on equipment that formerly contained PCBs (reclassified equipment), it was determined that the dielectric fluid in one of the transformers contained elevated concentrations of PCBs. The transformer was drained and refilled with non-PCB oil, and the PCB oils were transported offsite for disposal after temporary storage at the Area 6 PCB storage and management facility. (This transformer will go through the declassification process once again.) The only other items known to contain PCBs at the NTS are below the regulatory threshold concentrations of 50 parts per million. As the DOE continues to decommission facilities, electrical equipment will be managed in accordance with regulatory requirements. In the past several years, DOE has also assisted the DoD with disposal operations of PCBs from their ongoing operations within areas that are the DOE's responsibility.

Comment Code: Federal Agency 4-11

Location of EIS Revision(s): Volume I, Appendix C, Clean Air Act, 3rd paragraph

Response: This section has been revised to address this concern by inserting the word "asbestos" after radioactivity.

Comment Code: Federal Agency 5-1

Location of EIS Revision(s): None required

Response: A discussion of Prevention of Significant Deterioration Class I areas near the NTS is provided in Volume 1, Section 4.1.7 of the EIS. The nearest Class I area to the NTS is Death Valley National Park, which is approximately 19 kilometers (12 miles) to the west. The actions proposed in the EIS would not affect any Prevention of Significant Deterioration Class I Areas because the NTS would have no emission sources subject to Prevention of Significant Deterioration review.

Comment Code: Federal Agency 5-2

Location of EIS Revision(s): None required

Response: A discussion of general conformity determination under the Clean Air Act is provided in Volume 1, Section 5.1.1.7 of the EIS.

Comment Code: Federal Agency 5-3

Location of EIS Revision(s): Summary

Response: The text has been revised accordingly.

Comment Code: Federal Agency 5-4

Location of EIS Revision(s): Summary, Table S-3 and Volume 1, Table 3-5

Response: The text referenced in the comments consists of a discussion of mitigation measures. However, Tables S-3 and 3-5 have been revised accordingly.

Comment Code: Federal Agency 5-5

Location of EIS Revision(s): Volume 1, Section 5.3.5.7, Section 5.3.6.7, and Section 5.3.7.7

Response: The text in Volume 1, Sections 5.3.5.7, 5.3.6.7, and 5.3.7.7 has been revised.

Comment Code: Federal Agency 5-6

Location of EIS Revision(s): Volume 1, Sections 5.1.1.8 and 5.3.1.8

Response: The text in Volume 1, Sections 5.1.1.8 and 5.3.1.8 has been revised. No noise modeling for aircraft operations was conducted for this EIS. Based on composite noise contours developed by the U.S. Air Force in 1994 for subsonic and supersonic flight operations over the NAFR Complex (U.S. Air Force, 1994), the day-night average sound level (L_{dn}) in the NTS portion of the complex resulting from aircraft operations would be less than 50 decibels.

This Page Intentionally Left Blank

Sovereign Nations

Comment Code: Sovereign Nations 1-1

Location of EIS Revision(s): None required

Response: The DOE presents no proposals in this EIS to build any nuclear power generation facilities at the NTS. The technology to convert low-level waste into nuclear fuel is not currently available.

Comment Code: Sovereign Nations 1-2

Location of EIS Revision(s): None required

Response: The generation of electricity from methane extracted from NTS landfills was not included in any of the alternatives. The amount of methane produced in NTS landfills is insufficient for the generation of electricity. This lack of methane is due to the predominant types of waste (construction wastes) disposed of at the NTS.

Comment Code: Sovereign Nations 1-3

Location of EIS Revision(s): None required

Response: The DOE is sensitive to the concerns of American Indian groups regarding the value of the NTS. Consideration of the American Indian resources and general concerns has been a part of the DOE planning process since 1985. As a result of previously established procedures and ongoing consultation with the Consolidated Group of Tribes and Organizations, sensitive American Indian resources, including burials, will be appropriately acknowledged in project planning and specific concerns will be addressed on a case-by-case basis in consultation with the Consolidated Group of Tribes and Organizations.

Comment Code: Sovereign Nations 2-1

Location of EIS Revision(s): Volume 1, Appendix I, Chapter 2

Response: The DOE agrees that the presentations to the tribal government on transportation issues did not constitute full government-to-government consultation. The text in this section has been revised to remove the implication that government-to-government consultation has been completed. In addition, the DOE will conduct and complete a comprehensive study to assess the potential social and cultural impacts to American Indian people from the transportation of low-level waste. This study will be conducted by the University of Arizona ethnographic staff on behalf of the DOE/ NV. The study will focus on the American Indian people who reside along three of the primary routes previously evaluated for risk in the NTS EIS, and will ensure a full government-to-government relationship among potentially involved tribes and the DOE/ NV. The DOE is committed to having this study reflect the full range of American Indian opinion.

Comment Code: Sovereign Nations 2-2

Location of EIS Revision(s): Volume 1, Appendix I, Chapter 2

Response: The DOE regrets the apparent confusion and agrees that full government-to-government consultation with American Indian Tribes regarding the transportation of low-level waste has not yet occurred. The text in this section has been revised to clear up the confusion. In addition, the DOE/ NV will conduct a comprehensive study to assess the potential social and cultural impacts from the transportation of low-level waste on American Indian people. Please refer to Comment Code, Sovereign Nations 2-1 for more details concerning the proposed study.

Comment Code: Sovereign Nations 2-3

Location of EIS Revision(s): Volume 1, Appendix I, Chapter 2

Response: This section of text has been revised to remove the implication that American Indian tribes have had the opportunity to identify their concerns regarding the transportation of low-level waste, or that full government-to-government consultation has taken place.

Comment Code: Sovereign Nations 2-4

Location of EIS Revision(s): None required

Response: The DOE will conduct a comprehensive study to assess the potential social and cultural impacts from the transportation of low-level waste on American Indian people. The proposed study ensures a full government-to-government relationship between potentially involved tribes and the DOE, and reflects DOE's commitment to have the study elicit the full range of American Indian opinion.

Comment Code: Sovereign Nations 2-5

Location of EIS Revision(s): None required

Response: As previous comments in this letter have correctly pointed out, the current transportation study does not include American Indian issues as it should. The DOE is beginning a comprehensive study to assess the potential social and cultural impacts of the transportation of low-level waste on American Indian people along two of the routes previously evaluated in the NTS EIS.

Comment Code: Sovereign Nations 2-6

Location of EIS Revision(s): None required

Response: State-specific accident rate data (which was the most "local" data available) were used for the portions of the routes inside Nevada. The in-state route risks, reported in Volume 1, Appendix I, used state-specific accident rate data to calculate the risk.

Comment Code: Sovereign Nations 2-7

Location of EIS Revision(s): None required

Response: Railway transportation risks were not calculated for any of the alternatives evaluated in the NTS EIS because currently there is no rail spur providing service to the NTS. If rail risks are calculated, the accident rate data used would be the most recent, up-to-date values available.

Comment Code: Sovereign Nations 2-8

Location of EIS Revision(s): None required

Response: Transportation risk analyses typically do not address potential terrorist activities or sabotage. Terrorism and sabotage are addressed in safeguards and security analyses. Those analyses usually identify the ways a terrorist act or saboteur could disrupt the operation, and then provide an explanation of the safeguards in place to prevent the terrorist or saboteur from succeeding.

Comment Code: Sovereign Nations 2-9

Location of EIS Revision(s): Volume 1, Appendix I, Attachment F

Response: Attachment F has been significantly revised, particularly regarding the cultural resource analysis, which has been deleted from the report since it was deficient with regard to American Indian issues. A comprehensive study will be conducted by the DOE to assess the potential social and cultural impacts on American Indian people of the transportation of low-level waste.

Comment Code: Sovereign Nations 2-10

Location of EIS Revision(s): Volume 1, Appendix I, Attachment F

Response: The land use and affected environment sections of this report have been deleted. See response to Sovereign Nations 2-1 for discussion of a planned comprehensive study.

Comment Code: Sovereign Nations 2-11

Location of EIS Revision(s): Volume 1, Appendix I, Attachment F

Response: The land use and affected environments sections of this report have been deleted. See response to Sovereign Nations 2-1 for discussion of a planned comprehensive study.

Comment Code: Sovereign Nations 2-12

Location of EIS Revision(s): Volume 1, Appendix I, Attachment F

Response: The land use and affected environments sections of this report have been deleted. See response to Sovereign Nations 2-1 for discussion of a planned comprehensive study.

Comment Code: Sovereign Nations 2-13

Location of EIS Revision(s): None required

Response: Attachment E of Appendix I in Volume 1, "Transportation Study" of the Draft NTS EIS was prepared to address certain transportation concerns raised during scoping for the NTS EIS. The rail access study considered and incorporated the applicable portions of previous studies that considered potential rail routes serving the NTS. These studies included some drafted as part of the Yucca Mountain Project Studies (Figure F-1 was drawn from one of these Yucca Mountain Project Studies). Other sources were city of Caliente corridor studies, a draft report of high-speed surface transportation between Las Vegas and the NTS, and a 1962 Atomic Energy Commission feasibility study at the NTS.

The intent of Attachment E of Appendix I in Volume 1, was to initiate a dialogue regarding the issue of rail and truck transportation options to the NTS. As stated in its introductory section, there was no intent to propose rail as an access alternative in the NTS EIS. Any future proposal would be subject to appropriate National Environmental Policy Act analysis, including consultation with the Sovereign Nations and public input, when and if it is ripe for decision.

This attachment has been revised in the Final NTS EIS to remove any confusion created in the Draft version.

The Yucca Mountain Repository EIS will be prepared to consider the potential environmental impacts associated with the construction, operation, and eventual closure of a repository at Yucca Mountain, Nevada. It will include analysis of transportation of spent nuclear fuel and high-level radioactive waste from producer and generator sites across the nation. As stated in Volume 1, Section 3.2.6.1 of the NTS EIS, the Repository EIS will incorporate information from the NTS EIS and other EISs as appropriate, to support its analysis. The CGTO, along with all other organizations and members of the public, will have the opportunity to review and comment on the Draft Repository EIS when it has been released, and the DOE will again consider and respond to these comments as part of finalizing the Repository EIS.

Comment Code: Sovereign Nations 2-14

Location of EIS Revision(s): Volume 1, Appendix I, Attachment E

Response: The location of the Moapa Paiute Indian Reservation has been added to Figures E-2 and E-4.

Comment Code: Sovereign Nations 2-15

Location of EIS Revision(s): Volume 1, Appendix I, Attachment E

Response: Figures E-2 and E-4 have been corrected.

Comment Code: Sovereign Nations 2-16

Location of EIS Revision(s): Volume 1, Appendix I, Attachment F

Response: This section has been deleted from the text in response to Comment Code Sovereign Nations 2-11.

Comment Code: Sovereign Nations 2-17

Location of EIS Revision(s): Volume 1, Appendix I, Attachment E

Response: The term "Indian Reservation" has been deleted from Figure E-1 for consistency since no other reservations were identified. As part of the ongoing comprehensive American Indian transportation issues study, new and better maps that correctly identify the affected reservations will be drawn.

Comment Code: Sovereign Nations 2-18

Location of EIS Revision(s): Volume 1, Appendix I, Attachment E

Response: This section has been deleted from the text in response to Comment Code Sovereign Nations 2-11.

Comment Code: Sovereign Nations 2-19

Location of EIS Revision(s): Volume 1, Appendix I, Attachment E

Response: This section has been deleted from the text response to Comment Code Sovereign Nations 2-11.

Comment Code: Sovereign Nations 2-20

Location of EIS Revision(s): Volume 1, Appendix I, Attachment E

Response: The stated purpose of this discussion has been rewritten to indicate that it is provided as an introduction to any reader of alternate transportation options for radioactive and hazardous waste, and as a basis for beginning future discussions, which, for the NTS, will include full government-to-government consultation between the DOE and American Indian tribal governments.

Comment Code: Sovereign Nations 3-1

Location of EIS Revision(s): None required

Response: The DOE acknowledges the position of the Western Shoshone National Council.

Comment Code: Sovereign Nations 4-1

Location of EIS Revision(s): Volume 1, Section 5.1.1.12

Response: The comment is correct when it states that all members of the American Indian groups that have well-established cultural ties to the NTS would be equally affected, and that groups that live closer to the NTS would not be more severely affected than groups that live farther away. The reference to Figure 4-48 in Volume 1, Section 5.1.1.12 was intended to show that potential impacts to American Indian groups are not related in proximity to the NTS. This has been clarified in the text in Volume 1, Section 5.1.1.12.

Comment Code: Sovereign Nations 5-1

Location of EIS Revisions(s): None required

Response: The DOE acknowledges the additional concerns regarding issues related to the long-term effects of radiation exposure, nuclear waste transportation and storage, environmental justice, health, and socioeconomics. The DOE also believes these to be important issues, and will continue these discussions with the Sovereign Nations through continuing government-to-government consultation.

State Government

Comment Code: State Government 1-1

Location of EIS Revision(s): Volume 1, Section 1.6 and 3.6

Response: The recommendation for identifying the Preferred Alternative is noted. The Final NTS EIS describes the DOE's preferred alternative in Volume 1, Section 3.6.

Comment Code: State Government 2-1

Location of EIS Revision(s): None required

Response: The initial land withdrawal which created the Nevada Test Site (NTS) specifically acknowledged the primary purpose of the NTS as a weapons testing site. The various secondary activities pursued by DOE and its predecessor agencies at the NTS have all been compatible with the primary purpose for which the land was withdrawn. The DOE will consult with the Department of the Interior and engage in the appropriate process to ensure that future activities being contemplated by the DOE are undertaken in compliance with applicable federal land law and policy. See also the discussion in Section 1.4 of Volume 3.

Comment Code: State Government 2-2

Location of EIS Revision(s): None required

Response: The DOE disagrees with the comment's characterization of the No Action Alternative. The DOE has defined No Action as the continuation of past and current activities. This is consistent with guidance provided by the Council on Environmental Quality (46 FR 18026, March 23, 1981). The NTS presently serves as a disposal site for low-level waste generated by DOE-approved generators. Moreover, managed radioactive waste-disposal operations began at the NTS in the early 1960s, and waste has been disposed of in selected pits, trenches, landfills, and boreholes. Alternative 1 (No Action) acknowledges this historic use of the NTS, and would continue these current operations so that DOE could provide waste disposal capabilities to NTS generators and to currently approved off-site DOE waste generators. Alternative 2 evaluates the cessation of activities.

Comment Code: State Government 2-3

Location of EIS Revision(s): None required

Response: The DOE agrees with the state's comments concerning the importance of protecting people from exposure to contamination and has implemented numerous safeguards to protect workers and the public from exposure to radioactive elements at the NTS. In that regard, the current land withdrawals are of unlimited duration and, as Nevada notes, the State Legislature has consented to these withdrawals.

The DOE has never claimed exclusive jurisdiction nor does it intend to acquire exclusive jurisdiction over the NTS. By letter of November 22, 1968, DOE's predecessor agency, the U.S. Atomic Energy Commission, responded to Nevada's cession of jurisdiction pursuant to N.R.S. 328.170, by accepting concurrent civil and criminal jurisdiction with the state of Nevada. Also, Nevada has historically exercised jurisdictional authority at the NTS pursuant to several environmental statutes, including the Resource Conservation and Recovery Act, the Clean Air Act and the Clean Water Act, and continues to do so.

The State's commitment to protect both the people and the environment is well known and shared by the DOE. In view of this commitment, it is not reasonably foreseeable that access to any contaminated areas at the NTS will cease to be controlled. Furthermore, to the extent that certain areas cannot be remediated to levels which would permit return to public land status, the DOE has begun informal consultations with the Department of the Interior to ensure that future activities being contemplated by the DOE are undertaken in compliance with applicable federal law and current land management policy.

The DOE strongly encourages the state to take every opportunity provided under federal law to be involved in DOE plans and activities to ensure that the health and safety of employees and the public are adequately protected.

Comment Code: State Government 2-4

Location of EIS Revision(s): None required

Response: The DOE has established an environmental restoration program whose focus is to identify clean-up actions and requirements in consultation with the state of Nevada. It is not clear at this time that those levels will be background or some other level defined by the future use of the land. The DOE has established a program to ensure that the public does not have unrestricted access to lands on the NTS. These programs have been and continue to be effective in isolating contamination and over the 10-year period examined in this EIS are expected to continue to be effective. See previous response to Comment Code State Government 2-3.

Comment Code: State Government 2-5

Location of EIS Revision(s): Volume 1, Introduction

Response: The text in Volume 1 has been modified to describe the relationship between the *Resource Management Plan* and the NTS EIS. See Volume 2 and Section 1.7 in Volume 3.

Comment Code: State Government 2-6

Location of EIS Revision(s): Volume 1, Introduction

Response: The Introduction to Volume 1 explains more fully the DOE's policy regarding the principles of ecosystem management and sustainable development.

Comment Code: State Government 2-7

Location of EIS Revision(s): None required

Response: In Volume 1 of the NTS EIS, the change in DOE policies regarding land and facility use is discussed in Section 2.3, "Purpose and Need for DOE Action." This section describes the *Resource Management Plan* and its relationship to the NTS EIS. Volume 2 discusses in Section 1.3, "Policy and Procedures," the changes in DOE direction and the land-use planning concepts of the Plan. The DOE does not consider it necessary to modify these descriptions.

Comment Code: State Government 2-8

Location of EIS Revision(s): Volume 2, Section 1.3, Section 1.5, and Section 4.4

Response: The DOE agrees that the concepts of resource stewardship and sustainable development should be emphasized in Volume 2. Section 1.3 has been modified to include the concept of sustainable development. Section 1.5 has been modified to emphasize the importance of stewardship of natural resources in the *Resource Management Plan*. The DOE also agrees that the importance of conserving undisturbed land for maintaining ecosystem health and soil-water-biota is important. Therefore, a goal has been added under Section 4.4 of Volume 3 (Land) reflecting the DOE's commitment to protecting undisturbed land as much as possible.

Comment Code: State Government 2-9

Location of EIS Revision(s): None required

Response: The DOE will give serious consideration in the Record of Decision to completing the *Resource Management Plan*. However, a specific schedule for implementation will probably not be finalized in time for publication in the Record of Decision.

Comment Code: State Government 2-10

Location of EIS Revision(s): Volume 1, Section 1.4; and Volume 1, Section 3.2.6.1

Response: The first paragraph of Volume 1, Section 1.4, "Relationship of This Sitewide Environmental Impact Statement and Other Statements," refers the reader to Volume 1, Section 3.2.6.1, for a description of the NTS EIS that the DOE plans to prepare for the Yucca Mountain Project. (The Draft NTS EIS incorrectly referred the reader to Section 3.2.7.1 and the reference has been changed.) Section 3.2.6.1 has been expanded to provide further explanation on why the Yucca Mountain Repository Program is outside the scope of the NTS sitewide EIS. See also Section 1.1 of Volume 3.

Comment Code: State Government 2-11

Location of EIS Revision(s): None required

Response: To the extent necessary, information developed through the Yucca Mountain Project has been used in the NTS EIS. As the *Resource Management Plan* is developed, use of relevant information developed by the Yucca Mountain Project will be made.

Comment Code: State Government 2-12

Location of EIS Revision(s): None required

Response: The comment is incorrect. The National Environmental Research Park was discussed in the Draft NTS EIS. The National Environmental Research Park is part of the Nondefense Research and Development Program under Alternatives 1, 3, and 4. It is identified in Section 3.1.1.4, "Nondefense Research and Development Program under Alternative 1." In Section 3.1.3.4, "Nondefense Research and Development Program under Alternative 3," it is stated that the program described under Alternative 1 would continue. In Section 3.1.4.4, "Nondefense Research and Development under Alternative 4," it is stated that the program described under Alternative 3 would continue. Table 3-4 clearly shows the presence of the Environmental Research Park as part of Nondefense Research and Development. The program is described in Appendix A, "Description of Projects and Activities," in Section A.4.1.5.

Comment Code: State Government 2-13

Location of EIS Revision(s): None required

Response: The designation of a landmark by the National Park Service under the National Natural Landmarks Program is a voluntary act by the landowner or land manager. Protection of these landmarks is likewise voluntary. Adverse impacts to this large landmark over the next 10 years from any of the alternatives examined in the NTS EIS are not expected to occur.

Comment Code: State Government 2-14

Location of EIS Revision(s): None required

Response: Consistent with the DOE implementation plan in response to the Defense Nuclear Facilities Safety Board Recommendation 94-2, DOE performance assessments will be a composite analysis of pre- and post-1988 waste plus other interactive source terms. This analysis will comply with DOE Order 5820.2A and Recommendation 94-2. While not yet completed, it is expected that performance objectives will be met.

Changes to DOE Order 5820.2A have not yet been determined and cannot be included in the Final NTS EIS. It is more appropriate to discuss changes to the Order after it has been amended.

Comment Code: State Government 2-15

Location of EIS Revision(s): None required

Response: DOE Order 5820.2A requires that "field organizations with disposal sites shall prepare and maintain a site specific radiological performance assessment for the disposal of waste for the purposes of demonstrating compliance with the performance objectives..." There is no requirement that waste disposal cease until a performance assessment is prepared. The DOE has prepared and continues to maintain performance assessments for the Area 3 and Area 5 Radioactive Waste Management Sites.

The Area 5 Radioactive Waste Management Site Performance Assessment was completed in February 1992 and submitted to the DOE Peer Review Panel. Based on DOE Peer Review Panel comments, the revised Performance Assessment was prepared in June of 1995 (Shott et al. 1995). The revised Area 5 Performance Assessment is currently under review by the DOE Peer Review Panel. A final version reflecting the DOE Peer Review comments is expected to be completed by January 1997.

The DOE plans to maintain the Area 5 Performance Assessment as required by DOE Order 5820.2A. A separate performance assessment is being prepared to evaluate the Fernald Operable Unit 4 Waste, a waste stream not previously evaluated in the Area 5 Performance Assessment. This analysis is expected to be completed in September 1996. An update of the Area 5 Performance Assessment is scheduled to be completed in October 1998. This revision will evaluate all collocated waste types (low-level waste, mixed, and transuranic) disposed of since the beginning of the DOE operations and any residual soil or groundwater contamination from the DOE operations as requested by the Defense Nuclear Facilities Safety Board in their Recommendation 94-2.

The first Draft Performance assessment for the Area 3 Radioactive Waste Management Site was prepared in September 1991 (ORNL, 1991). This revision will consider all collocated waste types and any residual radioactivity left in place by DOE operations. In addition, this revision will be based on new site characterization data collected in Fiscal Years 1996 and 1997. Site-specific conceptual models will be refined based on the results of site-characterization studies. Preliminary analysis of data collected during Fiscal Year 1995 supports the "no groundwater pathway" conceptual model.

Thus, the DOE believes it has sufficient existing information to support its conclusion that current and proposed disposal operations do not result in unacceptable impacts and has used this information in the development of the NTS EIS.

Comment Code: State Government 2-16

Location of EIS Revision(s): None required

Response: DOE is required to describe the affected environment in sufficient detail to inform the public and decisionmakers of the potential impacts of the proposed action and alternatives. The NTS EIS summarizes information on the environmental fate of the radiological source in sufficient detail to inform the reader and the decisionmakers regarding potential environmental impacts. Maps of the distribution of radionuclides on the NTS are in Volume 2, *The Framework for Resource Management Plan* (Plates 3 and 4). Regulatory standards have not been established for soils; clean-up standards will be determined in consultation with state regulatory agencies during the Environmental Restoration Program. These standards will be applied to not only the NTS, but also to the Tonopah Test Range, the Project Shoal Area, and the Central Nevada Test Area.

Comment Code: State Government 2-17

Location of EIS Revision(s): None required

Response: The DOE believes that sufficient information is provided concerning the radionuclide source term in the unsaturated zone, in that an entire subsection of the NTS EIS is devoted to this topic (Subsurface Radiologic Sources in Section 4.1.4.2). This section details the best available estimates for the remaining inventory of radionuclide activity from shallow borehole and deep borehole tests. See Section 1.10 of Volume 3.

Comment Code: State Government 2-18

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: Additional text has been added to the NTS EIS about these two programs.

Comment Code: State Government 2-19

Location of EIS Revision(s): None required

Response: Information concerning the areas of superficial contamination is provided in Section 4.1.4.3, Radiological Sources in Soil; and in Plates 3 and 4 of the *Framework for Resource Management Plan.*

Comment Code: State Government 2-20

Location of EIS Revision(s): Volume 1, Appendix A, Section A.2.1.2, and Chapter 2, Section 2.4.2; Volume 1, Chapter 3, Section 3.1.3.2

Response: Text has been added to the Final NTS EIS to explain the term "special case waste" in the context of the NTS Waste Management Program. Refer to Section 1.12 of Volume 3 for a discussion of this issue.

Comment Code: State Government 2-21

Location of EIS Revision(s): Volume 1, Section 2.4.2

Response: The term "special case waste" is not a formal waste category, but rather is an informal designation DOE uses for low-level waste that may require measures beyond normal low-level waste disposal procedures to meet waste acceptance criteria. Refer to Section 1.12 of Volume 3.

Comment Code: State Government 2-22

Location of EIS Revision(s): Volume 1, Appendix A, Sections A.2.1.2, A.2.3.2, and Chapter 2, Section 2.4.2; Volume 1, Chapter 3, Section 3.1.3.2

Response: The DOE is in the early stages of planning for the management of greater-than-Class-C low-level waste. Appropriate National Environmental Policy Act documentation will be prepared when a proposal for action is formulated. Refer to Section 1.12 of Volume 3.

Comment Code: State Government 2-23

Location of EIS Revision(s): None required

Response: "Environmental Consequences" are described in Chapter 5. Baseline information is presented in Chapter 4. The project or activity-specific information upon which the analysis was based is in Appendix A. The methods of analysis are described in Appendix E.

Comment Code: State Government 2-24

Location of EIS Revision(s): None required

Response: The DOE believes that state-of-the-art assessment methodologies have been used in the NTS EIS.

Comment Code: State Government 2-25

Location of EIS Revision(s): Volume 1, Chapter 6

Response: The Chapter on "Cumulative Impacts" has been expanded in the Final NTS EIS. This includes a broader discussion of the methods used and an expansion of the base against which the cumulative impacts have been derived. A more quantitative approach to the analyses has also been included in the Final NTS EIS.

Comment Code: State Government 2-26

Location of EIS Revision(s): Volume 1, Chapter 6

Response: The information in Chapter 6, "Cumulative Impacts," has been expanded in the Final NTS EIS. See the response to Comment Code State Government 2-25. The analyses were conducted to ensure that they inform the reader of the cumulative impacts of each alternative.

Comment Code: State Government 2-27

Location of EIS Revision(s): Volume 1, Chapter 6 and Appendix I

Response: An expanded assessment of impacts from the past, present, and foreseeable future transportation of radioactive wastes and special nuclear materials has been added to Volume 1, Chapter 6 and Appendix I. This would account for potential activities included in Alternative 3 in which other DOE sites would transport low-level waste and mixed waste to the NTS for disposal. As a separate action, special nuclear materials (plutonium and highly enriched uranium) would be sent to the NTS for demilitarization activities and storage.

Comment Code: State Government 2-28

Location of EIS Revision(s): Volume 1, Chapter 6

Response: The information in Chapter 6, "Cumulative Impacts," has been expanded in the Final NTS EIS. This includes an evaluation of the impacts from transportation in the state of Nevada. See the response to Comment Code State Government 2-25.

Comment Code: State Government 2-29

Location of EIS Revision(s): Volume 1, Chapter 6

Response: Volume 1, Appendix H, assesses the human health risks associated with the treatment, storage, and disposal of radioactive waste and special nuclear material at the NTS. Volume 1, Appendix I, assesses the human health risks associated with the transportation of radioactive waste and special nuclear material. Chapter 5 of the NTS EIS summarizes the results of the risk studies documented in Appendices H and I. The Cumulative Impact Analysis in Chapter 6 has been revised to assess the cumulative effect of these NTS actions along with other past, present, and reasonably foreseeable actions in that region.

Comment Code: State Government 2-30

Location of EIS Revision(s): Volume 1, Chapter 3, Section 3.2.6.1, and Volume 1, Chapter 6

Response: Section 3.2.6.1 has been revised to clarify that the only activities currently authorized at Yucca Mountain are site characterization activities to determine the suitability of the site for development as a repository. The discussion also now notes that the NTS EIS includes site characterization activities at Yucca Mountain in the discussion of the existing environment at the NTS (Chapter 4), as well as in the analysis of cumulative impacts (Chapter 6).

Possible future activities at Yucca Mountain, such as construction, operation, and closure of a repository, are dependent on the DOE's first determining that the site is suitable, recommending to the President that the site be developed as a repository, and obtaining Congressional authorization, as well as a Nuclear Regulatory Commission license. These actions, if they occur, are beyond the 10-year timeframe covered by this EIS.

The cumulative impacts associated with developing a potential repository at Yucca Mountain, including transportation of wastes by highway and rail, added to other past, present, and reasonably foreseeable actions at the NTS and the surrounding region, will be analyzed in the Repository EIS. The Repository EIS will consider the information presented in this NTS EIS, as well as other National Environmental Policy Act documents, and will update that information to the extent that it is relevant to the analysis and to the extent that additional information is available.

See additional discussion of this topic in Section 1.1 of Volume 3.

Comment Code: State Government 2-31

Location of EIS Revision(s): Volume 1, Chapter 6

Response: The information in Chapter 6, "Cumulative Impacts," has been expanded in the Final NTS EIS. See the response to Comment Codes State Government 2-25 and 2-28.

Comment Code: State Government 2-32

Location of EIS Revision(s): None required

Response: By social/cultural/political impacts, it is assumed that the comment is referring to stigma effects. Potentially stigmatizing effects of various NTS activities do not seem to have affected the economy negatively in southern Nevada. See additional response under Section 1.9 of Volume 3.

Comment Code: State Government 2-33

Location of EIS Revision(s): None required

Response: The analysis of employment and population is a necessary element in the identification of impacts on other socioeconomic elements such as local government revenue and expenditures, housing, and public services. Population increases, for example, do not necessarily result in positive contributions to state and local economics. If unusually large population increases occur as a result of a project over a short period of time, it has the potential for adversely affecting the housing market and public services in a community, at least over a short period. NTS-related activities, even under Alternative 3 (Expanded Use Alternative), would not result in unusually large population increases (638 people or 0.06 percent of the Clark County 1996 population). Nonetheless, impacts on housing and local government revenue and expenditures are presented in the Public Finance segments of the Socioeconomic section.

Comment Code: State Government 2-34

Location of EIS Revision(s): None required

Response: The DOE believes that the NTS EIS does evaluate the potential for negative socioeconomic impacts from NTS-related growth. Population increases associated with NTS-related activities would be generated by jobs. If increased obligations do occur as a result of decisions made by the federal government, NTS employees would continue to contribute funds to the local budget in the form of fees, taxes, etc. Any gap between revenues and expenditures for public services would occur no matter which alternative is chosen by the DOE. For additional information, see response to Comment Code State Government 2-33.

Comment Code: State Government 2-35

Location of EIS Revision(s): None required

Response: See discussion in Section 1.9 in Volume 3.

Comment Code: State Government 2-36

Location of EIS Revision(s): None required

Response: See discussion in Section 1.9 in Volume 3.

Comment Code: State Government 2-37

Location of EIS Revision(s): None required

Response: See discussion in Section 1.9 in Volume 3.

Comment Code: State Government 2-38

Location of EIS Revision(s): None required

Response: Four cooperating agencies participated in the preparation of this EIS (Bureau of Land Management, U.S. Air Force, Nye County, and U.S. Fish and Wildlife Service). These agencies were contacted to provide information and data used to develop the environmental baseline for the sites examined in the document and they reviewed preliminary drafts of the NTS EIS. *Resource Management Plans* prepared by these agencies, particularly the Bureau of Land Management, for federal lands near the project sites were reviewed, and resource management policies of these agencies will be considered in developing the NTS *Resource Management Plan*. In addition, Nye County was a cooperating agency and provided information on socioeconomic conditions of use in the NTS EIS.

Comment Code: State Government 2-39

Location of EIS Revision(s): Volume 1, Section 1.1 and Section 2.2

Response: The NTS EIS contains the project-level National Environmental Policy Act analysis for the use of the Big Explosives Experimental Facility. The purpose and impacts of the Big Explosives Experimental Facility tests are discussed in detail in Appendix F, Section F.5.1, and impacts from expanded use of the Big Explosives Experimental Facility (Alternative 3) are discussed in detail in Section F.5.2. Environmental effects identified in Appendix F are also included in Chapter 5, Environmental Consequences. If substantially different activities or levels of activities are proposed for the Big Explosives Experimental Facility in the future, appropriate National Environmental Policy Act reviews would be conducted. The DOE believes that the analysis of this facility in the NTS EIS is sufficient to allow informed decisions to be made concerning this facility. The relationship between Appendix F and the NTS EIS has been clarified in Chapters 1 and 2 of Volume 1.

Comment Code: State Government 2-40

Location of EIS Revision(s): None required

Response: Comment noted. The DOE believes that the analysis of this facility in the NTS EIS is sufficient to allow for decisions to be made concerning this facility. If substantially different activities or levels of activities are proposed for the Lyner Complex in the future, appropriate National Environmental Policy Act reviews would be conducted.

Comment Code: State Government 2-41

Location of EIS Revision(s): None required

Response: The focus of Volume 1, Appendix H, is the assessment of human health risks associated with activities proposed under the four EIS alternatives. The assessment of impacts to other environmental resources are addressed in other sections of the NTS EIS (e.g., biological resources, geology and soils, hydrology). The assessment of human health risks examines the two exposure pathways, air and groundwater, that have been demonstrated in previous studies to be the pathways of principal concern to human health risks.

Comment Code: State Government 2-42

Location of EIS Revision(s): None required

Response: Volume 1, Appendix H, and its supporting technical references, provide sufficient information to demonstrate that the findings and conclusions of the human health risk study were developed in a credible, scientific manner.

Comment Code: State Government 2-43

Location of EIS Revision(s): None required

Response: The DOE agrees that some evaluations of movement of contaminants within the environment require an ecosystem approach that can be achieved through the principles and guidelines identified in the *Resource Management Plan*. The DOE also agrees that this is relevant to the Environmental Restoration Program. However, the DOE believes that sufficient examples of the benefits of the ecosystem approach are provided in Chapter 3. Volume 2 is not meant to be a comprehensive list of all actions to be considered under this plan.

Comment Code: State Government 2-44

Location of EIS Revision(s): None required

Response: The transportation activities for radioactive and hazardous materials and waste are summarized in Chapter 5 for each of the alternatives. More detailed information on transportation activities are in Appendix I of the NTS EIS.

Comment Code: State Government 2-45

Location of EIS Revision(s): Volume 1, Chapters 5 and 6 and Appendix I

Response: A detailed analysis of the risks associated with the transportation of hazardous and radioactive materials to the NTS has been included in Appendix I, and summarized in Chapter 5. The expected shipments of the following types of material are described in Appendix I: low-level and mixed waste, special nuclear material, and hazardous materials. The impacts associated with the use of petroleum products are addressed in the baseline and environmental impact sections in Chapters 4 and 5. In addition, the assessment of cumulative impacts in Chapter 6 has been expanded to more fully examine the past, present, and foreseeable future impacts of transporting these materials.

Comment Code: State Government 2-46

Location of EIS Revision(s): Appendix I and Volume 1, Chapter 5

Response: Appendix I and Chapter 5 have been modified to address the potential impacts from the transportation of nuclear materials (including plutonium pits and nuclear weapons components), low-level and mixed wastes, and hazardous materials and waste. Transuranic wastes and Type B radioactive materials are not expected to be shipped to the NTS. The estimated volumes and the number of shipments for each waste type analyzed are given in Appendix I and Chapter 5.

Comment Code: State Government 2-47

Location of EIS Revision(s): None required

Response: The potential impacts of activities under each alternative are, including cumulative impacts of transportation, evaluated without regard to the NTS mission program (e.g., waste management, environmental restoration, defense). The transportation risks associated with each alternative are summarized in Chapter 5 and described in detail in Appendix I. Cumulative impacts of the alternatives examined, along with other activities in the region of influence, are described in Chapter 6. The additive impacts of the NTS mission programs are described in Chapter 5. Analysis of the potential health, safety, and transportation risks takes into account a wide range of information including (1) origin and destination of the shipment, (2) quantity of material or waste shipped, (3) radioactive "source term" of the material or waste, (4) shipping container and method of shipment, and (5) shipping route. The qualifications of carriers are defined by the applicable regulations of the U.S. Department of Transportation. Timing of shipments was considered to be the average annual number of shipments over the 10-year period.

Comment Code: State Government 2-48

Location of EIS Revision(s): Appendix I and Volume 1, Chapters 5 and 6

Response: Appendix I and Chapter 5 of the NTS EIS have been modified to include an analysis of risk associated with the transportation of all forms of waste and hazardous materials that may be shipped to the NTS under each alternative. The analysis now includes defense-related materials (e.g., plutonium pits) and other hazardous materials. Furthermore, the cumulative impacts of transportation have been enhanced in Chapter 6.

Comment Code: State Government 2-49

Location of EIS Revision(s): Appendix I and Volume 1, Chapter 5

Response: The comment is correct. The transportation risk calculations have been revised to include all radioactive and hazardous wastes and materials that could be shipped to the NTS over the next 10 years.

Comment Code: State Government 2-50

Location of EIS Revision(s): Appendix I, Volume 1, Chapter 5

Response: The Transportation Study was prepared in a manner that allows the interested reader to review the data that is part of the record for the study and for the NTS EIS. An analysis of the maximum credible transportation accident has been added to Appendix I and summarized in Chapter 5. The consequences of terrorist attacks are not specifically analyzed but the radiological consequences are not believed to be greater than the maximum release scenario presented.

Comment Code: State Government 2-51

Location of EIS Revision(s): None required

Response: The potential health and safety risks associated with the transportation of defense-related nuclear materials are documented in Appendix I and Chapter 5. In 1961, the Area 5 Radioactive Waste Management Site was established at the NTS for the disposal of low-level waste from both on-site and off-site generators. There is no historical evidence that perceptions associated with the transportation of low-level waste to the NTS has affected the economy of Nevada. The potential for negative perceptions that affect the economy of the state resulting from the transport of nuclear waste within Nevada is addressed in Section 1.9 of Volume 3.

Comment Code: State Government 2-52

Location of EIS Revision(s): None required

Response: The Department of Transportation regulations (49 CFR 397.101) require the carrier to select the route. These regulations also give the states the authority to designate routes for Class 7 Radioactive Materials. Refer to the discussion in Section 1.6 of Volume 3 for additional information.

Comment Code: State Government 2-53

Location of EIS Revision(s): None required

Response: The DOE concurs that the inclusion of routing preferences is not in violation of any U.S. Department of Transportation regulation dealing with radioactive or hazardous material shipments. It is not DOE policy to use contract carriers when no added benefit to the public is realized. See Section 1.6 of Volume 3.

Comment Code: State Government 2-54

Location of EIS Revision(s): None required

Response: It is not DOE's position to use contract carriers when common carriers that can meet the regulations are available. No benefit is derived from using a contract carrier instead of a common carrier in this case. Transportation routing decisions are made in compliance with the U.S. Department of Transportation regulations to which both common and contract carriers must comply. See Section 1.6 of Volume 3.

Comment Code: State Government 2-55

Location of EIS Revision(s): Abstract

Response: The Abstract has been modified to incorporate information on the relationship between the NTS EIS and the *Resource Management Plan*. The Abstract is meant to summarize the contents of the NTS EIS and does not address any elements beyond the scope of the NTS EIS. Therefore, the rationale for not including the Yucca Mountain Repository in the NTS EIS is not in the Abstract. However, this rationale is contained in the Summary and in Chapter 3 of the NTS EIS.

Comment Code: State Government 2-56

Location of EIS Revision(s): Summary

Response: The Summary has been modified to include a discussion of the relationship between the *Resource Management Plan* and the NTS EIS, as well as a discussion of the Yucca Mountain Project.

Comment Code: State Government 2-57

Location of EIS Revision(s): None required

Response: The DOE believes that the NTS EIS contains an adequate discussion of the Environmental Research Park. Section 2.4.4 identifies the Environmental Research Park, along with other Nondefense Research and Development Program projects. Section A.4.1.5 in Appendix A provides details of the program. The Environmental Research Park is next mentioned in Section 3.1.1.4, "Nondefense Research and Development Program under Alternative 1." Sections 3.1.3.4 and 3.1.4.4 refer the reader back to Section

3.1.1.4 when describing the Nondefense Research and Development Program under Alternatives 3 and 4. The impacts of Nondefense Research and Development Program activities are analyzed in Chapter 5. See also the response to Comment Code State Government 2-12.

Comment Code: State Government 2-58

Location of EIS Revision(s): Glossary

Response: The definition of "Protective levels" has been added to the Glossary. Protective levels are those levels which would meet acceptable human health and risk factors based on future land uses, as established through the Federal Facility Agreement and Consent Order (State of Nevada, 1996).

Comment Code: State Government 2-59

Location of EIS Revision(s): None required

Response: Section 2.4.2 acknowledges that classified waste is managed at the NTS. Referring to a low-level waste as "classified" denotes waste weapons components and assemblies designated by the U.S. Government pursuant to executive orders, statutes, or regulations that require protection against unauthorized information or material disclosure for reasons of national security. Additional security and safeguard activities are required in the handling of these materials. In all other characteristics, this waste is similar in radionuclide content and physical makeup to the other waste being accepted for disposal.

Classified transuranic waste treatment and disposal options have not yet been developed. At this time, the only disposal option for transuranic waste is the Waste Isolation Pilot Plant, which does not accept classified wastes.

The volume of the classified transuranic waste stored at the NTS Area 5 radioactive waste management site is approximately $54m^3$ and is stored in 295 drums. The radioisotopes that contaminate the waste are primarily Uranium-235, Plutonium-238, and Plutonium-239.

Comment Code: State Government 2-60

Location of EIS Revision(s): Summary and Volume 1, Section 4.1.5

Response: The sentence in question refers to wells, not surface water. For clarity, however, additional text has been added to the Summary and to the Hydrology section, briefly describing the information in Section 4.1.5.

While water drawn from Well UE-5n did have a tritium activity of $2.6x10^4$ pCi/l as noted in the NTS Annual Site Environmental Report - 1994 (DOE/NV, 1995a); this well is not used as a water supply well. Increased tritium in this well is thought to be the result of a radionuclide migration experiment conducted near the well. The list of NTS water supply wells and their radioactivity averages in 1994 is on page 5-38, Table 5.13, of the 1994 NTS Annual Site Environmental Report.

Sampling wells at the Project Faultless site have shown tritium at background levels. As stated in the NTS Annual Site Environmental Report - 1994 (DOE/NV, 1995a), the results "...are consistent with results obtained in previous years, and indicate that migration of radioactivity from the test cavity has not occurred."

Comment Code: State Government 2-61

Location of EIS Revision(s): None required

Response: The Summary is simply a synopsis of information contained in the NTS EIS. Section 2.5, Volume 1, of the NTS EIS includes brief descriptions of other studies that were used to support the NTS EIS. Including information in the Summary on the risks described in these other studies would put the waste management subsection of the Summary out of balance with descriptions of the other programs. There are no references in the Summary to other sections of the NTS EIS. The Reader's Guide is intended to provide information on how to find information in the multi-volume EIS.

Comment Code: State Government 2-62

Location of EIS Revision(s): None required

Response: Alternative 2 was included in this EIS to satisfy the requirement of the National Environmental Policy Act to analyze a full range of alternatives. In Alternative 2, the DOE has analyzed and compared to the other alternatives the potential environmental effects of no restoration.

Comment Code: State Government 2-63

Location of EIS Revision(s): None required

Response: Since National Environmental Policy Act provisions are purely procedural and do not impose substantive requirements, cessation of restoration activities would not violate the National Environmental Policy Act. However, cessation of restoration activities would be inconsistent with the Resource Conservation and Recovery Act permit for the NTS and with signed agreements with the state of Nevada.

Comment Code: State Government 2-64

Location of EIS Revision(s): Summary

Response: As stated in Section 5.5.1.1 with regard to subcritical tests in the Lyner Complex, "Irreversible effects would include the deposition of radiological material within and near the cavity mined in the subsurface." The text in the Summary under Unavoidable Adverse Impacts has been revised to include this wording.

Comment Code: State Government 2-65

Location of EIS Revision(s): Volume 1, Introduction

Response: The Introduction to Volume 1 has been modified in the Final NTS EIS to include additional information about the Yucca Mountain Project and the relationship between the NTS EIS and the *Resource Management Plan.*

Appendix F explains the status of the Big Explosives Experimental Facility with regard to National Environmental Policy Act review.

Comment Code: State Government 2-66

Location of EIS Revision(s): None required

Response: The Public Land Orders withdrawing the NTS are discussed fully in Section 4.1.1.1 of Volume 1.

Comment Code: State Government 2-67

Location of EIS Revision(s): Volume 1, Chapter 1, Section 1.4

Response: The reference to Section 3.2.7.1 has been changed to Section 3.2.6.1.

Comment Code: State Government 2-68

Location of EIS Revision(s): None required

Response: This EIS is a type of programmatic EIS. It evaluates the impacts of potential actions, as well as ongoing and planned specific activities. Activities proposed after this Final EIS is published will receive a case-by-case evaluation and, if necessary, a National Environmental Policy Act document will be prepared.

The footprint and resource requirements for the heavy industrial facilities have been described in the impact analysis for Alternative 3. The NTS may at some time be considered for siting of a mixed-oxide fuel facility, which is one of the alternative technologies evaluated in the Storage and Disposition of Weapons-Usable Fissile Materials Programmatic EIS, and also for a commercial satellite launch-and-recovery facility (a Nondefense Research and Development Program). These possible activities are bounded by the general evaluation of the large, heavy-industrial facility identified in Alternative 3. Once these or other proposals become more defined, additional National Environmental Policy Act reviews will be conducted in the context of the programmatic heavy-industrial-facility analysis, and further refined as necessary.

Comment Code: State Government 2-69

Location of EIS Revision(s): None required

Response: The comment is correct. Both programmatic EISs address the storage of strategic reserves of plutonium. This allows the full coverage of the alternatives for managing these reserves of plutonium. The DOE has stated that no decision will be made until both EISs have been completed. The DOE's Stockpile Stewardship and Management Programmatic Environmental Impact Statement acknowledges that there is a potential overlap with the Storage and Disposal Programmatic EIS regarding storage of strategic reserves of plutonium. The Storage and Disposal Programmatic EIS considered strategic reserves of Special Nuclear Material. Because the storage of strategic reserves is covered in both Programmatic EISs, the decision for location of storage of strategic reserves will not be made until completion of both Programmatic EISs, in a Record of Decision that will jointly consider both proposals.

Comment Code: State Government 2-70

Location of EIS Revision(s): None required

Response: See response to Comment Code State Government 2-69. Consideration of the combined analyses in the two Programmatic EISs assure that all reasonable possible uses of the Device Assembly Facility are addressed.

Comment Code: State Government 2-71

Location of EIS Revision(s): Volume 1, Chapter 1, Section 1.4

Response: The NTS is also a candidate site for the disposition facilities that are described in Section 2.4 of the Storage and Disposition of Weapons-Usable Fissile Materials Programmatic EIS. The text in Section 1.4 of the NTS EIS has been revised accordingly.

Comment Code: State Government 2-72

Location of EIS Revision(s): None required

Response: Decisions concerning future uses of the NAFR Complex will be the subject of an EIS to be prepared by the U.S. Air Force. Scoping for that EIS has not begun and it is inappropriate for the DOE to speculate on the results of that EIS. Potential impacts to DOE operations from proposed and alternative actions by the U.S. Air Force should be examined in the Air Force's EIS. Access and control of Double Tracks and other environmental restoration sites on the NAFR Complex are not expected to change.

Comment Code: State Government 2-73

Location of EIS Revision(s): None required

Response: DOE Order 5820.2A, Chapter III, Paragraph 3,b, (1) requires that "Field organizations with disposal sites shall prepare and maintain a site-specific radiological performance assessment for the disposal of waste..." A performance assessment is not required to be completed before waste is disposed of. Further, there is no requirement in the Order that the waste acceptance criteria be based on a completed performance assessment. See also the response to Comment Code State Government 2-15.

Comment Code: State Government 2-74

Location of EIS Revision(s): None required

Response: Refer to the discussion in Section 1.4 of Volume 3.

Comment Code: State Government 2-75

Location of EIS Revision(s): None required

Response: See response to Comment Code State Government 2-3.

Comment Code: State Government 2-76

Location of EIS Revision(s): None required

Response: See response to Comment Code State Government 2-20.

Comment Code: State Government 2-77

Location of EIS Revision(s): None required

Response: See response to Comment Code State Government 2-20.

Comment Code: State Government 2-78

Location of EIS Revision(s): References, Volume 1, Section 4.8

Response: Pertinent data on biology and reclamation developed from the Yucca Mountain Project were used in the preparation of the NTS EIS (additional references have been added to Section 4.8, "References.")

Comment Code: State Government 2-79

Location of EIS Revision(s): None required

Response: Major studies listed in Figure 2-1 are described in detail in the various volumes of the NTS EIS. The biological-ecological studies and information about reclamation studies (including the Yucca Mountain Project) are in the box in Figure 2-1 labeled, "NTS Environmental Impact Statement." See also response to Comment Code State Government 2-78.

Comment Code: State Government 2-80

Location of EIS Revision(s): Volume 1, Chapter 2, Section 2.5.5

Response: Clarification of the scope of the performance evaluation (across the entire weapons complex) has been added to Section 2.5.5 as recommended. The introduction to the Performance Evaluation section has also been updated to include a reference which provides additional information on performance evaluations.

As discussed in Section 2.5.5, the performance evaluation process is being conducted by the DOE, in collaboration with states, to compare the potential technical capabilities of the DOE sites for mixed waste disposal. It is not being undertaken as a part of a National Environmental Policy Act evaluation, but as a mechanism to satisfy state disposal concerns related to the Federal Facilities Compliance Act. As noted in the comment and in Section 2.5.5, it does provide information that is relevant to the final disposition of low- level mixed waste. The results of the performance evaluations provide a scoping-level analysis to compare the strengths and weaknesses of 15 DOE sites for disposal of mixed waste using simple, conservative, and consistent analysis. This information will be factored into the DOE's decision-making process for both the NTS EIS and the Waste Management PEIS.

Comment Code: State Government 2-81

Location of EIS Revision(s): None required

Response: Based on the analysis in Chapter 5 of Volume 1, DOE believes that the referenced statements are correct, and that no credible groundwater pathway exists. Plans for the next revision of the Area 3 Performance Assessment are discussed in the response to Comment Code State Government 2-15. New conceptual models of the performance of the Area 3 Radioactive Waste Management Site will be based on the results of site characterization data collected up through Fiscal Year 1996. A groundwater pathway will be evaluated if site characterization data cannot demonstrate conclusively that transport to the uppermost aquifer is physically impossible within the compliance period.

The estimated performance assessment schedule is provided in Chapter 2, Section 2.5.6.1 and Appendix A, Section A.2, of this EIS. The estimated schedule for completion is not appropriate for inclusion into the Record of Decision.

Comment Code: State Government 2-82

Location of EIS Revision(s): None required

Response: Initial characterization of the zone under the disposal craters in Area 3 suggest that there are no consistent differences between the properties in the rubble chimney and the undisturbed area. Characterization of the alluvium under the disposal units is continuing to take place. The final results of this analysis will provide information that can be used to determine detailed vertical flow parameters. Results of this analysis will be incorporated into the Area 3 performance assessment. See the response to Comment Code State Government 2-15 for more information on performance assessments.

Comment Code: State Government 2-83

Location of EIS Revision(s): None required

Response: See response to Comment Codes State Government 2-81, 2-82, and 2-15.

Comment Code: State Government 2-84

Location of EIS Revision(s): None required

Response: See response to Comment Codes State Government 2-15, 2-81, and 2-82.

Comment Code: State Government 2-85

Location of EIS Revision(s): Volume 1, Chapter 2; Volume 1, Appendix A

Response: Section 2.5.6.2 has been rewritten and refers generally to composite analyses to be performed to analyze the long-term impacts of disposal operations at the Areas 3 and 5 Radioactive Waste Management Sites. The performance assessment discussion of the transuranic waste in Trench T04C has been updated and moved from Volume 1, Section 2.5.6.2 to Volume 1, Section A.2. DOE has conducted a preliminary performance assessment, and believes that additional evaluation is required. Current plans call for an additional performance assessment review to determine whether the waste site can be closed with the waste left in place, or retrieved and subsequently disposed of in a system that meets the 40 CFR 191 performance objectives. The text in Section A.2 has been revised to reflect these plans.

Comment Code: State Government 2-86

Location of EIS Revision(s): Volume 1, Section 2.5.6.2; Volume 1, Section A.2

Response: The discussion of transuranic waste performance assessments has been moved to Appendix A. Section 2.5.6.2 has been rewritten and refers generally to composite analyses to be performed to analyze the long-term impacts of disposal operations at the NTS. In 1990, the DOE suspended use of the Greater Confinement Disposal boreholes in Area 5 pending a review of the regulatory requirements and available options under the Safe Drinking Water Act. In 1993, the Environmental Protection Agency published a clarification of the regulations contained in 40 CFR Part 191 (58 FR 66408) which concluded that the underground disposal of containerized radioactive waste in geologic repositories subject to Part 191 is not "underground injection," and thus, not prohibited under the Safe Drinking Water Act. The DOE is aware that the state of Nevada has not recognized the EPA's 1993 clarification.

The DOE has been conducting a performance assessment to evaluate whether the waste emplaced in the Greater Confinement Disposal boreholes is otherwise in compliance with the Part 191 regulations. As stated in the NTS EIS, Volume 1, Section A.2, "Greater Confinement Disposal Performance Assessment:" "Based on the second performance assessment, the Greater Confinement Disposal Unit is in compliance with the containment standard for limits on cumulative releases of radiation to the accessible environment." Therefore, it will not be necessary for the DOE to take further action to bring the Greater Confinement Disposal boreholes into compliance with applicable standards. Furthermore, there is no evidence to suggest that contamination resulting from the emplacement of transuranic waste in greater confinement disposal has occurred.

Comment Code: State Government 2-87

Location of EIS Revision(s): None required

Response: Refer to the discussion in Section 1.4 of Volume 3 and the response to Comment Code State Government 2-1.

Comment Code: State Government 2-88

Location of EIS Revision(s): None required

Response: Refer to the discussion in Section 1.4 of Volume 3 and see responses to Comment Codes State Government 2-1 and 2-2.

Comment Code: State Government 2-89

Location of EIS Revision(s): None required

Response: Funding for demilitarization demonstration projects was provided in the National Defense Authorization Act for Fiscal Year 1993 (NDAA, 1992), under the heading High Energetic Explosives Research Program.

Comment Code: State Government 2-90

Location of EIS Revision(s): None required

Response: If Congress completes an action related to "interim storage" and the NTS, that action and direction would be evaluated in terms of the National Environmental Policy Act and analysis and documentation would be prepared, as appropriate.

Comment Code: State Government 2-91

Location of EIS Revision(s): Volume 1, Section 1.4

Response: The comment concerning the continued use of Pahute Mesa by the DOE is noted. The DOE currently manages Pahute Mesa under a Memorandum of Understanding between the U.S. Air Force and the DOE signed June 10, 1982 (DoD, 1982). A statement has been added to Section 1.4 under "NAFR Complex EIS" that DOE operations on Pahute Mesa could be affected by decisions associated with the NAFR Complex EIS. See Section 1.5 of Volume 3.

Comment Code: State Government 2-92

Location of EIS Revision(s): None required

Response: Refer to the discussion in Section 1.4 of Volume 3 and see responses to Comment Codes State Government 2-1 and 2-2.

Comment Code: State Government 2-93

Location of EIS Revision(s): None required

Response: The *Resource Management Plans* developed by agencies such as the Bureau of Land Management and the U.S. Air Force, which are two major land owners that adjoin the NTS, recognize NTS activities. The new operations examined under the four alternatives would not be expected to significantly and adversely affect the management of these surrounding lands and would, therefore, be compatible with the management plans developed by these agencies. Moreover, the Bureau of Land Management, the U.S. Air Force, as well as the U.S. Fish and Wildlife Service (which administers land to the east of the NTS), were cooperating agencies in preparing the NTS EIS.

Comment Code: State Government 2-94

Location of EIS Revision(s): None required

Response: As decisions are reached based on the Final NTS EIS referenced in this comment (and discussed in Section 1.4, of Volume 1, of the NTS EIS), the need for additional National Environmental Policy Act documents would be reviewed. Questions such as conflicts with federal plans and policies would be evaluated.

Comment Code: State Government 2-95

Location of EIS Revision(s): None required

Response: Refer to the discussion in Section 1.4 of Volume 3.

Comment Code: State Government 2-96

Location of EIS Revision(s): Volume 1, Sections 2.4.2, 3.1.3.2, and A.2.1.2

Response: See Section 1.12 of Volume 3.

Comment Code: State Government 2-97

Location of EIS Revision(s): Volume 1, Sections 2.4.2, 3.1.3.2, and A.2.1.2

Response: Refer to Chapter 5, Volume 1 for a discussion of the analysis. See Section 1.12 of Volume 3.

Comment Code: State Government 2-98

Location of EIS Revision(s): Volume 1, Sections 2.4.2, 3.1.3.2, and A.2.3.2

Response: See Section 1.12 of Volume 3.

Comment Code: State Government 2-99

Location of EIS Revision(s): Volume 1, Section 2.5.6.1

Response: The DOE plans to complete composite analyses and performance assessments for the Areas 3 and 5 Radioactive Waste Management Sites. The Area 3 Draft Performance Assessment and composite analyses is scheduled for completion in March 1998. The Area 5 Composite Analyses is scheduled for completion in September 1999. Text has been added to the NTS EIS to reflect the fact that these will be performance assessments and composite analyses.

Comment Code: State Government 2-100

Location of EIS Revision(s): None required

Response: Refer to the discussion in Section 1.4 of Volume 3 and response to Comment Code State Government 2-1.

Comment Code: State Government 2-101

Location of EIS Revision(s): None required

Response: Refer to the response to Comment Code State Government 2-3.

Comment Code: State Government 2-102

Location of EIS Revision(s): None required

Response: Refer to the response to Comment Code State Government 2-13.

Comment Code: State Government 2-103

Location of EIS Revision(s): None required

Response: Refer to the response to Comment Code State Government 2-2.

Comment Code: State Government 2-104

Location of EIS Revision(s): None required

Response: See response to Comment Code State Government 2-30.

Comment Code: State Government 2-105

Location of EIS Revision(s): None required

Response: As stated in the referenced Memorandum of Agreement between the DOE Nevada Operations Office (DOE/NV) and the Yucca Mountain Site Characterization Office, the intent of the agreement is to "obtain from DOE/NV certain support necessary for the operation of the Yucca Mountain Site Characterization Office and the performance of its mission; obtain for the Yucca Mountain Site Characterization Office the authority to conduct its programmatic activities on the NTS to the extent consistent with DOE regulations and policies; clarify responsibilities for Yucca Mountain Site Characterization Project programs and operations; and foster coordination and communication between the parties in order to avoid adverse impacts in the performance of their respective missions." The Memorandum of Agreement is identified in Volume 2, *Framework for Resource Management Plan,* Section 1.3, of the NTS EIS to ensure that land-use planning and resource management will be coordinated in accordance with the Memorandum of Agreement. The Memorandum of Agreement is not an inter-agency agreement; rather it is an internal DOE coordination agreement and not included in Appendix C, "Relevant Regulatory Requirements."

Comment Code: State Government 2-106

Location of EIS Revision(s): Volume 1, Section 3.2.6.1

Response: The comment is correct. The referenced language has been deleted. The entire section has been revised.

Comment Code: State Government 2-107

Location of EIS Revision(s): Volume 1, Section 3.2.6.1

Response: The comment is correct; the referenced language has been deleted. The entire section has been revised and states that Section 113 of the Nuclear Waste Policy Act, as amended, categorizes the current site-characterization activities at Yucca Mountain as "preliminary activities" and specifically excludes them from the requirement of preparing an Environmental Impact Statement. However, the NTS EIS includes these activities as part of the description of the existing environment at the NTS (see Chapter 4) as well as in the discussion of cumulative impacts (see Chapter 6).

Comment Code: State Government 2-108

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: The statement about the leaching of radionuclides from cavities has been removed from the text. The text has been modified to clarify the mobility of tritium and other radionuclide species in the groundwater. Additional information has been added to the text related to the inability to mobilize most cavity radionuclides during extensive pumping at the Cambric site, the limited number of instances in which non-tritium radionuclides have been found to migrate, and the relatively short migration distances detected.

Comment Code: State Government 2-109

Location of EIS Revision(s): Volume 1, Section 4.1.4.2

Response: The text has been modified to include a discussion of the uncertainties regarding the current knowledge of the radiological source term.

Comment Code: State Government 2-110

Location of EIS Revision(s): None required

Response: Results that verify the statement that vehicle-related consequences dominate the transportation risk can be found throughout the Draft NTS EIS. Under Alternative 3, vehicle-related fatalities are 8 (in 10 years) and injuries are 97, compared to radiation-induced cancer fatalities of less than one (0.06) in 10 years and radiation detriment of 4.5×10^{-2}. This shows clearly that vehicle-related, not cargo-related, consequences dominate the risks of transporting low-level waste and mixed waste.

Comment Code: State Government 2-111

Location of EIS Revision(s): Volume 1, Chapter 5 and Appendix I

Response: Analysis of the maximum, credible, transportation accident has been added to Appendix I and summarized in Chapter 5. The consequence of a terrorist attack would not be greater than the maximum reasonable foreseeable accident, which postulates a maximum release scenario.

Comment Code: State Government 2-112

Location of EIS Revision(s): None required

Response: Refer to the discussion in Section 1.6 of Volume 3. In addition, the state of Nevada can join in the route selection process by requesting participation from the U.S. Department of Transportation under the existing regulations.

Comment Code: State Government 2-113

Location of EIS Revision(s): Volume 1, Section 3.3 and Sections 5.1.1.4, 5.1.1.5.2, and 5.3.1.5.2

Response: The referenced statement in Section 3.3 (and elsewhere) has been deleted and replaced with an explanation in light of data recently obtained from ongoing borehole investigations at the UE3ax/bl disposal crater complex. These data provide additional support to the hypothesis that no credible groundwater pathway exists beneath UE3ax/bl (Van Cleave, 1996). However, were it to migrate, the source term from the waste in the craters would be a minor addition to the underground source term from the nuclear tests that created the craters. Additionally, the underground shot cavities beneath the subsidence craters and waste cells in the Area 3 RWMS are located in the unsaturated zone more than 101 m (330 ft) above the water table. This substantial separation between the shot cavities and the water table provides a further basis, albeit preliminary, to conclude that there is no vertical groundwater flow between the low-level waste unit and the water table. Given the proximity of Area 5 to Area 3 (22 km [14 mi]) and the very similar hydrologic conditions, the defensible hydrogeologic conceptual model for Area 5 is now being tested and validated for the Area 3 Radioactive Waste Management Site.

Comment Code: State Government 2-114

Location of EIS Revision(s): None required

Response: The traffic impacts identified in Table 3-5 are summarized in Chapter 5 of the NTS EIS. A description of the analytical method used to determine the traffic impacts is in Appendix E of Volume 1. The supporting information for transportation risks is in Appendix I.

Comment Code: State Government 2-115

Location of EIS Revision(s): Volume 1, Appendix I; Sections 5.1.1.2.3 and 5.3.1.2.3

Response: The Final NTS EIS includes a discussion of the probability and consequences of the maximum, reasonably foreseeable transportation accidents for both low-level and mixed waste shipments. The consequences of terrorist attacks are not specifically analyzed, but the radiological consequences of a terrorist attack would not be greater than the maximum reasonable foreseeable accident, which postulates a maximum release scenario.

Comment Code: State Government 2-116

Location of EIS Revision(s): Volume 1, Section 4.1

Response: The DOE concurs and the text has been modified to state that the NTS is surrounded by a combination of public lands that are open to public entry and federal installations that are closed to public entry.

Comment Code: State Government 2-117

Location of EIS Revision(s): None required

Response: Estimates of the total remaining activity are not yet available for each of the underground testing areas. The NTS EIS presents the estimated total remaining subsurface activity in Section 4.1.4.2. This total comprises the best available estimate of the total activity in the vadose zone, while the information presented in Table 4-27 presents the total activity for tests that were conducted under, or within, 100 meters of the water table. Work being performed under the Environmental Restoration Program will help to refine these estimates so that the total inventory in the vadose zone of Pahute Mesa, Yucca Flat, and Frenchman Flat can be estimated. Also refer to the discussion in Section 1.10 of Chapter 1 of Volume 3.

Comment Code: State Government 2-118

Location of EIS Revision(s): Volume 1, Section 1.4

Response: The comment concerning the continued use of Pahute Mesa by the DOE is noted. A statement has been added to Section 1.4 under *Nellis Air Force Range Complex EIS* that DOE operations on Pahute Mesa could be affected by decisions associated with the Nellis Range EIS.

Comment Code: State Government 2-119

Location of EIS Revision(s): None required

Response: The description in the Draft NTS EIS concerning the Bureau of Land Management's 1983 review of the Public Land Orders that withdrew the NTS land correctly and adequately reflects both the U.S. Bureau of Land Management's Federal Land Policy and Management Act withdrawal review and its current status.

Comment Code: State Government 2-120

Location of EIS Revision(s): None required

Response: This EIS is intended to provide a comprehensive, cumulative review of all current and proposed activities at the NTS. It supports the programmatic decisions on the various programs at the site, including the Defense Program Stockpile Stewardship and Counter Proliferation efforts and the Work for Others Program efforts. Chapter 2 and Chapter 3 describe the programmatic need to perform conventional high-explosives test and research and the development of advanced conventional weapons technologies.

Appendix F is intended to include project-specific analysis that in the context of the whole EIS completes the National Environmental Policy Act requirements for the Big Explosives Experimental Facility. Chapters 1, 2 and 3 of Volume 1 have been modified to clarify this point. See also the response to Comment Code State Government 2-39.

Comment Code: State Government 2-121

Location of EIS Revision(s): None required

Response: The Yucca Mountain land withdrawal consists of 4,255 acres withdrawn by Public Land Order 6802 on September 17, 1990 (PL Order 6802).

Comment Code: State Government 2-122

Location of EIS Revision(s): Volume 1, Section 4.1.1.3

Response: The reference has been changed from Section A.7 to A.6.

Comment Code: State Government 2-123

Location of EIS Revision(s): Volume 1, Section 4.1.1.3, Table 4-3

Response: Table 4-3 has been corrected.

Comment Code: State Government 2-124

Location of EIS Revision(s): None required

Response: Details describing the condition of the existing water supply and distribution systems are presented in Appendix A.

Under Alternative 3, Expanded Use, the existing water-distribution systems would be used whenever possible. Should upgrades to the water-distribution systems be necessary, the upgrades would occur, whenever practical, along the existing routes to minimize impacts to the environment.

Comment Code: State Government 2-125

Location of EIS Revision(s): Volume 1, Appendix A, Section A.6.1.1.1

Response: At the time Appendix A was written in the Draft NTS EIS, upgrades were not planned to be completed. The plans have changed and Appendix A has been modified to reflect the current status of system parameters.

Comment Code: State Government 2-126

Location of EIS Revision(s): None required

Response: The DOE presently manages Restricted Airspace 4808 and 4809. All flights are scheduled and controlled by the DoD. The decision to maintain or release Special Use Airspace is made by the Federal Aviation Administration, in coordination with the agencies that use the airspace, during its annual review process. Decisions to relinquish parts or all of Special Use Airspace at the NTS or the NAFR Complex would be determined through this process based on the nation's and other federal agency requirements. Presently, it is too speculative to analyze or entertain the relinquishment of these airspaces based on ongoing activities.

Comment Code: State Government 2-127

Location of EIS Revision(s): None required

Response: Refer to response in Comment Code State Government 2-126.

Comment Code: State Government 2-128

Location of EIS Revision(s): None required

Response: A general discussion of the formation of subsidence craters can be found in Section 4.1.4.2 of the NTS EIS. Figure 4-23 illustrates a pictorial sequence of subsidence crater formation. The particular events which created the craters used for low-level waste disposal were Paca (U3ax) 1962, Bobac (U3bl) 1962, Fisher (U3ah) 1961, and Ierboa (U3at) 1963. The depth of burial of the event was about 210 to 270 meters (700 to 900 feet). The event cavities are about 150 meters (500 feet) above the water table, which is about 485 meters (1,600 feet) below the land surface. See also the response to Comment Codes State Government 2-82 and 2-113.

Comment Code: State Government 2-129

Location of EIS Revision(s): None required

Response: Geologic and soil conditions at facilities such as the Area 3 waste disposal site are characterized as part of the permitting or compliance requirements, and typically include detailed descriptions of conditions over a limited area. Such detail is not needed for a sitewide EIS. As noted in the comment, other documentation is available which provides location-specific information. The statement concerning separate subsections for specific administrative units is correct. The Area 3 disposal site, however, is not an administrative unit. The NTS, Tonopah Test Range, and Nellis Air Force Range Complex are the administrative units, as stated in the first paragraph of Section 4.1.4.

Comment Code: State Government 2-130

Location of EIS Revision(s): Volume 1, Section 4.8

Response: Two references to Hawkins and Kunkle have been added to Section 4.8.

Comment Code: State Government 2-131

Location of EIS Revision(s): None required

Response: A copy of the referenced document has been sent to the state of Nevada.

Comment Code: State Government 2-132

Location of EIS Revision(s): None required

Response: The DOE evaluated in the NTS EIS the impact of possible additional wastes being disposed of in the proposed Mixed-Waste Disposal Unit. The DOE recognizes that additional activities must be completed prior to the Nevada Division of Environmental Protection considering the proposed Mixed-Waste Disposal Unit. The DOE here notes that the state of Nevada believes that completion of DOE's Waste Management Programmatic EIS and Record of Decision and the Area 5 Performance Assessment must precede action on the Resource Conservation and Recovery Act Part B permit for the proposed Mixed-Waste Disposal Unit.

Comment Code: State Government 2-133

Location of EIS Revision(s): None required

Response: The DOE prepared the Environmental Assessment to evaluate alternatives to meet requirements of new solid waste regulations. The Nevada Division of Environmental Protection implemented amendments to the solid waste regulations requiring the DOE to temporarily close and modify the Area 9 Landfill. The modifications have been completed and the landfill has reopened. The description on the rationale used in the Environmental Assessment is in Section 4.1.1.5, "Waste Management Program." A more detailed discussion of existing and potential impacts at the Area 9 Landfill is in the Environmental Assessment for Solid Waste Disposal (DOE, 1995a).

Comment Code: State Government 2-134

Location of EIS Revision(s): None required

Response: The text, as presented in Section 4.1.1.5 under Nonhazardous Solid Waste, states that although "...both landfills are currently classified as Class II landfills, changes in state regulatory requirements will cause the Area 9 Landfill to undergo partial closure and to reopen as a Class III construction and demolition landfill. The Area 23 Landfill will remain in operation as a Class II landfill, but will be modified to comply with new State regulation."

Comment Code: State Government 2-135

Location of EIS Revision(s): Volume 1, Section 4.1.1.5

Response: The text has been changed to indicate that the Area 9 Landfill is located in a subsidence crater (U-10C) formed as a result of a subsurface nuclear test.

The text states that the Area 9 Landfill will undergo partial closure. Any potential environmental impacts are addressed in the Environmental Assessment for Solid Waste Disposal (DOE, 1995a), as stated in the text.

Comment Code: State Government 2-136

Location of EIS Revision(s): None required

Response: The actions required by the Site Treatment Plan and the Consent Order are addressed in the NTS EIS in Appendix A, Section A.2.3.2, under the "Expanded Use Alternative" (Alternative 3). The proposed treatment system (Cotter Concentrate Treatment Unit) is presented under the "Expanded Use Alternative" because (1) the DOE and Nevada Division of Environmental Protection did not sign the Federal Facility Compliance Act Consent Order until after the Draft NTS EIS was distributed to the public for comment, and (2) the specific type of treatment or design of the proposed treatment system has not been finalized. The referenced Site Treatment Plan does not provide the specific treatment requirements for each waste stream but does provide treatment options for each waste stream. These options were included because of the lack of characterization data, treatability test results, and/or the potential availability of off-site treatment systems. The Site Treatment Plan and the Consent Order provide a process for determining the specific treatment option for each waste. The DOE recognizes that the examination of the impacts of a treatment system in the NTS EIS does not necessarily preclude a future environmental assessment for a specific activity or treatment unit.

Comment Code: State Government 2-137

Location of EIS Revision(s): Volume 1, Section 4.1.2.3

Response: The text has been corrected to indicate that the total amount of waste received between 1961 and 1982 was 14 million ft^3.

Comment Code: State Government 2-138

Location of EIS Revision(s): None required

Response: The region of influence for specific impact analyses includes Clark and Nye counties. A summary of economic indicators in Section 4.1.3 includes the state of Nevada and the nation.

Comment Code: State Government 2-139

Location of EIS Revision(s): None required

Response: There is no information that documents a deterioration in tourism in Nevada as a consequence of past or present activities at the NTS. There is no reason to conclude that future activities, as evaluated in the NTS EIS, would adversely affect tourism or the state's economic system. See also discussion in Volume 3, Section 1.9.

Comment Code: State Government 2-140

Location of EIS Revision(s): None required

Response: As stated in the NTS EIS, the largest contributor to the economy of Nevada is the service industry (which includes tourism and the gaming industry). In Clark County, the service industry represents approximately 48 percent of the total economy and, in Nye County, approximately 64 percent. The NTS has been in operation since the 1950s and activities in the past, when nuclear testing was at its peak, have not adversely affected the growth of tourism and the gaming industry. In fact, the Las Vegas area has experienced remarkable growth over the past three decades. Tourism in southern Nevada has increased from 21 million visitors in 1990 to a forecasted 31 million in 1996 (Schwer, 1995). The increase in visitors is attributed to the creation of new mega-resorts and other large attractions. Based on available data, the effects of the NTS on the tourism industry are negligible.

As discussed in Section 4.1.3, total employment in Nevada increased from 256,000 jobs in 1970 to 488,000 in 1990. Although the unemployment rate increased from 4.9 percent to 5.5 percent in the same period, this is attributed to the in-migration rate exceeding the rate of employment opportunities (Schwer, 1995). With Alternative 1, no population increase can be ascribed to the NTS; therefore, there would be no impact on the tax-revenue system in Nevada.

Comment Code: State Government 2-141

Location of EIS Revision(s): Volume 1, Sections 4.1.3 and 5.1.1.3

Response: Text has been added to clarify the response capabilities of affected jurisdictions and the DOE. See Section 1.6 of Volume 3.

Comment Code: State Government 2-142

Location of EIS Revision(s): None required

Response: A detailed discussion of the geology of the various sites mentioned in the comment is not needed for this sitewide NTS EIS. The geologic and soil conditions at facilities of this nature are typically characterized as part of the permitting or compliance requirements and include detailed descriptions. Other, more detailed National Environmental Policy Act review may be accomplished for some of these developments, as appropriate.

Comment Code: State Government 2-143

Location of EIS Revision(s): None required

Response: A discussion of radiological sources in groundwater is presented in Section 4.1.5.2. Information concerning the estimated radionuclide inventory is presented in the geology and soils section (4.1.4).

Comment Code: State Government 2-144

Location of EIS Revision(s): None required

Response: The DOE believes the NTS EIS, and the reference cited that addresses releases (OTA, 1989), adequately describe the releases to the atmosphere from nuclear tests since the last EIS was issued in 1977.

Comment Code: State Government 2-145

Location of EIS Revision(s): None required

Response: During the Cold War Era, hundreds of individual structures were built on the NTS and many of these structures would not meet current seismic-zone standards. For certain types of facilities, a seismic risk evaluation may be required prior to issuing a permit or license to operate. Where such evaluations are required, the DOE has performed them or is in the process of performing them. A listing of all structures and their seismic rating is not required for this EIS, and doing so would add no value to the NTS EIS. In instances where such an evaluation or rating is necessary or required in support of a specific project, it would be presented in a separate National Environmental Policy Act document.

Comment Code: State Government 2-146

Location of EIS Revision(s): None required

Response: The NTS EIS covers a 10-year planning period. Volcanic activity is not a significant issue with respect to the proposed actions because the probability cannot be defined for such a short period for a specific area. Therefore, a complete discussion of the extensive literature that has been written on this subject is not warranted or appropriate.

For facilities with siting criteria that include evaluations of volcanic hazards, the DOE will evaluate the volcanic hazards on a case-by-case basis with the documentation prepared to meet the specific requirements of the permitting or licensing authority.

Comment Code: State Government 2-147

Location of EIS Revision(s): None required

Response: The NTS EIS presents a brief overview of volcanism at a level commensurate with its significance with respect to the alternatives examined. A presentation of the current state of knowledge about volcanic hazard, and the assessment of future risk is not needed. See also response to Comment Code State Government 2-146.

Comment Code: State Government 2-148

Location of EIS Revision(s): None required

Response: A map of geotechnical hazards is not available for the NTS. Geotechnical investigations of slope and soil stability are performed on a case-by-case basis depending upon the type of facility or action to be taken, and the specific location.

Comment Code: State Government 2-149

Location of EIS Revision(s): None required

Response: The DOE believes that the amount and detail of information presented in the NTS EIS on mineral resources is adequate.

Comment Code: State Government 2-150

Location of EIS Revision(s): Volume 1, Section 4.8

Response: The cited reference has been added to Section 4.8. The statements in question are not at odds in that binary geothermal power has not been proven to be commercially viable. There are no anticipated uses of geothermal resources for other commercial or industrial applications at the NTS, thus a discussion of such applications is not warranted.

Comment Code: State Government 2-151

Location of EIS Revision(s): Volume 1, Section 4.1.4.3

Response: The text has been modified to better describe the areas of local interest. The following text was inserted:

"Areas of local interest include specific facilities, such as some large structures and waste disposal sites. In these cases, soil investigations are primarily limited to the characterization of specific geotechnical parameters. In some instances, the results of these investigations are published in formal documents, (e.g., Ho et al., 1986, discusses the suitability of natural soils for foundations for surface facilities at Yucca Mountain). Often, information from these investigations has not been published and appears in various permit applications and the DOE files."

Comment Code: State Government 2-152

Location of EIS Revision(s): None required

Response: The baseline conditions for soils have indeed been updated from the very limited information presented in the 1977 EIS. The discussion presented in Section 4.1.4.3 is also applicable to the NAFR Complex. Discussions of general soil conditions on the Tonopah Test Range are in Section 4.2.4.3. Information on soil contamination at all three sites is in Section 4.1.4.3.

Comment Code: State Government 2-153

Location of EIS Revision(s): None required

Response: A breakdown of remaining soil contamination by geographic area is available in the cited references, particularly McArthur (1991), who lists major radionuclide activities in soils for each area of the NTS. Information from this report and other sources will be used by the DOE to make both short-term and long-term resource management decisions within the *Resource Management Plan*. The DOE does not plan to limit its ecosystem management to information presented in the NTS EIS. Rather, all pertinent information will be considered.

Comment Code: State Government 2-154

Location of EIS Revision(s): None required

Response: The DOE believes the requested information is already contained in the NTS EIS. Table S-2, "Summary of Remaining Radioactivity on the NTS," has a column heading "Source of Radioactivity," which includes an entry for safety tests. This entry, under the heading "Remaining Inventory (curies)," shows "approximately 35." Section 4.1.4.3 of the NTS EIS, "Soils," contains a discussion on safety tests and a listing of where the tests were conducted. Figure 4-29 shows the locations of safety tests on the NTS and the NAFR Complex and the approximate areas of plutonium contamination exceeding 10pCi/g. Figure 4-30 indicates the approximate areas on the NTS where plutonium concentration is in excess of 10pCi/g. Figures 4-31 through 4-37 provide additional details about the plutonium contamination plumes.

Comment Code: State Government 2-155

Location of EIS Revision(s): None required

Response: The regulations cited in the NTS EIS (Table 4-16) relate to the construction of specific facilities on the NTS and the NAFR Complex, and do not relate to the NTS as a whole. Site-specific floodplain analyses are prepared, as required, for individual facilities prior to construction.

Comment Code: State Government 2-156

Location of EIS Revision(s): None required

Response: Site-specific floodplain analyses will be prepared, as required, for individual facilities prior to construction.

Comment Code: State Government 2-157

Location of EIS Revision(s): None required

Response: The discussion for the NAFR Complex is limited to the areas where environmental restoration activities will be conducted; there are no springs in these areas. For the Tonopah Test Range, the springs are discussed in the section describing the hydrology of that facility. The only significant impoundment is Crystal Reservoir, which is discussed in the NTS EIS. A table listing all springs and impoundments in the region is not needed.

Comment Code: State Government 2-158

Location of EIS Revision(s): None required

Response: Any actions that could impact spring discharge and associated vegetation would have to be in compliance with federal and state environmental laws and regulations.

Comment Code: State Government 2-159

Location of EIS Revision(s): None required

Response: For any actions that are not determined to be part of the DOE mission, the DOE will comply with the provisions of the Nevada Water Law.

Comment Code: State Government 2-160

Location of EIS Revision(s): None required

Response: The data presented in Table 4-18 in the Draft NTS EIS are the most current and include all springs in the region for which data are available.

Comment Number: State Government 2-161

Location of EIS Revision(s): None required

Response: There are no other sources of surface water on the NAFR Complex or the Tonopah Test Range that could be affected by DOE/NV alternatives. Thus, only the relevant radiological or chemical data for surface water is provided in Table 4-18.

Comment Code: State Government 2-162

Location of EIS Revision(s): None required

Response: The sites specified in Table 4-22 in the NTS EIS have been included in the list of corrective action units scheduled for characterization and closure as indicated in Appendix II of the Federal Facility Agreement and Consent Order (State of Nevada, 1996). Appendix II contains a list of all corrective action units which have been identified to date and which have not yet been transferred to subsequent appendices or corrective action sites which have not yet been grouped into corrective action units. By the time that the corrective action units have been fully characterized, the corrective action decision document will discuss the appropriate remedial alternatives for each corrective action unit. Appropriate National Environmental Policy Act documentation, which may detail alternatives for cleanup, will be developed prior to the corrective action.

Comment Code: State Government 2-163

Location of EIS Revision(s): Volume 1, Section 4.1.5

Response: A figure has been added to the NTS EIS that shows the groundwater flow regime for the NTS (Figure 4-41a).

Comment Code: State Government 2-164

Location of EIS Revision(s): None required

Response: The areas of interest within the NAFR Complex are already included in Table 4-23. A figure of the groundwater regime has been added to the NTS EIS. A table showing water-well production rates is provided in the water supply section of the NTS EIS (Table 4-29). Water level variations are discussed in the NTS EIS.

Comment Code: State Government 2-165

Location of EIS Revision(s): Volume 1, Section 4.1.5

Response: Additional information on groundwater pumping has been added to the NTS EIS.

Comment Code: State Government 2-166

Location of EIS Revision(s): Volume 1, Section 4.8

Response: The reference to Seaber et al., 1995, has been deleted from the NTS EIS. The reference to Clary et al., 1995, has been added to Section 4.8.

Comment Code: State Government 2-167

Location of EIS Revision(s): None required

Response: No groundwater conduits have been identified in the groundwater system at the NTS. Rather, the results of well tests to date indicate that porous flow is the predominant mechanism for groundwater flow. The results of capture-zone analyses, performed as part of the DOE's Wellhead Protection Program, did not reveal any connections with testing areas that would impact downgradient areas of concern. The DOE will be developing detailed groundwater flow models of the underground testing areas to provide better definition of the flow regime in the vicinity of the testing areas.

Comment Code: State Government 2-168

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: The reference to Laczniak et al., 1992, has been deleted and the following text has been inserted:

"More recently, additional conceptual models of the system have been published by PAL Consultants, 1995, Faunt, 1994, and D'Agnese, 1994."

Comment Code: State Government 2-169

Location of EIS Revision(s): Volume 1, Section 4.1.5

Response: A figure showing the groundwater regime of the Death Valley flow-system has been added to the NTS EIS (Figure 4-41a). This map includes pertinent parts of the NAFR Complex.

Comment Code: State Government 2-170

Location of EIS Revision(s): None required

Response: Refer to Comment Code State Government 2-163.

Comment Code: State Government 2-171

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: As recommended, a link between the discussion of springs in Section 4.1.5.2 and the tables in the surface hydrology section has been made. The discharge rates of the springs are presented in the text of the NTS EIS. The following text was added to the NTS EIS:

"The chemistry of these springs is summarized in Tables 4-18, 4-19, and 4-21 in the Surface Hydrology section."

Comment Code: State Government 2-172

Location of EIS Revision(s): None required

Response: Refer to Comment Code State Government 2-161.

Comment Code: State Government 2-173

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: The DOE concurs that literature or report citations should be included to support this statement. The statement will be rewritten to reflect the results of the literature search.

Comment Code: State Government 2-174

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: The information contained in Section 4.1.5.2 has been revised to better describe the groundwater contamination on the NTS. As part of the Environmental Restoration Program, the DOE is evaluating the location, extent, and types of contamination. Because the areas of contaminated groundwater have not yet been fully characterized, it is not possible to compare concentrations with EPA standards. Plate 2 in Volume 2 of the NTS EIS provides an indication of where groundwater contamination is likely to be present.

Comment Code: State Government 2-175

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: Section 4.1.5.2 has been revised to explain further the total remaining hydrologic source term inventory of 112 million Ci.

Comment Code: State Government 2-176

Location of EIS Revisions: Volume 1, Section 4.1.5.2

Response: Additional text has been added to the NTS EIS to present more of the details of these two programs.

Comment Code: State Government 2-177

Location of EIS Revision(s): None required

Response: Studies under the Environmental Restoration Underground Test Area project include both field and data analysis tasks.

From 1992 to 1994, 13 new wells were completed and 10 existing wells refurbished on and near the NTS. Objectives for the wells were to gather geologic, hydrologic, and water-chemistry data in locations removed from the testing areas. The 13 wells were drilled in locations away from testing areas. In 1995 and 1996, five wells were drilled near expended nuclear tests to examine effects of testing on hydrology and water chemistry. Results from the 1995 and 1996 effort are preliminary and were not included in this EIS.

Data analysis under the Underground Testing Areas subproject primarily supports modeling efforts. Models have been used to simulate groundwater flow, particle pathlines, and tritium concentrations. A one-dimensional, contaminant-transport model, MC-TRANS (GeoTrans, Inc., 1995a), was used to predict tritium concentrations along the pathlines and at potential ecological receptor locations. A three-dimensional groundwater flow model, MODFLOW (McDonald and Harbaugh, 1988), was first used to simulate groundwater flow and the hydraulic head distribution. A particle-tracking code, MODPATH (Pollock, 1994), was used to define the specific pathlines of particles originating from the nuclear test cavities. At the time of this writing, modeling results are being peer-reviewed.

Uncertainty in the parameters and mechanisms of radionuclide transport was examined during flow-and-transport modeling. Changes in groundwater flow paths as a result of flow parameter variations were examined as part of the flow-model-sensitivity analyses. The effects of flow-and-transport parameter uncertainty on the predicted tritium activity were included in the modeling via a Monte Carlo sampling method. Sensitivity of the tritium predictions to transport parameters were calculated to assess the importance of different transport mechanisms. These results are currently undergoing peer review and should be available near the end of Fiscal Year 1996.

Comment Code: State Government 2-178

Location of EIS Revision(s): None required

Response: Past activities at these sites were aboveground safety tests. There were no deep underground tests. Therefore, it is not expected that source term radionuclides would have been introduced into the groundwater from DOE activities at the Tonopah Test Range and the NAFR Complex.

Comment Code: State Government 2-179

Location of EIS Revision(s): None required

Response: A discussion of water availability on the Tonopah Test Range is provided in Section 4.2.5.2 of the NTS EIS.

Comment Code: State Government 2-180

Location of EIS Revision(s): None required

Response: The current primary mission of the NTS and the Tonopah Test Range is to help ensure the safety and reliability of the nation's nuclear stockpile. Other missions include the support of DOE waste management activities and other national-security-related research, development, and testing programs. The NTS and the Tonopah Test Range missions are defined by statute, Presidential direction, and Congressional authorization and appropriation. The DOE anticipates no activities beyond its current missions. The DOE does not presume to manage the NAFR Complex or define its missions.

Comment Code: State Government 2-181

Location of EIS Revision(s): None required

Response: The DOE does not propose or contemplate the use of groundwater from the Ash Meadows Basin.

Comment Code: State Government 2-182

Location of EIS Revision(s): None required

Response: Table 4-28 lists materials used in underground nuclear testing. However, the fate of many of these materials as a result of underground testing is not fully understood, and no estimates are available concerning the total quantity or form of these materials that may still remain in the subsurface at the NTS.

The main concern regarding hazardous or toxic materials that may remain in the subsurface is their mobility (i.e. ability to travel into and within groundwater). The Environmental Restoration Program, through the Underground Test Area Subproject at the NTS, is in the process of assessing the occurrence, distribution, and mobility of contaminants in the vicinity of the expended nuclear tests. Once the data from the Underground Test Area Subproject have reduced the level of uncertainty in the groundwater model to an acceptable level, then the impact of any of these remaining materials that may be mobilized along the groundwater pathway can be assessed.

Comment Code: State Government 2-183

Location of EIS Revision(s): None required

Response: If it is determined that a particular action is outside the DOE mission, then the DOE will comply with the provisions of the Nevada Water Law.

Comment Code: State Government 2-184

Location of EIS Revision(s): None required

Response: The integrated database analysis, as requested, has not been performed. The sampling results are generally static. The absence of notable departures from prior results is not typically reported. Notable trends are investigated and reported in the Annual Site Environmental Report which is available to the state of Nevada in the public reading room.

Comment Code: State Government 2-185

Location of EIS Revision(s): Volume 1, Section 4.1.6

Response: The suggested reference was added to the NTS EIS. The significance of the Mojave Desert and Great Basin Desert vegetation associations, and their transitional ecotone, are described in Section 4.1.6.

Comment Code: State Government 2-186

Location of EIS Revision(s): Volume 1, Introduction

Response: Information about the *Framework for Resource Management Plan*, and its relationship to the NTS EIS, has been included in the Introduction (Chapter 1). See Section 1.7 in Volume 3.

Comment Code: State Government 2-187

Location of EIS Revision(s): None required

Response: Those sites recorded as a result of DOE activities, including the Yucca Mountain Project, are considered in subsequent parts of Section 4.1.10.

Comment Code: State Government 2-188

Location of EIS Revision(s): None required

Response: The internal boundaries of the NTS shown on Figure 4-47 in the Draft NTS EIS correspond to NTS-designated "areas." Figures 3-1 through 3-4 of the Draft NTS EIS show the numbers designating individual areas within the NTS. Many of these areas are discussed throughout the NTS EIS.

Comment Code: State Government 2-189

Location of EIS Revision(s): None required

Response: As requested, the "Contaminated Areas Report" will be provided to the state of Nevada. The report contains detailed information requested by the commentor. Planned remediation actions for individual sites either have been or will be provided to the state of Nevada for concurrence. As required in the Federal Facility Agreement and Consent Order, recently signed by the DOE and the state of Nevada, remediation actions for these sites will be jointly prioritized, developed, and approved.

Comment Code: State Government 2-190

Location of EIS Revision(s): Volume 1, Section 4.1.11

Response: The requested citations have been provided. The ecological studies conducted as part of the Yucca Mountain Project were not acknowledged because the information was not gathered to monitor changes in the flora and fauna on the NTS associated with past activities described in the NTS EIS.

Comment Code: State Government 2-191

Location of EIS Revision(s): Volume 1, Section 4.1.11

Response: The Final NTS EIS has been revised in Section 4.1.11 to include the following text:

"Prior to 1972, monitoring was performed by the U.S. Public Health Service. The objectives of the Off-Site Environmental Surveillance Program are to ensure nearby residents of the safety of the air and water; to provide a long-term environmental baseline; and to detect contamination from DOE activities, if present."

Comment Code: State Government 2-192

Location of EIS Revision(s): Volume 1, Section 4.8

Response: The Final EIS for the Tonopah Test Range Area 10, dated February 1988 (not 1990 as stated in the comment), has been included as a reference.

Comment Code: State Government 2-193

Location of EIS Revision(s): Volume 1, Section 4.2.4.3, and Section 4.1.4.3

Response: Section 4.2.4.3, "Soils," has been revised to include information from the 1977 soils inventory (Cox et al., 1977) conducted by the U.S. Department of Interior. Section 4.1.4.3, "Soils, <u>RADIOLOGICAL SOURCES IN SOIL</u>, Safety Tests," was also modified.

A bibliography was compiled for the Soils Media Corrective Action Unit. Inclusion of a summary of the content of the citations would be distracting to the reader and only add to the length of the document. However, a copy of the bibliography will be provided to the state of Nevada.

Comment Code: State Government 2-194

Location of EIS Revision(s): Volume 1, Section 4.2.6

Response: A paragraph which describes plutonium in the Tonopah Test Range ecosystem and provides specific literature references has been added to the section as recommended. The reference on line 18 for Section 2.0 of Appendix E, "Biological Resources," directs the reader to the appropriate section titled "Biological Resources" within the Appendix E section titled "Methods and Assumptions."

Comment Code: State Government 2-195

Location of EIS Revision(s): Volume 1, Section 4.3.1.2

Response: The description of land use and control of the Project Shoal Area site has been modified.

Comment Code: State Government 2-196

Location of EIS Revision(s): Volume 1, Section 4.3.1.2

Response: The Navy has applied for a withdrawal of a large area which surrounds and overlaps the DOE's Project Shoal Area. If the Navy's withdrawal is granted, it would overlap the DOE's withdrawal and would probably result in public access restrictions. The DOE's plans are to characterize and conduct any necessary remediation such that the surface would provide unrestricted use. The DOE would still maintain the deep subsurface withdrawal and would continue to monitor the subsurface for the long term. The deep groundwater issues have yet to be studied; no determination of potential risk to the public has yet been made. Section 4.3.1.2, "Land Use," was modified to reflect this information.

Comment Code: State Government 2-197

Location of EIS Revision(s): Volume 1, Figure 4-55

Response: B-18 has been changed to B-19 on Figure 4-55.

Comment Code: State Government 2-198

Location of EIS Revision(s): None required

Response: As part of the Environmental Restoration Program, site characterization will be performed to identify and define the extent of contamination. Sensitive resources would also be identified during this process. The results of site characterization, in conjunction with the appropriate National Environmental Policy Act review, will be used to select and implement any required remediation activity.

Comment Code: State Government 2-199

Location of EIS Revision(s): None required

Response: See response to Comment Code State Government 2-198.

Comment Code: State Government 2-200

Location of EIS Revision(s): None required

Response: The initial land withdrawal which created the NTS specifically acknowledged the primary purpose of the NTS as a weapons testing site. The various secondary activities pursued by the DOE and its predecessor agencies at the NTS have been compatible with the primary purpose for which the land was withdrawn. Also refer to the discussion in Section 1.4 of Volume 3 and response to Comment Code State Government 2-2.

Comment Code: State Government 2-201

Location of EIS Revision(s): None required

Response: Refer to Comment Code State Government 2-33.

Comment Code: State Government 2-202

Location of EIS Revision(s): None required

Response: Refer to the discussion in Section 1.9 of Volume 3.

Comment Code: State Government 2-203

Location of EIS Revision(s): None required

Response: The public finance section of the socioeconomics analysis discusses fiscal impacts to potentially affected local jurisdictions brought on by changes in NTS-related population, employment, and income. Each line item in the income statements (including taxes) was projected. NTS-related fiscal impacts are expected to be minimal. If increased obligations do occur as a result of decisions made by the federal government, NTS employees would continue to contribute funds to the local budget. Any gap between revenues and expenditures would occur no matter which alternative is chosen by the DOE. For additional information, refer to Comment Code State Government 2-140.

Comment Code: State Government 2-204

Location of EIS Revision(s): None required

Response: The labor-force number for Alternative 1 is based on Fiscal Year 1995 employment and was obtained from Raytheon Services Nevada, the Maintenance and Operations contractor at the NTS at the time of the preparation of the Draft NTS EIS. Because employment at the NTS is dynamic, this cut-off date was chosen to represent employment for Alternative 1. The employment history of the NTS, including recent reductions in employment is in Section 4.1.3 of the NTS EIS. The NTS EIS does investigate a range of employment estimates, each of which could be used for planning purposes. These estimates range from 86 personnel for Alternative 2 to 6,718 personnel in Alternative 3 (peak year). This analysis therefore contains a full range of employment scenarios, from site-maintenance to expanded use of the site.

Comment Code: State Government 2-205

Location of EIS Revision(s): None required

Response: The comment is correct in stating that the "...size or yield of underground nuclear explosions is controlled by the Threshold Test Ban Treaty to a maximum high-explosive equivalent of 150 kt."

The rationale for reserving Pahute Mesa for future nuclear testing, if the DOE is directed to do so, is mandated by Declaration I of the Threshold Test Ban Treaty of September 25, 1990 (Nixon and Brezhnev, 1974). Mandate I directs the DOE to maintain the "...basic capability to resume nuclear test activities prohibited by treaties should the United States cease to be bound to adhere to such treaties." Therefore, Pahute Mesa has to be reserved for the unlikely need to implement the above-stated mandate to conduct high-yield nuclear tests.

Furthermore, Pahute Mesa allows for resource, schedule, and management controls of NTS activities if the DOE were ever directed to conduct nuclear tests. While it is true that the Pahute Mesa is U.S. Air Force-withdrawn land and is subject to renewal, any problems with the renewed withdrawal of Pahute Mesa will be dealt with as a separate issue, if necessary.

Comment Code: State Government 2-206

Location of EIS Revision(s): None required

Response: The basis for the statement that the overall impacts to soils are not considered significant is contained in the discussion that follows the statement referred to in the comment. For example, soil erosion will not increase appreciably and soil contamination will be cleaned up in accordance with environmental regulatory requirements.

Comment Code: State Government 2-207

Location of EIS Revision(s): None required

Response: The text in Section 4.1.1.5 under "Disposal Operations" provides a description of the criteria used in selecting subsidence craters for the disposal of waste. The text also provides a reference to Hawkins and Kunkle.

Comment Code: State Government 2-208

Location of EIS Revision(s): None required

Response: While the gross area subject to potential disturbance has been conservatively estimated and is presented in Appendix A of the NTS EIS, the areal extent and nature of the soil that would be lost for the long term have not yet been fully defined. Characterization of impacted sites and assessments of potential remedial technologies is ongoing at some sites, but not yet started at others. The extent of lost soil may be changed when characterization is complete, remedial technologies are chosen, and clean-up standards have been agreed to by the DOE and the state of Nevada through the Federal Facility Agreement and Consent Order process. Section 4.1.4.3 of this EIS discusses soils in detail. Data and information from the Yucca Mountain Project are routinely shared with the Environmental Restoration Program; this information is used, as applicable, to help guide decisionmaking and planning.

Comment Code: State Government 2-209

Location of EIS Revision(s): None required

Response: See response to Comment Code State Government 2-156. The disposal units at the Area 3 and Area 5 Radioactive Waste Management Sites are located outside of all Federal Emergency Management Agency regulatory 100-year flood hazard zones. This information can be reviewed in the following reports available from the DOE: *Flood Assessment at the Area 5 Radioactive Waste Management Site* and the *Proposed Hazardous Waste Storage Unit, DOE/Nevada Test Site, Nye County, Nevada*, (Schmeltzer et al., 1993), and the Draft Flood Assessment for the Area 3 Radioactive Waste Management Site.

Comment Code: State Government 2-210

Location of EIS Revision(s): Volume 1, Sections 4.1.4 and 5.1.1.5

Response: Additional information concerning the existing nuclear test holes has been added to the NTS EIS. It is the policy of the DOE to protect groundwater quality consistent with its mission for the NTS.

Comment Code: State Government 2-211

Location of EIS Revision(s): Volume 1, Section 2.2, Chapter 4, Section 4.1.1.2, Appendix A, Section A.1.1.1 and Section A.1.1.2

Response: Changes to the text have been made to identify the 33 emplacement holes that have been identified as potential sites for experiments or exercises. A map of the NTS has been included in Appendix A showing the location of these holes.

Comment Code: State Government 2-212

Location of EIS Revision(s): Volume 1, Section 5.1.1.5.2

Response: This text has been modified to remove any perceived implication that the conclusion drawn concerning the movement of surface water to the groundwater at the Area 5 Radioactive Waste Management Site is also applicable to the Area 3 Radioactive Waste Management Site.

Comment Code: State Government 2-213

Location of EIS Revision(s): Volume 1, Section 7.6

Response: The DOE disagrees that this section reflects an inadequacy of data needed to conduct the level of analysis required for this EIS. The NTS has one of the most extensively studied environments in Nevada. The DOE does agree that the *Resource Management Plan*, as outlined in Volume 2, will be a valuable tool for minimizing impacts of proposed activities on the environment and has included that Plan as a proposed mitigation measure in Section 7.6 of the Final NTS EIS. The text of Section 7.6 has been modified to clarify the value of the *Resource Management Plan.*

Comment Code: State Government 2-214

Location of EIS Revision(s): None required

Response: Until the DOE completes the final revision to DOE Order 5820.2A, it is inappropriate to speculate what changes may occur. Upon finalization of the revision to DOE Order 5820.2A, the DOE will modify the performance assessment process accordingly.

Comment Code: State Government 2-215

Location of EIS Revision(s): Volume 1, Section 5.1.2.1

Response: The comment concerning the Public Law 99-606 is noted. The last two sentences of the cited section have been deleted. As stated in Section 4.2.1.1, the DOE manages the Tonopah Test Range through a Memorandum of Understanding with the U.S. Air Force for which the Tonopah Test Range has been withdrawn under Public Law 99-606. DOE comments concerning relinquishment of U.S. Air Force withdrawn lands are not appropriate for this EIS. See Section 1.5 of Volume 3.

Comment Code: State Government 2-216

Location of EIS Revision(s): None required

Response: The reuse of the NTS facilities for non-federal uses is not discussed in the alternatives, therefore, employment opportunities were not analyzed. Based on current trends in job creation and in-migration, the NTS would not influence the economy significantly under any alternative, and the analysis supports this conclusion.

Comment Code: State Government 2-217

Location of EIS Revision(s): None required

Response: Given that no soil-disturbing activities would occur under Alternative 2, there would be no significant adverse impacts to uncontaminated soil resources. However, any contaminated soils that are not remediated would be irretrievably lost as a soil resource.

Comment Code: State Government 2-218

Location of EIS Revision(s): Volume 1, Section 5.2.1.6 and Section 4.1.6

Response: The first sentence in Section 5.2.1.6 concerning impacts to biological resources has been deleted. Text has been added to Section 4.1.6 of the Final NTS EIS to substantiate the statement that some species, horses in particular, would be affected by the shutdown of manmade water sources. Other than for horses, no data exist that documents the use of manmade water sources by wildlife. However, the DOE/NV initiated a monitoring program in 1995 to assess the use of both natural and manmade water sources on the NTS by wildlife. The water sources will also be mapped as data is collected.

Comment Code: State Government 2-219

Location of EIS Revision(s): Volume 1, Section 5.1.1.2.3 and Section 5.3.3.2.3

Response: The Draft NTS EIS contained information about shipments and the differences between the transportation activities for Alternatives 1 and 3. The Final NTS EIS contains information in a more explicit manner that identifies the number of shipments for each alternative. This information is in tables in Chapter 5 and Appendix A, and in the text of Chapter 5 of Volume 1 in Sections 5.1.1.2.3 and 5.3.1.2.3.

Comment Code: State Government 2-220

Location of EIS Revision(s): None required

Response: Baseline socioeconomic conditions are described in Chapter 4. See also the response to Comment Code State Government 2-33.

Comment Code: State Government 2-221

Location of EIS Revision(s): None required

Response: Refer to the discussion in Section 1.9 of Volume 3.

Comment Code: State Government 2-222

Location of EIS Revision(s): Volume 1, Sections 4.1.3 and 5.1.1.3

Response: Text has been added to clarify the response capabilities of affected jurisdictions and the DOE.

Comment Code: State Government 2-223

Location of EIS Revision(s): None required

Response: The multiplier effect is based on disposable income as well as possible expenditures for supplies and materials. When requirements of construction supplies and employment increase, the multiplier increases as well. Conversely, as construction is completed on various programs, local expenditures and procurement of supplies decrease and the multiplier becomes lower. The *Economic Outlook 1995* (Schwer, 1995) states that the multiplier effect for southern Nevada is 2. This is consistent with the Regional Interindustry Multiplier System model (discussed in Appendix E) used to support this analysis.

Comment Code: State Government 2-224

Location of EIS Revision(s): None required

Response: Soils are included within the overall topic of geologic media in this discussion and it is noted that the impacts under Alternative 3 are the same as for Alternative 1. The commentor is referred to Alternative 1 for a discussion of those impacts.

Comment Code: State Government 2-225

Location of EIS Revision(s): None required

Response: Refer to the response to Comment Code State Government 2-213.

Comment Code: State Government 2-226

Location of EIS Revision(s): None required

Response: The comment is correct when stating there would be slight job decreases at the NTS from implementing Alternative 4. However, this slight job decrease would not trigger out-migration of population. The comment is incorrect when stating that there are population changes forecast because of the NTS job level under Alternative 4.

Comment Code: State Government 2-227

Location of EIS Revision(s): None required

Response: The referenced section states that the impacts on soils under Alternative 4 would be similar to those described under Alternative 2 for Defense Programs, Alternative 1 for the Waste Management and Work For Others Programs, Alternative 3 for the Site Support Activities, and Alternatives 1 and 3 for the Nondefense Research and Development Program. The basis for this conclusion is provided in the referenced sections except for Alternative 2, wherein no impacts would occur because no contaminated soil would be disturbed. Any contaminated soil that is not remediated would be irretrievably lost as a soil resource.

Comment Code: State Government 2-228

Location of EIS Revision(s): None required

Response: No adverse impacts to biological resources are anticipated under Alternative 2, Section 5.2.1.6, or from Defense Programs under Alternative 4, Section 5.4.1.6, because these alternatives would not result in disturbances of the desert ecosystem.

Comment Code: State Government 2-229

Location of EIS Revision(s): Volume 1, Section 5.5.1.1

Response: The NTS EIS has been revised to include the following text in Section 5.5.1.1: "As discussed in Section 4.1.2, approximately 45,000 Ci/kt would remain in the subsurface 180 days after a test. The types of radionuclides produced are further discussed in Section 4.1.5.2, with tritium likely to be the most abundant radionuclide. Many of the other radionuclides would remain bound up in the melted glass in the event cavity."

Comment Code: State Government 2-230

Location of EIS Revision(s): None required

Response: The requested projection of future tortoise mortality based on rates of known take since 1992 is provided in Section 5.5.1.1 of the NTS EIS. In its Biological Opinion issued May 20, 1992, (U.S. FWS, 1992), the U.S. Fish and Wildlife Service provided an incidental-take authorization of 5 desert tortoises killed during construction or maintenance activities, 20 harassed when moved out of harms way, an unquantifiable number killed by vehicles using authorized routes on the NTS, an unquantifiable number of eggs crushed accidentally, an unquantifiable number of tortoises and eggs taken indirectly due to burrow collapse caused by seismic activity, and an unquantifiable number of tortoises and eggs taken as a result of exposure to hazardous materials.

Comment Code: State Government 2-231

Location of EIS Revision(s): Volume 1, Chapter 1

Response: The DOE's National Environmental Policy Act regulation (10 CFR 1021.330(d)) requires that DOE evaluate sitewide National Environmental Policy Act documents at least every five years. The NTS EIS examines a 10-year planning period as a way to separate short-term (0 to 5 years) from longer-term (5 to 10 years) potential impacts. The requirement to review sitewide National Environmental Policy Act documents every 5 years was discussed in the *Framework for Resource Management Plan* in the NTS EIS. To clarify this issue, this discussion has been added to Chapter 1 of the Final NTS EIS.

Comment Code: State Government 2-232

Location of EIS Revision(s): Volume 1, Section 4.1.6

Response: Additional text has been added to Section 4.1.6 to serve as a base for discussions about soil productivity, revegetation success, and natural rehabilitation.

Comment Code: State Government 2-233

Location of EIS Revision(s): Volume 1, Section 5.6.3.2

Response: Additional text has been added to Section 5.6.3.2 of the NTS EIS to serve as a basis for discussions about soil productivity, revegetation success, and natural rehabilitation. See also response to Comment Code State Government 2-232.

Comment Code: State Government 2-234

Location of EIS Revision(s): None required

Response: Complete information on the locations, extent, and types of groundwater contamination on the NTS is not currently available, but is being gathered by the Environmental Restoration Program. Future studies will help reduce the current levels of uncertainty concerning both the mechanisms and consequences of radionuclide transport via groundwater flow at the NTS. When sufficient information has become available to characterize the extent and type of contamination, it will be made available to the state of Nevada.

Comment Code: State Government 2-235

Location of EIS Revision(s): Volume 1, Section 5.7.3.1

Response: Additional text has been added to Section 5.7.3.1 of the NTS EIS to describe how replacement soil for reclamation purposes would be acquired and to discuss general information about soil productivity, revegetation success, and natural rehabilitation. See also response to Comment Code State Government 2-232.

Comment Code: State Government 2-236

Location of EIS Revision(s): Volume 1, Chapter 6

Response: The cumulative analysis methodology has been revised. Cumulative impacts are now consistently evaluated by examining the NTS impacts with other impacts described in programmatic analyses prepared by other governmental agencies. This revision has enhanced the consistency of the analysis and has also simplified the methodology to make it more understandable and comprehensive.

The use of "personal communications" has allowed the DOE to accurately verify, update, and supplement the previously published evaluations used in the cumulative analysis. These are included in the NTS EIS files.

Comment Code: State Government 2-237

Location of EIS Revision(s): None required

Response: The discussions concerning the Stateline *Resource Management Plan* and EIS prepared by the U.S. Bureau of Land Management does reference and excerpt information (including Alternative E) presented in the supplemental EIS issued in 1994.

The U.S. Bureau of Land Management's commitment to ecosystem management is addressed in the Biological Resource sections of the Draft EIS. Both the U.S. Bureau of Land Management and the U.S. Air Force are cooperating agencies on this EIS and each participated in the NTS EIS process. The Department of the Interior also filed formal written comments on the NTS EIS. They did not question the referenced section.

Comment Code: State Government 2-238

Location of EIS Revision(s): Volume 1, Chapter 6, Section 6.3

Response: The reference to Table 3-1 has been corrected to read Table 3-5.

Comment Code: State Government 2-239

Location of EIS Revision(s): Volume 1, Chapter 6 and Appendix I

Response: An assessment of impacts from the transportation of radioactive wastes and special nuclear materials has been added to the NTS EIS and Appendix I. This would account for potential activities included in Alternative 3 in which other DOE sites would transport low-level waste and mixed waste to the NTS for disposal and, as a separate action, special nuclear materials (plutonium and highly enriched uranium) would be sent to the NTS for demilitarization activities and stored.

The cumulative impacts to human health from the transportation of low-level waste, mixed waste, and Defense Program materials have been added to the NTS EIS in Chapter 6. Appendix I has been revised to include shipments of Defense Program materials such as surplus plutonium and highly enriched uranium.

Comment Code: State Government 2-240

Location of EIS Revision(s): Volume 1, Section 6.4.6

Response: The requested information relative to the "take" of desert tortoises has been added to the text.

Comment Code: State Government 2-241

Location of EIS Revision(s): None required

Response: The cumulative impacts to air quality are described only to the extent that information is available from published sources. Since most of the programs of other federal, state, and local agencies are still in the conceptual stages and have not gone through rigorous environmental analysis, cumulative impacts can only be discussed in qualitative terms.

The Final NTS EIS does include the air-quality impacts of the six program categories individually, and totals them to show what the commentor refers to as the "cumulative impacts." Table 5.3-13 in the Final NTS EIS shows the Expanded Use Alternative impacts, which are the maximum impacts that would occur as a result of any of the alternatives. The quantitative analysis presented in Chapter 5 has not been repeated in Chapter 6; only the necessary conclusions are presented.

Comment Code: State Government 2-242

Location of EIS Revision(s): Volume 1, Chapter 6

Response: The cumulative analysis methodology has been revised. Cumulative impacts are now consistently evaluated by adding the NTS impacts in a particular discipline to other similar programmatic analyses conducted by other governmental agencies addressing resource management and development plans. This revision has enhanced the consistency of the analysis and has also simplified the methodology to make it more understandable and comprehensive.

Additionally, both the Transportation Study and Human Health Risk Assessment have been revised. Both appendices contain additional information regarding associated risks for all on-going and future activities at the NTS.

Comment Code: State Government 2-243

Location of EIS Revision(s): None required

Response: Refer to Comment Code State Government 2-33 and the general response in Section 1.9 of Volume 3.

Comment Code: State Government 2-244

Location of EIS Revision(s): None required

Response: Soils are included in Section 7.4 as "surface geologic media." As stated in Section 7.4, mitigation measures include administrative and physical controls; minimization of disturbed areas; application of dust palliatives and revegetation; and shoring, bolting, and grouting of unstable slopes.

Comment Code: State Government 2-245

Location of EIS Revision(s): Volume 1, Introduction; Volume II, Section 3.2.3

Response: The NTS EIS text has been revised to reflect the need to consider resource-management policies of federal agencies. The introduction to Chapter 1 has been revised to reflect that the *Resource Management Plan* process will be conducted in accordance with the DOE's Land- and Facility-Use Management Policy. Section 3.2.3 of the NTS EIS Volume II has been modified to indicate that ecosystem management policies of the other federal agencies controlling land near the NTS will be considered during the development and implementation of the *Resource Management Plan*. The reader is also referred to the response to Comment Code State Government 2-38. Also see Section 1.7 of Volume 3.

Comment Code: State Government 2-246

Location of EIS Revision(s): None required

Response: The cleanup of nuclear test areas, which would include any post-shot operations, is covered in the NTS Standard Operating Procedure 6405 (DOE, 1995b). This procedure is prescriptive and establishes a limit for residual radioactive soil at a nuclear test area at 0.2 mrad/hr at 1 cm as averaged over a 1 m^2 area with a maximum of 1.0 mrad/hr. Inclusion of this information in the body of the NTS EIS is not necessary.

Comment Code: State Government 2-247

Location of EIS Revision(s): Appendix A, Section A.1.3.1.3

Response: Appendices F and J include additional information on potentially hazardous materials associated with dynamic and hydrodynamic tests. The following sentence has been added to Section A.1.3.1.3: "Additional information on potentially hazardous materials associated with dynamic and hydrodynamic tests is provided in Appendix F and the classified supplement, Appendix J."

Comment Code: State Government 2-248

Location of EIS Revision(s): None required

Response: As noted in Volume 1, Section 1.4 of the Draft NTS EIS, the NTS is no longer considered a potential host for tritium supply and recycling facilities. This reference to tritium production has been removed from the Final NTS EIS.

Comment Code: State Government 2-249

Location of EIS Revision(s): None required

Response: Environmental impacts of proposed actions at the Tonopah Test Range under Alternative 3 are discussed in Section 5.3.2. The DOE/NV has environmental, health, and safety responsibility for the Tonopah Test Range. The DOE/NV would ensure that appropriate National Environmental Policy Act reviews are conducted prior to conducting any tests.

Comment Code: State Government 2-250

Location of EIS Revision(s): Volume I, Appendix A

Response: A copy of the referenced *Operable Unit 4 Treatability Study Report for the Vitrification of Residues, from Silos 1, 2, and 3*, Fernald Environmental Management Project, Fernald, Ohio, May 1993, Fernald Office, U.S. Department of Energy (DOE, 1993a), and a copy of the *Final Report of Vitrification Development Studies for Fernald CRU-4 Silo Wastes*, Battelle-Pacific Northwest Laboratory, Richland, WA, April 1994 (Battelle, 1994), for the Fernald Environmental Restoration Management Corporation, has been forwarded to the state of Nevada as requested.

"Corrective action waste" has been deleted from the text of the NTS EIS. This phrase only refers to the action that produces it, and does not provide information on the exact nature of the waste. The corrected form is "Operable Unit 4 vitrified silo waste."

See response to Comment Codes State Government 2-20 through 2-22 and Section 1.12 of Volume 3 for a discussion of special case waste and greater-than-Class-C low-level waste.

Comment Code: State Government 2-251

Location of EIS Revision(s): None required

Response: The statement in the Draft NTS EIS was correct. No new construction was included in Alternative 1. New construction is included in Alternative 3 and is discussed in Section A.2.3.2 of Volume 1.

Comment Code: State Government 2-252

Location of EIS Revision(s): None required

Response: The DOE is not planning to prepare a separate programmatic EIS on disposal alternatives for high-specific-activity low-level wastes.

Please note that high-specific-activity waste is a separate category from Nuclear Regulatory Commission-regulated greater-than-Class-C low-level waste, and from special case waste defined by DOE in the Programmatic EIS. See Comment Codes State Government 2-20 through 2-22 and Section 1.12 of Volume 3 for a definition of special case waste and greater-than-Class-C low-level waste.

Comment Code: State Government 2-253

Location of EIS Revision(s): None required

Response: The actions required by the Site Treatment Plan and the Consent Order are addressed in the NTS EIS in Appendix A, Section A.2.3.2, under the Expanded Use Alternative (Alternative 3). This discussion is based on the assumption that the Cotter concentrate can successfully be treated in an on-site facility. The Site Treatment Plan describes other treatment options to be based on treatability tests and the availability of off-site treatment. These data are not and will not be available prior to the finalization of this EIS. The scope of this EIS is to evaluate the overall impact of several activities; this does not preclude the potential need for additional environmental review for a specific activity. Details on the treatment system, if determined to be feasible, will be presented to the Nevada Division of Environmental Protection in the Part B Permit Application.

Comment Code: State Government 2-254

Location of EIS Revision(s): None required

Response: The DOE is working closely with the federal-grant-funded Corporation for Solar Technology and Renewable Resources to develop the mission principles of the Solar Enterprise Zone. The Corporation for Solar Technology and Renewable Resources is currently engaged in evaluating one or more of the two on-site locations, and the three off-site locations for the potential construction of a large-capacity solar power project. DOE included three off-site locations in the Draft NTS EIS to provide preliminary environmental data in the event one of the sites is proposed for construction of a solar plant. Upon proposal, the appropriate additional National Environmental Policy Act review will be conducted.

Comment Code: State Government 2-255

Location of EIS Revision(s): Volume 1, Section 5.4.5

Response: As discussed in Section 5.3.4, 5.3.6, and 5.3.7, if the Eldorado Valley, Dry Lake Valley, or Coyote Spring Valley sites were chosen for the Solar Enterprise Zone facility, an environmental impact statement, supplemental environmental impact statement, and/or other environmental studies would be performed, as appropriate, to describe all impacts should this site be chosen for a Solar Enterprise Zone facility. Project plans, site preparation, technical studies, and worker-transition training development and implementation would also be accomplished. This information has also been clarified in Alternative 4.

Comment Code: State Government 2-256

Location of EIS Revision(s): Appendix C, Section C.3

Response: Appendix C has been modified to include the DOE Land-and Facility-Use Policy and DOE Order 430.1, "Life Cycle Asset Management" (1995). The Corporate Facilities Land-Use Directive has been canceled with the issuance of DOE Order 430.1. These are the formal expressions of the DOE policy relevant to the *Resource Management Plan.*

Comment Code: State Government 2-257

Location of EIS Revision(s): None required

Response: The regulatory requirements and Public Land Orders described in Appendix C apply to the DOE and the operation of the NTS and other DOE sites in Nevada that were examined in this EIS. The DOE does not concur that the U.S. Bureau of Land Management review process for pre-Federal Land Management Policy Act withdrawals need to be described in Appendix C. See also the response in Chapter 1, Section 1.4 of Volume 3.

Comment Code: State Government 2-258

Location of EIS Revision(s): None required

Response: The DOE disagrees. The use of analytical models for determining the area of influence of pumping water wells is widely used and accepted. The DOE is in the process of developing a calibrated regional groundwater flow model for further evaluation.

Comment Code: State Government 2-259

Location of EIS Revision(s): None required

Response: The methods used to identify and evaluate impacts are described in Section E.26. The matrix described by Wright and Green was used during the initial steps in that process to identify the biological resources and the components and processes of the natural environment that might be affected by proposed activities.

Comment Code: State Government 2-260

Location of EIS Revision(s): None required

Response: The purpose of Appendix E is not to present the detailed technical methodologies used by various resource disciplines in evaluating the potential environmental impacts, but rather to provide an overview of the general methods used and the assumptions made in analyzing potential impacts. The specific methods used by the technical personnel in preparing this document are based on comprehensive and interdisciplinary methods that have been used successfully in completing other environmental impact analyses prepared by these individuals for the DOE and other federal, state, and local agencies. The methods used were tailored to specific project requirements and the level of analysis required for this EIS. Interdisciplinary aspects of potential environmental impacts were evaluated during the initial analysis of potential impacts and during extensive internal DOE review of the document prior to its being released to the public for review and comment.

Comment Code: State Government 2-261

Location of EIS Revision(s): None required

Response: Appendix F of the NTS EIS evaluates the project-specific environmental, health and safety impacts for the continued and expanded use of the Big Explosives Experimental Facility. As described in Appendix F, the high-explosive devices would be assembled in the existing Area 27 Complex facilities. This assembly operation would be consistent with ongoing Area 27 operations and would comply with existing user laboratory and NTS procedures, safety documentation requirements, and building operating limits. Appropriate operational and safety procedures (material inventory limits and controls, access restrictions, mustering, emergency procedures, evacuation guidelines, etc.) would be followed during the assembly, storage, and transportation of the devices. Any potential impacts from accidental detonation of the devices in Area 27 would be bounded by the accident scenarios developed in the existing safety-analysis documentation for Area 27 Complex facilities (i.e., the assembly devices would be limited in size so that their potential impact from detonation would not be greater than the potential impacts already presented in the existing safety documents). Hence, the devices could be assembled in pieces so they do not exceed the Area 27 Complex facility limits. The final assembly of the devices, including the nonexplosive support fixtures and apparatus needed for the test assemblies, would be done at the Big Explosives Experimental Facility. The Area 27 Complex facilities are existing facilities and have appropriate National Environmental Policy Act compliance for their ongoing mission of assembly, disassembly, or modification of nuclear and high-explosive devices.

Comment Code: State Government 2-262

Location of EIS Revision(s): Volume 1, Sections 1.1 and 2.1; Appendix F, Section F

Response: Changes have been made to Chapters 1 and 2 and Appendix F of Volume 1 to explain the purpose of the analysis and the relationship of Appendix F to the rest of the NTS EIS. Chapter 4.0 is the description of the existing environment, therefore, it is not necessary to include or reference program, projects, or activities that are part of the expanded-use alternatives or project-specific analysis of future projects. Appendix F analyzes project-specific potential environment, health, and safety impacts, and provides National Environmental Policy Act analysis for the Big Explosive Experimental Facility.

Comment Code: State Government 2-263

Location of EIS Revision(s): None required

Response: Appendix F analyzes potential environment, and health, and safety impacts and is consistent with the National Environmental Policy Act. The Big Explosives Experimental Facility operations comply with applicable federal, state, and local regulations. The NTS operates under appropriate permits and, if project-specific permits are required, they would be obtained before the start of the expanded use of the facility. Section F.7, "Regulation, Order, Law," is intended to list any references used in preparation of the project-specific analysis.

Comment Code: State Government 2-264

Location of EIS Revision(s): None required

Response: The Big Explosives Experimental Facility is an existing facility in Area 4 of the NTS (described in Volume 1, Chapter 1, Section 1.1). This facility has appropriate National Environmental Policy Act compliance for its ongoing bunker-certification tests and shaped-charge experiments (described as Alternative 1 in Appendix F). The project-specific impact analysis in Appendix F has been incorporated into Chapter 5 of the NTS EIS. This EIS is intended to complete the National Environmental Policy Act requirements for the Big Explosives Experimental Facility by evaluating the potential impacts resulting from the alternatives of ongoing or expanded use of the facility.

Comment Code: State Government 2-265

Location of EIS Revision(s): None required

Response: The focus of Volume 1, Appendix H, is the assessment of human health risks associated with activities proposed under the four EIS alternatives. The assessment of impacts to other environmental resources are addressed in other sections of the NTS EIS; e.g., biological resources, geology and soils, hydrology. The assessment of human health risks examines the two exposure pathways, air and groundwater, that have been demonstrated in previous studies to be the pathways of principal concern to human health risk.

Comment Code: State Government 2-266

Location of EIS Revision(s): None required

Response: Volume 1, Appendix H, and its supporting technical references provide sufficient information to demonstrate that the findings and conclusions of the human-health-risk study were developed in a credible, scientific manner.

Comment Code: State Government 2-267

Location of EIS Revision(s): Summary; Volume 1, Chapter 1

Response: The Summary and Chapter 1 of Volume 1 have been revised to include the requested information regarding the relationship between the *Resource Management Plan* and the NTS EIS. See Section 1.7 of Volume 3.

Comment Code: State Government 2-268

Location of EIS Revision(s): None required

Response: In Section 2.3 of the Draft NTS EIS, the DOE indicated that a revised *Resource Management Plan* would be issued with the Final NTS EIS. A revised Plan has been included with the Final NTS EIS, and it contains a schedule for *Resource Management Plan* development. The Record of Decision has not been prepared but the plan will be part of the DOE planning processes as noted in the NTS EIS.

Comment Code: State Government 2-269

Location of EIS Revision(s): Volume 2, Section 1.3; Volume 2, Section 2.1, Step 2

Response: The proposed Corporate Facilities Land Use Order has been canceled due to the issuance of DOE Order 430.1, "Life Cycle Asset Management" (DOE Order 430.1, 1995). The text of Volume 2, Section 1.3, has been modified to include discussion of DOE Order 430.1. Discussion also has been added in Section 1.3 to include the involvement of the future use project with a comprehensive planning process. The DOE does not agree that the NTS EIS needs to include discussion of The Future Use Project report (DOE/EM, 1996). This report lists the status of the NTS *Resource Management Plan*, but provides no additional insight into DOE policy.

The DOE agrees that the importance of sustainable development should be emphasized. The text in Volume 2, Sections 1.3, and 2.1 has been modified.

Comment Code: State Government 2-270

Location of EIS Revision(s): None required

Response: The *Resource Management Plan* in Volume 2 of the NTS EIS is the appropriate location for the acknowledgment of the Memorandum of Agreement (MOA) between the DOE/NV and the Yucca Mountain Site Characterization Office. For further explanation and a description of the purpose of the Memorandum of Agreement, see response to Comment Code State Government 2-105.

Comment Code: State Government 2-271

Location of EIS Revision(s): Volume 2, Chapter 1

Response: The text in Chapter 1 has been modified.

Comment Code: State Government 2-272

Location of EIS Revision(s): Volume 2, Section 1.5

Response: Section 1.5 has been modified to acknowledge stewardship of both manmade and natural resources.

Comment Code: State Government 2-273

Location of EIS Revision(s): None required

Response: The DOE does not agree that this statement implies that the Yucca Mountain Project is given the status of a cooperating agency on the NTS EIS. The DOE will coordinate resource management on those areas managed by the Yucca Mountain Project in accordance with the Memorandum of Agreement between the DOE/NV and the Yucca Mountain Site Characterization Office. See Section 1.5 of Volume 3.

Comment Code: State Government 2-274

Location of EIS Revision(s): Volume 2, Section 1.5

Response: The DOE agrees that the importance of natural resources on the NTS, and the consideration of natural resources in the *Resource Management Plan*, should be emphasized in Section 1.5. The text of that section has been modified in response to Comment Code State Government 2-272 on this topic.

Comment Code: State Government 2-275

Location of EIS Revision(s): Volume 2, Chapter 3, Section 3.2.1 and Chapter 4, Section 4.4

Response: The DOE agrees that another citation from the Yucca Mountain Project would strengthen this point. The text has been modified. Based on this comment, the DOE also has added the following goal to Section 4.4, which concerns land resources and constraints: "When possible, site new facilities in, or as close as possible to, previously disturbed lands in order to preserve and protect undisturbed areas."

Comment Code: State Government 2-276

Location of EIS Revision(s): Chapter 3, Section 3.2.3

Response: The DOE agrees that neighboring agencies have ecosystem management policies that should be considered by the DOE. The text has been modified to reflect this point.

Comment Code: State Government 2-277

Location of EIS Revision(s): Volume 2, Section 4.4

Response: The DOE agrees that the health of ecosystems on the NTS is tied to the interactions between soil, moisture, biota, and the conservation of undisturbed lands. The DOE, therefore, has added a goal to Section 4.4 "Land" to ensure that land disturbances are minimized (refer to Comment Code State Government 2-275). However, the DOE does not agree that a section discussing the importance of soil-water-biota interactions should be added to Section 3.3. The DOE agrees that these concepts should be considered and incorporated into ecosystem-management practices on the NTS when applicable.

Comment Code: State Government 2-278

Location of EIS Revision(s): None required

Response: The Five Party Cooperative Agreement was mentioned in the *Resource Management Plan* only as an example of interagency cooperation and, as such, does not warrant further discussion.

Comment Code: State Government 2-279

Location of EIS Revision(s): None required

Response: The DOE agrees that the concept of protecting undisturbed lands to maintain soil-water-biota relationships is important. See responses to Comment Codes State Government 2-275 and 2-277.

Comment Code: State Government 2-280

Location of EIS Revision(s): Volume 2, Chapter 3, Section 3.3.4

Response: The text in Volume 2 has been modified to include a reference to Volume II of the Report of the Interagency Ecosystem Management Task Force.

Comment Code: State Government 2-281

Location of EIS Revision(s): None required

Response: When land is withdrawn from public use and reserved for a federal purpose, the Government's right to appurtenant water is implied. As noted in the NTS EIS in Section 4.1.1.1 of Volume 1, the NTS is on withdrawn land and jurisdiction is assigned to the DOE, a federal agency. For any actions that are determined to be outside the mission of the NTS, the DOE will pursue the appropriate process to ensure compliance with all applicable water-appropriation requirements.

Comment Code: State Government 3-1

Location of EIS Revision(s): None required

Response: The U.S. Department of Transportation regulations or orders do not require notification of the DOE for low-level waste shipments. However, the state of Nevada, Clark County, the city of Las Vegas and the city of North Las Vegas require carriers hauling hazardous materials (including radioactive materials) to notify them when entering their jurisdictions. It is DOE policy to require carriers to comply with all state and local regulatory requirements. For additional information, see Section 1.6 of Volume 3.

Comment Code: State Government 3-2

Location of EIS Revision(s): None required

Response: The Record of Decision will contain the final decision concerning the proposed action in this EIS and commitments for associated mitigations. Shipment schedules are not a mitigation; therefore, it would not be appropriate to include them in the Record of Decision. A list of generators, types of waste, volumes, and estimated number of shipments appears in Appendix I and Chapter 5 in Volume 1.

Comment Code: State Government 3-3

Location of EIS Revision(s): None required

Response: The Transportation Protocol Working Group will continue to meet several times a year to discuss transportation issues with the DOE. In addition, concerns that arise between regular meetings can be expressed by conference calls, faxes and telephone conversations. The Energy Technologies Division Director, the DOE/NV Transportation Manager, and the Environmental Management Public Affairs representative are available to the public for interaction.

Comment Code: State Government 3-4

Location of EIS Revision(s): None required

Response: The DOE does not have the authority to select routes. Routes are selected by the carrier in accordance with U.S. Department of Transportation regulations (49 CFR 397.101(a)). Under U.S. Department of Transportation regulations, authority for safe-haven identification is given to individual states. Nevada has not chosen to exercise this authority; if it does, then the DOE will comply. The DOE will arrange for low-level waste shipment carriers arriving during off-hours to park in a secure area inside the gate.

Comment Code: State Government 3-5

Location of EIS Revision(s): None required

Response: It is the DOE's position to use common carriers who are responsible for route selection. It would be inappropriate to include this topic in the Record of Decision. Refer to Section 1.6 of Chapter 1, Volume 3, for further discussion associated with routing.

Comment Code: State Government 3-6

Location of EIS Revision(s): None required

Response: Each carrier or route does not have an individual risk analysis. The transportation risk analysis documented in Appendix I of Volume 1 serve a tool for evaluation in the NTS EIS. U.S. Department of Transportation regulations require the driver to have the route plan in his or her immediate possession.

Comment Code: State Government 3-7

Location of EIS Revision(s): None required

Response: The U.S. Department of Transportation provides the authority for safe haven identification, time of day limitations, holidays, and peak traffic periods to individual states. Nevada has not chosen to initiate any of these restrictions; if it did, the DOE would comply.

Comment Code: State Government 3-8

Location of EIS Revision(s): None required

Response: Refer to Comment Code State Government 3-3.

Comment Code: State Government 3-9

Location of EIS Revision(s): None required

Response: The DOE supplies information to the stakeholders upon request. The DOE is researching possibilities of alternative ways of transmitting information to stakeholders.

Comment Code: State Government 3-10

Location of EIS Revision(s): None required

Response: Relevant analyses from other DOE EISs are incorporated into this EIS. The resource area analyses in Chapter 5 of the NTS EIS were cross-referenced to other EISs, and the potential impacts to the NTS were also considered in the "Cumulative Impacts" analyses of this EIS.

Comment Code: State Government 3-11

Location of EIS Revision(s): None required

Response: Refer to the discussion in Volume 3, Section 1.6.

Comment Code: State Government 3-12

Location of EIS Revision(s): None required

Response: Presently the DOE is evaluating its inventories of radiation detection equipment for possible donation to local communities. Refer to discussion in Section 1.6 of Volume 3.

Comment Code: State Government 3-13

Location of EIS Revision(s): None required

Response: It is not the DOE's policy to provide standard emergency response equipment to local communities. Refer to discussion in Section 1.6 of Volume 3 for additional information.

Comment Code: State Government 3-14

Location of EIS Revision(s): None required

Response: Refer to discussion in Volume 3, Section 1.6.

Comment Code: State Government 3-15

Location of EIS Revision(s): None required

Response: Refer to information in Volume 3, Section 1.6.

Comment Code: State Government 3-16

Location of EIS Revision(s): None required

Response: Refer to the discussion in Volume 3, Section 1.6.

Comment Code: State Government 3-17

Location of EIS Revision(s): None required

Response: Refer to the discussion in Volume 3, Section 1.6.

Comment Code: State Government 3-18

Location of EIS Revision(s): None required

Response: The DOE complies with all applicable regulations. Regulations require Class 7 materials to be shipped, as a minimum, in strong, tight containers that preclude aerosol disbursement.

Comment Code: State Government 3-19

Location of EIS Revision(s): None required

Response: The stakeholders have identified all general concerns about parking of shipments of low-level waste and mixed waste carriers arriving at the NTS during off hours. The DOE has committed to making parking available in a secure area inside the main gate of the NTS.

Comment Code: State Government 3-20

Location of EIS Revision(s): None required

Response: There is no regulatory requirement to have two drivers present at all times during the transportation of Class 7 waste. If the U.S. Department of Transportation or the Nuclear Regulatory Commission makes this mandatory in the future, DOE will comply.

Comment Code: State Government 3-21

Location of EIS Revision(s): None required

Response: Best management practices require carriers to respond to driver advisories and notifications of delays and adjust their route plans accordingly. For additional information refer to Section 1.6 of Volume 3.

Comment Code: State Government 3-22

Location of EIS Revision(s): None required

Response: Commercial Vehicle Safety Alliance inspections are not required for low-level waste shipments; it is the DOE position to use the Motor Carrier Evaluation Program to ascertain carrier worthiness. The U.S. Department of Transportation and local law enforcement agencies already have enforcement authority; law enforcement can pull over and inspect any vehicle. Vehicles are inspected prior to shipment, as well as through the evaluation program (mentioned above), which uses the Commercial Vehicle Safety Alliance standards. No additional inspection is necessary.

This Page Intentionally Left Blank

Municipal Government

Comment Code: Municipal Government 1-1

Location of EIS Revision(s): None required

Response: The Purpose and Need for this EIS is discussed in the Summary and in Volume 1, Section 2.3.4. The moratorium on underground nuclear testing has resulted in the need for the DOE to redefine mission priorities and manage land use at the NTS to support current and future activities mandated by statute, Presidential direction, and Congressional authorization and appropriation. Unlike other project-related EISs, this is a sitewide programmatic EIS and the purpose and need statement addresses in a broad fashion the focus of this EIS.

Comment Code: Municipal Government 1-2

Location of EIS Revision(s): None required

Response: The alternatives describe a number of scenarios that are designed to accommodate current and potential future uses of the NTS. These scenarios are of a programmatic nature and represent a wide range of potential uses.

Comment Code: Municipal Government 1-3

Location of EIS Revision(s): None required

Response: The relationship between the *Resource Management Plan* and this EIS is explained both in the Plan in Sections 1.1 and 1.4 and in the NTS EIS in Volume 1, Section 2.3. In both places, the Plan is characterized as the basis for future planning and is an integral part of the National Environmental Policy Act process for the NTS. It is presented with this EIS as the first step in its development and as an opportunity to solicit public comment on the Plan.

Comment Code: Municipal Government 1-4

Location of EIS Revision(s): None required

Response: Volume 1, Section 2.3, Purpose and Need for DOE Action, describes the development and function of a *Resource Management Plan* for the NTS. The framework for this plan was distributed for public comment as Volume 2 of the Draft NTS EIS. The *Resource Management Plan* will build upon the resource and use descriptions of the Final NTS EIS.

Comment Code: Municipal Government 1-5

Location of EIS Revision(s): None required

Response: Some aspects of Alternative 2 may cause non-compliance with state agreements and with state and federal laws. The Council of Environmental Quality regulations do not require the dismissal of an alternative which contains potential legal issues. The DOE decided to evaluate this alternative in order to look at the full range of use alternatives for this EIS. The no action alternative (Alternative 1) is defined as the continuation of current programs, projects, and activities, which would have the impacts described in Volume 1, Chapter 5. The Council of Environmental Quality requires evaluation of the No Action Alternative.

Comment Code: Municipal Government 1-6

Location of EIS Revision(s): None required

Response: The NTS EIS is of a programmatic nature and thus does not address site-specific impacts except in the case of Appendices F and J. However, where appropriate, quantitative analyses were performed and are included in Volume 1, Chapter 5 of this EIS.

Comment Code: Municipal Government 1-7

Location of EIS Revision(s): None required

Response: Impacts of past weapons testing are described in great detail in Volume 1, Chapter 4, Affected Environments. Section 4.1.2 describes the land use of each area on the NTS and includes the number and type of nuclear tests. Section 4.1.4.2 Geology provides an exhaustive narrative on the geological effects of past nuclear testing. The radiological source term from past testing can be found in this section. Radiologic sources in groundwater are discussed in Section 4.1.5.2. Sections 4.1.6, 4.1.9, 4.1.10, and 4.1.11 all include discussion on the past effects of nuclear testing on the various resources. The information in Chapter 4 was used as a baseline for the impacts analysis (Chapter 5) and was also included in the cumulative impacts analysis.

Comment Code: Municipal Government 1-8

Location of EIS Revision(s): None required

Response: The increased truck traffic related to waste shipments is negligible compared to the total traffic along the main routes leading to the NTS through Clark County. Such an increase in traffic is not likely to depress property values in the urban Las Vegas area, which experiences heavy traffic of a varied nature along its major routes. The court case from a rural area in New Mexico is not analogous to the situation in urban Las Vegas. Property values along established highways in urban Las Vegas are determined by a number of factors, not just by the negative perception that some people may have regarding the transportation of waste on these highways. In New Mexico, private property was condemned to build a new highway bypass specifically for the purpose of transporting waste. In urban Las Vegas, the routes taken by waste haulers are established public highways where the number of trucks hauling waste are a very small percentage of the total traffic.

Furthermore, there is currently no historical or existing information that substantiates a deterioration of the economic environment in southern Nevada based on images or perceptions related to waste shipments. Refer to Section 1.9 of Volume 3 for more information on perception of risk.

Comment Code: Municipal Government 1-9

Location of EIS Revision(s): Chapter 6

Response: Volume 1, Chapter 6, Cumulative Impacts, has been expanded in the Final NTS EIS. This includes a broader discussion of the methods used and an expansion of the base against which the cumulative impacts have been derived. A more quantitative approach to the analysis has also been included in the Final NTS EIS. It is believed that these changes will address the concerns noted.

Comment Code: Municipal Government 1-10

Location of EIS Revision(s): None required

Response: Impacts related to past weapons testing are discussed in Volume 1, Section 4.1.11, Occupational and Public Health and Safety, and in Volume 1, Chapter 6, Cumulative Impacts. Cumulative impacts related to the site characterization impacts at Yucca Mountain have been included in the Cumulative Impacts section. Other future activities at Yucca Mountain that may be associated with construction, operation, and/or closure of a repository are dependent on the DOE first determining that the site is suitable, recommending to the President that the site be developed as a repository, and obtaining Congressional authorization as well as a Nuclear Regulatory Commission license. These actions, if they occur, are beyond the 10-year timeframe of the NTS EIS. Further detail on the relationship of the Yucca Mountain Project Repository EIS and this EIS is found in Volume 1, Section 3.2.6.1 and Section 1.1 of Volume 3.

Comment Code: Municipal Government 1-11

Location of EIS Revision(s): Chapter 6

Response: The information in Volume 1, Chapter 6, Cumulative Impacts, has been expanded, and now includes planned Air Force activities. See the response to Comment Code Municipal Government 1-9 for further information.

Comment Code: Municipal Government 2-1

Location of EIS Revision(s): Volume 1, Sections 4.1.3 and 5.1.1.3

Response: Text has been added to clarify the training that the DOE provides and the responsibilities that the DOE has. For additional information concerning transportation, refer to Section 1.6 of Volume 3.

Comment Code: Municipal Government 2-2

Location of EIS Revision(s): Volume 1, Section 4.1.3 and 5.1.1.3

Response: Text has been added to clarify DOE training and its responsibilities.

Comment Code: Municipal Government 2-3

Location of EIS Revision(s): None required

Response: The DOE is not required to provide notification for low level-waste shipment activities. However, the state of Nevada, Clark County, the city of Las Vegas and the city of North Las Vegas, require carriers hauling hazardous materials (including radioactive materials) to notify them when entering their jurisdictions. It is DOE policy to require carriers to comply with all state and local regulatory requirements. Refer to Section 1.6 of Volume 3 for more information on transportation.

Comment Code: Municipal Government 2-4

Location of EIS Revision(s): None required

Response: The Transportation Protocol Working Group will continue to meet several times a year to discuss transportation issues with the DOE. In addition, concerns that arise between regular meetings can be expressed to the Energy Technologies Division Director, the DOE/NV Transportation Manager, and the Environmental Management Public Affairs representative. Refer to Section 1.6 of Volume 3.

Comment Code: Municipal Government 2-5

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-4.

Comment Code: Municipal Government 2-6

Location of EIS Revision(s): None required

Response: See the response to Comment Code Municipal Government 2-1.

Comment Code: Municipal Government 2-7

Location of EIS Revision(s): None required

Response: The material shipped to the NTS does not require special instruments for detection of radioactivity. The low levels of gamma and beta radiation from this material can be detected with a CDV-700 instrument, which has been supplied to the state of Nevada for years by the Federal Emergency Management Agency. The DOE/NV presently is reviewing radiation detection equipment inventories to determine quantity and type of surplus equipment that could be donated to local jurisdictions. Refer to Section 1.6 of Volume 3 for more information.

Comment Code: Municipal Government 2-8

Location of EIS Revision(s): None required

Response: Communication systems and optical devices are standard items for routine responders to incidents involving hazardous materials including radioactive material, explosives, poisons, flammable materials, etc. It is not DOE policy to provide these types of items.

Comment Code: Municipal Government 2-9

Location of EIS Revision(s): None required

Response: Local public safety and emergency response agencies are candidates for the distribution of DOE surplus equipment. Refer to Comment Code Municipal Government 2-7 for more information.

Comment Code: Municipal Government 2-10

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-1.

Comment Code: Municipal Government 2-11

Location of EIS Revision(s): Volume 1, Sections 4.1.3 and 5.1.1.3

Response: The First-on-Scene responder training program is available to all emergency response personnel in the state of Nevada. Additional information concerning emergency management and training can be found in Volume 1, Sections 4.1.3 and 5.1.1.3 and in Volume 3, Section 1.6.

Comment Code: Municipal Government 2-12

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-1.

Comment Code: Municipal Government 2-13

Location of EIS Revision(s): None required

Response: It is DOE policy to comply with all applicable transportation regulations. At a minimum, all Class 7 materials are shipped in strong, tight, closed containers that preclude aerosol disbursement.

Comment Code: Municipal Government 2-14

Location of EIS Revision(s): Volume 1, Chapter 7

Response: The DOE agrees to make parking space available within the secured area of the NTS.

Comment Code: Municipal Government 2-15

Location of EIS Revision(s): None required

Response: There is no regulatory requirement to have two drivers present at all times during the transportation of Class 7 waste. If the U.S. Department of Transportation or the Nuclear Regulatory Commission makes this mandatory in the future, the DOE would comply.

Comment Code: Municipal Government 2-16

Location of EIS Revision(s): None required

Response: Carriers are required to respond to driver advisories and notifications of delays, and to adjust their routes as appropriate. Refer to Volume 3, Section 1.6 for more transportation information.

Comment Code: Municipal Government 2-17

Location of EIS Revision(s): None required

Response: Commercial Vehicle Safety Alliance inspections are not required for carriers of low-level waste shipments; however, it is DOE policy to use the Motor Carrier Evaluation Program to ascertain carrier worthiness. Vehicles are inspected prior to shipment as well as through the evaluation program, which uses the Commercial Vehicle Safety Alliance standards. No additional inspection is necessary. The U.S.

Department of Transportation and local law enforcement agencies have enforcement authority; law enforcement officially can stop any vehicle and inspect it.

Comment Code: Municipal Government 2-18

Location of EIS Revision(s): None required

Response: The U.S. Department of Transportation provides the authority to individual states for safe haven identification as well as, time of day, holiday, and peak traffic period limitations. The Nevada Department of Transportation has not initiated these restrictions. Refer to Comment Code Municipal Government 2-14.

Comment Code: Municipal Government 3-1

Location of EIS Revision(s): None required

Response: Refer to the information in Section 1.9 of Volume 3.

Comment Code: Municipal Government 3-2

Location of EIS Revision(s): Section 3.2.6.1

Response: The DOE will evaluate the possible environmental impacts from the construction, operation, and eventual closure of a potential repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain; including transportation and discussion of potential routing for these waste shipments, in a separate, ongoing EIS. It is not necessarily true that the routes deemed appropriate and designated under the Department of Transportation regulations for low-level waste shipments are the same routes that will be deemed appropriate for future high-level radioactive waste shipments, when they occur. The DOE will follow the Department of Transportation's routing regulations that are in effect at that time to cover shipments of spent nuclear fuel and high-level radioactive waste. See Section 3.2.6.1 and Section 1.1 of Volume 3 for a discussion of the relationship between the Yucca Mountain Repository EIS and this EIS.

Comment Code: Municipal Government 3-3

Location of EIS Revision(s): None required

Response: The DOE is aware of the local concern regarding Craig Road. Refer to the response to Section 1.6 of Volume 3 for a discussion of how routes are selected.

Comment Code: Municipal Government 3-4

Location of EIS Revision(s): Section 3.2.6.1

Response: The routing regulations for hazardous radioactive materials and waste are issued by the U.S. Department of Transportation. Regulations pertaining to the transportation of radioactive high level waste are found in 49 CFR, Part 397, Subpart D, "*Routing of Class 7 (Radioactive) Materials.*" The regulations pertaining to the transportation of hazardous, low-level radioactive materials and waste are found in 49 CFR Part 107 "*Hazardous Material Program Procedures.*"

It is not necessarily true that the routes deemed appropriate and designated (under the Department of Transportation regulations) for low-level waste shipments are the same routes that will be deemed appropriate for future high-level radioactive waste shipments, when they occur. The DOE will follow the Department of Transportation's routing regulations that are in effect at the time to cover shipments of spent fuel and high-level radioactive waste. For additional information on the relationship of Yucca Mountain and the NTS, refer to Volume 1, Section 3.2.6.1, and Volume 3, Section 1.1.

Comment Code: Municipal Government 3-5

Location of EIS Revision(s): None required

Response: In 1961, the Area 5 Radioactive Waste Management Site was established at the NTS for the disposal of low-level waste from both on-site and off-site generators. There is no historical evidence that perceptions associated with the transportation of low-level waste to the NTS has affected the economy of Nevada. The potential for negative perceptions that affect the economy of the state resulting from the transport of nuclear waste within Nevada is addressed in Section 1.9 in Volume 3.

The DOE finds any route selection methodology that meets the U.S. Department of Transportation regulations acceptable. Route selection criteria for the transportation of low-level and high-level waste are found in United States Department of Transportation Regulations 49 CFR 397.101 (a) and (b). The primary criterion for route selection is to minimize radiological risk to the public. Local conditions would be a factor in determining the risk along a given route. Section 1.6 of Volume 3 provides more information on transportation.

Comment Code: Municipal Government 3-6

Location of EIS Revision(s): None required

Response: The DOE maintains an emergency response capability that is prepared to assist in any event involving radioactive materials. This capability exists to support its own operations as well as to assist local and state governments should that assistance be needed. As long as operations continue at the NTS, the emergency response capability will be maintained. See Section 1.6 of Volume 3.

Comment Code: Municipal Government 3-7

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-4.

Comment Code: Municipal Government 3-8

Location of EIS Revision(s): None required

Response: There is no requirement for the DOE to notify local governments of low-level-waste shipment activities. However, the state of Nevada, Clark County, the city of Las Vegas, and the city of North Las Vegas require carriers hauling hazardous materials (including radioactive materials) to notify them when entering their jurisdictions. It is the DOE policy to require carriers to comply with all state and local regulatory requirements. For further discussion on Radioactive Waste shipments, refer to Section 1.6 of Volume 3.

The importance of the state having an established notification system is that normally the first on the scene is a policeman or fireman who uses his chain of command to initiate response. The DOE does not automatically respond, but must be asked to participate by a cognizant state of Nevada authority.

Comment Code: Municipal Government 3-9

Location of EIS Revision(s): Chapter 4, Section 4.1.2.4

Response: In Section 4.1.2.4 of the NTS EIS, the phrase, "which are small private airports" has been deleted. It referred to Sky Harbor Airport, Boulder City Airport, and North Las Vegas Air Terminal.

Comment Code: Municipal Government 3-10

Location of EIS Revision(s): Volume 1, Section 4.7.2.4

Response: The text has been revised to replace the reference to Dry Lake Valley with Coyote Spring Valley.

Comment Code: Municipal Government 3-11

Location of EIS Revision(s): None required

Response: Under Alternative 2, even if half the group that out-migrates lived in North Las Vegas, the city would lose only 5 percent of its 1995 population. The anticipated growth of 11 percent would compensate for the loss within the first year, and the result would be a net growth of 6 percent.

Comment Code: Municipal Government 3-12

Location of EIS Revision(s): None required

Response: The growth of traffic resulting from normal population expansion and increased economic activity such as the development of the Las Vegas Motor Speedway is included in the baseline traffic projections as represented by Alternative 1. Alternative 1 (No Action Alternative) shows a traffic growth of 30 percent between the years 1996 and 2000 and another 30 percent between 2000 and 2005. The traffic growth between 1996 and 2005 amounts to approximately 69 percent. In spite of this baseline growth, development of the Solar Enterprise Zone Project would not result in any change in the level of service on Interstate 15 which will continue to operate at level of service "B" or better.

Comment Code: Municipal Government 3-13

Location of EIS Revision(s): Volume 1, Section 5.4.6.2.2

Response: Volume 1, Section 5.4.6.6.2, as referenced by the comment, is actually Section 5.4.6.2.2. Sections 5.3.6.2.2 and 5.4.6.2.2 have been corrected to read U.S. Highway 93.

Comment Code: Municipal Government 3-14

Location of EIS Revision(s): Volume 1, Table 4-6, Table 5.1-4, Table 5.2-4, Table 5.3-4, Table 5.4-4

Response: The reference to North Las Vegas Terminal has been deleted in the indicated tables. The tables have been modified to clarify the road segment references.

Comment Code: Municipal Government 3-15

Location of EIS Revision(s): Chapter 4, Section 4.1.3

Response: The population data provided by the comment have been included in the Final NTS EIS.

Comment Code: Municipal Government 3-16

Location of EIS Revision(s): Volume 1, Section 5.1.1.3, Table 5.1-8, Table 5.1-10, Section 5.2.1.3, Table 5.2-5, Table 5.2-7, Section 5.3.1.3, Table 5.3-9, (was 5.3-10) Table 5.3.-11, (was 5.3-12).

Response: The housing unit data provided by the comment have been included in the Final NTS EIS.

Comment Code: Municipal Government 3-17

Location of EIS Revision(s): Sections 5.1.1.3, 5.2.1.3, and 5.3.1.3

Response: The DOE agrees. New population projections based on the figures provided by the comment have been included in the Final NTS EIS.

Comment Code: Municipal Government 3-18

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 3-11.

Comment Code: Municipal Government 3-19

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 in Volume 3.

Comment Code: Municipal Government 3-20

Location of EIS Revision(s): None required

Response: The DOE is aware of the local concerns regarding Craig Road. Refer to the response to Section 1.6 of Volume 3 for a discussion of route selection.

Comment Code: Municipal Government 4-1

Location of EIS Revision(s): None required

Response: Refer to the response to Comment Code Municipal Government 3-8.

Comment Code: Municipal Government 4-2

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 of Volume 3.

Comment Code: Municipal Government 4-3

Location of EIS Revision(s): None required

Response: Refer to responses in Comment Code Municipal Government 2-1.

Comment Code: Municipal Government 4-4

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-7.

Comment Code: Municipal Government 4-5

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-8.

Comment Code: Municipal Government 4-6

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 of Volume 3 and Comment Code Municipal Government 2-1.

Comment Code: Municipal Government 4-7

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 of Volume 3 and Comment Code Municipal Government 2-1.

Comment Code: Municipal Government 4-8

Location of EIS Revision(s): None required

Response: Refer to comment responses Comment Code Municipal Government 2-13 through 2-17.

Comment Code: Municipal Government 4-9

Location of EIS Revision(s): None required

Response: The stakeholder's concern is noted. The U.S. Department of Transportation provides the authority for safe haven identification time of day, holiday, and peak traffic period limitations to individual states. The

Nevada Department of Transportation has not initiated any of these restrictions; if they did adopt these programs, the DOE would comply.

Comment Code: Municipal Government 4-10

Location of EIS Revision(s): None required

Response: The programmatic EIS does not present specific details on the Environmental Restoration Program. At present, conceptual alternatives for cleanup have been identified for some of the contaminated media, and demonstration projects are underway for a limited number of alternatives. The final plans for actual remediation have not yet been developed.

With respect to monitoring, the DOE will continue its basic monitoring programs, as described in the NTS EIS, until the additional characterization data is available. At that time, the DOE, in consultation with the regulatory authority, will develop plans for the long-term monitoring of the site that take into consideration the selected remedial alternatives.

Comment Code: Municipal Government 4-11

Location of EIS Revision(s): Volume 1, Figure 4-41a

Response: Figure 4-39 is a map of the hydrographic basins, and shows the boundaries of the basins with respect to surface water drainage, not groundwater flow. The discussion of groundwater basins and flow systems is contained in the groundwater section of this EIS, Section 4.1.5.2 and notes that Death Valley is the final discharge area for the Death Valley Flow system. A map (Figure 4-41a) has been added to the NTS EIS that includes more of the California portions of the flow system.

Comment Code: Municipal Government 4-12

Location of EIS Revision(s): Volume 1, Section 5.1.1.5.2

Response: The reference to Section 4.1.3 is incorrect and has been deleted.

Comment Code: Municipal Government 4-13

Location of EIS Revision(s): Volume 1, Section 5.1.1.5.2

Response: The text has been revised to remove the term "significant existing contamination" from the discussion. The DOE will welcome the opportunity to explore the ways for Inyo County to participate in the environmental restoration process.

Comment Code: Municipal Government 5-1

Location of EIS Revision(s): None required

Response: The DOE included the four federal agencies and Nye County as cooperating agencies during the early stages of the development of this EIS in accordance with the Council on Environmental Quality regulations for implementing the National Environmental Policy Act (Title 40 CFR Parts 1500.5 and 1500.6). These agencies were included because of their jurisdiction and specific expertise with regard to environmental issues which are discussed in this EIS. The DOE sought their cooperation to identify potential impacts to lands owned, administered, or managed by these agencies as a result of implementing the proposed alternatives. The DOE wanted the alternatives evaluated in this EIS to be consistent with the programs and policies of these agencies.

Although the DOE did not request other federal, state, or local agencies to be cooperating agencies, the DOE did contact numerous agencies during the preparation of this EIS and sent copies of the Draft NTS EIS to local governments throughout Nevada, including Esmeralda County, for their review and comment; not just Clark, Lincoln, and Nye counties. The input provided by these agencies during scoping, and in comments on the Draft NTS EIS has been a very valuable component in the overall process. The DOE is committed to working with local governments in Nevada in implementing the preferred alternative, and will continue to seek their input regarding issues related to the NTS.

The DOE has not excluded Esmeralda County from activities involving the NTS. The DOE mailing lists for the NTS include several Esmeralda County agencies and officials, including the County Commission, County Clerk, and School Superintendent. The mailing lists also include the public libraries in Goldfield and Dyer. The DOE also has published public notices regarding NTS activities in the *Tonopah Times*. In March 1995, the DOE held a meeting on transportation issues in Goldfield, which was attended by several Esmeralda County officials; and a scoping meeting for the NTS EIS was held in nearby Tonopah in September 1994.

Comment Code: Municipal Government 5-2

Location of EIS Revision(s): None required

Response: The NTS EIS includes a discussion of environmental resources in Nye, Clark, and Lincoln counties because most direct and indirect effects of the alternatives being considered would occur in those counties. Esmeralda County is not included to the same extent because no direct environmental impacts would occur in the county, and only minimal indirect socioeconomic effects would occur for any of the alternatives.

Comment Code: Municipal Government 5-3

Location of EIS Revision(s): None required

Response: The region of influence for the socioeconomics discussion in the NTS EIS is contained in Section 4.1.3. The region of influence is defined as the area in which the principal direct and secondary socioeconomic effects are likely to occur, and are expected to be of the most consequence to local jurisdictions. Most employees of the DOE, contractor personnel, and supporting government agencies live in Clark County (90 percent) or Nye County (7 percent). The remaining 3 percent live in other areas including Lincoln and

Esmeralda Counties. It was assumed that past trends would continue based on past and predicted settlement patterns, and that the majority of socioeconomic impacts would occur to jurisdictions in these counties.

Comment Code: Municipal Government 5-4

Location of EIS Revision(s): None required

Response: There are two stages for analysis of Environmental Justice impacts. The first stage is the determination of significant adverse impacts for each resource. The second stage is the determination of whether these significant impacts disproportionately impact minority or low-income populations. No significant impacts were identified for any resource in Esmeralda County; therefore, no Environmental Justice impacts would occur.

Comment Code: Municipal Government 5-5

Location of EIS Revision(s): None required

Response: Refer to the responses to Comment Code Municipal Government 5-1, 5-2, 5-3, and 5-4.

Comment Code: Municipal Government 5-6

Location of EIS Revision(s): None required

Response: Refer to the response to Comment Code Municipal Government 3-8.

Comment Code: Municipal Government 5-7

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-4.

Comment Code: Municipal Government 5-8

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-1.

Comment Code: Municipal Government 5-9

Location of EIS Revision(s): None required

Response: The DOE policy is to provide stakeholders with necessary reports for information. Presently the DOE is considering supplying information to the stakeholder in alternative forms of communication.

Comment Code: Municipal Government 5-10

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 3-8.

Comment Code: Municipal Government 5-11

Location of EIS Revision(s): Volume 1, Sections 4.1.3 and 5.1.1.3

Response: Text has been added to clarify the training that the DOE provides and the responsibilities that the DOE has.

Comment Code: Municipal Government 5-12

Location of EIS Revision(s): Volume 1, Sections 4.1.3 and 5.1.1.3

Response: Text has been added to clarify the training that the DOE provides and the responsibilities that the DOE has. The First-on-Scene responder training program is available to all emergency response personnel in the state of Nevada. Additional information concerning emergency management and training can be found in Volume 1, Sections 4.1.3 and 5.1.1.3.

Comment Code: Municipal Government 5-13

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 5-12 for the response to this comment.

Comment Code: Municipal Government 5-14

Location of EIS Revision(s): None required

Response: It is the DOE policy to comply with all applicable transportation regulations. All Class 7 materials are shipped, at a minimum in strong, tight, containers that preclude aerosol disbursement.

Comment Code: Municipal Government 5-15

Location of EIS Revision(s): None required

Response: The DOE agrees to make parking space available within the secured area of the NTS.

Comment Code: Municipal Government 5-16

Location of EIS Revision(s): None required

Response: There is no regulatory requirement to have two drivers present at all times during the transportation of Class 7 waste. If the U.S. Department of Transportation or the Nuclear Regulatory Commission were to make this mandatory in the future, the DOE would comply.

Comment Code: Municipal Government 5-17

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 of Volume 3.

Comment Code: Municipal Government 5-18

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-17.

Comment Code: Municipal Government 5-19

Location of EIS Revision(s): None required

Response: Routes are selected by the carrier in accordance with the U.S. Department of Transportation regulations [49 CFR 397.101 (a)]. Refer to Section 1.6 of Volume 3, for additional information on transportation.

Comment Code: Municipal Government 5-20

Location of EIS Revision(s): None required

Response: It is the DOE's position to use common carriers to ship low-level waste. These carriers are required to know and use the U.S. Department of Transportation regulations (49 CFR 100-177). Please refer to the discussion in Section 1.6 of Volume 3. As discussed in the Transportation Study, Appendix I to this EIS, there are several advantages to using common carriers, not the least of which is their liability for shipments. The DOE has concluded that no benefit is derived from using contract carriers, solely to be able to dictate routes. There has been, and will continue to be some special instances when a contract carrier will be used to meet requirements and the circumstances for a specific shipment.

Comment Code: Municipal Government 5-21

Location of EIS Revision(s): None required

Response: It is not appropriate for this document to make commitments for the contents of the Record of Decision. The Record of Decision will be developed after consideration of public comments and the Final NTS EIS.

Comment Code: Municipal Government 5-22

Location of EIS Revision(s): None required

Response: Any methodology to select routes that meets the requirements of the U.S. Department of Transportation regulations [49 CFR 397.101(a)] is acceptable. By authority of the U.S. Department of Transportation, carriers are required to select their routes based on the route selection criteria. The primary criterion of route selection is to minimize radiological risk to the public. Refer to Section 1.6 of Volume 3 for additional information on transportation.

Comment Code: Municipal Government 5-23

Location of EIS Revision(s): None required

Response: The Record of Decision has not yet been prepared and the DOE cannot commit in this EIS to its content. Please refer to the discussion in Section 1.6 of Volume 3 regarding route selection.

Comment Code: Municipal Government 5-24

Location of EIS Revision(s): None required

Response: The U.S. Department of Transportation regulations [49 CFR 397.101 (a)] govern route selection for carriers used by generators that ship waste to the NTS. The DOE has no authority in route selection, scheduling and cannot interfere with interstate commerce. Refer to Section 1.6 of Volume 3.

Comment Code: Municipal Government 5-25

Location of EIS Revision(s): None required

Response: The U.S. Department of Transportation provides the authority to individual states for safe haven identification as well as time of day, holiday, and peak traffic period limitations. The Nevada Department of Transportation has not initiated these restrictions.

Comment Code: Municipal Government 6-1

Location of EIS Revision(s): None required

Response: The DOE will continue to keep Clark County informed of activities and functions which may impact the county.

Comment Code: Municipal Government 6-2

Location of EIS Revision(s): Volume 1, Sections 4.1.3 and 5.1.1.3

Response: Text has been added to clarify DOE's responsibilities and the training that it provides. Radiological Assistance Program Team is available to respond to radiological emergencies that occur within DOE Region 7, which includes Nevada, California, and Hawaii. The Radiological Assistance Program Team identifies, controls, and confines hazards resulting from radioactive materials. The scope includes, but is not limited to, radioactive materials of all types and levels bound for the NTS. The expected sequence of notification and telephone numbers for the primary and alternative contacts can be found in DOE/NV-362, *The DOE/NV Radiological Assistance Program Notification Procedure Manual* (DOE/NV, 1995b). Refer to Comment Code Municipal Government 4-6.

Comment Code: Municipal Government 6-3

Location of EIS Revision(s): None required

Response: Analysis presented in this EIS indicates that increased traffic along transportation routes in southern Nevada would not affect property values along transportation routes. Under Alternative 3, the number of trucks bringing radioactive waste from off-site locations to the NTS would increase to 11 per day from 2 per day under Alternative 1. Even this greater than five-fold increase would not add measurably to the current or projected traffic on I-15, U.S. Highway 95, and U.S. Highway 93. For comparison purposes, the 1993 annual average daily traffic count was 11,500 on I-15; 3,635 on U.S. Highway 95, and 747 on U.S. Highway 93 along their most lightly traveled sections in Clark County.

A comprehensive transportation study to accompany this EIS (Appendix I) was conducted with input from the stakeholders through the Transportation Protocol Working Group and the Big Group. This study concluded that the risks along all in-state routes were so low and so similar that it was not meaningful to rank routes solely on the basis of risk. Within Nevada, the transportation risk results in an estimated 0.07 fatalities and 3.8 injuries over the 10-year period of radioactive waste-related shipments.

Comment Code: Municipal Government 6-4

Location of EIS Revision(s): Chapter 4, Section 4.1.12

Response: A discussion of Environmental Justice with regard to the transportation routes has been included in the Final NTS EIS. Because less than 2 percent of the transportation routes would travel through areas of low-income or minority populations in Clark County, it was determined that these populations would not be disproportionately affected by transportation routes, even if they represented a significant, adverse impact.

Comment Code: Municipal Government 6-5

Location of EIS Revision(s): None required

Response: The routes evaluated in the transportation risk analysis are not proposed routes, but were chosen as representative routes for evaluation only. Routes will be selected in accordance with the U.S. Department of Transportation regulations [49 CFR 397.101(a)]. Any methodology to select routes that meets the requirements of the U.S. Department of Transportation regulations is acceptable. Under these regulations, carriers are required to select their routes based on the route selection criteria. The primary criterion of route selection is to minimize radiological risk to the public. The DOE understands the local concern regarding specific routes. See Section 1.6 of Volume 3 for more information.

Comment Code: Municipal Government 6-6

Location of EIS Revision(s): Section 5.1.1.11, Appendix H

Response: Issues related to cultural resources and health risks are found in Cultural Resources and Occupational and Public Health and Safety Sections. The NTS EIS has been revised to clarify the discussion of human health risks. American Indian perspectives on these issues were prepared by the American Indian Writers Subgroup, and are found in italics in these sections. Background on the American Indian Writers Group, which was made up of representatives from the Consolidated Group of Tribes and Organizations, can be found in Appendix G. The discussion of disproportionate impacts to minority and low-income populations as related to cultural resources and risk is found in the Environmental Justice sections of Chapter 5, Sections 5.1.1.12, 5.2.1.12, 5.3.1.12, and 5.4.1.12. The American Indian perspective is also found in italics in these sections.

Comment Code: Municipal Government 6-7

Location of EIS Revision(s): None required

Response: The DOE notes the interest in continuation and enhancement of dialogue. As outlined in Volume 1, Sections 1.6, 2.1, 3.2.3, 3.3.4, and 4 of Volume 2, the DOE is committed to communicating and participating with interested and affected parties in the development of the *Resource Management Plan.*

Comment Code: Municipal Government 6-8

Location of EIS Revision(s): None required

Response: It is not appropriate in this EIS to make commitments on the contents of the Record of Decision. However, the DOE is committed to completing the *Resource Management Plan*, and anticipates completion of the *Resource Management Plan* within 2 years of the publication of the Record of Decision.

Comment Code: Municipal Government 6-9

Location of EIS Revision(s): None required

Response: A region of influence is defined as the area in which effects of site actions are likely to occur and are expected to be of the most consequence. As discussed in this EIS, the regions of influence addressed may vary as appropriate from one resource to another. For example, the economic activity information presented discusses conditions in a region of influence made up of Nye and Clark counties because they included 97 percent of the residential distribution of employees of the DOE, its contractor personnel, and supporting government agencies. The region of influence for air quality was the Nevada Intrastate Air Quality Control Region 147. The region of influence for noise included all sites analyzed and the regions surrounding those sites.

Comment Code: Municipal Government 6-10

Location of EIS Revision(s): None required

Response: Appendix I and the summary of the results in Volume 1, Section 5.1.1.2 of this EIS address the impacts of transporting materials under normal conditions and in case of an accident. Vehicle-related and cargo-related risks along each route were calculated based on present data and projected planned missions.

Comment Code: Municipal Government 6-11

Location of EIS Revision(s): None required

Response: The Environmental Justice analysis for each alternative is located in separate sections. Therefore, Environmental Justice effects related to risk assessment and transportation routes would not be found in the Transportation or Occupational and Public Health and Safety impact sections, but in the Environmental Justice Sections 5.1.1.12, 5.2.1.12, 5.3.1.12, and 5.4.1.12 of Volume 1.

Comment Code: Municipal Government 6-12

Location of EIS Revision(s): None required

Response: The total number of vehicle trips associated with Defense Program and Waste Management Program activities on southern Nevada highways is estimated at approximately 13 shipments per day. Such an increase on any highway in southern Nevada is not likely to cause any traffic congestion. The major generators of off-site traffic on Nevada highways leading to the NTS would be from construction and operation employees. Impacts on highway traffic congestion from these sources are presented in Volume 1, Chapter 5 of this EIS. No significant impacts were found.

Comment Code: Municipal Government 6-13

Location of EIS Revision(s): None required

Response: The analysis of employment and population is a necessary element in the identification of impacts on other socioeconomic elements such as local government revenue and expenditures, housing, and public services. Population increases, for example, do not necessarily result in positive contributions to state and local economics. If unusually large population increases occur as a result of a project over a short period of time, it has the potential for adversely affecting the housing market and public services in a community, at least over a short period. NTS-related activities, even under Alternative 3 (Expanded Use Alternative), would not result in unusually large population increases (638 people or 0.06 percent of the Clark County 1996 population). Nonetheless, impacts on housing, public services, and local government revenue and expenditures are presented in the Socioeconomics section.

Comment Code: Municipal Government 6-14

Location of EIS Revision(s): None required

Response: Population increases associated with NTS-related activities would be generated by jobs. If increased obligations do occur as a result of decisions made by the federal government, NTS employees would continue to contribute funds to the local budget in the form of fees, taxes, etc. Any gap between revenue and expenditures for public services would occur no matter which alternative is chosen by the DOE. A discussion of perception-based impacts on regional prosperity and economic development is presented in Section 1.9 of Volume 3. Mitigation measures are discussed in Section 7.3 of Volume 1, and the Record of Decision will discuss which measures will be implemented.

Comment Code: Municipal Government 6-15

Location of EIS Revision(s): None required

Response: Refer to the discussion in Section 1.9 of Volume 3.

Comment Code: Municipal Government 6-16

Location of EIS Revision(s): Volume 1, Chapter 6

Response: Sitewide alternatives considered in the NTS EIS were developed to include elements contained in numerous other DOE Program EISs that may be located at the NTS. For example, the amount of low-level waste to be shipped to the NTS as described in Alternative 3 is consistent with the amount identified in the "Centralized at the NTS" alternative of the Waste Management Programmatic EIS. The range of alternatives included in the NTS EIS is designed to accommodate and bound the potential decisions that are supported by the other Program EISs. The NTS-specific environmental impacts are then analyzed along with impacts from a range of other programs (e.g., Bureau of Land Management *Resource Management Plans*) within the region of influence for each discipline. This analysis is included in Chapter 6, Cumulative Impacts, which has been revised and augmented.

Comment Code: Municipal Government 6-17

Location of EIS Revision(s): Volume 1, Section 1.4

Response: Related EISs, including DOE Programmatic EISs, are discussed in Section 1.4 of Volume 1. Additional information has been added to clarify the relationship to other DOE EISs.

Comment Code: Municipal Government 6-18

Location of EIS Revision(s): None required

Response: Waste Management, Environmental Restoration, and Defense Programs are considered in this EIS. High-level waste disposal and storage options are considered too speculative at this time to be included in this EIS. Should plans for such facilities at the NTS mature, a separate National Environmental Policy Act analysis will be undertaken. Please refer to the discussion in Section 1.1 of Volume 3.

Comment Code: Municipal Government 6-19

Location of EIS Revision(s): None required

Response: The NTS EIS includes evaluations of cumulative impacts to all resources of contaminated dirt, mixed wastes, plutonium pits, and other low-level wastes representative of current and projected operations. Not all risks are additive. This EIS is not designed to support, and will not be used for, project-specific decisions except for those evaluated in the Appendices to Volume 1. Any major new projects or disposal actions would be subject to additional National Environmental Policy Act review, as appropriate. This review will include cumulative impact analyses.

Comment Code: Municipal Government 6-20

Location of EIS Revision(s): Volume 1, Chapter 6

Response: Volume 1, Chapter 6, Cumulative Impacts has been revised to evaluate long-term plans for both urban and undeveloped regions of southern Nevada. It is unclear how this interactive process mentioned by the comment would enhance the DOE's current planning processes. Refer to Comment Code Municipal Government 6-19 for more information on impact analyses.

Comment Code: Municipal Government 6-21

Location of EIS Revision(s): None required

Response: A cumulative assessment of the impacts of the transportation of low-level waste and radioactive materials is included in this EIS (see Chapter 6, Cumulative Impacts). The transportation risk analysis evaluates the risks from each of the DOE programs, including waste management, environmental restoration, and defense programs. This analysis includes the combined effects of all programs for incident-free transportation. Results from accident analyses should not be combined since the probability of more than one of the "maximum credible" accidents occurring at the same location along the transportation routes is highly unlikely.

The level of information requested is not consistent with a programmatic evaluation of impacts; however, many of the items listed in the comment are included in this EIS. The current analysis includes expected origin of inbound materials, overall material quantities, expected level of radioactivity (source term), and shipping container characteristics and capacities. Similar information is also included for outbound materials. Several decisions must be made by the DOE before some of the items can be accurately specified. Other requested items are specified in applicable regulations or would be expected to be determined when plans become more definite.

Comment Code: Municipal Government 6-22

Location of EIS Revision(s): None required

Response: The routes selected and analyzed in the transportation study were identified using the computer model HIGHWAY. This model identified the primary and secondary routes that would be used based on point of destination. With the primary point of destination being the NTS, some of the shipments are required to pass through the Las Vegas area. The routes analyzed take into consideration traffic congestion, road construction, as well as many other factors.

Comment Code: Municipal Government 6-23

Location of EIS Revision(s): None required

Response: Traffic generated by Defense and Waste Management Program activities amounts to approximately 13 shipments per day. Such an increase on any highway in southern Nevada is not likely to add significantly to traffic congestion caused by transportation improvement programs. It is hoped that the agencies responsible for transportation improvement programs in Clark County would take into account NTS-related traffic in developing their enhanced traffic management programs or other remediation programs.

Comment Code: Municipal Government 6-24

Location of EIS Revision(s): None required

Response: In accordance with the U.S. Department of Transportation regulations, routes are chosen by the carriers. The primary criterion of route selection is to minimize radiological risk to the public. The main factors in reducing risk are time and distance considerations, but other factors, such as population density and local conditions, are also factors which would have to be considered when minimizing risk. Refer to Section 1.6 of Volume 3 for additional information.

Comment Code: Municipal Government 6-25

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 6-24.

Comment Code: Municipal Government 6-26

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 6-24.

Comment Code: Municipal Government 6-27

Location of EIS Revision(s): None required

Response: As discussed in Section 1.6 of Volume 3, the DOE does not have responsibility for route selection. Route selection is the responsibility of the carrier. Each driver is required to have a route plan, including plans for deviations, in immediate possession and must follow that route plan. No additional benefit is gained from using a contract carrier for the transport of low-level waste and mixed waste when common carriers, who are familiar with and have used the U.S. Department of Transportation regulations, are available.

Comment Code: Municipal Government 6-28

Location of EIS Revision(s): None required

Response: It is the DOE's position to use common carriers to ship low-level waste. These carriers are required to know and use the U.S. Department of Transportation regulations (49 CFR 100-177). Please refer to the discussion in Section 1.6 of Volume 3. As discussed in the Transportation Study, Appendix I to this EIS, there are several advantages to using common carriers, not the least of which is their liability for shipments. The DOE has concluded that no benefit is derived from using contract carriers, solely to be able to dictate routes. There have been, and will continue to be special instances when a contract carrier will be used to meet requirements for a specific shipment.

Comment Code: Municipal Government 6-29

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 6-28. As noted in the response to preceding comments, there are no significant advantages to using contract carriers.

Comment Code: Municipal Government 6-30

Location of EIS Revision(s): None required

Response: Refer to the discussion of perceived risk in Section 1.9 of Volume 3.

Comment Code: Municipal Government 6-31

Location of EIS Revision(s): None required

Response: Refer to the discussion of perceived risk in Section 1.9 of Volume 3.

Comment Code: Municipal Government 6-32

Location of EIS Revision(s): None required

Response: Refer to the discussion of perceived risk in Section 1.9 of Volume 3.

Comment Code: Municipal Government 6-33

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 1-8.

Comment Code: Municipal Government 6-34

Location of EIS Revision(s): None required

Response: Appendices H and I of this EIS contain risk assessments for human health and transportation. These assessments were prepared to assist the public in understanding some of the primary risks associated with ongoing DOE operations. The DOE will prepare a Mitigation Action Plan which will address management of onsite risks. The Department of Transportation regulations that govern transportation of radioactive materials are discussed in Section 1.6 of Volume 3 and are designed to minimize risk to the public. See Chapter 7 for a discussion of mitigation measures.

Comment Code: Municipal Government 6-35

Location of EIS Revision(s): None required

Response: There are no regulatory requirements for shipment tracking or escort teams for the transportation of low-level waste or mixed waste. It is the DOE policy to comply with all local and state regulations for transportation notification, procedures concerning the shipment, and management of hazardous materials and waste including low-level radioactive waste. The DOE uses the Motor Carrier Evaluation Program for vehicle inspections. This program meets all regulatory requirements of management of transportation vehicles. Refer to Section 1.6 of Volume 3 for more information on transportation.

Comment Code: Municipal Government 6-36

Location of EIS Revision(s): None required

Response: Ambient air quality impacts associated with criteria pollutant increases from all mobile sources, including shipments associated with Defense Program and Waste Management Program activities, are presented in Table 5.3-13 of this EIS. The total number of vehicle trips associated with these program activities are very small (about 13 shipments per day). The increase in traffic on any Nevada highway by 13 trucks per day is not expected to impact the ambient air quality.

Comment Code: Municipal Government 6-37

Location of EIS Revision(s): None required

Response: The DOE has long-standing agreements with various agencies concerning the water resources of Clark County. Through Memorandums of Agreement, the DOE has established its arrangements with regard to water resources. These specific agreements are a matter of record and their presentation is not necessary in an EIS.

Comment Code: Municipal Government 6-38

Location of EIS Revision(s): Volume 1, Section 4.1.3 and Section 5.1.1.3

Response: Text has been added to clarify the DOE's responsibilities and training that it provides.

Comment Code: Municipal Government 6-39

Location of EIS Revision(s): None required

Response: The appropriate DOE mitigation commitments will be considered in the Record of Decision. The DOE also will prepare a Mitigation Action Plan to support implementation of the mitigation commitments presented in the Record of Decision.

Comment Code: Municipal Government 6-40

Location of EIS Revision(s): None required

Response: Direct, indirect, and induced effects of employment and procurement were considered in this EIS. The multiplier effect is based on disposable income, as well as possible expenditures for supplies and materials. When requirements of supplies and employment increase, the multiplier increases as well. A

Regional Interindustry Multiplier System model (discussed in Appendix E) was used to support the multiplier effect analysis.

Comment Code: Municipal Government 6-41

Location of EIS Revision(s): None required

Response: The DOE is committed, to the greatest extent practicable and permitted by law, to achieving Environmental Justice as part of its mission. DOE has attempted in this EIS (and will continue in subsequent, tiered National Environmental Policy Act documents) to present information that would allow identification of any disproportionately high and adverse human health or environmental effects on minority and low-income populations, resulting from decisions based on this EIS. When such effects are identified, mitigation measures are also identified. Environmental Justice is discussed in EIS Sections 4.1.12 and 5.1.1.12 (Volume 1). Census blocks with minority and low-income populations are indicated in Figures 4-49 and 4-50 for Clark, Nye, and Lincoln counties.

Comment Code: Municipal Government 6-42

Location of EIS Revision(s): None required

Response: Several sources were cited in the Environmental Justice sections. In addition, the references mentioned in the comment were referred to. See also the discussions in Volume 1, Sections 4.1.12 and 5.1.1.12.

Comment Code: Municipal Government 6-43

Location of EIS Revision(s): None required

Response: The region of influence for Environmental Justice does include Clark County. See Figure 4-49 (Clark County census block groups) and the discussions in Volume 1, Sections 4.1.12 and 5.1.1.12.

Comment Code: Municipal Government 6-44

Location of EIS Revision(s): None required

Response: Refer to the response to Comment Code Municipal Government 6-43.

Comment Code: Municipal Government 6-45

Location of EIS Revision(s): None required

Response: The comment implies that NTS-related activities have adverse impacts on tourism and the economy of the Las Vegas area. It is further implied that adverse impacts to tourism and the gaming industry have the potential of being detrimental to all residents of Clark County and particularly to minority and low-income populations who rely on the gaming industry for service-level employment. These statements are not borne out by historical experience. The NTS has been in operation since the 1950s and activities in the past, when nuclear testing was at its peak, have not adversely affected the growth of tourism and the gaming industry. In fact, the Las Vegas area has experienced remarkable growth over the past three decades. Since the DOE believes that NTS activities have not resulted in adverse impacts on tourism and the gaming industry, no disproportionately high impacts occur on minority and low-income populations and analysis. Therefore, no analysis of social amplification (sic) and stigma impacts is justified.

Comment Code: Municipal Government 6-46

Location of EIS Revision(s): Volume 1, Sections 4.1.3, 4.1.11, 4.1.12, 5.3.1.10, 6.4, and Appendix G

Response: As a result of internal review, additional information on the extent of cultural resources possibly affected by Alternative 3 programs has been incorporated into this EIS in Volume 1, Section 5.3.1.10 and Section 6.4. Also, as a result of internal comments, the American Indian Writers Subgroup has prepared additional sections concerning socioeconomic issues, perceived health risks, and issues of Environmental Justice. Impacts to these American Indian concerns were also provided by the American Indian Writers Subgroup and incorporated in this EIS under the various alternatives. These additions were also included in the appropriate places in Appendix G. In Volume 1, Chapters 4 and 5 of this EIS, American Indian input is in italics.

Comment Code: Municipal Government 7-1

Location of EIS Revision(s): None required

Response: Several primary routes go through Las Vegas on the way to the NTS. All routing decisions are the responsibility of the carrier, which complies with all applicable local, state, and federal transportation regulations. These regulations require all routes used to minimize the radiological risk to the public. Refer to Section 1.6 of Volume 3 for more information on transportation.

Comment Code: Municipal Government 7-2

Location of EIS Revision(s): None required

Response: The probability of either a release accident or "fender bender" involving a radioactive load is extremely small (Appendix I, *The Transportation Study*). However, the possibility of this happening does not seem to have affected the economy negatively in southern Nevada. Please refer to the discussion of perceived impacts in Section 1.9 of Volume 3.

Comment Code: Municipal Government 7-3

Location of EIS Revision(s): None required

Response: The NTS EIS takes into account all potential activities at the NTS involving DOE wastes that have been formally proposed for shipment to the NTS in addition to those wastes generated at the site. The effects of site characterization activities at Yucca Mountain are addressed in Volume 1, Chapter 6, Cumulative Impacts. Any potential environmental impacts associated with the construction, operation, and eventual closure of a potential repository or interim storage facility will be addressed in a separate National Environmental Policy Act document. Refer to Section 1.1 of Volume 3 for more information.

Comment Code: Municipal Government 7-4

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 6-24.

Comment Code: Municipal Government 7-5

Location of EIS Revision(s): None required

Response: The DOE is aware of local concerns about Hoover Dam; however, it is not DOE's responsibility to select routes. Routes are selected by the carrier in accordance with the U.S. Department of Transportation regulations (49 CFR 397). The primary criterion in selecting routes is to minimize risk to the public. Refer to the discussion of route selection criteria in Section 1.6 of Volume 3.

Comment Code: Municipal Government 7-6

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 3-8 for the response to this comment.

Comment Code: Municipal Government 7-7

Location of EIS Revision(s): None required

Response: A Radiological Assistance Program Team is available to respond to radiological emergencies that occur within DOE Region 7, which includes Nevada, California, and Hawaii. The Radiological Assistance Program Team for this region is based in Las Vegas, NV. The Radiological Assistance Program Team identifies, controls, and confines hazards resulting from radioactive materials. The scope includes, but is not limited to, radioactive materials of all types and levels bound for the NTS. The expected sequence of notification and telephone numbers for the primary and alternative contacts can be found in DOE/NV-362, *The DOE/NV Radiological Assistance Program Notification Procedure Manual* (DOE/NV, 1995b). The DOE does not believe that the expense of a dedicated Radiological Assistance Program Team for the NTS is warranted, in view of the extremely low risk of a radiological emergency, as described in Appendices H and I of this EIS.

Comment Code: Municipal Government 7-8

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 of Volume 3.

Comment Code: Municipal Government 7-9

Location of EIS Revision(s): None required

Response: Please refer to the discussion in Section 1.9 of Volume 3.

Comment Code: Municipal Government 7-10

Location of EIS Revision(s): None required

Response: The appropriate DOE mitigation commitments will be incorporated into the Record of Decision. Further, the DOE also will prepare a Mitigation Action Plan in support of implementation of the mitigation commitments presented in the Record of Decision.

Comment Code: Municipal Government 8-1

Location of EIS Revision(s): None required

Response: As described in Section 3.6, the Final NTS EIS identifies Alternative 3 and additionally, the public education activities from Alternative 4 as the Preferred Alternative. At the time of publication of the Draft NTS EIS, the DOE had not yet selected a Preferred Alternative.

Comment Code: Municipal Government 8-2

Location of EIS Revision(s): None required

Response: Consistent with the definition of the No Action Alternative in the Council on Environmental Quality regulations, Alternative 1 of this EIS is defined as the continuation of ongoing DOE and interagency programs and activities at the NTS and associated areas in the state of Nevada. The NTS presently serves as a disposal site for low-level waste generated by DOE-approved generators. Managed radioactive waste disposal operations began at the NTS in the early 1960s, and waste has been disposed of in selected pits, trenches, landfills, and boreholes. Under Alternative 1, the DOE would continue to provide waste disposal capabilities to NTS generators and approved off-site generators in the same manner and degree as have occurred within the past 3 to 5 years. Receipt of waste from off-site generators is a legitimate current activity eligible for inclusion as a current operation. This alternative is considered as the "No Action" alternative in this EIS because it does not represent a change in current and planned program activities and operations.

Comment Code: Municipal Government 8-3

Location of EIS Revision(s): Volume 1, Section 3.2.6.1

Response: As a result of internal reviews, Section 3.2.6.1 was modified to better explain the relationship between the Yucca Mountain Project Repository EIS and the NTS EIS. Also refer to the discussion in Section 1.1 of Volume 3.

Comment Code: Municipal Government 8-4

Location of EIS Revision(s): None required

Response: The best available estimates are presented in this EIS for all environmental media. The presentation of more detailed information and the comparison of levels with regulatory standards is not possible at this time and is beyond the scope of this EIS.

Comment Code: Municipal Government 8-5

Location of EIS Revision(s): Volume 1, Chapter 6

Response: The cumulative impact discussion in Chapter 6 has been revised to include a broader prospective on the issues identified.

Comment Code: Municipal Government 8-6

Location of EIS Revision(s): None required

Response: The decision to retain, reallocate, or dispose of special-use airspace presently delegated to the DOE for NTS activities will be based on current and future DOE and DoD requirements and the Federal Aviation Administration's review of these requirements relative to national airspace system needs.

Comment Code: Municipal Government 8-7

Location of EIS Revision(s): None required

Response: This EIS discusses the transportation activities of the Defense Program, Waste Management Program, and ongoing site support activities for all the alternatives at a level appropriate for a programmatic EIS. A detailed discussion of this information can be found in Appendix I, the Transportation Study.

Comment Code: Municipal Government 8-8

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 3-8.

Comment Code: Municipal Government 8-9

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 3-8.

Comment Code: Municipal Government 8-10

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-4.

Comment Code: Municipal Government 8-11

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-4 and 6-2 for further discussion.

Comment Code: Municipal Government 8-12

Location of EIS Revision(s): None required

Response: This information is routinely provided to the state of Nevada.

Comment Code: Municipal Government 8-13

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 3-8.

Comment Code: Municipal Government 8-14

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-7.

Comment Code: Municipal Government 8-15

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 4-6.

Comment Code: Municipal Government 8-16

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-1.

Comment Code: Municipal Government 8-17

Location of EIS Revision(s): None required

Response: The DOE does not have the authority to make routing commitments in the Record of Decision. Any methodology that meets the requirements of the U.S. Department of Transportation regulations [49 CFR 397.101(a)] is acceptable. Refer to Section 1.6 of Volume 3 for additional information on transportation.

Comment Code: Municipal Government 8-18

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 of Volume 3 for a description of DOE responsibilities regarding transportation.

Comment Code: Municipal Government 8-19

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 4-9 and Section 1.6 of Volume 3.

Comment Code: Municipal Government 9-1

Location of EIS Revision(s): Volume 1, Chapter 6

Response: Chapter 6 of Volume 1, "Cumulative Impacts" has been updated to more fully address additive impacts of the NTS alternatives and other reasonably foreseeable development in southern Nevada. Transportation health risks and occupational health and safety analyses are presented in Appendices I and H. These effects would not be expected to be additive since it is highly unlikely that the same individual would be subjected to both an occupational dose and a collective transportation dose.

Comment Code: Municipal Government 9-2

Location of EIS Revision(s): None required

Response: The comment is mistaken when it asserts that the NTS EIS "looks to the next several decades." It analyzes impacts that would likely occur up to the year 2005; however, further National Environmental Policy Act review may be accomplished in 5 years. At that time, subsidized transportation and alternate worker settlement patterns may be in place and would be analyzed. For this EIS, it was assumed that past trends would continue based on past and predicted settlement patterns, and that the majority of socioeconomic impacts would occur in the jurisdictions analyzed. The region of influence chosen is discussed in Section 4.1.3. Most employees of the DOE, contractor personnel, and supporting government agencies live in Clark County (90 percent) or Nye County (7 percent). The remaining 3 percent live in other areas, including Lincoln and Esmeralda counties.

Comment Code: Municipal Government 9-3

Location of EIS Revision(s): None required

Response: Further National Environmental Policy Act review may be accomplished in 5 years, at which time the impacts of subsidized transportation and alternate worker settlement patterns may have changed sufficiently to be analyzed. For this EIS, it was assumed that past trends would continue based on past and predicted settlement patterns, and that the majority of socioeconomic impacts would occur in the region of influence discussed in Section 4.1.3.

Comment Code: Municipal Government 9-4

Location of EIS Revision(s): None required

Response: The DOE believes that the risks and benefits for all surrounding jurisdictions are adequately addressed in this EIS. Risk analysis for the NTS EIS was included in a Human Health Risks and Safety Impacts Study (Appendix H), a Transportation Study (Appendix I) and in Chapter 5. The Human Health Risks and Safety Impacts Study evaluated effects on human health from radiological, chemical, and toxicological substances, as well as physical hazards associated with construction, maintenance, and operations activities at the NTS. Impacts of normal operations and the maximum foreseeable accident were evaluated and negligible risks were found for surrounding communities. Nevertheless, DOE is not authorized to compensate jurisdictions for such risks, perceived or otherwise, and therefore it is not appropriate to speculate on how this might be done.

Comment Code: Municipal Government 9-5

Location of EIS Revision(s): None required

Response: The accident rate along rural two-lane highways in Nevada may well be greater than those along rural segments in another state. Although not under the purview of the DOE, improving the conditions of the roads could reduce accident rates. Total national transportation risk is dominated by vehicle-related consequences, which are not a function of the cargo, and also do not represent a large incremental increase (less than one additional fatality per year), over the total vehicle fatalities already occurring. In addition, very few vehicle accidents result in a release. In fact, the radiological risk results are dominated by incident-free transportation (not accident-related releases), and this is true along the whole route. In-state accident rate data were used to calculate the risk along the in-state routes, and the risk inside Nevada is compared to risk along the national routes in the NTS EIS. See Appendix I, Volume 1, for more information.

Comment Code: Municipal Government 9-6

Location of EIS Revision(s): None required

Response: Refer to Comment Code Municipal Government 2-1.

Comment Code: Municipal Government 9-7

Location of EIS Revision(s): None required

Response: As reflected in Alternative 1, the NTS has been available for use by federal agencies and by private companies for many years. The Spill Test Facility, for example, has been used by the chemical industry and spill containment industry since 1986. In addition, Alternatives 2 and 4 have elements which could result in increased usage of NTS land by the private sector. For example, the Solar Enterprise Zone is a partnership between government and private industry. Also, there are other projects described under Alternative 3 such as Nondefense Research and Development that may also create partnerships among the DOE and other federal agencies, private companies or both. The impacts of these projects have been analyzed in this EIS, although the actual participants of each project have not always been identified. The DOE welcomes proposals for projects particularly suited for the NTS.

Comment Code: Municipal Government 9-8

Location of EIS Revision(s): None required

Response: Epidemiological baseline studies were discussed in several instances at meetings with stakeholder groups which included representatives of the counties and the state. The concern was noted and part of the answer given, at the time, was that the state of Nevada would review the issues and identify any need for such studies within the state. The state has not identified that need. Additionally, the DOE has sponsored and participated in detailed studies of past releases and their consequences, and the results have been published in the open literature. These studies have identified the potential effects of past releases from the NTS. Congress established the Radiation Exposure Compensation Program in response to issues raised by members of the public related to past activities at the NTS (1-800-729-RECP). Refer to Volume 1, Section 3.2.6.3 for more information.

In the recent past, releases of radioactivity from the NTS have been minimal, and have not exceeded the standards established by the U. S. Environmental Protection Agency. Any emissions from the activities proposed in this EIS are predicted to be well below these standards, now and into the future. On this basis, studies and monitoring programs have not been considered to be necessary and have not been included in this EIS.

Comment Code: Municipal Government 9-9

Location of EIS Revision(s): None required

Response: While the commentor's suggested activities are not specifically included in the Final NTS EIS, the DOE, under Alternative 3, examined the impacts of constructing and operating a Class II sanitary landfill in Area 5 (Volume 1, Section 5.3). The estimated waste capacity for this landfill is 160,000 yd^3 and it could accommodate municipal solid waste originating in the rural counties. The acceptance of off-site solid waste at the NTS, however, would be subject to various approvals including the approval of the state of Nevada Division of Environmental Protection, and appropriate National Environmental Policy Act reviews would have to be completed prior to any solid waste disposal for off-site generators.

The NTS is a critical facility in the DOE's efforts to meet the nation's need to safely maintain the nuclear weapons stockpile, to retain the capability to conduct underground nuclear tests, and to focus on new and challenging issues of national security, energy, and the environment.

This EIS is not the "final word" and is not designed to address all potential future activities at the NTS. Rather, this EIS includes only those actions and alternatives that are considered reasonable at this time. New initiatives and proposals that are compatible with projected site uses would be supported by additional lower tier National Environmental Policy Act documentation.

Comment Code: Municipal Government 9-10

Location of EIS Revision(s): Volume 1, Figures 3-1, 3-2, 3-3, 3-4, 4-3

Response: The figures noted above have been corrected.

Comment Code: Municipal Government 9-11

Location of EIS Revision(s): None required

Response: The DOE is committed to the goal of remediating contaminated sites to ensure that risks to the environment and to human health and safety are either eliminated, or reduced to protective levels. A description of Environmental Restoration Program activities, including Area 13, can be found in Appendix A, Section A.3, Nevada Environmental Restoration Program. An ongoing assessment to identify and remediate contamination will continue in pursuit of these goals.

Comment Code: Municipal Government 10-1

Location of EIS Revision(s): Volume 1, Section 4.1.3

Response: Additional text has been added to this EIS to reflect recent efforts by Nye County to increase economic development in relation to federal installations in the county, including the NTS.

Comment Code: Municipal Government 10-2

Location of EIS Revision(s): Volume 1, Section 4.1.3

Response: Based upon the County's input, additional text concerning Nye County's efforts to increase economic development opportunities from federal facilities (including the NTS) has been added to Chapter 4.

Comment Code: Municipal Government 10-3

Location of EIS Revision(s): None required

Response: The DOE recognizes Nye County's concerns and also places a priority on the protection of water resources in Amargosa Valley. In conducting the evaluations, the DOE used the most recently available data including the most up-to-date evaluations by the U.S. Geological Survey and the Yucca Mountain Project. While the DOE believes that the modeling done to evaluate the impacts of pumping wells and tritium transport was adequate for the purposes of this EIS, it has also sponsored the on-going development of a calibrated groundwater flow model and regional tritium transport model, additional groundwater characterization, and continued monitoring of water levels and water chemistry. These efforts are designed to further refine the understanding of the conditions in the region with a focus on areas that are potentially impacted, i.e., Beatty and Amargosa Valley. The models are not yet available; upon their completion, the results will be provided to the county. Another keystone of the DOE's approach to protection of the water resources of the region has been to provide the forums for the involvement of county personnel and the public. The DOE has found the input of the county and its citizens to be of extreme importance and will continue to provide the forums for their involvement.

Comment Code: Municipal Government 10-4

Location of EIS Revision(s): None required

Response: The DOE has strategic plans at the national level and at the operations office level. The last revision of the DOE/NV Strategic Plan was January 1995. Alternative 3 most closely reflects the DOE and DOE/NV Strategic Plans.

The DOE has been engaged in an extensive impact analysis and identification of mitigation measures for this EIS. Certain projects were not fully defined, which limited the impact analysis that could be completed. As these projects become better defined, additional National Environmental Policy Act reviews will be conducted. The DOE will publish a mitigation action plan after the Record of Decision is issued on this EIS.

Comment Code: Municipal Government 10-5

Location of EIS Revision(s): None required

Response: As stated in this NTS EIS, the groundwater used for the construction and operation of the proposed Solar Enterprise Zone will reduce the availability of groundwater available for appropriation. However, because the withdrawals will be limited to hydrographic basins on the NTS, they should not have a significant impact on the downgradient areas in Oasis Valley or Amargosa Valley. As noted in this EIS, the information concerning the zone is preliminary. The final configuration of the Solar Enterprise Zone and water demand have not yet been developed. In performing the evaluations for this EIS, a worst-case evaluation was done that tends to overestimate the impacts. As additional information becomes available concerning this development, it will be shared with the county. Additional impact evaluation would be documented in a tiered National Environmental Policy Act analysis when the proposal is better defined.

Comment Code: Municipal Government 10-6

Location of EIS Revision(s): None required

Response: As with any development, there are "opportunity costs" associated with the development of a Solar Enterprise Zone facility. That is, any water used in the development of a given proposed action is not available for other actions. These opportunity costs may constrain future uses of the NTS. The degree to which future ventures will be constrained cannot be fully ascertained until the plans for the Solar Enterprise Zone facility have been refined and additional evaluations performed. These impacts would be detailed in a tiered National Environmental Policy Act evaluation specific to the Solar Enterprise Zone facility, when the proposal is better defined.

Comment Code: Municipal Government 10-7

Location of EIS Revision(s): None required

Response: The DOE shares Nye County's goal of protecting the water resources of the region. The county is correct; much of the information presented about water resources is general and is drawn upon published sources, as is appropriate for an EIS. The specifics for the analytical models that were used are presented in Appendix E, and all information used will be included in the Administrative Record which will be made available to the county. Refer to response to Comment Code Municipal Government 10-3.

Comment Code: Municipal Government 10-8

Location of EIS Revision(s): None required

Response: The DOE is in the process of calibrating detailed groundwater flow and contaminant transport models for the region. These models have not yet been completed; thus, the results were not available for inclusion in this EIS. Following calibration and final documentation, the models may be of use in evaluating the alternative actions considered in this EIS. Nye County should be aware, however, that there are limitations in the sensitivity of even the most sophisticated models, and there may be more appropriate techniques for conducting such evaluation (such as the more specific analytical models done during EIS evaluations).

Comment Code: Municipal Government 10-9

Location of EIS Revision(s): None required

Response: The DOE agrees that in many instances, evaluations were based upon published information that is decades old. However, the estimated values have served as the basis for water planning in Nevada, and while different investigators may have derived somewhat larger or smaller estimates, revised estimates have not been adopted by the Nevada State Engineer. In many instances, it is simply not possible to measure a value, and estimates must be used. For storage in the upper 100 feet of sediments, the actual value is unknown, and estimates may vary. It is known, however, that a vast amount of water is held in storage.

Comment Code: Municipal Government 10-10

Location of EIS Revision(s): Volume 1, Section 4.1.5.2

Response: The small imbalance between published values of recharge and discharge are the result of the uncertainties in developing the estimates that are presented in the published literature. Section 4.1.5.2 has been revised to indicate that such uncertainties exist. With respect to mining of groundwater, the recharge and discharge are equal, or nearly so, for all of the hydrographic basins in the Great Basin. Just comparing these values would lead to the assumption that any groundwater withdrawals would result in groundwater mining; however, this is not the case. As long as withdrawals do not exceed the recharge to the basin, there is no mining of the groundwater because each year, the groundwater withdrawals are replenished by the recharge for that year. Where withdrawals exceed the recharge, groundwater is removed from storage, i.e., the groundwater is mined. It is only in areas where large-scale groundwater withdrawals have occurred (for example, the Las Vegas Basin) that mining of groundwater has resulted in dramatic declines in water levels. Such declines have not been observed in the basins on the NTS in spite of decades of groundwater withdrawals.

Comment Code: Municipal Government 10-11

Location of EIS Revision(s): None required

Response: As noted in this EIS discussion, water withdrawals for the proposed Solar Enterprise Zone facility would, indeed, result in a lowering of water levels over the area of influence of the well field used to supply the zone. To ensure that these withdrawals do not induce the migration of contaminants or impair water quality, water development will be reviewed within the context of the *Framework for Resource Management Plan* in Volume 2 of this EIS. Before any water development is conducted, the effects of the development will be fully evaluated and the supply wells carefully located to either eliminate or minimize any adverse impacts. For example, the single largest contribution of recharge to the NTS is via underflow from Indian Springs Valley. This underflow is of relatively poor quality, however, because of the high concentration of total dissolved solids. The capture and use of this water through strategically located wells would have no impact on underground testing areas and would remove poorer quality water from the system, resulting in a beneficial impact on the overall water quality.

Comment Code: Municipal Government 10-12

Location of EIS Revisions: None required

Response: The section of this EIS referenced in this comment is in the discussion on surface water and states that "no public water supplies are drawn from springs in Amargosa Valley." The DOE does not anticipate that the status will change in the future because the springs on the NTS are too small for development, and springs in Amargosa Valley are not available for development. The DOE has always considered the groundwater under the NTS to be a precious water resource, and through the implementation of the *Framework for Resource Management Plan*, the DOE will continue to place a high priority on the protection of water resources.

Comment Code: Municipal Government 10-13

Location of EIS Revision(s): None required

Response: The DOE disagrees with the comment that the impacts of contaminated ponds and sewage lagoons are underestimated. The DOE is committed to the goal of remediating contaminated sites to ensure that risks to the environment and to human health and safety are either eliminated, or reduced to protective levels. The specific nature of contamination and contaminant migration at the ponds and sewage lagoons cannot be completely defined until additional information is gathered from characterization activities. When this information is available, the DOE and the state of Nevada, with public input, as defined in the agreement promulgated under the auspices of the Federal Facility Agreement and Consent Order, will agree to any necessary remediation required for these sites. Ponds and sewage lagoons that are potentially contaminated from past activities at the NTS are managed by the Environmental Restoration Program. An ongoing assessment to identify and remediate contamination will continue in pursuit of these goals. Should, through assessment and characterization, the need for liners and/or draining be required for contaminated ponds and sewage lagoons, the DOE will take the necessary remedial actions.

Many ponds and lagoons formerly used at the NTS have been dewatered. Any transient moisture which may accumulate from precipitation would not create enough head pressure to force additional liquids into the vadose zone that had not already been present due to the percolatory effect.

Based on experience at other sites, ponds and lagoons that have been utilized for lengthy periods of time may be sedimented. Depending on the nature of the suspended particulates, the sediment that collects over time in these ponds and lagoons may effectively clog the interstitial spaces in the native material, and form a barrier that prevents the additional migration of liquid into the vadose zone.

Current operating ponds and sewage lagoons are permitted and are in compliance with applicable state and federal regulations. In accordance with state of Nevada Water Pollution Control permits issued for the NTS, all operational primary sewage lagoons are lined with bentonite, and the secondary lagoons, whose purpose are to percolate the water into the vadose zone, conversely are not lined.

Comment Code: Municipal Government 10-14

Location of EIS Revision(s): None required

Response: Under Alternative 2, approximately 582 persons are expected to migrate from Nye County. At the current growth rate, Nye County would continue to grow in population, despite this loss. The NTS EIS recognizes that short-term adverse impacts would occur as a result of Alternative 2. However, because continued economic growth is expected to overcome any loss of jobs from the NTS, no significant socioeconomic impacts are anticipated.

Comment Code: Municipal Government 10-15

Location of EIS Revision(s): Volume 1, Section 7.3

Response: The text has been modified as suggested.

Comment Code: Municipal Government 10-16

Location of EIS Revision(s): Volume 1, Section 4.1.3

Response: Additional text concerning Nye County's efforts to increase economic development opportunities from federal facilities (including NTS) has been added to Chapter 4.

Comment Code: Municipal Government 10-17

Location of EIS Revision(s): Volume 1, Section 4.1.3

Response: The DOE agrees with the first two statements of the comment. Additional text concerning Nye County's efforts to increase economic development opportunities (including with the NTS) has been added to the NTS EIS to provide a more complete description of the relationship between the county and the NTS.

Comment Code: Municipal Government 10-18

Location of EIS Revision(s): Volume 1 Section 4.1.3

Response: Most of the NTS workforce commutes to the Las Vegas area and most food and other services are provided at federally subsidized facilities on the NTS. Intergovernmental revenues of Nye County were approximately 55 percent of total revenues in Fiscal Year 1994. A major component of this revenue was supplemental city/county relief; therefore, the NTS cannot be considered a principal element of intergovernmental revenues. The DOE recognizes the importance of the contribution of Nye County to the NTS; however, the true nature of the role of the NTS in Nye County is somewhat narrow.

Comment Code: Municipal Government 10-19

Location of EIS Revision(s): None required

Response: The DOE recognizes the importance of the NTS to Nye County employment. Volume 1, Section 4.1.3 acknowledges that the NTS dominated the Nye County economy in the 1970s and 1980s and that in 1990 the largest employment sector in Nye County was service industries, which includes NTS jobs.

Comment Code: Municipal Government 10-20

Location of EIS Revision(s): None required

Response: The NTS EIS recognizes that the federal government controls 93 percent of the land area in Nye County, limiting the amount available for private development.

Comment Code: Municipal Government 10-21

Location of EIS Revision(s): None required

Response: Public service ratios for communities in Nye County are discussed in Section 4.1.3, "Socioeconomics." Impacts of increased or decreased population related to the alternatives on Nye County services are presented in Chapter 5. No impacts on Nye County public services are expected as a result of any alternative.

Comment Code: Municipal Government 10-22

Location of EIS Revision(s): None required

Response: Local emergency management, response personnel, and mutual aid agreements are discussed in Volume 1, Section 4.1.3, under the Public Services subheading.

Comment Code: Municipal Government 10-23

Location of EIS Revision(s): None required

Response: The DOE recognizes that Alternative 2 would result in short-term adverse impacts. These impacts would not be significant, however, because the Nye County economy would recover within one year if the current growth rate continues. Average annual employment growth in Nye County between 1980 and 1990 was 6.4 percent, higher than the state of Nevada (5.3 percent) and the United States (2.2 percent).

Comment Code: Municipal Government 10-24

Location of EIS Revision(s): None required

Response: As noted by the comment, unusually large population increases occurring over a short period of time as a result of a project, have the potential for adversely affecting public services in a community. The trend noted by the comment is acknowledged; however, the NTS-related activities, even under Alternative 3 (Expanded Use Alternative), do not result in unusually large population increases (90 people or 0.33 percent of the Nye County 1996 population). If increased obligations do occur as a result of decisions made by the federal government, NTS employees living in Nye County would continue to contribute funds to the local budget. Any gap between local jurisdictions' revenues and expenditures would occur no matter which alternative is chosen by the DOE.

Comment Code: Municipal Government 10-25

Location of EIS Revision(s): Chapter 6

Responses: Chapter 6, Cumulative Impacts, has been restructured and augmented, addressing the concern noted by the comment. Please see Volume 1, Section 6.4.3.

Comment Code: Municipal Government 10-26

Location of EIS Revision(s): Volume 1, Chapter 7 Introduction

Response: The DOE recognizes and appreciates the relationship that has existed between the NTS and Nye County over the past four decades and is pleased to acknowledge this relationship in this document. Text in Volume 1, Chapter 7 has been modified.

Comment Code: Municipal Government 10-27

Location of EIS Revision(s): Volume 1, Section 7.3

Response: Volume 1, Section 7.3 has been modified to reflect local impacts.

Comment Code: Municipal Government 10-28

Location of EIS Revision(s): None required

Response: The DOE recognizes Nye County's concerns regarding expanded waste management operations at the NTS. As actions comprising the expanded waste management operations are formulated and potential risks and/or burdens to the county associated with this program are identified, appropriate mitigation actions including those listed in the comment will be included in the DOE's on-going discussions with Nye County.

Comment Code: Municipal Government 10-29

Location of EIS Revision(s): Chapter 7

Response: The referenced sentence was modified to indicate that the DOE will participate in the development of a joint state, federal, and local government conference to promote a national and international environmental technology development center.

Comment Code: Municipal Government 10-30

Location of EIS Revision(s): None required

Response: The transportation section of this EIS (specifically Volume 1, Section 5.3.1.2.2, "Off-site Traffic") states that key road segments within metropolitan Las Vegas and U.S. Highway 93 at Hoover Dam would deteriorate to an unacceptable level of service "F" by the year 2000. This deterioration refers to the level of service or amount of traffic congestion, not the physical condition of the roads. At its highest level of contribution to traffic congestion (Alternative 3), approximately 100 to 250 vehicles of all types, including waste shipment trucks, would be added to U.S. Highway 95 between Las Vegas and Mercury during the peak hour by the year 2000. Other roadway segments would experience less than 100 additional vehicles during the peak hour. Because of regional growth in the Las Vegas area, key roads would deteriorate to level of service "F" even if Alternative 2 (Discontinue Use) were chosen. U.S. Highway 93 at Hoover Dam already operates at level of service "F" because of its steep grades and narrow curves. The amount of additional traffic expected as a result of Alternative 3 would not cause any road to reach the level of service "F" at a faster rate. DOE's contribution to any mitigation of deteriorating conditions would be addressed based on this analysis.

Comment Code: Municipal Government 10-31

Location of EIS Revision(s): None required

Response: Attachment F of Appendix I, Transportation Study, in Volume 1 of the Draft NTS EIS was prepared to study the provision of rail access to the Nevada Test Site, and took other previous studies into account in developing the alternatives that would be analyzed in the NTS EIS. These other studies include those prepared to support the Yucca Mountain Project (Figure F-1 was drawn from one of these Yucca Mountain studies), as well as city of Caliente corridor studies, a 1962 Atomic Energy Commission feasibility study at the NTS, and a draft report of high-speed surface transportation between Las Vegas and the NTS. All of these studies were considered before developing the two options for the NTS rail access that are described in Attachment F, Section F.1.2. The analysis is performed to consider potential environmental effects that may occur from developing these rail access routes. The introductory paragraphs to Attachment F make it clear that it is not targeted at supporting a specific decision in this EIS, because rail transportation is not being proposed as part of the alternatives evaluated in this EIS. Rail transport is not being considered in the NTS EIS because there is no rail spur to provide service to the NTS.

The Yucca Mountain Repository EIS will be prepared to consider the potential environmental impacts associated with construction, operation, and eventual closure of a repository at Yucca Mountain, Nevada. It will include analysis of transportation of spent nuclear fuel and high level radioactive waste from producer and generator sites across the nation. As stated in Section 3.2.6.1 of the NTS EIS, the Repository EIS will incorporate information from the NTS EIS and other EISs, as appropriate, to support its analysis. The CGTO, along with all other organizations and members of the public, will have the opportunity to review and comment on the Draft Repository EIS when it has been released, and the DOE will again consider and respond to these comments as part of finalizing the Repository EIS. See Section 1.1 of Volume 3.

Comment Code: Municipal Government 10-32

Location of EIS Revision(s): None required

Response: Refer to Section 1.1 of Volume 3.

Comment Code: Municipal Government 10-33

Location of EIS Revision(s): Volume 1, Chapter 5, Section 5.3.1.2.3

Response: Under Alternative 3, Defense Program test devices, nuclear explosives, and pits may be shipped to the NTS for dismantlement and/or storage. These shipments have been added to the transportation analysis documented in Appendix I.

Comment Code: Municipal Government 10-34

Location of EIS Revision(s): None required

Response: Alternative 3, the Expanded Use Alternative, was defined by including any project indicated in other DOE EISs that identify the NTS as an alternative site as well as the potential expansion of programs that already exist at the NTS.

The analysis of impacts to the NTS under Alternative 3 includes those identified in proposed projects in other EISs (to the extent that this information is available at this time). However, the Record of Decision for the NTS EIS will not make a decision to select the proposed projects in these other EISs. Therefore, the NTS EIS can only identify land and facilities that could be used for such projects. If the Expanded Use Alternative were selected in the NTS EIS Record of Decision, this information could be used along with other factors to aid the decisionmaker in selecting the location for activities in the *Resource Management Plan*. If other DOE EISs have chosen the NTS as the site for the potential programs, further National Environmental Policy Act reviews would occur prior to the commencement of that program at the NTS.

Comment Code: Municipal Government 10-35

Location of EIS Revision(s): Volume 1, Sections 5.1.1.2.3, and 5.3.1.2.3, and Appendix I

Response: The comment is noted. Defense Program transportation activities for ongoing and future activities has been added to the text. The revision includes analyses of all potential programs that have been identified to be relocated to the NTS by other DOE programmatic environmental impact statements. When complete information about these programs becomes available, DOE will examine whether the transportation analysis should be updated.

Comment Code: Municipal Government 10-36

Location of EIS Revision(s): None required

Response: Potential stigmatizing effects of various NTS activities do not seem to have affected the economy negatively in southern Nevada. No historical or existing information describes a deterioration of the economic environment in southern Nevada based on the development activities or images that are being presented. In fact, the reverse is true, given the current development history of the area. Section 1.9, Volume 3, of this EIS provides a more detailed response on the perceived stigma related to the NTS and the economy of southern Nevada.

Comment Code: Municipal Government 10-37

Location of EIS Revision(s): None required

Response: The incident-free transportation risk calculations do not explicitly reflect projected changes in traffic volumes and population in communities located adjacent to Interstate 15, U.S. Highway 95, and U.S. Highway 93. Some communities along transportation routes are expected to experience increases in traffic volume and population in the future, while other communities would experience decreases. It would not be reasonable to attempt to account for community-specific changes along all the shipping routes considered in this EIS. If such a detailed analysis were to be undertaken, the results of the analysis would not be expected to be substantively different from the analysis already performed.

Comment Code: Municipal Government 10-38

Location of EIS Revision(s): Appendix I, Chapter 2

Response: The Appendix has been re-worked to clarify this point. This EIS now states that the only alternative under which rail transport would be viable is the one in which the NTS is the sole disposal site for low-level waste and mixed waste (Alternative 3) for the entire DOE complex.

Comment Code: Municipal Government 10-39

Location of EIS Revision(s): None required

Response: Attachment F of Appendix I, Transportation Study, in Volume 1 of the Draft NTS EIS was prepared to study the provision of rail access to the NTS, and took other previous studies into account in developing the alternatives that would be analyzed in the NTS EIS. These other studies include those prepared to support the Yucca Mountain Project (Figure F-1 was drawn from one of these Yucca Mountain studies), as well as city of Caliente corridor studies, a 1962 Atomic Energy Commission feasibility study at the NTS, and a draft report of high-speed surface transportation between Las Vegas and the NTS. All of these studies were considered before developing the two options for NTS rail access that are described in Attachment F, Section F.1.2. The analysis is performed to consider potential environmental effects that may occur from developing these rail access routes. The introductory paragraphs to Attachment F make it clear that it is not targeted at supporting a specific decision in this EIS, because rail transportation is not being proposed as part of the alternatives evaluated in this EIS. Rail transport is not being considered in the NTS EIS because there is no rail spur to provide service to the NTS.

The Yucca Mountain Repository EIS will be prepared to consider the potential environmental impacts associated with construction, operation, and eventual closure of a repository at Yucca Mountain, Nevada. It will include analysis of transportation of spent nuclear fuel and high level radioactive waste from producer and generator sites across the nation. As stated in Chapter 3, Section 3.2.6.1 of the NTS EIS, the Repository EIS will incorporate information from the NTS EIS and other EISs, as appropriate, to support its analysis. The CGTO, along with all other organizations and members of the public, will have the opportunity to review and comment on the Draft Repository EIS when it has been released, and the DOE will again consider and respond to these comments as part of finalizing the Repository EIS. See Section 1.1 of Volume 3.

Comment Code: Municipal Government 10-40

Location of EIS Revision(s): Volume 1, Sections 4.1.3 and 5.1.1.3

Response: Text has been added to clarify the DOE's responsibilities and the training that it provides.

Comment Code: Municipal Government 10-41

Location of EIS Revision(s): None required

Response: The demilitarization activity underway at the NTS is a demonstration of potential technologies for the destruction of obsolete conventional munitions. This demonstration involves the destruction of a small quantity of conventional munitions and could lead to a program of demilitarization activities; however, no large-scale demilitarization programs are currently being considered in this EIS. Future large-scale activities involving the demilitarization of obsolete conventional munitions would require their own National Environmental Policy Act reviews before they could begin. Affected state, local, and tribal governments as well as the public would have an opportunity to review National Environmental Policy Act documents and participate in the process.

Comment Code: Municipal Government 10-42

Location of EIS Revision(s): Volume 2, Section 2.1

Response: The DOE has supported the formation of the Community Reuse Organization in Nevada as a single voice to communicate to the DOE and coordinate economic development initiatives. This in no way precludes direct interaction between the DOE and Nye County on these or other issues. The text has been changed in Volume 2, Section 2.1, Step 3, to emphasize the role of local communities in economic development issues.

Comment Code: Municipal Government 10-43

Location of EIS Revision(s): None required

Response: At this time, the DOE/NV has not developed further details of public participation in the planning process. These comments are noted and will be carefully considered as the *Resource Management Plan* is developed.

Comment Code: Municipal Government 10-44

Location of EIS Revision(s): None required

Response: As described in Volume 2, Section 1.6, the *Resource Management Plan* will be developed with the participation of state, county, and local governments. The DOE is currently seeking comments on how to involve all interested parties in the process. The recommendation to establish intergovernmental working groups will be reviewed and will likely be implemented.

Comment Code: Municipal Government 10-45

Location of EIS Revision(s): None required

Response: At this time, the DOE/NV has not developed further details on how planning will be conducted in conjunction with Nye County or other agencies; however, the DOE is committed to meaningful partnerships with surrounding land managers. These comments are noted and will be carefully considered as the *Resource Management Plan* is developed.

Comment Code: Municipal Government 10-46

Location of EIS Revision(s): Volume 2, Section 2.1

Response: The text has been modified as requested.

This Page Intentionally Left Blank

Companies

Comment Code: Company 1-1

Location of EIS Revision(s): Volume 1, Appendix A, 4.3.1

Response: The DOE/NV acknowledges that the Corporation for Solar Technology and Renewable Resources has refined the Solar Enterprise Zone projects during the last 18 months and has also reviewed the additional information provided by the Corporation for Solar Technology and Renewable Resources. The new information provided allowed sections in the NTS EIS to be updated where necessary. The Draft NTS EIS was published in January 1996 using the best information available at that time, and analyzed a reasonable scenario for Solar Enterprise Zone activities regarding land disturbance and water requirements, among others.

Comment Code: Company 1-2

Location of EIS Revision(s): Volume 1, Appendix A, Section A.4.3.1

Response: Information presented in the Draft NTS EIS regarding the Solar Enterprise Zone was based upon the best available data during the preparation of this document. Analysis in the Draft NTS EIS uses a scenario which maximizes disturbed land and water use. This assumes a 1,000 MW facility that disturbed 2,400 acres of land and a solar technology that maximizes water use. The new information provided regarding the acreage of disturbed land or the amount of water required for the facility(ies) was considered during revision of the NTS EIS, but since a reasonable scenario had already been evaluated, no changes to the impact evaluations were made. Appendix A descriptions of these activities have been revised to reflect Corporation for Solar Technology and Renewable Resources' current strategy. Any additional National Environmental Policy Act reviews would consider the most recent data to provide decision makers with up-to-date information regarding the Solar Enterprise Zone initiative.

Comment Code: Company 1-3

Location of EIS Revision(s): None required

Response: The DOE/NV agrees that southern Nevada is an ideal place for the development of alternative energy resources, specifically solar energy, and actively promotes the NTS for Solar Enterprise Zone facilities. As has been stated in the NTS EIS, the NTS could support 100 MW of solar energy generation with no investment needed towards upgrading the existing transmission infrastructure. Additional power generation is feasible if the transmission infrastructure is upgraded. The EIS, however, analyzes the impacts of a 1,000 MW facility located on a single site, disturbing 2,400 acres of land and using solar technology which maximizes water use.

Comment Code: Company 1-4

Location of EIS Revision(s): None required

Response: The DOE/NV agrees that the Solar Enterprise Zone generating facilities represent a variety of technologies that may occur at locations on the NTS and at one (or more) off-site locations. The technologies discussed in the NTS EIS include photovoltaic, solar thermal parabolic trough, solar central receiver (power tower), and parabolic dish/sterling. For analysis purposes, however, the NTS EIS uses a 1,000 MW facility located on a single site, disturbing 2,400 acres of land and using solar technology which maximizes water use. The resulting positive socioeconomic impacts are described in the NTS EIS in Sections 5.3.1.3 and 5.3.7.3 in the Alternative 3, "Expanded Use," sections.

Comment Code: Company 1-5

Location of EIS Revision(s): None required

Response: The DOE/NV agrees that the NTS is an ideal place for the development of alternative energy resources, specifically solar energy, and actively promotes the NTS for Solar Enterprise Zone generating facilities.

Comment Code: Company 1-6

Location of EIS Revision(s): Volume 1, Chapter 6, Section 6.4.5 and Chapter 7, Section 7.5.2

Response: Although it is not prudent to place water-dependent solar technologies at water-deficient sites, these types of situations have been considered in this EIS. The sites being considered for solar technology development have been evaluated using a worst-case scenario in terms of affected environment; this analysis includes scenarios which maximize water use. As such, Section 7.5.2 discusses the possible mitigating measures needed if the Solar Enterprise Zone is located on the NTS and substantially impacts the quantity and quality of its groundwater resources.

Comment Code: Company 1-7

Location of EIS Revision(s): None required

Response: The construction of Solar Enterprise Zone generating facilities and the associated land disturbance have been considered in this EIS. The sites being considered for solar technology development have been assigned a reasonable scenario in terms of affected environment. This analysis includes land disturbance, and as stated in Section 5.5 of the NTS EIS, some adverse effects would result from these activities.

Comment Code: Company 1-8

Location of EIS Revision(s): None required

Response: The DOE expects to continue its involvement in many alternative energy projects, including solar energy research. Although no plans exist at the current time, the possibility does exist for the DOE to become involved in future Solar Enterprise Zone/Corporation for Solar Technology and Renewable Resources projects.

Comment Code: Company 1-9

Location of EIS Revision(s): None required

Response: The analysis which was performed to determine the impacts of the Solar Enterprise Zone facilities were based upon a 1,000 MW facility, located on a single site, and disturbing 2,400 acres of land while maximizing water use. This has been an assumption used to formulate information regarding the impacts of Solar Enterprise Zone activities.

Comment Code: Company 1-10

Location of EIS Revision(s): None required

Response: Although the Eldorado Valley appears more suitable for a larger power generating facility, all of the potential sites have been assessed in the same way in the NTS EIS. The types of solar technologies to be used and their respective sites have not yet been finalized at this time. Therefore, acreage requirements and water use for the potential facilities were based upon a worst-case scenario which sites a 1,000 MW facility at a single location.

Comment Code: Company 1-11

Location of EIS Revision(s): None required

Response: Socioeconomic impacts for Solar Enterprise Zone activities have been assessed in Sections 5.3.1.3 and 5.3.7.3 of this EIS. It is anticipated that Solar Enterprise Zone activities would increase local employment and aid local economies.

Comment Code: Company 2-1

Location of EIS Revision(s): None required

Response: The alternatives have been designed to allow the DOE to analyze and compare the potential environmental effects of a wide range of use options. The Final NTS EIS has identified Alternative 3 plus the public education activities of Alternative 4 as the DOE Preferred Alternative.

Comment Code: Company 2-2

Location of EIS Revision(s): None required

Response: The DOE is acting in coordination with the federal-grant funded Corporation for Solar Technology and Renewable Resources to develop the mission principles of the Solar Enterprise Zone. The Corporation for Solar Technology and Renewable Resources is currently engaged in analyzing suitability preparatory to selecting one or more of the two on-site locations and/or one or more of the three off-site locations for the construction of a large-capacity solar power project.

The National Environmental Policy Act requires that all reasonable alternatives be analyzed. The three off-site locations have been identified as potential locations for solar generation facilities and consequently must be analyzed in this EIS.

Comment Code: Company 2-3

Location of EIS Revision(s): None required

Response: The DOE, in order to satisfy the intent of the National Environmental Policy Act and to evaluate a full range of use alternatives, included an alternative (Alternative 2) that would discontinue Environmental Restoration Program activities. Alternative 2 provides the DOE with the means to evaluate the impacts of not performing environmental restoration. The commentor should note that the DOE has identified Alternative 3 as the Preferred Alternative in the Final NTS EIS, and this alternative includes environmental restoration.

Comment Code: Company 2-4

Location of EIS Revision(s): None required

Response: According to the Council on Environmental Quality, the No Action Alternative consists of continuing with the present course of action until that action is changed (46 FR 18026; March 23, 1981). Therefore, Alternative 1 (Continue Current Operations) was considered the No Action Alternative for this EIS. The NTS EIS does examine two alternatives with reduced levels of activity: Alternative 2 (Discontinue Operations) and Alternative 4 (Alternate Use of Withdrawn Lands).

Comment Code: Company 2-5

Location of EIS Revision(s): None required

Response: Please see the response to comment Company 2-4 for a discussion of the No Action Alternative.

Comment Code: Company 2-6

Location of EIS Revision(s): None required

Response: At the time the Draft was prepared, the DOE did not have a preferred alternative and thus more was stated in accordance with the Council on Environmental Quality regulations. The DOE believes that the four alternatives evaluated in the NTS EIS are reasonable and allow the DOE to analyze and compare the potential environmental effects of a wide range of use options for the NTS. The DOE conducted seven public scoping meetings, four public hearings, four community workshops, and allowed an extended 90-day comment period to accommodate extensive public review of the Draft NTS EIS. The DOE does not believe that another Draft EIS is necessary.

Comment Code: Company 2-7

Location of EIS Revision(s): None required

Response: The DOE has attempted to provide meaningful opportunities for citizen involvement in the preparation of the NTS EIS. See response to Comment Code Company 2-6 above.

Comment Code: Company 3-1

Location of EIS Revision(s): None required

Response: The statement in this EIS that the NTS is probably the most geologically well known large area is based on the thousands of technical reports that have been issued not only through DOE publications, but also by such highly respected organizations as the Nevada Department of Conservation and Natural Resources, the U.S. Geological Survey, the Geological Society of America, and the National Academy of Sciences. The statement is not made within the restricted viewpoint of stratigraphy, but rather for all areas of geological interest. Given that the DOE has sponsored many technical investigations since 1977, the information based on the geology of the NTS has grown significantly and the geologic conditions are even better known.

Comment Code: Company 3-2

Location of EIS Revision(s): None required

Response: The geologic community has always had access to the extensive published materials regarding the geologic conditions at the NTS as well as information through symposiums, meetings of technical organizations, and other presentations. The DOE also allows access to the NTS for research under the Nevada Environmental Research Park program. Researchers must first agree to adhere to security and environmental requirements to protect site resources and access procedures necessary to avoid interference with other activities on the NTS.

Comment Code: Company 3-3

Location of EIS Revision(s): None required

Response: As part of the Defense and Environmental Restoration programs, the DOE has developed detailed stratigraphic sections and cross sections. This information was used by the preparers of this EIS, but it was not included because it is too voluminous, and the level of detail was not necessary for analysis. This information is cited in the references which provide more detailed discussions of specific geology subareas. The wealth of published information is supported by myriad data drawn from extensive characterizations of both the surficial geology and the subsurface conditions. In fact, the DOE is considered by many to be at the forefront of investigations into many areas because of the detailed investigations and sophisticated testing that has been, and continues to be done under its sponsorship at the NTS. The DOE continues to collaborate with respected practitioners of modern regional structural geology, stratigraphy, and volcanology. See also Comment Code Company 3-1.

Comment Code: Company 3-4

Location of EIS Revision(s): None required

Response: Because of the many geologic environments present at the NTS, numerous stratigraphic sections have been prepared and published. The commentor is referred to the stratigraphy section and reference section of the Site Characterization Plan for Yucca Mountain (DOE, 1988). This document, available in all of the Yucca Mountain Reading Rooms and in most Nevada county and municipal libraries, provides a more detailed description of the stratigraphy and a more comprehensive reference list. Correlations with regional units have also been done and are available in published sources. The sequences that are part of the regional carbonate aquifer are shown on Figure 4-21 in this EIS. On this figure, the hydrogeologic units are listed in the second column while the corresponding geologic formations are shown under the heading "Geologic Formations." The commentor is correct in noting that there is no reference to regional karst intervals; however, a discussion of areas with increased transmissivity is provided as part of the discussion of the NTS hydrology in Section 4.1.5 of the NTS EIS.

Comment Code: Company 3-5

Location of EIS Revision(s): None required

Response: The DOE is conducting an extensive investigation of the aquifers on the NTS including not only the Paleozoic sequence, but the extensive alluvial and volcanic terrains as well. The information concerning the potential for economic development of oil, gas, or mineral deposits on the NTS is defined in Chapter 4 of the NTS EIS. This level of information is adequate for determining the potential impacts of alternative actions being considered for the NTS.

Comment Code: Company 3-6

Location of EIS Revision(s): None required

Response: Over the almost 50-year period that the DOE has been conducting detailed geologic studies of the NTS, highly qualified scientists representing all geologic disciplines have conducted independent, peer reviewed investigations.

Comment Code: Company 3-7

Location of EIS Revision(s): None required

Response: Surface gamma ray logs are seldom used for correlations of surface and subsurface sections. Rather, reliable ties are based upon a variety of physical and chemical rock characteristics. In the carbonate sequence, adequate correlations for the scale of investigations are based upon lithologic descriptions and paleontology. The DOE routinely has a whole suite of down-hole geophysical logs run for their characterization borings and wells. In some cases, the principal investigators include the results of gamma logs side by side with the stratigraphic log. In other instances, the logs are shown separately.

Comment Code: Company 3-8

Location of EIS Revision(s): None required

Response: The paragraph summarizes briefly the tectonic history of the region. A detailed discussion of each particular tectonic episode is beyond the appropriate level-of-detail for this EIS. The hydrology section of the NTS discusses the relationship between groundwater flow and geologic structures.

Comment Code: Company 3-9

Location of EIS Revision(s): None required

Response: A detailed description of the geologic history of the NTS, and adjoining regions would be of academic interest only, and is not necessary to determine the impacts of the alternative being analyzed in this EIS.

Comment Code: Company 3-10

Location of EIS Revision(s): None required

Response: The possible relationship between similar structures of different ages necessitates a level of detail far greater than required to support analyses in this EIS.

Comment Code: Company 3-11

Location of EIS Revision(s): None required

Response: The relationship between structures on the NTS and hydrocarbon potential is not addressed because of the low potential for hydrocarbons. The relationship between hydrothermal circulation and these structures is not included because it is not within the scope of this EIS. The discussion of the relationship between groundwater and structures on the NTS is provided in the section on hydrology. A discussion of fault control on hydrocarbon fluid migration is beyond the scope of this EIS.

Comment Code: Company 3-12

Location of EIS Revision(s): None required

Response: A discussion of the types of faults bounding the Elena Formation is not necessary to support analysis in this EIS. The commentor is referred to the cited references for more information concerning the structures on the NTS.

Comment Code: Company 3-13

Location of EIS Revision(s): None required

Response: The definition of specific thrust sheets is not needed to support the analysis of impacts in this EIS. The reader is referred to the cited references for more information concerning geologic structures on the NTS.

Comment Code: Company 3-14

Location of EIS Revision(s): None required

Response: A discussion of the particular structural plates involved in nuclear testing is not needed to support the analysis of impacts in the NTS EIS. Information about groundwater in the carbonates has been used in the analysis in this EIS.

Comment Code: Company 3-15

Location of EIS Revision(s): None required

Response: The DOE's groundwater investigations are not limited to perched aquifers; these investigations include all of the aquifers under the NTS that have potential as a contaminant pathway.

Comment Code: Company 3-16

Location of EIS Revision(s): None required

Response: The map presented in Figure 4-24 is a generalized map that was included to support the discussion on recent seismicity. Many other mapped faults which are either inappropriate to display at the scale shown or are no longer active exist on the NTS.

Comment Code: Company 3-17

Location of EIS Revision(s): None required

Response: A detailed discussion of the many fault-related studies that have been conducted at the NTS would require a level of detail not needed to support the analysis of impacts in this EIS.

Comment Code: Company 3-18

Location of EIS Revision(s): None required

Response: The commentor is referred to the cited references in the section on hydrocarbon resources. The principal investigators who conducted the work were qualified scientists; with expertise in geology and soil sciences.

Comment Code: Company 3-19

Location of EIS Revision(s): None required

Response: The Nevada Bureau of Mines and Geology maintains an extensive database on petroleum exploration and potential in Nevada which is available for review. The identity of those who collected the data, the structural plate, and the sequences would be available in the database. For a discussion of the parameters used in defining the hydrocarbon references, the commentor is referred to the cited references.

Comment Code: Company 3-20

Location of EIS Revision(s): None required

Response: The cited references include publications by the Nevada Bureau of Mines and Geology, and the U.S. Geological Survey. The commentor is referred to the cited references for more information concerning the certifications of the investigators.

Comment Code: Company 3-21

Location of EIS Revision(s): None required

Response: Test wells on the NTS were not drilled for the purposes of petroleum exploration, but most were logged by contract geophysical logging firms active in the petroleum industry using standard operating and quality assurance procedures.

Comment Code: Company 3-22

Location of EIS Revision(s): None required

Response: The cited references include publications by the Nevada Bureau of Mines and Geology, and the U.S. Geological Survey, two of the many well-qualified organizations that have published information which has been summarized in the NTS EIS. For example, the hydrocarbon potential map presented in Figure 4-28 is based upon a Nevada Bureau of Mines and Geology document. The DOE believes that the documents were prepared by independent, experienced, and unbiased agencies and that the findings presented in those documents are reliable.

Comment Code: Company 3-23

Location of EIS Revision(s): None required

Response: No further evaluations are planned.

Comment Code: Company 4-1

Location of EIS Revision(s): Volume 1, Appendix A, Section A.4.3.4

Response: The Draft NTS EIS included descriptions of projects and activities as known prior to its publication in February 1996. Alternative 3 descriptions also included an expansion of research, test, and experiment land-use zones on the NTS that are set aside for compatible defense and nondefense use. Kistler Aerospace's contemplated activities are consistent with this land-use zone definition. Additionally, the potential impacts from Kistler Aerospace's contemplated activities are bounded by the general heavy-industrial facility evaluated under Defense Program activities.

In response to this comment, the DOE considered Kistler Aerospace's Project a Technology Development Program activity and modified Section A.4.3.4 to include Kistler Aerospace's contemplated activities as a potential future activity under this program. The DOE understands that, to the extent that future National Environmental Policy Act review is required in connection with the satellite delivery aspects of this project, such review would occur in conjunction with the Federal Aviation Administration licensing process.

Comment Code: Company 5-1

Location of EIS Revision(s): Volume 1, Chapter 6

Response: The Cumulative Impacts sections have been updated, as necessary, to reflect currently available information on other proposed activities in the region. Environmental impact statements being prepared by Nellis Air Force Base and the Fallon Naval Air Station on their respective proposed actions will provide the opportunity for the state of Nevada, the Western Shoshone Nation, and other interested parties to express any concerns regarding those actions.

Comment Code: Company 5-2

Location of EIS Revision(s): None required

Response: The decision to retain, reallocate, or dispose of special-use airspace presently delegated to the DOE for NTS activities will be based on current and future DOE and Nellis Air Force Base requirements and the Federal Aviation Administration's review of these requirements relative to national airspace system needs.

Comment Code: Company 6-1

Location of EIS Revision(s): None required

Response: This comment is a duplicate of Comment Code Company 3-1, 3-2, and 3-3. The commentor is referred to the responses to those comments.

Comment Code: Company 6-2

Location of EIS Revision(s): None required

Response: This comment is a duplicate of Comment Code Company 3-4, 3-5, 3-6. and 3-7. The commentor is referred to the responses to those comments.

Comment Code: Company 6-3

Location of EIS Revision(s): None required

Response: This comment is a duplicate of Comment Code Company 3-8 except for the last sentence which is responded to as part of Comment Code Company 6-4. The commentor is referred to the responses to those comments.

Comment Code: Company 6-4

Location of EIS Revision(s): None required

Response: The processes that result in the "mixing" of waters in the aquifers under the NTS are complicated, reflecting the location of multiple source and discharge areas, the presence of a number of aquifers of quite variable hydraulic properties, and the geologic structures that are present. A discussion of the current level of understanding of these processes is not necessary for the analysis in this EIS. The NTS EIS focuses on the water resources, their quantity and quality, and the potential impacts upon these resources that could result if the proposed actions or alternatives are implemented.

The commentor is correct in noting that there is no discussion of how the Las Vegas shear-zone affects groundwater movement in the deep carbonate aquifer. The DOE has focused its past investigations on the portions of the flow system that include the NTS and areas hydraulically downgradient of that facility. A description of the potential interactions between specific aquifers and structures upgradient of the potentially impacted areas is not necessary for the analysis in this EIS.

There is no mention of deep-monitoring wells to measure the velocity of a hypothetical tritium plume toward the Las Vegas basin because the movement of groundwater from the NTS into the Las Vegas basin is not a credible scenario. Migration of a tritium plume from the NTS to the Las Vegas basin is contrary to all published literature concerning the hydrology of the region, and is considered to be a hydraulic impossibility.

Comment Code: Company 6-5

Location of EIS Revision(s): None required

Response: This comment is a duplicate of Comment Code Company 3-9. The commentor is referred to the response to that comment.

Comment Code: Company 6-6

Location of EIS Revision(s): None required

Response: This comment is a duplicate of Comment Code Company 3-10 and 3-11. The commentor is referred to the responses to those comments.

Comment Code: Company 6-7

Location of EIS Revision(s): None required

Response: This comment is a duplicate of Comment Code Company 3-12 and 3-13. The commentor is referred to the responses to those comments.

Comment Code: Company 6-8

Location of EIS Revision(s): None required

Response: This comment is a duplicate of Comment Code Company 3-14, and 3-15. The commentor is referred to the responses to those comments.

Comment Code: Company 6-9

Location of EIS Revision(s): None required

Response: The first half of this comment is a duplicate of Comment Code Company 3-16 and 3-17. The commentor is referred to the responses to those comments. With respect to the second half of the comment, the commentor may request the referenced material through standard channels for access of data concerning the NTS, including the Nevada Library System. The scientists who contributed to the preparation of this EIS and who have performed detailed geologic analyses are imminently qualified both by training and experience to perform the assigned tasks.

Comment Code: Company 6-10

Location of EIS Revision(s): None required

Response: This comment is a duplicate of Comment Code Company 3-18, 3-19, 3-20, 3-21, 3-22 and 3-23. The commentor is referred to the responses to those comments.

Comment Code: Company 6-11

Location of EIS Revision(s): None required

Response: The deep carbonate aquifer is discussed in this EIS. A sequence stratigraphic analysis is not necessary for the analysis in this EIS. Summary information on the stratigraphy is presented at a level commensurate with a sitewide EIS.

Comment Code: Company 6-12

Location of EIS Revision(s): None required

Response: The suggested analysis is not required for analysis in this EIS.

This Page Intentionally Left Blank

Organization

Comment Code: Organization 1-1

Location of EIS Revision(s): None required

Response: The DOE will remediate contaminated sites in accordance with applicable environmental laws and regulations. For some areas, however, remediation is not currently feasible because of technological limitations. The goal of the DOE's Environmental Restoration Program is to ensure that risks to the environment and to human health and safety, as posed by inactive and surplus facilities and sites, are either eliminated or reduced to safe levels. Safe levels are established by law and through consultation with appropriate federal and state regulatory authorities.

Investigations and risk assessments are being conducted for each Corrective Action Unit (grouping of environmental restoration sites) to determine the extent of contamination, the potential for exposure to the contamination, and to compare potential exposure to established standards for protection of human health and the environment. The DOE will continue to monitor lands that could potentially pose a threat to public health and the environment and will take appropriate actions to mitigate potentially significant impacts should monitoring suggest that significant impacts could occur.

Comment Code: Organization 1-2

Location of EIS Revision(s): None required

Response: It is agreed that transportation is not 100-percent accident free. The Transportation Study in Appendix I identifies possible accidents and their risks. The values noted are very low. The DOE exerts every effort to prevent accidents and the accident record demonstrates success.

Comment Code: Organization 1-3

Location of EIS Revision(s): None required

Response: Many options are considered by waste-generating sites prior to deciding on the final disposition of waste. In some cases, on-site storage is chosen as the preferred option. One off-site generator that has disposed of low-level waste at the NTS has recently decided to store a specific waste stream on-site. This was determined to be the best disposition of the waste stream. On-site storage, however, is not a solution to a waste problem in most cases. Stored waste can pose a risk to human health from direct exposure, as well as a risk to the environment from potential leaks. Disposed waste, however, can eliminate or reduce the potential for human health impacts from contact with the waste and eliminate or reduce the potential for environmental damage.

Comment Code: Organization 1-4

Location of EIS Revision(s): None required

Response: Activities and operations conducted by the DOE at the NTS are planned and carried out in a manner that minimizes risk to members of the general public and the on-site workforce. The remoteness of the NTS from populated areas, the considerable land area that provides a buffer between the public and on-site activities, as well as public access restrictions, all serve to enhance public health and safety. In addition, the goal of the DOE's Environmental Restoration Program is to ensure that risks to the environment and to human health and safety posed by inactive and surplus facilities and sites are either eliminated or reduced to protective levels.

Comment Code: Organization 1-5

Location of EIS Revision(s): None required

Response: There is no evidence to indicate that activities conducted at, or in relationship to, the NTS over the last 40-plus years or as discussed in the NTS EIS would significantly alter the potential for continued economic prosperity and economic development in the region. For additional discussion on this topic, please refer to the Major Issues discussion contained in Volume 3, Chapter 1, Section 1.9.

Comment Code: Organization 1-6

Location of EIS Revision(s): None required

Response: The goal of the DOE's Environmental Restoration Program is to ensure that risks to the environment and to human health and safety, as posed by inactive and surplus facilities and sites, are either eliminated or reduced to safe levels. For additional discussion, please refer to the response under Comment Code Organization 1-1.

Comment Code: Organization 1-7

Location of EIS Revision(s): None required

Response: The DOE concurs with the comment that precipitation should not be contaminated by contact with toxic soils. The DOE has sampled the occasional flows in the streambeds that drain the NTS to evaluate if runoff is contaminated through contact with soils. The results to date have not indicated the migration of contaminants via this pathway except for naturally occurring salts that result from the interactions between the runoff and playa sediments, volcanic rocks, and limestones.

Comment Code: Organization 1-8

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.1.4.2

Response: The DOE agrees with the observation that aquifers can transport contamination very long distances, and the definition of the extent and magnitude of subsurface contamination under the NTS is the major focus of the DOE's Environmental Restoration Program. As noted in this EIS (Section 4.1.5.2), the zones of high transmissivity in rocks are associated with fractures and dissolution features. With respect to seismic activity, some temporary fluctuation in groundwater levels may be caused by earthquakes, and some increased fracturing of the rock aquifers may occur. The section on seismicity (Section 4.1.4.2) has been modified to reflect these phenomenon.

Comment Code: Organization 1-9

Location of EIS Revision(s): None required

Response: The migration of radionuclides through the ecosystem and the effects of radiation on plants, animals, and humans have been intensively studied since the advent of the nuclear age. The Unites States, under the auspices of the Atomic Energy Commission, then the Energy Research and Development Administration, and now the DOE has funded many such investigations conducted by state universities and national laboratories. The Nevada Applied Ecology Group was one of several DOE-funded programs.

The Nevada Applied Ecology Group's specific goals included (1) delineating locations of radiation contamination on and near the NTS, (2) determining radionuclide concentrations in ecosystem components, (3) quantifying rates of movement among ecosystem components, (4) evaluating radiological hazards of radionuclides (plutonium in particular), (5) identifying areas which need to be cleaned up or treated, and (6) developing techniques for cleanup or treatment. To meet these goals, the Nevada Applied Ecology Group conducted studies of plutonium, uranium, americium, and other radionuclides in the environment on and near the NTS from July 1970 to September 1986. About 540 reports and papers were prepared during this 16-year effort and much of what is currently known about radioecology in desert ecosystems came from this effort. As stated in the comment, plants can take up radionuclides through their roots from contaminated soil, and grazing domestic and wild animals can absorb these radionuclides. These processes have been documented in numerous Nevada Applied Ecology Group publications (see Friesen, 1992, referenced in the NTS EIS for a summary of the Nevada Applied Ecology Group programs).

Ecosystem studies in the 1970s and 1980s were coupled with investigations on the distribution and inventory of radionuclides in soils in and near the NTS (funded through the Radionuclide Inventory and Distribution Program (1981-1986) and the Plutonium Inventory and Distribution Program (1970-1980). The DOE has used the results of all radionuclide investigations to prioritize areas slated for decontamination. A major goal of DOE's Environmental Restoration Program, whose activities are described in this EIS, is to decontaminate nuclear testing areas for possible future unrestricted use. It is the awareness of possible adverse effects of chronic radiation exposure which mandates the need for this program.

Comment Code: Organization 1-10

Location of EIS Revision(s): None required

Response: Sections 3.2.6.3 and 4.1.7 of this EIS discuss past and current atmospheric releases of radioactivity. Current releases are very small and do not exceed the standards established by the U.S. Environmental Protection Agency. Future releases are predicted to meet current standards as well. The DOE has sponsored and participated in evaluations of past radioactive releases, and the information has been widely published in the relevant literature. The studies have included the areas of southern Nevada and Utah, areas considered "downwind." Congress has established programs for compensating those individuals who have suffered harm resulting from radioactive releases. Information about these programs can be found by calling the Radiation Exposure Compensation Program Office at 1-800-729-REAP.

Comment Code: Organization 1-11

Location of EIS Revision(s): None required

Response: General noise levels at the NTS are discussed in Section 4.1.8. As discussed in this section, the major noise sources at the NTS include equipment and machines (such as transformers, engines, pumps, boilers, construction and material-handling equipment, and vehicles), explosives testing, and aircraft operations. At the NTS boundary, which is away from facilities, noise levels are normally barely distinguishable from background noise levels.

The comment states that explosion noise has been heard outside the NTS boundary. While noise from the Big Explosives Experimental Facility might be heard off of the NTS, the noise levels are below safety limits. Noise impacts from the Big Explosives Experimental Facility are discussed in Appendix F, Section F.5.5.2. Noise levels have been monitored, and noise levels were found to be below 140 dB at 8 m (27 ft) from the explosive charge. The 140-dB limit has been adopted by the U.S. Department of Defense Explosives Safety Board and is also an Occupational Safety and Health Administration limit. Traffic and personnel would be prevented from entering within a radius of between 500 m and 8,500 m (1,640 ft and 28,000 ft) from the explosive charges. Therefore, while the explosive charge detonations can be heard, no personnel or members of the public would be allowed within the radius of exclusion (safety zone) and noise impacts would not be significant.

Comment Code: Organization 1-12

Location of EIS Revision(s): None required

Response: Visual impacts, as analyzed in an NTS EIS, result from a change in the basic visual elements of form, line, color, and texture. Unless contamination directly affects the physical appearance of the affected landscape, it would not result in the reduction of visual quality.

Comment Code: Organization 1-13

Location of EIS Revision(s): None required

Response: American Indian cultural sites, as well as other kinds of archaeological sites, are abundant on the NTS. These have been summarized in Chapter 4. To ensure that these sites are identified and protected, cultural resource surveys are conducted prior to ground-disturbing activities. It is DOE policy to avoid such sites when possible. Consultations with tribal groups that have historic or cultural ties to the NTS are conducted to include tribal participation in the DOE's Cultural Resource Management Program.

Comment Code: Organization 1-14

Location of EIS Revision(s): None required

Response: The comment has been noted. The DOE is committed to all aspects of health and safety, and protection of the environment. Appendix H of this EIS, evaluates the risk associated with ongoing and future activities to the public and workers.

Comment Code: Organization 1-15

Location of EIS Revision(s): None required

Response: The DOE is committed, to the greatest extent practicable and permitted by law, to achieving Environmental Justice as part of its mission. The DOE has attempted in this EIS, and will continue in subsequent tiered National Environmental Protection Act documents, to present information that would allow identification of any disproportionately high and adverse human health or environmental effects on minority and low-income populations resulting from decisions based on this EIS. When such effects are identified, mitigation measures are also identified.

There are several ways an individual or group can get information for evaluating DOE activities. The Community Advisory Board, established in early January of 1994, meets monthly. Eighteen public reading rooms are available throughout Nevada where DOE documents and other materials are available for public review. Any group, association, organization, technical or professional conference attendees, community affairs and special events participants, and other interested parties are welcome to call or write in requests for information, display, or speakers. The NTS tours are coordinated though the Public Affairs and Information Office and are available to the general public, students, and other interested groups.

A comprehensive mailing list consisting of those interested in various topics has been developed so that timely, topical information can be sent to them. Any member of the public can be added to the mailing list by calling or writing the DOE/NV.

In addition, public participation is encouraged and requested for all DOE NEPA documents. For this EIS, public participation included a 90-day period, from February 2, 1996, to May 3, 1996, to provide comments regarding the Draft NTS EIS. A series of four public hearings and four Community Outreach Education workshops were held. In addition, comments on this EIS were accepted by fax, in writing, or through a 24-hour toll-free comment line.

Comment Code: Organization 1-16

Location of EIS Revision(s): None required

Response: All toxic hazardous wastes are shipped off-site for treatment and disposal. There are no plans to develop hazardous-waste treatment and disposal facilities at the NTS under any of the alternatives. Mixed-waste (radioactive waste that contains some hazardous constituent) disposal is considered under Alternatives 1, 3 and 4. Alternatives 1 and 4 consider only Nevada-generated mixed waste whereas Alternative 3 includes the disposal of mixed waste generated off-site and at the NTS. Alternatives 3 and 4 contain plans for the development of mixed-waste treatment facilities to reduce the hazardous-constituent concentrations to environmentally safe levels, thereby meeting the requirements of the Resource Conservation Recovery Act prior to disposal.

Comment Code: Organization 1-17

Location of EIS Revision(s): None required

Response: The goal of the DOE's Environmental Restoration Program is to ensure that risks to the environment and to human health and safety, as posed by inactive and surplus facilities and sites, are either eliminated or reduced to safe levels. Safe levels are established by law and through consultation with appropriate federal and state regulatory authorities. In its environmental restoration activities, the DOE employs demonstrated remediation techniques and practices. In addition, the DOE's Environmental Restoration Program includes a technology development effort that considers new and evolving technologies with the potential to provide more effective and efficient cleanup of contaminated facilities and sites.

Comment Code: Organization 1-18

Location of EIS Revision(s): None required

Response: The DOE programs are approved and funded by the U.S. Congress. Neither the DOE nor its contractors may conduct activities not approved by Congress.

Comment Code: Organization 1-19

Location of EIS Revision(s): None required

Response: The intent of the Environmental Restoration Program is to characterize and remediate contaminated areas to protect human health and safety, and the environment. This program would continue in all alternatives except Alternative 2. Expanded use or alternate use of the NTS, as discussed in Alternatives 3 and 4 respectively, would not take place unless it has been determined through a detailed analysis of potential impacts to the environment, and an assessment of public and worker health and safety, that such risks have been mitigated to acceptable regulatory limits for the activities and land uses proposed.

Comment Code: Organization 1-20

Location of EIS Revision(s): None required

Response: At present, the total area comprising the sites for which the DOE is responsible and upon which human access is restricted due to high levels of contamination represents a very small percentage of the NTS, Tonopah Test Range, and NAFR Complex. Through the Federal Facility Agreement and Consent Order process, the DOE and Defense Nuclear Agency, for their respective sites, will reach agreement with the state of Nevada regarding clean-up levels. The Corrective Action strategy outlined in the Federal Facility Agreement and Consent Order is that corrective action alternatives will be based on applicable regulatory standards or proposed clean-up levels if no standards apply. Proposed levels will be based on pertinent factors, including, but not limited to, assessment of risk, current and projected land use, resource management, and technical feasibility. Those areas which are determined through the Federal Facility Agreement and Consent Order process as potentially usable for recreational, educational, or industrial uses would be remediated to or below contamination levels deemed to be safe for the particular use identified.

Comment Code: Organization 1-21

Location of EIS Revision(s): None required

Response: The comment has been noted. Although the DOE policy recommends that the NTS EIS process take only 15 months, the NTS EIS has extended public comment periods and has held numerous public hearings and workshops to ensure an ample opportunity for public input in the National Environmental Policy Act process.

Comment Code: Organization 2-1

Location of EIS Revision(s): Volume 1, Appendix H

Response: Volume 1, Section 3.1.4.7, Figure 3-4 of this EIS identifies the areas that could potentially be turned back to the U.S. Bureau of Land Management for limited public use under Alternative 4. Several potential exposure scenarios were assessed and eliminated from further consideration, while other exposure scenarios were bounded by new analyses performed for the Final NTS EIS. These potential exposure scenarios considered health risks to the public from the following sources: (1) residual contamination on the land surface, (2) contaminated groundwater, and (3) future NTS activities proposed under Alternative 4.

Residual contamination on the land surface was eliminated as a potential exposure scenario because no contaminated land areas would be turned back to the U.S. Bureau of Land Management. Based on the groundwater modeling study performed by GeoTrans (1995b), potential turn back areas located south of Pahute Mesa could have groundwater contaminated with tritium above the drinking water limit of 20,000 pCi/L established by the U.S. Environmental Protection Agency. The DOE would not install a water supply well that was vulnerable to contamination, and the Nevada Bureau of Health Protection Services requires that any future water supply wells have groundwater vulnerability assessments performed before the well will be permitted as a public water supply.

Members of the public using the potential turn-back areas could potentially be impacted by NTS Waste Management activities at Areas 3 and 5 or by activities at the Spill Test Facility. Routine activities would be expected to have no impacts because all wastes disposed of or stored at Areas 3 and 5 are contained, and routine tests conducted at the Spill Test Facility are performed under controlled conditions when the wind is blowing away from the potential turn-back areas. The public could be impacted by potential accidents at the Waste Management Areas or the Spill Test Facility. Additional accident analyses have been performed for the Final NTS EIS which bound potential impacts to members of the public located in the potential turn-back areas.

Comment Code: Organization 2-2

Location of EIS Revision(s): None required

Response: The exposure scenarios suggested in the comment have been evaluated and addressed in the response to Comment Code Organization 2-1.

Comment Code: Organization 2-3

Location of EIS Revision(s): EIS Summary; Volume 1; Chapter 3, Table 3-5; Volume 1, Chapter 5, Sections 5.1, 5.1.1.11, 5.1.3.11, 5.1.4.11; Volume 1, Appendix H, and Executive Summary

Response: Appendix H of the Draft NTS EIS clearly identified the potential for tritium migration off the Project Shoal Area and Central Nevada Test Area sites. However, these results were not reflected in this EIS Summary. The NTS EIS Summary has been revised to reflect the potential for tritium migration from these sites. For underground test areas located within the NTS boundaries, the Draft NTS EIS identified no potential for tritium concentrations above the detection limit of 1 pCi/L outside areas currently under control of the DOE or the U.S. Air Force. The discussion of tritium migration from NTS test locations has been revised in the Final NTS EIS and includes discussion of earlier predictions by Daniels et al. (1993) and Andricevic et al. (1994) of potential tritium concentrations above the detection limit for a receptor in Oasis Valley.

Appendix H of this EIS has also been revised to present a more complete summary of the tritium migration studies performed for underground weapons test areas on the NTS, Project Shoal Area, and Central Nevada Test Area. The revised discussion addresses the uncertainties in the modeling results and presents results as a range of values representing the uncertainties in the analyses. The Summary, and Chapters 3 and 5 of this EIS have also been revised to more consistently reflect the information contained in Appendix H.

Comment Code: Organization 2-4

Location of EIS Revision(s): None required

Response: The Final NTS EIS addresses the uncertainties in the modeling of tritium migration from underground test locations. See response to Comment Code Organization 2-3.

Comment Code: Organization 2-5

Location of EIS Revision(s): None required

Response: The Final NTS EIS provides a more complete summary of the tritium migration studies performed for underground test locations. See response to Comment Code Organization 2-3.

Comment Code: Organization 2-6

Location of EIS Revision(s): None required

Response: The Final NTS EIS addresses the uncertainties in the modeling of tritium migration from underground test locations. See response to Comment Code Organization 2-3.

Comment Code: Organization 2-7

Location of EIS Revision(s): None required

Response: The Final NTS EIS addresses the uncertainties in the modeling results and presents results as a range of values representing the uncertainties in the analyses. See response to Comment Code Organization 2-3.

Comment Code: Organization 2-8

Location of EIS Revision(s): Summary, Volume 1, Appendix H

Response: Earlier estimates of migration of tritium contaminated groundwater beyond the boundaries of the NTS and the U.S. Air Force controlled areas ranged from 890 pCi/L to 3,800 pCi/L at the nearest uncontrolled area boundary in Oasis Valley (Daniels et al., 1993). These results are higher than those estimated by GeoTrans (1995b) due to the preliminary, or screening, basis of the calculations performed by Daniels et al. For example, both studies base their source terms on shot cavity samples, but Daniels et al. assumed all groundwater at the source is contaminated to the highest observed tritium concentration of 7.6×10^9 pCi/L, while GeoTrans assumed an average groundwater concentration of tritium at the source of 1×10^9 pCi/L.

Other assumptions used by Daniels et al. were conservative, or worst case, estimates that would lead to somewhat higher concentration and risk estimates than the average case estimates used by GeoTrans. The GeoTrans estimates were made based on Environmental Restoration Project work-in-progress and will be refined and reported with estimated uncertainty in the future.

Modeling results to date consistently indicate no migration of tritium contamination at levels above EPA guidelines outside the current boundaries at the NTS and the U.S. Air Force controlled areas. Further, the most recent results from the Environmental Restoration Project predict no detectable tritium contamination above natural background levels outside controlled areas. For completeness, Volume 1, Appendix H of the Final NTS EIS has been revised to include discussion of the earlier predictions by Daniels et al. of potential migration of tritium above background levels at the nearest uncontrolled area boundary in Oasis Valley. The

NTS EIS Summary has also been revised to reflect the expanded discussion of tritium migration studies contained in the Final NTS EIS, Appendix H.

Comment Code: Organization 2-9

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1

Response: The Final NTS EIS presents modeling results for all of the locations identified in Section 2.2.5.1 of Volume 1, Appendix H.

Comment Code: Organization 2-10

Location of EIS Revision(s): NTS EIS Summary, Volume 1, Appendix H

Response: The "no migration" statement has been modified in the Final NTS EIS. See response to Comment Code Organization 2-8.

Comment Code: Organization 2-11

Location of EIS Revision(s): Summary

Response: The NTS EIS Summary has been revised to reflect the expanded discussion of potential tritium migration off the NTS, Project Shoal Area, and Central Nevada Test Area sites as contained in the Final NTS EIS, Appendix H. This discussion includes the range of estimated impacts based on the uncertainties in key modeling parameters such as flow velocity and hydraulic conductivity.

Comment Code: Organization 2-12

Location of EIS Revision(s): None required

Response: The Final NTS EIS Summary discusses the potential for tritium migration off the Project Shoal Area and Central Nevada Test Area sites. See response to Comment Code Organization 2-11.

Comment Code: Organization 2-13

Location of EIS Revision(s): Summary

Response: The NTS EIS Summary has been revised to reflect the expanded discussion of potential tritium migration off the Central Nevada Test Area site as contained in the Final NTS EIS, Appendix H.

Comment Code: Organization 2-14

Location of EIS Revision(s): Summary

Response: The NTS EIS Summary has been revised to reflect the expanded discussion of potential tritium migration off the Central Nevada Test Area site as contained in the Final NTS EIS, Appendix H.

Comment Code: Organization 2-15

Location of EIS Revision(s): Volume 1, Appendix H; Executive Summary and Section 5.1

Response: The Executive Summary of Appendix H has been revised to reflect the expanded discussion of potential tritium migration off the NTS, Project Shoal Area, and Central Nevada Test Area sites as contained in the Final NTS EIS, Appendix H, Section 5.1.

Comment Code: Organization 2-16

Location of EIS Revision(s): Volume 1, Appendix H; Executive Summary and Section 5.1

Response: See response to Comment Code Organization 2-15.

Comment Code: Organization 2-17

Location of EIS Revision(s): Volume 1, Appendix H; Section 2.2.5.1

Response: Section 2.2.5.1 of Volume 1, Appendix H, has been revised to provide more detail on development of the tritium source concentration used in the migration study for the NTS underground test locations. As described in GeoTrans (1995b), a compilation of maximum observed concentrations in test cavity samples (Daniels et al., 1993) indicates that the maximum observed concentration of tritium was 7.6×10^9 pCi/L. Other samples that have been collected had lower concentrations. For the GeoTrans (1995b) migration study, a source concentration of 1×10^9 pCi/L was assumed.

Comment Code: Organization 2-18

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 2-17.

Comment Code: Organization 2-19

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 2-17.

Comment Code: Organization 2-20

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1

Response: Section 5.1 of Volume 1, Appendix H has been revised to provide a more complete discussion of the results for the three flow paths evaluated by GeoTrans (1995b) for the migration of tritium from test locations on Pahute Mesa and Yucca Flat.

Comment Code: Organization 2-21

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1

Response: Section 5.1 of Volume 1, Appendix H has been revised to provide a more complete discussion of the results for the three flow paths evaluated by GeoTrans (1995b) for the migration of tritium from test locations on Pahute Mesa and Yucca Flat.

Comment Code: Organization 2-22

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1

Response: Volume 1, Appendix H of the Final NTS EIS has been revised to include discussion of the earlier predictions by Daniels et al. (1993) of potential cancer fatality risk to a public receptor at the nearest uncontrolled area boundary in Oasis Valley. For additional discussion on this topic, please see response to Comment Code Organization 2-8.

Comment Code: Organization 2-23

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1

Response: The Final NTS EIS has been revised to include discussion of the earlier predictions by Daniels et al. (1993) of potential cancer fatality risk to a public receptor at the nearest uncontrolled area boundary in Oasis Valley. For additional discussion on this topic, please see the response to Comment Code Organization 2-8.

Comment Code: Organization 2-24

Location of EIS Revision(s): None required

Response: The document (GeoTrans, 1995b) containing the data and results for the MC-TRANS modeling of tritium migration from NTS underground test locations is available in public reading rooms that received a copy of the Draft NTS EIS. However, the results provided in GeoTrans (1995b) are in terms of tritium concentration and do not extrapolate the results to human health risk. Risk estimates were calculated from the concentrations reported by GeoTrans (1995b) using the equation listed in Attachment A of Appendix H. For the off-site test locations (Project Shoal and Central Nevada Test Area sites), details of the human health risk calculations can be found in Daniels et al. (1993).

Comment Code: Organization 2-25

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 2-24.

Comment Code: Organization 2-26

Location of EIS Revision(s): None required

Response: For the off-site test locations (Project Shoal and Central Nevada Test Areas), details of the human health risk calculations can be found in Daniels et al. (1993). See response to Comment Code Organization 2-24.

Comment Code: Organization 2-27

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 2-24.

Comment Code: Organization 2-28

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 2-24.

Comment Code: Organization 2-29

Location of EIS Revision(s): Volume 1, Appendix H, Section 2.2.5.2

Response: Section 2.2.5.2 of Volume 1, Appendix H has been revised to briefly describe the method used to calculate risks at the off-site locations (Project Shoal and Central Nevada Test Area sites).

Comment Code: Organization 2-30

Location of EIS Revision(s): Volume 1, Appendix H, Section 2.2.5.2

Response: Section 2.2.5.2 of Volume 1, Appendix H has been revised to briefly describe the method used to calculate risks at the off-site locations (Project Shoal and Central Nevada Test Area sites).

Comment Code: Organization 2-31

Location of EIS Revision(s): Volume 1, Appendix H, Section 2.2.5.2

Response: Section 2.2.5.2 of Volume 1, Appendix H has been revised to briefly describe the method used to calculate risks at the off-site locations (Project Shoal and Central Nevada Test Area sites).

Comment Code: Organization 2-32

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 2-1.

Comment Code: Organization 2-33

Location of EIS Revision(s): None required

Response: The exposure scenarios suggested by the comment have been evaluated and addressed in the response to Comment Codes Organization 2-1 and Organization 2-32.

Comment Code: Organization 2-34

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1, Table 5-1

Response: Table 5-1 of Appendix H has been revised to present the range of calculated values from the Desert Research Institute reports for Project Shoal and Central Nevada Test Area sites. In addition, Table 5-1 has been revised to provide a more complete summary of the migration scenarios analyzed by GeoTrans for test locations within NTS boundaries. Corresponding changes have been made to the text discussions in Section 5.1 of Appendix H.

Comment Code: Organization 2-35

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1

Response: Volume 1, Appendix H of the Final NTS EIS has been revised to include discussion of the earlier predictions by Daniels et al. (1993) of potential cancer fatality risk to a public receptor at the nearest uncontrolled area boundary in Oasis Valley. For additional discussion on this topic, please see the response to Comment Code Organization 2-8.

Comment Code: Organization 2-36

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1

Response: The Final NTS EIS has been revised to include discussion of the earlier predictions by Daniels et al. (1993) of potential cancer fatality risk to a public receptor at the nearest uncontrolled area boundary in Oasis Valley. For additional discussion on this topic, please see the response to Comment Code Organization 2-8.

Comment Code: Organization 2-37

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1

Response: Appendix H of this EIS has been revised to present a more complete summary of the tritium migration studies performed for underground weapons test areas on the NTS, Project Shoal Area, and Central Nevada Test Area. The revised discussion addresses the uncertainties in the modeling results and presents results as a range of values representing the uncertainties in the analyses.

Comment Code: Organization 2-38

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1

Response: See response to Comment Code Organization 2-37.

Comment Code: Organization 2-39

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1

Response: Section 5.1 of Volume 1, Appendix H has been revised to provide a more complete discussion of the results for the three flow paths evaluated by GeoTrans (1995b) for the migration of tritium from test locations on Pahute Mesa and Yucca Flat. Please see GeoTrans (1995a) for details on the framework for the parameters and calculations used in the study.

Comment Code: Organization 2-40

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 2-39.

Comment Code: Organization 2-41

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 2-39.

Comment Code: Organization 3-1

Location of EIS Revision(s): None required

Response: In this and subsequent comments, the commentor makes comparisons between the NTS EIS and the DOE Waste Management Programmatic EIS and points out various discrepancies. The types of differences that the commentor identifies are expected to occur because of the different purposes and scope of the two documents. The Waste Management Programmatic EIS is designed to establish a broad framework of reasonable alternatives for consideration by the public and DOE decisionmakers in support of broad programmatic decisions. Data used for analyses of this type by necessity often must be aggregated or summarized for consistent application. In contrast, the NTS EIS has a sitewide focus and can use data specific to the site. Also, broadly scoped programmatic EISs make more conservative assumptions to ensure that the range of possible alternatives across a complex array of DOE program activities are adequately bounded. As a result, the DOE would expect estimates of waste volumes and health risks in the Waste Management Programmatic EIS to be at least as high or higher than related estimates in sitewide or project-specific National Environmental Policy Act documentation. Other differences arise because the analyses presented in the NTS EIS assess the range of reasonably foreseeable activities at the NTS over the next 10 years, whereas the Waste Management Programmatic EIS is designed to support DOE programmatic decisions affecting DOE-wide waste management activities over the next 20 years. Given these differences, the DOE believes that the results are reasonably comparable. Refer to Section 1.12 of Volume 3.

Comment Code: Organization 3-2

Location of EIS Revision(s): None required

Response: Estimated health risks in the DOE Waste Management Programmatic EIS are expected to be higher than those estimated in the NTS EIS because of the more conservative assumptions made in the Waset Management Programmatic EIS. These types of assuptions are appropriate for a broadly scoped programmatic EIS that is used as the basis for broad programmatic decisions and should bound the results of sitewide EISs such as the NTS EIS (see response to Comment Code Organization 3-1).

For example, the incident-free transportation risk assessment for the Waste Management Programmatic EIS uses the RADTRAN 4 program which does not take credit for shielding of the public by automobiles and residential construction. The analysis performed for the NTS EIS accounts for this shielding effect, resulting in lower estimated doses and health effects. The Waste Management Programmatic EIS also assumes higher waste volumes transported over a 20-year time period, but the waste volumes presented in the NTS EIS are considered more representative of expected waste volumes coming to the NTS over the next 10 years.

Comment Code: Organization 3-3

Location of EIS Revision(s): None required

Response: It is acknowledged that use of rail or intermodal transportation could be beneficial, in terms of both risk and cost, for off-site transportation. More evaluation would be required to determine the feasibility of a rail or intermodal transportation system.

The transportation of radioactive waste by rail was not evaluated, as an option in any of the alternatives in the NTS EIS, because there are no rail spurs that currently provide service to the NTS. However, Volume 1, Appendix I, Attachment F of this EIS provides a summary of the consideration related to rail spur development, use of truck/rail intermodal systems, and comparisons to the continued use of truck transportation systems.

Comment Code: Organization 3-4

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 3-1.

Comment Code: Organization 3-5

Location of EIS Revision(s): None required

Response: Refer to Comment Code Organization 3-1

Comment Code: Organization 3-6

Location of EIS Revision(s): None required

Response: The transportation risk results reported in the NTS EIS are valid only for the assumptions and volumes as given. If these volumes were to change, e.g., by adding a significant amount from ER activities, then the analysis would have to be revised to account for the larger volume in a separate National Environmental Policy Act evaluation.

Comment Code: Organization 3-7

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 3-2.

Comment Code: Organization 3-8

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 3-2.

Comment Code: Organization 3-9

Location of EIS Revision(s): None required

Response: The transportation of radioactive waste by rail is not evaluated as an option, in any of the alternatives in this EIS, because there are no rail spurs that currently provide service to the NTS. However, Volume 1, Appendix I, Attachment F of this EIS, provides a summary of the considerations related to rail spur development, use of truck/rail intermodal systems, and comparisons to the continued use of truck transportation systems.

Comment Code: Organization 3-10

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 3-9.

Comment Code: Organization 3-11

Location of EIS Revision(s): None required

Response: The U.S. Department of Transportation regulations do not impose restrictions on truck transportation that require trucks to travel across the Hoover Dam. Route selections are made in accordance with the U.S. Department of Transportation regulations (49 CFR 397.101[a]) which require the carrier to choose routes that would minimize radiological risk to the public. Rail transport is not likely to provide more discretion in route selection since access to mainline railways is limited in Southern Nevada, and these lines generally pass through major urbanized areas.

Comment Code: Organization 4-1

Location of EIS Revision(s): None required

Response: The referenced table is intended to present a summary of specific information contained in the discussions of geology, soils, hydrology, and air. The commentor is referred to each of those technical disciplines and the reference citations therein.

Comment Code: Organization 4-2

Location of EIS Revision(s): None required

Response: Table 4-1 of Volume 1 is meant to provide summary information and, for brevity, cannot present the same level of data as the original inventory reports.

Comment Code: Organization 4-3

Location of EIS Revision(s): None required

Response: The referenced table presents information on the major radionuclides based upon the information presented in a more recent study, McArthur (1991). Data were provided for the nine mentioned radioisotopes. Where this author reported the concentration of a radionuclide as zero, it was not included in Table 4-1, so the table is complete.

Comment Code: Organization 4-4

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.1.4.2

Response: The information concerning Sedan is presented in McArthur (1991) has been included in Chapter 4. According to this information, the Sedan total activity in Area 10 is 327.9 curies which was the source of the value presented in this EIS. According to this table, the total activity for Area 10 is 364.9 curies. If the Sedan-related contamination in Area 2 is considered, then the total contamination for Sedan is 344 curies. The text of this EIS has been changed to reflect this higher number.

Comment Code: Organization 4-5

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.1.4.2

Response: The DOE agrees, and the sentence has been deleted.

Comment Code: Organization 4-6

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.1.4.2

Response: Additional information concerning the source term has been incorporated in this EIS. It is worth noting that Borg et al. (1976) remains a thorough, readable, and authoritative reference on the subject of underground migration of radionuclides.

Comment Code: Organization 4-7

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.1.4.2

Response: The subject section was not based upon Borg et al. (1976). Rather, a more rigorous approach was used where each radionuclide was calculated using weapon design and performance data from Lawrence Livermore and Los Alamos National Laboratories. The text has been revised to provide additional information based on their estimates.

Comment Code: Organization 4-8

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.1.4.2

Response: The intent of the discussion is to provide a basis for comparison between different media for the remaining radioactivity at the NTS. The presentation of a lower bounding value is considered adequate for the purposes of this EIS.

The examples from Borg et al. (1976) were provided to show the magnitude of the radiological source term at the time of the detonation and the effect of decay of short-lived radionuclides. Additional details about the methodology used to estimate the radionuclide inventory, including fission and fusion contributions, were added to the text.

Comment Code: Organization 4-9

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.1.4.2

Response: Clarifying text has been added to the NTS EIS.

Comment Code: Organization 4-10

Location of EIS Revision(s): None required

Response: Borg et al. (1976) was not used alone to develop the estimates. Clarifying text has been added in response to other comments. Please refer to the response under Comment Code Organization 4-7 for additional discussion.

Comment Code: Organization 4-11

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.1.4.2

Response: Clarifying text has been added per Comment Code Organization 4-9.

Comment Code: Organization 4-12

Location of EIS Revision(s): None required

Response: While some classified materials were used that preclude the discussion of some of the underlying values, the overall estimate was not conducted in a "secretive nature." As was discussed for previous comments, Borg et al. (1976) was not the source of the estimates.

While the DOE is actively attempting to declassify additional source term data, some information will remain classified because of its relevance to weapons design and performance. The DOE is allowing representatives of the Nevada Division of Environmental Protection and the Harry Reid Center for Environmental Studies to study the classified data to dispel negative perceptions of the "secretive nature" of the process.

Comment Code: Organization 4-13

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.1.4.2

Response: The Benjamin memorandum (Benjamin, 1995) was the source of the information presented in Table 4-27 of the NTS EIS, and the reference was added to the discussion. The original source reference and methodology has been added to the text of this EIS.

Comment Code: Organization 4-14

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.1.4.2

Response: The date has been corrected.

Comment Code: Organization 4-15

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.1.4.2 and 4.1.5.2

Response: The text has been modified as suggested by the commentor.

Comment Code: Organization 4-16

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.8

Response: The text has been revised and appropriate references added to Section 4.8.

Comment Code: Organization 4-17

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.8

Response: The text has been revised and appropriate references added to Section 4.8.

Comment Code: Organization 4-18

Location of EIS Revision(s): Volume 1, Chapter 4, Table 4-28

Response: Table 4-28 has been modified as suggested by the commentor.

Comment Code: Organization 4-19

Location of EIS Revision(s): Volume 1, Chapter 4, Section 4.8

Response: Thallium has been added to Table 4-28.

Comment Code: Organization 4-20

Location of EIS Revision(s): Volume 1, Appendix H, Executive Summary and Section 5.1

Response: The Executive Summary of Appendix H has been revised to reflect the expanded discussion of potential tritium migration off the NTS, the Project Shoal Area, and the Central Nevada Test Area sites as contained in the Final NTS EIS, Appendix H, Section 5.1

Comment Code: Organization 4-21

Location of EIS Revision(s): Volume 1, Appendix H, Executive Summary and Section 5.1

Response: Volume 1, Appendix H of the Final NTS EIS has been revised to reflect the range of estimated impacts based on the uncertainties in key modeling parameters used in the various studies of potential tritium migration off the NTS, Project Shoal Area, and Central Nevada Test Area sites.

Comment Code: Organization 4-22

Location of EIS Revision(s): None required

Response: The assumption that Appendix H assesses human health risks and safety impacts only over a ten-year period is not correct. The activities evaluated under this EIS alternatives are those that can be foreseen to occur over a 10-year period. The most risk-dominant impacts, such as occupational injuries and fatalities, would be expected to coincide with the 10-year timeframe of activities evaluated in this EIS. However, some impacts from NTS activities may occur beyond the 10-year timeframe of this EIS. For example, accidental inhalation of plutonium by a worker could result in a long-term committed dose to the individual, and an increase in the worker's lifetime risk of contracting fatal cancer or other detrimental health effects. These detrimental health effects, if they actually developed in the individual, would most likely have a delayed onset beyond the 10-year timeframe of activities evaluated in this EIS. These delayed health effects are estimated and reported in this EIS even though they are not expected to occur within the 10-year timeframe of activities evaluated in this EIS.

Comment Code: Organization 4-23

Location of EIS Revision(s): Volume 1, Appendix H

Response: Volume 1, Section 3.1.4.7, Figure 3-4 of the NTS EIS identifies the areas that could potentially be turned back to the U.S. Bureau of Land Management for limited public use under Alternative 4. Several potential exposure scenarios were assessed and eliminated from further consideration, while other exposure scenarios were bounded by new analyses performed for the Final NTS EIS. These potential exposure scenarios considered health risks to the public from the following sources: (1) residual contamination on the land surface, (2) contaminated groundwater, and (3) future NTS activities proposed under Alternative 4.

Residual contamination on the land surface was eliminated as a potential exposure scenario because no contaminated land areas would be turned back to the U.S. Bureau of Land Management. Based on the groundwater modeling study performed by GeoTrans (1995b), potential turn back areas located south of Pahute Mesa could have groundwater contaminated with tritium above the drinking water limit of 20,000 pCi/L established by the U.S. Environmental Protection Agency. The DOE would not install a water supply well that was vulnerable to contamination, and the Nevada Bureau of Health Protection Services requires that any future water supply wells have groundwater vulnerability assessments performed before the well will be permitted as a public water supply.

Members of the public using the potential turn-back areas could potentially be impacted by NTS Waste Management activities at Areas 3 and 5 or by activities at the Spill Test Facility. Routine activities would be expected to have no impact because all wastes disposed of or stored at Areas 3 and 5 are contained, and routine tests conducted at the Spill Test Facility are performed under controlled conditions when the wind is blowing away from the potential turn-back areas. The public could be impacted by potential accidents at the Waste Management Areas or the Spill Test Facility. Additional accident analyses have been performed for the Final NTS EIS which bound potential impacts to members of the public located in the potential turn-back areas.

Comment Code: Organization 4-24

Location of EIS Revision(s): None required

Response: Section 1.3 of Appendix H correctly states its purpose to provide an assessment of human health risks and safety impacts associated with all of the alternatives considered in the NTS EIS. The comment refers to concerns raised in Comment Code Organization 4-23 that this EIS does not evaluate public exposure scenarios in released-land scenarios under Alternative 4. Potential exposure scenarios associated with use of NTS lands turned back for limited public use under Alternative 4 have been assessed (see the response to Comment Code Organization 4-23).

The comment is incorrect in assuming that Appendix H assesses human health risks and safety impacts only over a 10-year period. See the response to Comment Code Organization 4-22 for the detailed response to this comment.

Comment Code: Organization 4-25

Location of EIS Revision(s): Volume 1, Appendix H, Section 2.1

Response: The comment is correct. The lead sentence in Section 2.1, Volume 1, Appendix H, has been revised to include the component of "exposure" in the general concept of risk assessment.

Comment Code: Organization 4-26

Location of EIS Revision(s): Volume 1, Appendix H, Section 2.1.2.1

Response: The purpose of Section 2.1.2.1, Volume 1, Appendix H, is to explain basic concepts on the origin and types of ionizing radiation. Fission is included because it is an important process that produces ionizing radiation. The comment contains several suggestions which have been incorporated into Section 2.1.2.1. The discussion of the fission process has been revised to make it more relevant to activities at the NTS, and a discussion of the fusion process has also been added. The title of Section 2.1.2.1 has been revised to be representative of the revised subject matter.

Comment Code: Organization 4-27

Location of EIS Revision(s): Volume 1, Appendix H, Section 2.1.2.1

Response: The discussion of the fission process in Section 2.1.2.1, Volume 1, Appendix H, has been revised to make it more relevant to activities at the NTS.

Comment Code: Organization 4-28

Location of EIS Revision(s): Volume 1, Appendix H, Section 2.1.2.1

Response: A discussion of the fusion process has been added to Section 2.1.2.1, Volume 1, Appendix H, as suggested by the comment.

Comment Code: Organization 4-29

Location of EIS Revision(s): Volume 1, Appendix H, Section 2.1.2.1

Response: A discussion of the fusion process has been added to Section 2.1.2.1, Volume 1, Appendix H, as suggested by the comment.

Comment Code: Organization 4-30

Location of EIS Revision(s): Volume 1, Appendix H, Section 2.1.2.1

Response: A discussion of the fusion process has been added to Section 2.1.2.1, Volume 1, Appendix H, as suggested by the comment.

Comment Code: Organization 4-31

Location of EIS Revision(s): Volume 1, Appendix H, Section 2.2.3

Response: Units for worker collective dose have been changed from "rem" to "person-rem" as suggested by the comment.

Comment Code: Organization 4-32

Location of EIS Revision(s): None required

Response: The document (GeoTrans, 1995b) containing the data and results for the MC-TRANS modeling of tritium migration from NTS underground test locations is available in public reading rooms that received a copy of the Draft NTS EIS. The DOE confirmed that this reference was indeed in the public reading room on Losee Road in North Las Vegas. In addition, the DOE sent the commentor a copy directly. However, the results provided in GeoTrans (1995b) are in terms of tritium concentration and do not extrapolate the results to human health risk. Risk estimates were calculated from the concentrations reported by GeoTrans (1995b) using the equation listed in Attachment A of Appendix H. For the off-site test locations (Project Shoal and Central Nevada Test Area sites), details of the human health risk calculations can be found in Daniels et al. (1993).

Comment Code: Organization 4-33

Location of EIS Revision(s): Volume 1, Appendix H, Section 7

Response: The reference citation for Daniels et al. (1993) has been added to Section 7, Volume 1, Appendix H.

Comment Code: Organization 4-34

Location of EIS Revision(s): Volume 1, Appendix H, Section 2.2.5.1

Response: The tritium concentration of 1 x 10^9 pCi/L is the source concentration assumed by GeoTrans in their modeling of tritium migration from test locations within the NTS boundaries. The referenced citation has been added to the text of Section 2.2.5.1, Volume 1, Appendix H.

Comment Code: Organization 4-35

Location of EIS Revision(s): Volume 1, Appendix H, Section 2.2.5.1

Response: Section 2.2.5.1, Volume 1, Appendix H, has been revised to provide more detail on development of the tritium source concentration used in the migration study for the NTS underground test locations. As described in GeoTrans (1995b) a compilation of maximum observed concentrations in test cavity samples (Daniels et al., 1993) indicates that the maximum observed concentrations of tritium was 7.6 x 10^9 pCi/L. Other samples that have been collected had lower concentrations. For the GeoTrans (1995b) migration study, a source concentration of 1 x 10^9 pCi/L was assumed. The difference in the source term used in the model will have very little impact on the outcome or the estimated risk presented in the health study.

Comment Code: Organization 4-36

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1

Response: Earlier estimates of potential cancer fatality risk to a public receptor at the nearest uncontrolled area boundary in Oasis Valley ranged from 7 x 10^{-7} to 1 x 10^{-5} (Daniels et al., 1993). These results are higher than those estimated by GeoTrans (1995b) due to the preliminary, or screening, basis of the calculations performed by Daniels et al. (1993). For example, both studies base their source terms on shot cavity samples, but Daniels et al. (1993) assumed all groundwater at the source is contaminated to the highest observed tritium concentration of 7.6 x 10^9 pCi/L, while GeoTrans assumed an average groundwater concentration of tritium at the source of 1 x 10^9 pCi/L. Other assumptions used by Daniels et al. (1993) were conservative, or worst case estimates that would lead to somewhat higher concentration and risk estimates than the average case estimates used by GeoTrans. The GeoTrans estimates were made based on Environmental Restoration project work-in-progress, and will be refined and reported with estimated uncertainty in the future.

Volume 1, Appendix H of the Final NTS EIS has been revised to include discussion of the earlier predictions by Daniels et al. (1993) of potential cancer fatality risk to a public receptor at the nearest uncontrolled area boundary in Oasis Valley.

Comment Code: Organization 4-37

Location of EIS Revision(s): Volume 1, Appendix H, Section 4.2

Response: The consumption of tritium contaminated drinking water by the public is a future scenario that is not expected to have impacts within the 10-year timeframe of this EIS. This statement is based on the fact that tritium is not currently detectable above natural background levels in any existing public well near the NTS, Project Shoal Area, or Central Nevada Test Area boundaries. The statement is further supported by groundwater modeling results for the NTS, Project Shoal Area, and Central Nevada Test Area which show that tritium from test locations is not expected to be detectable at any existing public wells within the 10-year timeframe of the NTS EIS, with the possible exception of the first public well off the western boundary of the Project Shoal Area. At the nearest western well from the Project Shoal boundary area, predictions made by Chapman et al. (1995) estimate a range of tritium concentrations from less than 1 x 10^{-5} pCi/L to about 9,000 pCi/L, depending on uncertainties in the modeling parameters, during the 10-year period of this EIS (1996 to 2006). Nevertheless, this EIS assesses these potential health risks even though the impact is not expected to occur until future years, if ever. The sentence in Section 4.2, Volume 1, Appendix H, has been revised to state that impacts from this exposure scenario are not expected to occur within the 10-year timeframe of this EIS.

Comment Code: Organization 4-38

Location of EIS Revision(s): Volume 1, Appendix H, Table 5-1

Response: Table 5-1, Volume 1, Appendix H, has been revised to show that the peak tritium concentration was predicted to have crossed the boundary of the Central Nevada Test Area 8 to 15 years after the underground test date.

Comment Code: Organization 4-39

Location of EIS Revision(s): None required

Response: The comment disagrees with the statement that there is no expected impact to the public from tritium-contaminated groundwater during the 10-year timeframe evaluated in the NTS EIS. Please see the response to Comment Code Organization 4-37.

Comment Code: Organization 4-40

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1, Table 5-1 and text

Response: Table 5-1 of Appendix H has been revised to present the range of calculated values from the Desert Research Institute reports for the Project Shoal Area and Central Nevada Test Area. In addition, Table 5-1 has been revised to provide a more complete summary of the migration scenarios analyzed by GeoTrans for test locations within NTS boundaries. Corresponding changes have been made to the text discussions in Section 5.1.

Comment Code: Organization 4-41

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1, Table 5-1

Response: In the Final NTS EIS, data values in Table 5-1 of Volume 1, Appendix H, are reported with the same number of significant figures as used in the original author's reports.

Comment Code: Organization 4-42

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.1

Response: Section 5.1 of Volume 1, Appendix H has been revised to provide a more complete discussion of the results for the three flow paths evaluated by GeoTrans (1995b) for the migration of tritium from test locations on Pahute Mesa and Yucca Flat. In addition, Appendix H has been revised to include discussion of the earlier predictions by Daniels et al. (1993) of potential cancer fatality risk to a public receptor at the nearest uncontrolled area boundary in Oasis Valley.

Comment Code: Organization 4-43

Location of EIS Revision(s): None required

Response: The risk values presented in the NTS EIS are incremental risks above natural background levels. It is not the purpose of this EIS to establish screening levels for "significance," but rather, this EIS presents an assessment of risks, in addition to impacts and consequences, to inform the public, and to serve as a decisionmaking tool for the DOE. By their review of the results presented in this EIS, the public and DOE decisionmakers can form their own conclusions as to the significance of the results.

Regarding the Linear, No-Threshold Dose-Response Curve, the health risk factors used in this EIS are recommended by the International Commission on Radiological Protection (ICRP, 1991) and assume that for stochastic effects, such as latent cancer fatality, the risk of contracting the health effect is a linear function of the dose. The Linear, No-Threshold Dose-Response model is not the only model proposed by the scientific community to estimate health effects from low-levels of radiation, but it is the model currently adopted by all national and international agencies responsible for establishment of radiation protection standards used in the United States. Use of the International Commission on Radiological Protection risk factors is also consistent with DOE internal guidance on the preparation of Environmental Impact Statements (DOE, 1993b).

Comment Code: Organization 4-44

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 4-43.

Comment Code: Organization 4-45

Location of EIS Revision(s): None required

Response: The NTS EIS estimates human health risks based on the current recommendations of the International Commission on Radiological Protection (ICRP, 1991). See responses to Comment Code Organization 4-43.

Comment Code: Organization 4-46

Location of EIS Revision(s): None required

Response: The risk values presented in this EIS are incremental risks above natural background levels. See response to Comment Code Organization 4-43.

Comment Code: Organization 4-47

Location of EIS Revision(s): None required

Response: The risk values presented in this EIS are incremental risks above natural background levels. See response to Comment Code Organization 4-43.

Comment Code: Organization 4-48

Location of EIS Revision(s): None required

Response: The authors of the tritium migration study for the Central Nevada Test Area (Chapman et al., 1995) performed their assessment of human health risks based on a 70-year time period around the time of peak tritium concentration at various locations. This approach was intended to assess maximum potential health risks to human receptors at these locations. In the case of a hypothetical receptor at the Central Nevada Test Area boundary, where no public well currently exists, the peak tritium concentration was predicted to occur 8 to 15 years after the Project Faultless Test. Since the Project Faultless Test was conducted in 1968, the peak tritium concentration is predicted to have passed the Central Nevada Test Area boundary between the years 1976 and 1983.

The comment is correct about the need to consider radioactive decay in the evaluation of these modeling results. The effects of radioactive decay since 1983 are discussed in the text of Section 5.1 of Appendix H. By the year 1996, radioactive decay would result in at least a 50 percent reduction in the predicted peak tritium concentration, and additional reduction would be expected from diffusion within the aquifer.

Comment Code: Organization 4-49

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 4-22.

Comment Code: Organization 4-50

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 4-22.

Comment Code: Organization 4-51

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 4-22.

Comment Code: Organization 4-52

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 4-22.

Comment Code: Organization 4-53

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 4-22.

Comment Code: Organization 4-54

Location of EIS Revision(s): Volume 1, Appendix H, Section 5.3

Response: The dose of 281 rem reported in Section 5.3 of the Draft NTS EIS is a 50-year committed dose to a hypothetical exposed worker from inhalation of plutonium. The dose rate effectiveness factors, Φ_c and Φ_d, listed on Page B-3 of Appendix H were not used in this calculation. Less than 5 percent of the 50-year committed dose, about 12 rem, would occur in the first year after exposure. The first year dose would not be considered an acute dose, and no acute health effects would be expected. However, for stochastic effects, such as latent cancer fatality, the International Commission on Radiological Protection (ICRP, 1991) recommends that the risk factors be doubled for individual doses greater than 20 rem or dose rates greater than 10 rem per hour. In this instance, based on the 50-year committed dose of 281 rem, the individual would have an increased lifetime probability of 0.22 (about 1 in 4) of contracting a fatal cancer and an increased lifetime probability of 0.09 (about 1 in 11) of contracting any other detrimental health effect. The Final NTS EIS has been revised to account for the higher estimated health risks when individual doses exceed 20 rem or when dose rates exceed 10 rem per hour.

Comment Code: Organization 4-55

Location of EIS Revision(s): Volume 1, Appendix H, Section 6

Response: Section 6 of Volume 1, Appendix H has been revised as suggested by the comment.

Comment Code: Organization 4-56

Location of EIS Revision(s): Volume 1, Appendix H, Executive Summary and Section 5.1

Response: The potential for migration of tritium-contaminated groundwater off the boundaries of the DOE and the U.S. Air Force controlled areas has been addressed in response to previous comments. See responses for Comment Codes Organization 4-20 and 4-42.

Comment Code: Organization 4-57

Location of EIS Revision(s): Volume 1, Appendix H

Response: The comment is correct. However, the Dose and Dose Rate Effectiveness Factor only applies to doses greater than 20 rem or dose rates greater than 10 rem per hours. The only calculation that was affected by this factor in the Draft NTS EIS was the Maximum Reasonably Foreseeable Accident at the Device Assembly Facility. The comment is correct that the Dose and Dose Rate Effectiveness Factor recommended by the International Commission on Radiological Protection is 2. See response to Comment Code Organization 4-54.

Comment Code: Organization 4-58

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 4-43.

Comment Code: Organization 4-59

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 4-43.

Comment Code: Organization 5-1

Location of EIS Revision(s): None required

Response: The underground testing program has a Presidential mandate to maintain the ability to conduct nuclear tests, if directed to do so. The science-based Stockpile Stewardship Program enables the DOE and its national laboratories to exercise elements necessary to maintain that ability. Activities such as the subcritical experiments discussed in Volume 1, Section 2.4.1 also enable the DOE to exercise some elements necessary to maintain the ability to conduct nuclear testing in the future.

Additional discussion of policy considerations may be found in Section 2.2 of this EIS. Section 3.1.1.1 is a discussion of Defense Program activities under Alternative 1, and Section 3.1.3.1 is a discussion of Defense Program activities under Alternative 3.

Comment Code: Organization 5-2

Location of EIS Revision(s): None required

Response: No long-term storage of plutonium is required at the NTS to conduct underground tests. Special nuclear material is shipped to the NTS and staged just prior to the need to prepare the test package. The amount of special nuclear material required would vary from test to test and the precise number is classified. However, normally several kilograms would be involved.

Comment Code: Organization 5-3

Location of EIS Revision(s): None required

Response: The primary criteria for selecting an emplacement hole from the inventory are yield and containment. There are presently 33 emplacement holes in the inventory with only one extending below the aquifer. It is configured with a steel liner. The DOE would not use this hole unless all other options were deemed unsuitable.

Comment Code: Organization 5-4

Location of EIS Revision(s): None required

Response: The aquifer of concern for underground testing is the Volcanic Aquifer. The policy of the DOE/NV requires a hydrologic review of the impact of the working point on groundwater. The DOE attempts to establish working points as far above the watertable as possible consistent with containment of atmospheric releases to minimize possible contamination of that aquifer.

As stated in Section 5.5.1.1, "However, some groundwater might be unavoidably contaminated if the shot cavity is below or intercepts the water table."

Comment Code: Organization 5-5

Location of EIS Revision(s): None required

Response: No testing that can result in a nuclear yield is performed at the Tonopah Test Range. There is extensive security for special nuclear material protection. No tests are performed at the Tonopah Test Range that could result in the release of special nuclear material off range.

Comment Code: Organization 5-6

Location of EIS Revision(s): None required

Response: A method of destruction of a damaged nuclear weapon is through sympathetic detonation underground. Presidential direction would be required to implement such a procedure.

Comment Code: Organization 5-7

Location of EIS Revision(s): None required

Response: The Community Advisory Board can have a presentation of the Greater Confinement Disposal Program at any of the regularly scheduled monthly meetings of the full board. Please contact the Assistant Manager for Environmental Management point-of-contact for the Community Advisory Board to coordinate the schedule.

Comment Code: Organization 5-8

Location of EIS Revision(s): None required

Response: There are three documents which describe the analysis and adoption of this concept. They are *Proceedings of the Third Annual Information Meeting DOE Low-Level Waste Management Program* (ORNL, 1981) in an article named "The Criteria and Technical Concept for Demonstrating Greater Confinement Disposal of Radioactive Wastes at Arid Western Sites" (Hunter, 1981), Document Number ORNL/NFW-81/34; *Documentation of Greater Confinement Disposal Technology: 1981-1982,* DOE/NV-10253-6 (DOE/NV, 1982a); and *Comparative Assessment of Disposal of TRU Waste in a Greater Confinement Disposal Facility,* DOE/NV-00410-68 (DOE/NV, 1982b). Copies of these documents can be obtained by the Community Advisory Board by contacting the Assistant Manager for Environmental Management point-of-contact.

Comment Code: Organization 5-9

Location of EIS Revision(s): None required

Response: At present, the DOE is not in possession of greater-than-Class C waste. There has not been a determination of the total volume of greater-than-Class C waste for which the DOE will ultimately be responsible, nor has there been a determination of the final disposal configuration. It would be premature to state that boreholes would be used or to indicate the number or type of disposal cells that would be required. Refer to Volume 3, Section 1.12.

Comment Code: Organization 5-10

Location of EIS Revision(s): None required

Response: The Yucca Mountain repository is being considered along with other possible disposal sites.

Comment Code: Organization 5-11

Location of EIS Revision(s): None required

Response: The commentor is referred to Section 1.12 of Volume 3 for a discussion of greater-than-Class C waste. The DOE has been educating stakeholders through its public outreach meetings and has offered training on many subjects, including the types of classes of radioactive waste. If the Community Advisory Board is interested in having a presentation about the classes of waste, they should contact the Assistant Manager for Environmental Management point-of-contact for the Community Advisory Board.

Community Code: Organization 5-12

Location of EIS Revision(s): None required

Response: The DOE will continue to brief the Community Advisory Board, receive and consider its input, and provide feedback as to the disposition of Community Advisory Board input. Additionally, the Federal Facility Agreement and Consent Order (state of Nevada, 1996) requires that the DOE receive and consider Community Advisory Board input in the prioritization process. For example, Part XVII, Public Involvement, of the Federal Facility Agreement and Consent Order calls for a Public Involvement Plan which "shall contain a mechanism for actively seeking public input (including input from the Community Advisory Board), concerning the DOE and DoD activities undertaken pursuant to this agreement." Similarly, other stakeholders will be kept apprised and have the opportunity to provide input and receive feedback. The DOE will continue to hold prioritization workshops for the Community Advisory Board and the results will be forwarded to the Internal Review Board for consideration.

The DOE commits to considering all relevant stakeholder input, along with the other factors listed in the sidebar in Section 2.4.3 of this EIS, in the prioritization process. Stakeholder input, while very important, is but one of the factors the DOE and its regulators will use in meeting their responsibilities to formulate prioritization of the Environmental Restoration Program activities.

Comment Code: Organization 5-13

Location of EIS Revision(s): None required

Response: The current fiscal year funding for the Defense Nuclear Agency's environmental restoration program is $300,000. FY 1997 funding is planned to be $1 million, FY 1998 funding is planned to be $2 million, and FY 1999 funding is expected to reach $5 million and remain at that level into the foreseeable future.

The Defense Nuclear Agency is signatory to the Federal Facility Agreement and Consent Order and will follow the process outlined in the agreement in prioritization of projects. The factors listed in this EIS in the sidebar in Section 2.4.3 of Volume 1, would be considered by the Defense Nuclear Agency, in conjunction with the state of Nevada, in completing its priority list.

Comment Code: Organization 5-14

Location of EIS Revisions(s): Volume 1, Chapter 2, Section 2.5.6.1.

Response: The performance assessment for Area 5 has been delayed until January 1997 because of the revisions requested by the DOE Headquarter's Peer Review Panel. The DOE is scheduled to provide a presentation to the Community Advisory Board in June 1996.

Comment Code: Organization 5-15

Location of EIS Revision(s): None required

Response: The performance assessment for the Area 3 Radioactive Waste Management Site is still scheduled to be delivered to the DOE Headquarters in March 1998. When the document is revised and finalized for submission to DOE Headquarters for approval, a briefing can be made to the Community Advisory Board and copies can be distributed to the members. Please contact the Assistant Manager for Environmental Management point-of-contact for the Community Advisory Board to arrange this briefing.

Comment Code: Organization 5-16

Location of EIS Revision(s): None required

Response: The NTS boundary lines shown in Figure 3-1 includes those areas withdrawn specifically for use by the DOE through Public Land Orders: 805, 2568, and 3759, as shown in Chapter 4 of the NTS EIS. Lands withdrawn under Public Land Order 1662 are managed by the DoD for their ongoing operations and are not considered in this EIS for any alterative by the DOE.

Comment Code: Organization 5-17

Location of EIS Revision(s): None required

Response: Reserved zones on the NTS are explained in Chapter 3 under Alternatives 1, 3, and 4. These zones provide flexible support for testing, training, and experimentation. These zones are designated by the DOE.

Comment Code: Organization 5-18

Location of EIS Revision(s): None required

Response: This comment appears to apply to Summary Table S-3, "Summary comparison of environmental impacts of the alternative," in the Draft NTS EIS. For the time period which is evaluated in this EIS, an additional 0.0116 percent of the NTS may be disturbed with the continuation of ongoing low-level waste management activities. This percentage, which represents approximately 34 acres of new disturbance, is considered to be a small amount, especially when compared to other land disturbing projects occurring elsewhere in southern Nevada. Much of the 34 acres would be removed from future use and would be irreversibly impacted by disposal operations. Some of the area used for storage prior to disposal could be restored and reused. No impact to groundwater resources is anticipated from waste storage and disposal activities.

Comment Code: Organization 5-19

Location of EIS Revision(s): Summary, Table S-3

Response: The approximated values provided in Table S-3 represent the volume of waste to be disposed of at the NTS under each of the four alternatives. The numbers in Table S-3 have been revised based on more accurate estimate information and consistency checks between the various sections of the NTS EIS. The number of shipments correlating to these waste volumes can be found in Chapter 5, Environmental Consequences, Table 5.1-5 for Alternative 1, Table 5.3-5 for Alternative 3, and Appendix I, Transportation Study. The number of waste shipments have been revised in the Final NTS EIS to correlate with the new estimates; however, the total number of waste shipments is similar to the original information provided.

Comment Code: Organization 5-20

Location of EIS Revision(s): Summary, Table S-3

Response: The numbers in Table S-3 have been revised based on more accurate estimate information and consistency checks between the various sections of the NTS EIS.

Comment Code: Organization 5-21

Location of EIS Revision(s): None required

Response: There has been an increase in the amount of environmental restoration waste that is sent to commercial facilities for disposal. An increasing amount of waste is being disposed of on the restoration sites. Although this has reduced the amount of DOE environmental restoration waste that could be expected to be disposed of at the NTS, it is reasonable to assume that some environmental restoration waste will continue to be shipped to the NTS for disposal. Under Alternative 1, environmental restoration wastes can be assumed to be shipped to the NTS from off-site, out-of-state locations at the same rate as has been the case in recent years. Waste shipped to the NTS from restoration sites within the state of Nevada can be assumed to increase in volume and number of shipments under Alternative 1.

Comment Code: Organization 5-22

Location of EIS Revision(s): Summary Table S-3 and Volume 1, Chapter 3, Table 3-5

Response: The statement is intended to mean that activities conducted or proposed to be conducted at the NTS or other locations would not influence the land uses in proximity to the sites identified.

Comment Number: Organization 5-23

Location of EIS Revision(s): None required

Response: When an EIS is prepared and economic, social, natural, or physical effects are interrelated, the NTS EIS must discuss these effects on the human environment. For example, considerable expansion of DOE activities could cause an increase in employment which, in turn, may cause additional employee traffic, that results, perhaps in a reduction in air quality. Unemployment, personal income, and housing demand are also analyzed in the same way.

As stated in the text, this EIS analyzes 10 years of activities. For example, in Chapter 5 the economic-demographic conditions of southern Nevada under Alternative 1 are presented for several benchmark years. Specifically, the employment of the NTS in the year 2005 is projected to be 6,576 or 1 percent of Clark County. This direct employment level would generate 12,516 secondary jobs. Furthermore, this direct employment would result in approximately 323 million dollars in personal income while the secondary earnings would be 339 million dollars.

Comment Code: Organization 5-24

Location of EIS Revision(s): None required

Response: The discussion upon which these statements in Summary of Environmental Impact of the Alternatives, Table 3-5, are based is located in Section 5.1.1.5.2. The total effects from the anticipated groundwater withdrawals under Alternative 1 are expected to be minor because the total quantity of water that will be used does not exceed historic pumping rates for the NTS. As noted in the discussion in Chapter 5, the impacts are expected to be limited to the localized lowering of water levels in the vicinity of the water supply wells. No off-site impacts are anticipated. It is indeed possible to extract more water from Yucca Flat than the perennial yield of the basin. This concept is referred to as groundwater mining, i.e., groundwater is removed from storage. Groundwater mining is not uncommon in developed portions of Nevada, for example, in 1994 more than 8.39×10^7 cubic meters (m^3) (68,000 acre feet [ac ft]) of groundwater were withdrawn from the Las Vegas Valley, far in excess of the perennial yield of 3.08×10^7 m^3 (25,000 ac ft/yr). The impacts of withdrawing water in Yucca Flat in excess of the perennial yield are expected to include the additional lowering of water levels in the vicinity of water supply wells and the potential for a reduction in subsurface flow into Frenchman Flat.

Comment Code: Organization 5-25

Location of EIS Revision(s): None required

Response: There would be no impacts to the Area 5 Radioactive Waste Management Site because of existing flood protection structures. Although flood studies have shown that the Area 3 Radioactive Waste Management Site would not be impacted by flood events, flood protection structures are planned to protect the disposed site from surface run-off.

Comment Code: Organization 5-26

Location of EIS Revision(s): Volume 1, Chapter 3, Table 3-5

Response: No substantial increases in air emissions related to the alternatives analyzed in the NTS EIS are expected. Nye County would continue its present attainment designation for all criteria pollutants. No additional violations of air quality standards would be produced in the nonattainment areas of Clark County as a result of any alternative.

Comment Code: Organization 5-27

Location of EIS Revision(s): Volume 1, Chapter 3, Table 3-5

Response: Table 3-5 has been modified to address ground disturbing impacts. Some impacts are expected under this alternative and those determined to be adverse would be negated through avoidance, minimized through project modification, or mitigated through data recovery programs.

Comment Code: Organization 5-28

Location of EIS Revision(s): None required

Response: The health effect risks presented in Volume 1, Chapter 3, Table 3-5, from exposure to tritiated groundwater and an explosion at the Device Assembly Facility, represent incremental increases in risk calculated to result from hypothetical exposure scenarios. This EIS uses hypothetical exposure scenarios to estimate the upper bound of potential human health risks as a result of an activity. For example, no public well currently exists at the boundary of the NTS and the U.S. Air Force controlled area in Oasis Valley. However, a public well at this location in the future cannot be categorically ruled out, so it is appropriate for purposes of analysis to postulate a well and an individual who uses the well as their primary source of drinking water. Using this approach, the estimated risks presented in the NTS EIS would be greater than the actual expected risks to existing public individuals.

The incremental risks presented in this EIS are in addition to other risks that an individual may encounter as a result of everyday life. For example, the risk of fatal cancer to an individual in the general population from all causes is about 0.2, or one in five. In other words, in a population of 100,000 people, 20,000 would be expected to contract fatal cancer from all causes. The accident scenario at the Device Assembly Facility estimated an incremental risk of 0.68 cancer fatalities in the exposed population within 50 miles, about 80,000 people. Within this population, about 16,000 fatal cancers (80,000 x 0.2) would be expected from all causes, and the incremental risk from the postulated accident at the Device Assembly Facility would add 0.68 to this total. In this case, the incremental increase in cancer risk within the population is well within the statistical uncertainty of the cancer risk estimates. Details of the human health risks summarized in Table 3-5 are contained in Volume 1, Appendix H of this EIS.

Comment Code: Organization 5-29

Location of EIS Revision(s): None required

Response: Average daily traffic volumes on the NTS were calculated with several considerations in mind. The daily trip rate accounts for trucks transporting waste as well as personal automobiles (employees and visitors), buses, and service vehicles. Vehicular trips generated at the NTS are slightly less than the typical vehicular trip generation rate for office and light industrial land uses, which is in the range of 3 to 6 vehicular trip ends per employee. Because approximately 70 percent of on-site employees ride the bus, the rate at the NTS is lower.

Comment Code: Organization 5-30

Location of EIS Revision(s): Volume 1, Chapter 5, Table 5.1-5, Section 5.1.1.2.1

Response: Table 5.1-5 includes low-level waste shipments from Nevada generators and out-of-state generators. The number of low-level waste shipments from out-of-state generators total 6,758, which is approximately the same as the number given in Table 5.1-5 of the Draft NTS EIS. Table 5.1-5 of this EIS discusses on-site traffic impacts and uses an estimate of 6,801 shipments. The two numbers agree well, considering that they were derived from different sources, and were used for different analyses in this EIS. Table 5.1-5 also identifies 9,177 shipments of mixed low-level waste coming from Rocky Flats. In the Final NTS EIS, the Rocky Flats mixed waste shipments have been eliminated from consideration as an activity under Alternative 1.

Comment Code: Organization 5-31

Location of EIS Revision(s): None required

Response: There is currently no monitoring and no monitoring is planned for the Muddy River Area as part of the overall monitoring program for the Area 5 Radioactive Waste Management Site. This facility is located in the Death Valley regional groundwater flow system while the Muddy River Area is located in the White River flow subsystem of the larger Colorado River flow system. There is no published information that has indicated that there is a hydraulic link between the Area 5 Radioactive Waste Management Site and the Colorado River flow system.

Comment Code: Organization 5-32

Location of EIS Revision(s): None required

Response: The waste generated from the remediation of Defense Nuclear Agency sites located on the NTS, would be stored and, if they meet land disposal restrictions, would be disposed of at the NTS.

Comment Code: Organization 5-33

Location of EIS Revision(s): None required

Response: The waste described is similar to greater-than-Class C, however, this is not greater-than-Class C because it is not commercially generated. A maximum of 0.03 cubic meters (m^3) 1 cubic yards (ft^3) of this waste was disposed of during the 1980s. No additional amounts of this waste are currently forecast to be disposed of in these boreholes.

Comment Code: Organization 5-34

Location of EIS Revision(s): None required

Response: This waste was disposed of in the greater confinement disposal boreholes at the Area 5 Radioactive Waste Management Site. The waste came from the DOE Experimental Breeder Reactor, which was disassembled and sent to the NTS by Rockwell, Canoga Park, CA.

Comment Code: Organization 5-35

Location of EIS Revision(s): None required

Response: The Solar Enterprise Zone concept analyzed in this EIS includes development of solar energy facilities at both the NTS and other alternative sites. Alternative Solar Enterprise Zone sites may be used in conjunction with the NTS to minimize infrastructure improvements required and to improve access to power markets (Appendix A, Section A.4.3.1). The Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley sites were identified as potentially feasible sites for such facilities by the Corporation for Solar Technology and Renewable Resources, the entity which would actually develop a solar energy facility. Thus, evaluation of the impacts of development of these sites is required by the DOE as part of its National Environmental Policy Act process.

Comment Code: Organization 5-36

Location of EIS Revision(s): None required

Response: American Indians with cultural or historic ties to the NTS have been involved in the monitoring of selected sites of cultural importance to American Indians since 1987. This monitoring program will continue, and at the request of American Indian groups, the DOE is working to develop an expanded monitoring program.

To keep tribal groups informed of DOE/NV activities that could potentially effect sites of importance to American Indians, the DOE sends a quarterly summary of cultural resource survey reports to tribes for review. Copies of the full reports are made available to tribes upon request.

Comment Code: Organization 5-37

Location of EIS Revision(s): Summary, Table S-3 and Volume 1, Chapter 3, Table 3-5

Response: Table 3-5 has been revised in the Final NTS EIS to show the estimated acreage devoted to each land use under each alternative. Moreover, the estimated acreage of land disturbed under each alternative has been added to the table. Over the 10-year period examined in this EIS, the estimated disturbances are as follows: 10,000 acres under Alternative 1; zero acres under Alternative 2; 21,000 acres under Alternative 3; and 16,500 acres under Alternative 4.

Comment Code: Organization 5-38

Location of EIS Revision(s): None required

Response: Impacts to biological resources for the Solar Enterprise Zone are found in Volume 1, Section 5.3.1.6, "Nondefense Research and Development Program." Descriptions of impacts associated with each technology were not included, because the base facility for each technology will likely disturb about the same acreage (2,400 acres) and have similar biological impacts. Impacts associated with the solar thermal parabolic-trough technology would have the largest impact on biological resources, and would disturb about 2,200 additional acres due to construction of a gas pipeline, but would likely be confined to previously disturbed rights-of-way. Upgrades in transmission facilities would be about the same for each technology. All technologies except the photovoltaic technology, the technology with the least impact on biological resources, would also require various amounts of water, although water use from deep groundwater sources would have little or no impact on springs on the NTS, or other biological resources (see Volume 1, Section 5.3.1.6 "Nondefense Research and Development Program").

Comment Code: Organization 5-39

Location of EIS Revision(s): None required

Response: The impacts on groundwater that are anticipated from the location of a Solar Enterprise Zone facility on the NTS are detailed in Section 5.3.1.2 of this EIS. The impacts would depend upon the location of the water supply for this zone, and are expected to include the lowering of water levels in the vicinity of water supply wells and the possible interception of some portion of the flow out of the basin. As noted in Chapter 5, it is not considered likely that the water withdrawals will have any significant adverse impacts on down gradient water levels or spring discharge rates. It is not believed that contamination that is in the underground testing areas will be mobilized as a result of this pumping because the testing areas are distant from the potential point of water use.

Comment Code: Organization 5-40

Location of EIS Revision(s): None required

Response: The DOE is committed to protecting biological resources and mitigating adverse impacts where possible. The DOE will work with the U.S. Fish and Wildlife Service and comply with any terms and conditions, and mitigation measures that would be issued in the Biological Opinion for these activities. Some of the current mitigation measures being used by the DOE at the NTS include conducting biological surveys prior to any construction activity and monitoring areas during construction activities. To date, no tortoises have been found within proposed construction areas; therefore, no tortoises have had to be displaced out of harms way. It is important to remember that desert tortoise densities are low on the NTS, and none of the areas that would be disturbed have been designated by the U.S. Fish and Wildlife Service as critical habitat for desert tortoises. Thus, the loss of this habitat would not significantly impact the continued existence of the desert tortoise.

Comment Code: Organization 5-41

Location of EIS Revision(s): None required

Response: For a discussion of habitat that might be disturbed by Solar Enterprise Zone activities, please see the response to Comment Code Organization 5-38.

Comment Code: Organization 5-42

Location of EIS Revision(s): None required

Response: The decision to retain, reallocate, or release Special Use Airspace is made by the Federal Aviation Administration during its annual review process, based on the stated needs of the agency that uses the airspace. Decisions to relinquish part or all of Special Use Airspace at the NTS or the Nellis Air Force Range Complex would be determined through this process.

Comment Code: Organization 5-43

Location of EIS Revision(s): None required

Response: The U.S. Department of Agriculture, Soil Conservation Service conducts soil surveys of selected areas to provide basic information to citizens that can be applied to managing farms, ranches and woodlands, selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts for farming, industry, and recreation. Within Nevada, these surveys have been limited to agricultural areas such as Meadow Valley, the Virgin River Area, and the Pahranagat-Penoyer area. Soil surveys are not done for public lands unless the lands are in the immediate vicinity of agricultural areas. Thus, no Soil Conservation Service soil survey has been done for the NTS or adjoining areas. The DOE has conducted numerous soil investigations on the NTS as part of scientific investigations and for facility design studies.

Comment Code: Organization 5-44

Location of EIS Revision(s): None required

Response: The DOE is not involved in the actions taken by other government agencies in managing the resources assigned to them. Questions should be directed to the specific agencies involved. The withdrawal of land does go through a public participation process in which questions can be answered.

Comment Code: Organization 5-45

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 5-39.

Comment Code: Organization 5-46

Location of EIS Revision(s): None required

Response: As proposed, Alternative 3 maintains the option of using Areas 18, 29, and 30 on the NTS. Under Alternative 3, those areas would be utilized in support of Defense, Work for Others, and Nondefense Research and Development Activities, and therefore would not be turned back for public use.

Comment Code: Organization 5-47

Location of EIS Revision(s): None required

Response: There is sufficient groundwater at the NTS to service activities in all the alternatives. However, there may be physical, environmental, legal, and administrative limitations on the availability of the groundwater resources from the NTS. These limitations will be considered when performing and siting specific activities at the NTS to ensure that a balance is achieved between current use of groundwater on the NTS and future sustainable use.

Comment Code: Organization 5-48

Location of EIS Revision(s): None required

Response: The process and requirements for the return of withdrawn lands to the public domain are discussed in Section 1.8 of Volume 3.

Comment Code: Organization 5-49

Location of EIS Revision(s): None required

Response: Two Solar Enterprise Zones would be developed under Alternatives 3 and 4. Under both alternatives, the Solar Enterprise Zone on the NTS would encompass an identical unidentified area of 8,300 acres. The off-site Solar Enterprise Zones under both alternatives could be developed in one of three valleys; Eldorado Valley, Dry Lake Valley, or Coyote Spring Valley. The size of the Solar Enterprise Zone in Eldorado Valley is 6,000 acres. The size of the Solar Enterprise Zone in Dry Lake Valley is 3,600 acres. The size of the Solar Enterprise Zone in Coyote Spring Valley is estimated at 7,000 acres.

Comment Code: Organization 5-50

Location of EIS Revision(s): None required

Response: Constructing a Solar Enterprise Zone facility on the NTS would not require remediation of any lands prior to establishment. The facility would be located in an area that has no surficial contamination. The other potential locations are located off the NTS on uncontaminated lands.

Comment Code: Organization 5-51

Location of EIS Revision(s): None required

Response: No clean-up technology would be used because the Solar Enterprise Zone facility would be located on uncontaminated land. See comment and response for Comment Code Organization 5-50 for more information.

Comment Code: Organization 5-52

Location of EIS Revision(s): None required

Response: Because the land for the Solar Enterprise Zone facility would not need to be cleaned, no health risk standard will be necessary. Please see comments and responses for Comment Code Organization 5-50 and 5-51 for more information.

Comment Code: Organization 5-53

Location of EIS Revision(s): None required

Response: Lands identified for solar energy development on the NTS do not require "cleanup" or turn-back activities prior to construction or operation of solar energy facilities. Development plans, such as cost and construction schedules, have not yet been developed.

Comment Code: Organization 5-54

Location of EIS Revision(s): None required

Response: The operating cost of a Solar Enterprise Zone facility at the NTS was not available for this EIS. Resource needs were summarized from the best available information at the program level. These resource assumptions have been added to Volume 1, Appendix A as Table A-4.

Comment Code: Organization 5-55

Location of EIS Revision(s): None required

Response: Use of the NTS airspace would not increase substantially under any alternative through the Work for Others Program. Primary use of this airspace would be for DoD training and defense-related research and development using aircraft in the DoD inventory. The Department of Energy aircraft may also be used depending on the type of DOE project or the needs of the user under the Work for Others Program.

Comment Code: Organization 5-56

Location of EIS Revision(s): None required

Response: Commercial and general aviation aircraft would not be able to use the NTS airspace under the Alternative 4 Work for Others program. The NTS airspace would continue to be used by the DoD and the DOE.

Comment Code: Organization 5-57

Location of EIS Revision(s): None required

Response: Commercial aviation includes scheduled air-carriers, air-cargo aircraft, and charters. General aviation normally refers to privately owned aviation interests.

Comment Code: Organization 5-58

Location of EIS Revision(s): None required

Response: Nellis Air Force Base operates an air-traffic-control radar facility and a range-control radar facility to monitor and control aircraft flights within airspace over the NTS and the NAFR Complex. These facilities use state-of-the-art radar equipment.

Comment Code: Organization 5-59

Location of EIS Revision(s): None required

Response: Any future upgrades to airfield facilities or increased staffing of air traffic/range control facilities would not be considered as a direct result of any enhanced use of the NTS.

Comment Code: Organization 5-60

Location of EIS Revision(s): None required

Response: Increased air traffic at the NTS would not directly affect current operation costs for controlling/monitoring flight operations within the NTS/NAFR Complex airspace.

Comment Code: Organization 5-61

Location of EIS Revision(s): None required

Response: All transuranic and transuranic mixed wastes will be shipped to the Waste Isolation Pilot Plant in transuranic packing and transport, revision II (TRUPACT II) type B containers on specially designed tractor trailers that hold up to three TRUPACT I.

Comment Code: Organization 5-62

Location of EIS Revision(s): None required

Response: The low-level liquid waste is now treated at the site of generation, thereby eliminating the need for a treatment facility and the need to transport liquid waste.

Comment Code: Organization 5-63

Location of EIS Revision(s): None required

Response: A decision regarding the shipping containers used to transport contaminated soils and materials to the NTS for disposal has not been made for all the sites under the Nevada Environmental Restoration Program. The first plutonium-contaminated soils cleanup is scheduled to start in July of this year. Use of double-lined durable plastic bags strengthened with fiberglass reinforcement (a.k.a. super sacks) loaded into enclosed transport trucks is currently planned for use in this project. In any case, the containers, covers, or both will, at a minimum, meet the U.S. Department of Transportation requirement for transportation of low specific-activity waste.

Comment Code: Organization 5-64

Location of EIS Revision(s): None required

Response: Under Alternatives 3 and 4, the on-site roadway network would have the operating capacity necessary to handle the increase in traffic as a result of the projects and activities associated with the Nondefense Research and Development Program and the Work for Others Program. Therefore, since no on-site roadway would experience significant traffic congestion, no mitigation would be required.

Comment Code: Organization 5-65

Location of EIS Revision(s): None required

Response: Under Alternatives 3 and 4, the current roadway network already has the necessary traffic capacity; therefore, no mitigation would be required as a result of traffic associated with the Nondefense Research and Development Program or the Work for Others Program. The costs incurred would be the ongoing maintenance costs of the NTS roads.

Comment Code: Organization 5-66

Location of EIS Revision(s): None required

Response: For employees directly affected by downsizing or reductions due to program changes, there have been programs established to assist in retraining or in searching for new jobs. In the case of major changes, a program like the Community Reuse Organization could be established. This program is intended to find new or different programs to compensate for the loss of jobs or activities. Chapter 7, Mitigation, of the Final NTS EIS, identifies the implementation of such programs.

Comment Code: Organization 5-67

Location of EIS Revision(s): None required

Response: The area of the radiologically contaminated soil sites on the NTS and surrounding areas can be found in this EIS, Section 4.1.4.3. Final clean-up levels will be determined through the process established in the Federal Facilities Agreement and Consent Order. That process includes a complex risk evaluation. The Federal Facilities Agreement and Consent Order requires the development of a Corrective Action Decision Document which will provide the rationale for the selected clean-up levels based on investigation activities, costs, and risk to receptors in conjunction with potential future land uses. Funding and schedules for environmental restoration at the DOE facilities is outlined in the Baseline Environmental Management Report published this year.

Comment Code: Organization 5-68

Location of EIS Revision(s): None required

Response: The NTS waste acceptance criteria NVO-325 (DOE, 1992) and the audits and surveillance of generators by the waste acceptance team are the first line of safety for the site. Through this process, items that are prohibited from disposal at the NTS, and wastes that are incorrectly prepared or packaged are refused permission to ship. Closure caps, air, vadose zone monitoring, and groundwater monitoring at the Area 5 Radioactive Waste Management Site are all additional safety features of the disposal sites.

A briefing on the Area 5 performance assessment and distribution of copies of the document could be provided in January 1997; and for Area 3 in April or May 1998.

Comment Code: Organization 5-69

Location of EIS Revision(s): None required

Response: As stated in Section 2.4.2, the Area 11 Explosive Ordnance Disposal Unit is not a disposal unit, but rather a thermal treatment unit where waste explosives are treated by detonation. Waste explosives are not disposed of by land burial on the NTS and the DOE does not plan to dispose of waste explosives by land burial in the future.

The Area 11 Explosive Ordinance Disposal Unit is a Resource Conservation and Recovery Act Permitted Treatment Unit and is subject to specific design, maintenance, operational, and monitoring requirements. As required by the Resource Conservation and Recovery Act and the Permit, these requirements ensure that the unit is maintained and operated to protect human health and the environment.

The DOE intends to continue to operate the Area 11 Explosive Ordinance Disposal Unit in a manner that is protective of human health and the environment. The future expansion of the operational capacity will be limited to the amounts specified in the Resource Conservation and Recovery Act Permit.

Alternative 1 in Section A.6.1.4 of the NTS EIS describes the destruction and treatment of non-nuclear energetic material (explosives) by detonation in a tunnel located in Area 25. This activity will be limited to the demonstration that this type of treatment is feasible, compliant with the Resource Conservation and Recovery Act, and is protective of human health and the environment.

Comment Code: Organization 5-70

Location of EIS Revision(s): None required

Response: Natural succession of disturbed areas on the NTS is generally a slow process requiring several decades or centuries to establish similar cover and productivity at adjacent undisturbed sites. The variables that have been determined to be important in revegetation success are: adequate moisture during seed germination and establishment, favorable soil conditions and seed of species adapted or native to the site. However, reclamation of disturbed areas can be accelerated. Reclamation trials at Yucca Mountain and at the NTS and Tonopah Test Range sites have shown that revegetation of disturbed areas is practical and that equivalent density and cover of vegetation can be accomplished much quicker (3-10 years) than through natural succession (EG&G/EM, 1995). See Section 4.1.6, "Biological Resources (FLORA)" for a more detailed discussion of revegetation problems, techniques and success.

Comment Code: Organization 5-71

Location of EIS Revision(s): None required

Response: Impacts to the environment and appropriate mitigation measures are dependent on the technologies selected for development at the NTS. Mitigation measures required to minimize and repair the environment around and beneath the potential solar energy facilities would be evaluated and selected through the Resource Management Planning process and future National Environmental Policy Act reviews. For additional discussion, please see responses to Comment Codes Organization 5-35 and 5-38.

Comment Code: Organization 5-72

Location of EIS Revision(s): Volume 1, Chapter 5, Section 5.4.1.7

Response: There will not be any significant impact to air quality in and around the NTS under Alternative 4. The Site Support Activities section has been clarified (refer to Section 5.4.1.7, Air Quality). For additional discussion, please see the response to Comment Code Organization 5-26.

Comment Code: Organization 5-73

Locations of EIS Revision(s): None required

Response: Noise impacts as a result of the implementation of Alternative 4 are discussed in Section 5.4.1.8. Under Alternative 4, noise impacts off of the NTS would be minor.

Comment Code: Organization 5-74

Location of EIS Revision(s): None required

Response: The Solar Enterprise Zone concept analyzed in this EIS includes the development of solar energy facilities at both the NTS and other alternative sites. Management of Solar Enterprise Zone facilities off the NTS will be the responsibility of the Corporation for Solar Technology and Renewable Resources (CSTARR), or its successor, and the governmental agencies responsible for the land and other resource management.

Comment Code: Organization 5-75

Location of EIS Revision(s): None required

Response: If a Solar Enterprise Zone facility project were to be undertaken at an off-NTS location, the project proponent would undertake the evaluation of the site, and any impacts created by the project. While the DOE has supported the initiatives related to the solar programs, the off-NTS projects would be privately funded and DOE would not be liable for any negative impacts.

Comment Code: Organization 5-76

Location of EIS Revision(s): None required

Response: The relationship among the NTS programs, the potential for construction and operation of a geologic repository at Yucca Mountain, and the U.S. Air Force programs are discussed in Chapter 6, Cumulative Impacts, and in Chapter 1, Introduction. Section 1.1 of Volume 3 contains additional information on the relationship between Yucca Mountain and the NTS. Chapter 6 also discusses the cumulative impacts related to planned projects of the U.S. Navy, the U.S. Bureau of Land Management, the state of Nevada, Nye County, Lincoln County, Clark County, and American Indian groups.

Comment Code: Organization 5-77

Location of EIS Revision(s): None required

Response: It was the DOE's intent to analyze all of the NTS-related sites in Nevada. This is the reason sites such as the Project Shoal Area, the Tonopah Test Range, and the Central Nevada Test Area are also included in this EIS. A discussion of the effects of the Environmental Restoration Program and the Waste Management Program for each environmental resource at each site is found in Chapter 5. In addition, Table 3-5 summarizes the total effects of these programs.

Comment Code: Organization 5-78

Location of EIS Revision(s): None required

Response: As described in Section 4.7 of Volume 2, the DOE proposes to manage biological resources so as to maintain viable populations of native plants and animals on the NTS. Top management priority will be given to those listed under the Endangered Species Act as threatened or endangered, candidates for listing under that Act, species of concern, and species classified by the state of Nevada as critically endangered.

Comment Code: Organization 5-79

Location of EIS Revision(s): None required

Response: The priorities of DOE with regard to the NTS are directly related to the primary mission of the NTS. Section 2.1 of this EIS describes the current primary mission as maintaining the capability to conduct underground nuclear tests, if needed, as well as supporting the science-based Stockpile Stewardship Program of experiments and other kinds of tests. Other activities on the NTS, including waste management are ongoing activities that support the primary mission.

Comment Code: Organization 5-80

Location of EIS Revision(s): None required

Response: The DOE concurs. The NTS extends into Lincoln County. Area 13, which is examined in this EIS, is also partly within Lincoln County.

Comment Code: Organization 5-81

Location of EIS Revision(s): None required

Response: Alternative 4 introduces, in a limited way, the use of the natural resources of the NTS that relate to economic, recreational, and social benefits. The creation of a nuclear era museum or other educational opportunities would provide social benefits, while opening the Timber Mountain Caldera to visitors could provide a recreational benefit. The DOE has not proposed the use of natural resources for economic benefit, although mining has been proposed for consideration by various state, local and private organizations.

Comment Code: Organization 5-82

Location of EIS Revision(s): None required

Response: The DOE's approach to defining goals at appropriate scales is defined in Section 3.3.3, Volume 2.

Comment Code: Organization 5-83

Location of EIS Revision(s): None required

Response: Participation by stakeholders in the land-use decisions through the development of the *Resource Management Plan* is considered to be very important by the DOE. The public participation process in this EIS has involved stakeholders in the evaluation of impacts related to land uses and has resulted in useful information. Public participation in the development of the *Resource Management Plan* is invited.

Comment Code: Organization 5-84

Location of EIS Revision(s): None required

Response: Detailed figures showing the location, size, and configuration of all facilities on the NTS would have been too large and too numerous to include in this EIS. However, numerous maps showing the location of facilities and infrastructure on the NTS were published in Volume 1, Chapters 3 and 4. For example, the land-use maps on Figures 3-1, 3-2, 3-3, and 3-4 in this EIS include the location of existing and proposed facilities. Volume 1, Chapter 4 figures include maps of water delivery facilities; the NTS power distribution system; existing treatment, storage, and disposal facilities; the NTS transportation system; and other maps describing the facilities on the NTS.

Comment Code: Organization 5-85

Location of EIS Revision(s): None required

Response: Future water needs for a facility or project are determined by the engineering design criteria for that specific facility or project. The engineering design criteria take into consideration all processes that will be conducted as well as the resource requirements for a project. The sum of projected water uses for all facilities or projects that are planned to be operating at some future date determine the future water needs at the NTS.

Comment Code: Organization 5-86

Location of EIS Revision(s): The Reader's Guide now precedes the Summary

Response: The Reader's Guide has been placed before the Summary in the Final NTS EIS to assist the reader in locating specific subjects throughout the document. In an attempt to reduce volume and printing costs, it was decided to combine the Reader's Guide and the Summary in one volume.

Comment Code: Organization 5-87

Location of EIS Revision(s): Volume 1, Section 3.6

Response: The Preferred Alternative is identified and described in the Final NTS EIS. The public will have the opportunity to review the Preferred Alternative during the period between the issuance of the Final NTS EIS and the Record of Decision. This period must be at least 30 days.

Comment Code: Organization 5-88

Location of EIS Revision(s): None required

Response: As noted in the Introduction to this EIS, this is a sitewide EIS and assesses the impacts of programs and actions into the reasonably foreseeable future. For purposes of analysis, the "reasonably foreseeable future" is defined as 10 years, a period of time in which one can predict some course of action for analysis. The NTS EIS assesses "impacts" of those actions for whatever period they cover, i.e., impacts may extend well beyond 10 years and would be addressed in this EIS.

Comment Code: Organization 5-89

Location of EIS Revision(s): None required

Response: This EIS is a programmatic type evaluation of potential alternative development scenarios for the NTS, at a sitewide level, and for other locations in the state of Nevada, over the next ten years. The DOE believes that the level of analysis is appropriate, given the nature of the proposed activities and potential impact at each location. The Tonopah Test Range like the NTS, has been evaluated in this EIS for all alternatives, programs, and environmental resources. Environmental restoration is the primary DOE/NV activity planned for the other locations off of the NTS (e.g. Project Shoal Area and the Central Nevada Test Area). Environmental restoration plans for these sites is described in Appendix A, Sections A.3.1.6, A.3.1.7 and A.3.1.8. The environmental restoration activities at these off-NTS sites are included in the analysis of impacts, including waste management, health and safety, and transportation areas (see Sections 5.1.2, 5.1.3, and 5.1.4 for evaluation of Alternative 1 and similar sections for Alternative 2, 3 and 4.) These sites contribute a small amount of material and risk when compared to the overall effect of the activities at the NTS.

Comment Code: Organization 5-90

Location of EIS Revision(s): None required

Response: The comment concerning the Nevada Legislature's support of establishment of the NTS is noted.

Comment Code: Organization 5-91

Location of EIS Revision(s): None required

Response: Scientific or engineering notation is used for very small and very large numbers because it is easier to read. The use of scientific notation also prevents the reader from misreading the many zeros that would have to be written out in standard numerical format. The explanation of how to use scientific notation is provided in this EIS Reader's Guide, located in the front of the Summary of this EIS.

Comment Code: Organization 5-92

Location of EIS Revision(s): None required

Response: The purpose of Chapter 4 of this EIS is to describe existing environmental conditions at the NTS and to establish the baseline from which to evaluate environmental changes resulting from the proposed alternatives. The estimated shipment amounts presented in the Transportation Study are associated with the alternatives, not to the baseline conditions established in Chapter 4, and are presented in Chapter 5, Environmental Consequences.

Comment Code: Organization 5-93

Location of EIS Revision(s): Volume 1, Chapter 4, Figures 4-35, 4-36, and 4-37

Response: There is contamination on land off the NTS resulting from testing activities originating on the NTS. The contamination falls within the NAFR Complex boundary and thus is still on controlled access land. The Draft NTS EIS did not include a detail for the locations of the safety tests conducted on the Tonopah Test Range. Inset location details have been added to the figures in the Final NTS EIS.

Comment Code: Organization 5-94

Location of EIS Revision(s): Volume 1, Chapter 3, Section 3.2.6.1

Response: Please see Section 3.2.6.1 of the NTS EIS for a discussion on the relationship of the NTS sitewide EIS to the Yucca Mountain Project. This section has been rewritten to clarify the relationship between NTS activities, which are under the purview of the DOE/NV, and the Yucca Mountain Project, which is under the purview of the Office of Civilian Radioactive Waste Management. In addition, please refer to the discussion in Section 1.1 of Volume 3.

Comment Code: Organization 5-95

Location of EIS Revision(s): None required

Response: Legislation that is pending before Congress relating to interim storage is speculative at this point and not amenable to analysis. The DOE plans and decisions regarding an interim storage facility, including appropriate National Environmental Policy Act analysis, would be made if legislation to that effect is passed.

Comment Code: Organization 5-96

Location of EIS Revision(s): Volume 1, Chapter 3, Section 3.3

Response: Groundwater contamination information is constantly being updated as data from the Underground Test Area project becomes available. This project entails well drilling and testing, both near and distant from underground nuclear test locations, to determine contaminant distribution as a function of distance from the test location. No map of this information is currently available. The text in the Draft NTS EIS (Section 3.3, Comparison of Alternatives and Environmental Impacts) has been changed in the Final NTS EIS. The change indicates that model results, to date, predict that any tritium originating from underground nuclear testing would arrive outside of the NTS/NAFR Complex controlled areas in concentrations which are below the EPA guidelines for drinking water.

Comment Code: Organization 5-97

Location of EIS Revision(s): None required

Response: Subsurface samples taken from boreholes drilled under U3ax/bl, the subsidence crater that has contained waste the longest, have been analyzed and no contaminants have been found. See Section 5.1.1.4 for a discussion of this analysis. An additional borehole is scheduled to be completed under U3ah/at before the end of the calendar year. Those samples will also be analyzed for contaminants from the waste.

A vadose zone monitoring system is being evaluated so that constant monitoring of the disposal cell can be accomplished.

Comment Code: Organization 5-98

Location of EIS Revision(s): None required

Response: The effects of waste management activities at the NTS or Clark County are covered in the discussions on socioeconomics. The waste disposal sites at the NTS are not in the same flow system at the Moapa Indian Reservation, thus impacts on water resources of the reservation are not considered likely. The potential impact to all areas of Clark County were considered in the evaluation of water resources.

Comment Code: Organization 5-99

Location of EIS Revision(s): None required

Response: The DOE did not rely on the 1977 EIS. Chapter 4 of this EIS presents an updated description of the physical, biological, socioeconomic, and operational conditions that currently exist at the NTS and at other DOE lands, and is the baseline environment used to assess the impacts of implementing each alternative.

Comment Code: Organization 5-100

Location of EIS Revision(s): None required

Response: As stated in Section 4.1.1.5, the waste in Area 3 consists primarily of contaminated soils and equipment from the atmospheric testing areas cleanup and construction debris from the decontamination and decommissioning of buildings from other DOE sites.

Comment Code: Organizations 5-101

Location of EIS Revision(s): None required

Response: Requirements for long-term monitoring activities by the DOE would be established by commitments in decision documents (e.g. Records of Decision, Finding of No Significant Impacts), regulations applicable to the DOE operations or activities, judicial decisions, and other binding agreements. Funding to meet these requirements is dependent on Congressional actions on the annual budget.

Comment Code: Organization 5-102

Location of EIS Revision: None required

Response: While it is true that funding is determined on an annual basis, it has been the experience of the DOE that commitment to monitoring and security has not been an issue with Congress, and that funding has been available for these kinds of programs. To establish a fund to assure continuity of funding would require congressional action.

Comment Code: Organization 5-103

Location of EIS Revision(s): None required

Response: The basic issue is that radionuclides may attach to colloids and be transported in water when they would otherwise not be expected to move. There have been a number of studies of the colloidal transport of radionuclides from underground nuclear testing in groundwater at the NTS. Related studies on similar radionuclides and rocks have been performed for the Yucca Mountain geologic repository project, and the DOE's Office of Subsurface Science has conducted studies on other rock types found on the NTS. Migration of tritium in groundwater at the NTS has been found to be more significant than transport of other radionuclides as colloids. Therefore, present studies focus on transport rates of radionuclides as a result of all mechanisms, not solely colloidal transport. It is also important to distinguish between groundwater flow and the much more rapid flow of water in streams on the earth's surface. Groundwater is subject to distinctly different chemical and physical processes than those applicable to surface waters.

Comment Code: Organization 5-104

Location of EIS Revision(s): None required

Response: Tritium has not been detected outside the northwest NTS boundary. However, due to the location of underground tests conducted in Pahute Mesa, it would be reasonable to assume that tritium exists in the subsurface outside the NTS boundary, but within the boundaries of the U.S. Air Force controlled area.

Comment Code: Organization 5-105

Location of EIS Revision(s): None required

Response: Section 3.2.6.1 of Volume 1 and Section 1.1 of Volume 3 of the NTS EIS explain why the Yucca Mountain project has been excluded from consideration in the NTS EIS. Possible environmental impacts from the construction, operation, and eventual closure of a potential repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain, including potential cumulative impacts, will be addressed in a separate, ongoing EIS. Site characterization activities at Yucca Mountain are included in the description of the existing environment at the NTS (see Section 4 of the NTS EIS) as well as in the discussion of cumulative impacts (see Section 6 of the NTS EIS).

Comment Code: Organization 5-106

Location of EIS Revision(s): None required

Response: The Nevada Risk Assessment Management Program, in their comments on this EIS, did identify several questions which have required detailed evaluation by the authors of this EIS. The DOE agrees that technical accuracy is very important and the authors have prepared responses to the comments and in many cases added information to this EIS to make clearer and more accurate the information contained in this EIS. The DOE believes that the existing information and added clarifications will support decisions based on the content of this EIS.

Comment Code: Organization 5-107

Location of EIS Revision(s): None required

Response: It is difficult for an organization to create a sense of trust in the public. It is possible for an organization to present itself in an open manner, providing information and inviting the public to evaluate, for itself, the honesty with which it is presented. If done correctly, this approach has the potential to increase the level of trust the public has in what is being said. In the process of developing this EIS, the DOE has tried to be open in discussing issues and in inviting a review and evaluation of what is being presented. In that regard, the DOE is trying to increase the level of trust the public has in the DOE.

Comment Code: Organization 5-108

Location of EIS Revision(s): None required

Response: It is the policy of the DOE to manage its facilities and operations in compliance with both the spirit and the requirements of environmental regulations. It is also the intent to use best management practices and recognize new directions to ensure that principles of environmental stewardship are acknowledged.

Comment Code: Organization 5-109

Location of EIS Revision(s): None required

Response: The DOE acknowledges that in many cases the risk of remediating a site, transporting, and disposing of the waste, is greater than the risk of leaving the contaminants in place. Cleanup of some of those sites is still anticipated because long-term institutional control or institutional knowledge cannot be guaranteed. By remediating the sites now, potential future problems may be avoided. Each environmental restoration site is evaluated on a case-by-case basis following the protocol established by the DOE and the state of Nevada in the Federal Facility Agreement and Consent Order.

Each contaminated site is reviewed on a site-specific basis. With the recent signing of the Federal Facility Agreement and Consent Order between the DOE, Defense Nuclear Agency, and the state of Nevada, a corrective action strategy was established. The steps used in implementing the corrective actions are identifying the Corrective Action Sites, Grouping the Corrective Action Sites, Prioritizing the Corrective Action Units, and Preparing Corrective Action Investigation and Corrective Action Documents. Some of the factors considered in prioritization are assessment of risk, available technology, cost, future use, geographic location, presence of cultural resources or sensitive species, stakeholders' concerns, and waste management concerns. These are explained in greater detail in Appendix VI, Corrective Action Strategy of the Federal Facility Agreement and Consent Order (state of Nevada, 1996).

Corrective action alternatives will be based on applicable regulatory standards or proposed clean-up levels, if no standards apply. Proposed levels will be based on pertinent factors including, but not limited to, assessment of risk, current and projected land use, resource management, and technical feasibility.

Comment Code: Organization 5-110

Location of EIS Revision(s): None required

Response: The DOE is trying to make more appropriate and compatible goals for resources on the NTS. Section 4.1 through 4.11 describe the DOE's proposed goals for the management and conservation of resources on the NTS. Sections 2.2 and 4 invite the public to participate in developing those goals.

Comment Code: Organization 5-111

Location of EIS Revision(s): Volume 2, Chapter 1, Section 1.7 and Chapter 2, Section 2.1

Response: The plates contained in Section 6 are included as examples of the types of information that can be used by the *Resource Management Plan*. It is not intended as a complete collection of spatial information that will be used during implementation of the *Resource Management Plan*. To clarify this point, a change was made to Volume 2, Section 2.1. Based on other comments, a change to further clarify this point has also been made in Section 1.7.

Comment Code: Organization 5-112

Location of EIS Revision(s): None required

Response: When land is withdrawn from public use and reserved for a federal purpose, the government's right to appurtenant water is implied. As noted in this EIS in Section 4.1.1.1, the NTS is on withdrawn land, and jurisdiction is assigned to the DOE, a federal agency.

Comment Code: Organization 5-113

Location of EIS Revision(s): None required

Response: The primary mission of the NTS is weapons testing. Section 2.1 of this EIS describes the current primary mission as maintaining the capability to conduct such tests, if needed, as well as supporting the science-based Stockpile Stewardship Program of experiments and other kinds of tests. In addition, the NTS supports programs in waste management as well as other research and development activities. Chapter 2 of this EIS describes in more detail what the programs are, and how they fit into future plans of the NTS.

Comment Code: Organization 5-114

Location of EIS Revision(s): None required

Response: The NTS EIS discusses past and current atmospheric releases of radioactivity in Sections 3.2.6.3 and 4.1.7. Current releases are very small and do not exceed the standards established by the U.S. Environmental Protection Agency. The DOE has sponsored and participated in evaluations of past releases, and the information has been widely published in the resultant literature. The studies have included the areas of southern Nevada and Utah. Congress has established programs for compensating those individuals who have suffered harm within the definitions of the congressional programs.

Comment Code: Organization 5-115

Location of EIS Revision(s): None required

Response: The DOE wishes to strike a balance between protecting natural resources and allowing existing activities to continue. The goals in Section 4 reflect that desire. For example, the goal for Management of Biological Resources (Section 4.7) reflects the need to protect populations, but does not restrict development unless that development will negatively impact a population. Also, the goal for socioeconomics (Section 4.11) reflects the DOE's commitment to use the resources on the NTS to stimulate local and regional economies.

Comment Code: Organization 5-116

Location of EIS Revision(s): Volume 2, Section 4.4

Response: The DOE is looking at all lands on the NTS that it manages when considering the management of biological resources. Work has been accomplished, and continues, to better understand the distribution of plant and animal populations on the NTS and to identify land resources needed to maintain the viability of these populations. To better protect land resources needed by plants and animals, and still promote the development of existing and future activities, an additional goal has been added to Section 4.4 (Land) that reflects the DOE's goal to site activities on or near existing disturbed areas and leave remote areas undisturbed.

Comment Code: Organization 5-117

Location of EIS Revision(s): None required

Response: The DOE plans to manage for biodiversity, as described in Section 3.3.1, by maintaining viability of populations for all native plant and animal species on the NTS. Section 3.2.4, states: there are few rare or endemic plants on the NTS, and the boundaries of most populations extend far beyond the NTS into some areas that are managed primarily for the protection of biological resources. Conservation of biodiversity should not conflict with future economic development and expansions on the NTS, unless proposed activities have very wide-ranging, long-term impacts.

Comment Code: Organization 5-118

Location of EIS Revision(s): None required

Response: The ecosystem management effort to be developed as part of the *Resource Management Plan* will not be used as a tool for the continuation of jobs. The guidelines in Section 3 describe a common-sense, uncomplicated means to implement ecosystem management on the NTS. They will not require development of a substantially larger program than currently exists on the NTS to monitor and conserve the ecosystem. They will, however, require a greater effort than currently exists to communicate and cooperate with surrounding land managers and owners.

Comment Code: Organization 5-119

Location of EIS Revision(s): None required

Response: There is no one answer to the question of, "How clean is clean?" "Clean" for the environmental restoration sites on the NTS will be determined as the level that ensures that risks to human health and safety are eliminated or reduced to the standards prescribed by federal and state regulations. Where regulations do not exist, final clean-up levels will be determined through the process established in the Federal Facilities Agreement and Consent Order. The Federal Facilities Agreement and Consent Order requires the development of a Corrective Action Decision Document which will provide the rationale for the selected clean-up level based on investigation activities, costs, and an evaluation of risk to receptors in conjunction with potential future land uses.

Comment Code: Organization 5-120

Location of EIS Revision(s): None required

Response: The *Resource Management Plan*, in combination with the National Environmental Policy Act process, is designed to evaluate future plans to determine whether or not they will degrade the condition of the site. That process is described in Sections 1.4 and 4 of Volume 2.

Comment Code: Organization 5-121

Location of EIS Revision(s): None required

Response: The U.S. Department of Agriculture, Soil Conservation Service conducts soil surveys of selected areas to provide basic information to citizens that can be applied to managing farms, ranches, and woodlands, selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts for farming, industry, and recreation. Within Nevada, these surveys have been limited to agricultural areas such as Meadow Valley, the Virgin River Area, and the Pahranagat-Penoyer area. Soil surveys are not done for public lands unless the lands are in the immediate vicinity of agricultural areas. Thus, no Soil Conservation Survey soil survey has been done for the NTS or adjoining areas. The DOE has conducted numerous soil investigations on the NTS as part of scientific investigations and for facility design studies.

Comment Code: Organization 5-122

Location of EIS Revision(s): None required

Response: Subsurface water is water that occurs below the surface of the earth, commonly referred to as groundwater. The depth to water at the NTS varies over the NTS from approximately 91 meters (m) (300 feet [ft]) to more than 457 m (1,500 ft). This information is summarized in Section 4.1.5.2 under the subheading "Water Levels." The DOE's understanding of interconnections between basins is presented in this same section and is based upon a number of reports published by the Nevada Water Resources Division and the U.S. Geological Survey. The commentor is referred to the cited references for more information concerning the phenomenon of the interbasin flow of groundwater.

Comment Code: Organization 5-123

Location of EIS Revision(s): Volume 2, Chapter 2, Section 2.1

Response: The text has been revised to include the Community Advisory Board.

Comment Code: Organization 5-124

Location of EIS Revision(s): None required

Response: Yes, one species of the genus *Halogeton* occurs on the NTS. That species, *H. glomeratus*, is an introduced plant that is relatively common, especially in and around disturbed areas in the bottom of the enlosed basins of Frenchman and Yucca Flats.

Comment Code: Organization 5-125

Location of EIS Revision(s): None required

Response: Natural resources that have economic benefits are mentioned; e.g., water and land. The point of Section 3.2.5 is that natural resources on the NTS historically have had few associated economic, recreational, or other social benefits. This is primarily because the public has not been allowed access to the site because of DOE/NV's missions.

Comment Code: Organization 5-126

Location of EIS Revision(s): None required

Response: The DOE has attempted to develop *Resource Management Plan* goals on an appropriate scale, as described in Section 3.3.3. Any suggestions that will improve that effort will be incorporated into the *Resource Management Plan.*

Comment Code: Organization 5-127

Location of EIS Revision(s): None required

Response: The DOE agrees that public monitoring is a crucial step to predict impacts and find suitable land uses. Extensive public monitoring and impact identification will occur during the National Environmental Policy Act process. In addition, the DOE is soliciting input from groups such as the NTS Community Advisory Board and the Community Reuse Organization on the selection of suitable land uses.

Comment Code: Organization 5-128

Location of EIS Revision(s): None required

Response: Maps describing facilities and infrastructure are available in the NTS Technical Site Information (RSN, 1994). This has been clarified as described in Comment Code Organization 5-111. It would not be possible, nor is it necessary, to include all of those maps in Volume 2. The plates included with Volume 2 are meant to be examples of the types of information available for land-use planning.

Comment Code: Organization 5-129

Location of EIS Revision(s): None required

Response: Section 2.1 of this EIS describes the current primary mission as maintaining the capability to conduct such tests, if needed, as well as supporting the science-based Stockpile Stewardship Program of experiments and other kinds of tests. In addition, the NTS supports programs in waste management as well as other research and development activities. Chapter 2 of this EIS describes in more detail what the programs are, and how they fit into the future plans of the NTS.

Comment Code: Organization 5-130

Location of EIS Revision(s): None required

Response: Future water needs for a facility or project are determined by the engineering design criteria for that specific facility or project. The engineering design criteria take into consideration all processes that will be conducted, as well as the resource requirements for a project. The sum of projected water uses for all facilities or projects that are planned to be operating at some future date determine the future water needs at the NTS.

Comment Code: Organization 5-131

Location of EIS Revision(s): Volume 1, Section 4.1.3

Response: The comment is correct when stating that the socioeconomic region of influence is not limited to Nye County. The text has been clarified.

Comment Code: Organization 5-132

Location of EIS Revision(s): None required

Response: The DOE recognizes local concerns regarding transportation issues and takes them very seriously. The DOE is committed to working with the public to resolve these concerns.

Comment Code: Organization 5-133

Location of EIS Revision(s): None required

Response: The one-on-one transportation meetings were intended to be held in the respective communities, as noted in Table 2-1 of the Transportation Study. The Lincoln County representatives requested that the meeting be held in Las Vegas, to allow attendance of additional personnel who were involved in the Lincoln County transportation studies. Thus, the meeting was held in Las Vegas.

Comment Code: Organization 5-134

Location of EIS Revision(s): None required

Response: The definitions presented in this document are as defined in applicable federal and state regulations. These definitions are applicable to all federal agencies as well as to the public sector. The inter-relationship between agencies with respect to waste management activities is limited to site locations of activities, (e.g., DoD operations on the NTS managed by DOE, DOE/NV and DOE/Yucca Mountain Site Characterization Office). Waste management activities at the NTS are managed by the maintenance and operation contractor for users of the NTS.

Comment Code: Organization 5-135

Location of EIS Revision(s): None required

Response: It is unlikely that a future decision to locate a spent nuclear fuel and high-level radioactive waste repository at Yucca Mountain would impact route selection for low-level waste shipments to and within the state of Nevada based on existing route selections and regulations. However, the cumulative impacts of shipments to Yucca Mountain and the NTS will be analyzed in the Yucca Mountain EIS. See Section 1.1 of Volume 3 for a discussion between Yucca Mountain and the NTS. See Section 1.6 of Volume 3 for a discussion of the transportation of radioactive waste.

Comment Code: Organization 5-136

Location of EIS Revision(s): None required

Response: All routing decisions are the responsibility of the carrier, which complies with all applicable local, state and federal transportation regulations. These regulations require all routes used to minimize the radiological risk to the public. One of the ways to accomplish this is to avoid populated areas when possible. The Transportation Study, Appendix I, identifies the associated risk for the transportation activities to be minimal. For additional discussion of route selection for radioactive waste shipments see Section 1.6 of Volume 3.

Comment Code: Organization 5-137

Location of EIS Revision(s): None required

Response: Please refer to Section 3.2.6.1 of Volume 1 and Section 1.1 of Volume 3.

Comment Code: Organization 5-138

Location of EIS Revision(s): Volume 1, Appendix I, Attachment E, Section E.1.1.2

Response: The route descriptions have been better defined to correct errors in place locations.

Comment Code: Organization 5-139

Location of EIS Revision: None required

Response: Transportation in the Final NTS EIS is discussed in the same way that it was discussed in the Draft. The comments related to transportation, the transportation study, or transportation-related issues have been addressed, and revisions made in the text, as appropriate. Revisions are noted by a side bar in the revised text margin. In those cases where action is required to address comments related to transportation or other commitments on the part of the DOE, they will be noted in the Record of Decision or in the Mitigation Action Plan that will follow publication of the Final NTS EIS.

Comment Code: Organization 5-140

Location of EIS Revision(s): None required

Response: The DOE is not authorized to select routes. Carriers select routes in accordance with the U.S. Department of Transportation regulations (40 CFR 397.101[a]). The primary criteria for route selection is to minimize radiological risk to the public. Drivers are required to have route plans, which also contain contingency plans for deviations from routing, in their immediate possession. In addition, please refer to the discussion in Section 1.6 of Volume 3.

Comment Code: Organization 5-141

Location of EIS Revision: None required

Response: The Record of Decision will be issued no sooner than 30 days after the Final NTS EIS is published. That is a requirement of the Council on Environmental Quality regulations implementing the National Environmental Policy Act and is not considered "fast track." As the Record of Decision has not yet been prepared, the DOE cannot speculate as to what it will contain regarding continued dialogue between the public and the DOE on transportation issues. However, it is the intent of the DOE to maintain positive interactions with stakeholders that have been established during the development of this EIS, and this would include continued interaction regarding transportation issues.

Comment Code: Organization 5-142

Location of EIS Revision(s): None required

Response: The methodology and criteria for decisions regarding radioactive waste shipments are continued in the U.S. Department of Transportation regulations (49 CFR 100-177). All entities that transport radioactive material or waste are subject to these regulations. Under those regulations, states in particular can have a role in those decisions involving high-level waste. Refer to Section 1.6 of Volume 3.

Comment Code: Organization 5-143

Location of EIS Revision(s): None required

Response: National routes and 10 in-state routes were generated for analysis using a software code called HIGHWAY. In HIGHWAY, routes are generated by minimizing the total distance and driving time along particular segments. HIGHWAY can also be instructed to generate routes that maximize use of a particular state, city, or highway segment. The representative routes generated by HIGHWAY for the NTS EIS were then evaluated to assess their risk.

Comment Code: Organization 5-144

Location of EIS Revision(s): None required

Response: Legislation that is pending before Congress relating to interim storage is speculative at this point and not amenable to analysis. The DOE plans and decisions regarding an interim storage facility, including appropriate National Environmental Policy Act analysis, would be made if legislation to that effect is passed.

Comment Code: Organization 5-145

Location of EIS Revision(s): None required

Response: The number of shipments that will be required is a prediction based on the known amount of stored waste and on estimated amounts of waste to be generated. The latter value is continually updated with new knowledge. As stated in Section 5.3.1.2.3 the current estimate being used for analysis and planning under Alternative 3 (the alternative with the most shipments) is 2,460 shipments of low-level waste per year and 2,395 Defense Program shipments per year.

Comment Code: Organization 5-146

Location of EIS Revision(s): None required

Response: Transportation and potential routing of spent nuclear fuel and high-level radioactive waste shipments will be evaluated in an ongoing, separate EIS to analyze the possible environmental impacts from the construction, operation, and eventual closure of a potential repository at Yucca Mountain, Nevada. Please see Section 3.2.6.1 of Volume 1 and Section 1.1 of Volume 3 for a discussion of the relationship between Yucca Mountain and the NTS.

The routes deemed appropriate and designated (under the U.S. Department of Transportation regulations) for low-level waste shipments are not necessarily the same routes that will be deemed appropriate for future high-level radioactive waste shipments, when they occur. Even if a repository is eventually developed at Yucca Mountain, the earliest that shipments of high-level radioactive waste are anticipated is the year 2010 which is beyond the timeframe of actions addressed by this EIS. The DOE will follow the U.S. Department of Energy routing regulations that are in effect at that time to cover shipments of spent nuclear fuel and high-level radioactive waste. Potential routes for spent nuclear fuel and high-level radioactive waste shipment will be addressed in the Yucca Mountain Repository EIS.

Comment Code: Organization 6-1

Location of EIS Revision(s): None required

Response: The descriptions of activities in the Draft NTS EIS were not meant to restrict development, but to define programs as clearly and concisely as possible to determine impacts. In this way, this EIS allows the

DOE to make decisions about uses of the NTS with the best possible information on environmental impacts. As new projects are proposed for the NTS, the DOE would conduct the appropriate reviews required by the National Environmental Policy Act.

Comment Code: Organization 6-2

Location of EIS Revision(s): None required

Response: The NTS has been withdrawn from all public use, including mining and mineral leasing. Alternative 4 includes the possibility of DOE relinquishing portions of the NTS for public use. If the DOE relinquishes land, it would be transferred to the Department of the Interior. The Department of the Interior would administer those lands according to appropriate federal land-use policies. It is too speculative to anticipate at this time whether mining might be included.

Comment Code: Organization 6-3

Location of EIS Revision(s): Volume 1, Section 3.1.4.6

Response: Once land is relinquished for public use, the Department of the Interior would assume management responsibilities, and existing Department of the Interior land-use policies would ensue. Education and recreation uses were included in the Draft NTS EIS as examples of alternate public uses of NTS lands. The draft incorrectly tied these potential activities to lands identified for potential public turn-back. The Final NTS EIS has corrected this error. Refer to Volume 3, Section 1.8.

Comment Code: Organization 6-4

Location of EIS Revision(s): None required

Response: The NTS has been withdrawn from all public use including mining and mineral leasing laws. If the DOE relinquishes land it would be transferred to the Department of the Interior. The Department of the Interior would administer those lands according to appropriate federal land-use policies. If mining were proposed, appropriate NEPA documentation would be prepared.

Comment Code: Organization 7-1

Location of EIS Revision(s): Volume 1, Section 4.1.4.2

Response: In response to a similar comment received from another source, text discussing the decay of tritium has been revised for this Final NTS EIS.

Comment Code: Organization 7-2

Location of EIS Revision(s): Volume 1, Section 4.1.4.2

Response: There is no missing tritium. The number cited in the referenced text was incorrect and has been corrected in the Final NTS EIS.

Comment Code: Organization 7-3

Location of EIS Revision(s): Volume 1, Chapters 3 and 5; Appendix H

Response: The discussion did reference two pathways considered in the groundwater evaluation. The discussions in Chapters 3 and 5, and in Appendix H, have been revised to more clearly describe the groundwater modeling and the results. As noted in the comment, other models show different results and these are discussed in the Final NTS EIS as well. Modeling results consistently indicate that any tritium levels would be below the EPA standards for drinking water.

Comment Code: Organization 7-4

Location of EIS Revision(s): None required

Response: The environmental restoration program is intended to characterize the groundwater systems on the NTS. The results will be incorporated in models to assure that monitoring programs are based on the best information available. However, the DOE believes that the analytical techniques used in preparing the NTS EIS were adequate to predict the environmental impacts of the alternatives. See discussion in Volume 1, Appendix A.

Comment Code: Organization 7-5

Location of EIS Revision(s): None required

Response: The DOE is in the process of declassifying information relating to past activities at the NTS. However, because of national and international security concerns, some material, such as that provided in Appendix J, will necessarily remain classified. Consequently, qualified individuals from the state of Nevada, Division of Environmental Protection and the University of Nevada, Las Vegas Harry Reid Center for Environmental Studies have been granted access by the DOE to classified information relevant to the NTS EIS.

Comment Code: Organization 7-6

Location of EIS Revision(s): None required

Response: The DOE appreciates the recommendations about the preferred alternative. The DOE has considered them in selecting the preferred alternative.

Comment Code: Organization 7-7

Location of EIS Revision(s): None required

Response: The DOE acknowledges that this EIS is large and contains much information. The comment period must be at least 45 days as noted in the Council on Environmental Quality and DOE regulations. The comment period for this EIS was 90 days, and during that time, eight public meetings and workshops were held, both to collect comments and to help the public understand what was in this EIS. The DOE also offered assistance to anyone who requested it to discuss the document and its content. The DOE does not believe an extension of the comment period was necessary.

Comment Code: Organization 7-8

Location of EIS Revision(s): None required

Response: The DOE welcomes comments on its activities and considers them an important component of the Department's programs. All comments received on programmatic and specific activities are reviewed by the Department and acted upon as appropriate. Comments received during the public comment period for the Draft NTS EIS have been responded to in this document in accordance with the Council on Environmental Quality and DOE regulations for implementing the National Environmental Policy Act.

Comment Code: Organization 8-1

Location of EIS Revision(s): Volume 1, Chapter 2, Sections 2.2 and 2.4.1; Chapter 3, Sections 3.1.1.1 and 3.1.3.1; Chapter 4, Sections 4.1.1, 4.1.1.2, 4.1.4.2; and 4.1.4.3 Appendix A, Sections A.1.1.1.1, A.1.1.4, and A.1.3.1; and the Glossary

Response: Contrary to the commentor's assumptions, subcritical experiments do not constitute a new activity at the NTS, and the Lyner Complex is not a new facility.

Subcritical experiments have been conducted at the NTS over many years. Historically, operations at the NTS have included tests or experiments that included both high explosives and special nuclear materials that were intended to produce no nuclear yield or negligible nuclear energy releases. These experiments frequently remained subcritical (that is, they did not achieve a self-sustaining nuclear reaction). They were often performed as dedicated, stand-alone experiments. In the prior terminology of the time, such experiments were often described as "one point safety" or "equations of state" experiments and were regarded as simply another aspect of the "nuclear testing" that was the predominant activity at the NTS at that time. Some of these earlier subcritical experiments were conducted on the surface, while others were conducted underground in shafts, shallow boreholes, or tunnels. However, environmental considerations resulted in a decision in 1962 to conduct these experiments only underground in the future, so that radioactive materials would not be introduced into the surface environment. The environmental impacts of the subcritical experiments conducted at the surface were principally the dispersal of special nuclear materials, such as plutonium, and other materials, caused by the detonation of high explosives. Subcritical experiments were mentioned in Environmental Impact Statements prepared by the predecessors of the DOE in the early 1970s, as well as in the 1977 NTS EIS under the names mentioned above. The impacts of past experiments are identified in Chapter 4, Section 4.1, Discussion of Affected Environment, of this EIS.

The DOE proposes to conduct the subcritical experiments referenced by the commentor in the Lyner Complex. Lyner Complex is similar in design to some of the facilities used for the earlier tests (i.e., it is a tunnel complex reached by a shaft). Initial work on what is now known as the Lyner Complex began in the late 1960s with the mining of the U1a shaft to a depth of 305 m (1,000 ft) for a nuclear test. It was not used at that time. Further work took place in the 1980s and early 1990s to develop a complex that could be used to perform intentionally designed low-yield tests or experiments, which, among others, would have included some experiments which would be expected to remain subcritical or provide negligible energy release. The Lyner Complex was completed under the 1977 EIS, which evaluated the impacts of underground nuclear testing. With the moratorium on nuclear testing and the anticipated Comprehensive Test Ban Treaty, Lyner Complex will now be dedicated solely to the conduct of dynamic experiments (including subcritical experiments) and hydrodynamic tests.

The Lyner Complex has been used successfully for testing purposes in the past. The Ledoux nuclear test, which produced a yield of less than 20 kilotons, was conducted on September 27, 1990, in a drift (a nearly horizontal mine passageway) within the tunnel complex. The Kismet experiment, which was conducted on March 1, 1995, was a dynamic experiment with high explosives, tritium, depleted uranium, and other materials. No special nuclear material was used in the Kismet experiment. Both Ledoux and Kismet were contained to prevent radiological release into other portions of the Lyner complex and the surface environment. The Ledoux nuclear test, with its less than 20 kiloton yield, had the potential for much greater impact than do subcritical experiments. The proposed future activities of dynamic experiments (including subcritical experiments involving special nuclear material) and hydrodynamic tests are described in Appendix A and their environmental consequences are discussed in the following Defense Program sections of Chapter 5, Environmental Consequences of this EIS: Sections 5.1.1.4, Geology and Soils; 5.1.1.5.2, Groundwater; 5.1.1.6, Biological Resources; 5.3.1.6, Biological Resources; 5.5, Unavoidable Adverse Effects; 5.6.1.1, Nevada Test Site; and 5.7.3, Nevada Test Site.

In summary, the term "subcritical experiments" does not define a new form of activity at the NTS. Use of the term is intended to clarify the fact that such experiments could not achieve the condition of criticality, and that they would meet current and prospective United States commitments to the moratorium on nuclear testing and the anticipated Comprehensive Test Ban Treaty. Although the specific term "subcritical" was not used in the previous EISs, some tests and experiments conducted over the past four decades, as well as the impacts of those tests and experiments, are substantially the same as those contemplated by the new terminology. What is new with the subcritical experiments proposed to be conducted in Lyner Complex is their increased importance in obtaining needed science-based Stockpile Stewardship data, since the moratorium prevents underground nuclear testing. In the past, when an issue was discovered and a redesign done, an underground nuclear test was almost always conducted to ensure that the redesign functioned as intended and that no unforeseen performance problem had been introduced into the system by the upgrade. Since the United States is no longer conducting underground nuclear tests to obtain information regarding weapons safety and reliability, subcritical experiments are now a more important element of the program for maintaining the reliability and confidence in the existing nuclear weapons stockpile.

Text changes have been made to Chapters 2, 3, 4, Appendix A, and the Glossary to further clarify the nature of these experiments. The DOE believes that the Draft NTS EIS adequately describes the impacts of these experiments, and thus a revised Draft NTS EIS is not needed.

Comment Code: Organization 8-2

Location of EIS Revision(s): None required

Response: The No Action Alternative accurately reflects the national policy of the United States, as expressed by the President. As stated in Section 2.1 of Volume 1, the United States is aggressively pursuing a zero-yield Comprehensive Test Ban Treaty. As a condition for entering into such a treaty, the President directed the DOE to maintain the readiness to conduct one or more tests if that is deemed to be within the supreme national interest of the United States. Tests conducted under such an unlikely scenario are analyzed in this EIS.

The DOE defined the No Action Alternative as a continuation of the past and current activities at the NTS. Since nuclear testing has been a principal mission for the NTS since its inception, and since it is possible, although unlikely, that additional tests may be required in the future, the DOE believes that it is appropriate to include testing in the No Action Alternative. However, the No Action Alternative is described as presenting two distinct alternative scenarios, one reflecting only maintaining the readiness to test, and one reflecting the potential for a Presidential direction to resume testing. (See Section 3.1.1.1.)

Comment Code: Organization 8-3

Location of EIS Revision(s): None required

Response: Chapter 5, Environmental Consequences, in Sections 5.1.1.4, Geology and Soils; 5.1.1.5.2, Groundwater; 5.1.1.6, Biological Resources; 5.3.1.6, Biological Resources; 5.5 Unavoidable Adverse Effects; 5.6.1.1, Nevada Test Site; and 5.7.3, Nevada Test Site, describes all environmental impacts associated with subcritical experiments.

See the response to Comment Code Organization 8-1 for a discussion of why subcritical experiments at the NTS continue to be a part of the ongoing activities at the NTS.

The recent emphasis on dismantling large numbers of weapons and maintaining a smaller stockpile does not detract from the requirement to ensure the safety and reliability of the remaining weapons. Subcritical experiments will have an enhanced role in that process in the absence of underground nuclear testing.

Comment Code: Organization 8-4

Location of EIS Revision(s): None required

Response: The DOE agrees that the types of tests which may be allowed by a Comprehensive Test Ban Treaty cannot be established at this time. In the face of this uncertainty, this EIS has analyzed and discussed the foreseeable activities associated with both subcritical experiments and the possibility of nuclear testing with yields up to current treaty limits.

Comment Code: Organization 8-5

Location of EIS Revision(s): None required

Response: Subcritical experiments by definition are dynamic experiments involving special nuclear material which do not reach criticality (see Section 2.4.1 of Volume 1 and the Glossary). There has been no attempt to "lump" subcritical experiments with non-nuclear experiments in preparing this EIS. To ensure that subcritical experiments cannot result in a nuclear explosion and are consistent with the zero yield policy, each experimental design would undergo a technical compliance review. This analysis would be performed by technical experts who have not been involved in the original design of the experiment. To proceed with the experiment, the analysis would have to conclude that, by design, the experiment cannot reach criticality. The technical review would also ensure that no nuclear material would be dispersed to the surface environment.

The commentor is referred to the response Comment Code Organization 8-1 for a discussion of the history of subcritical experiments at the NTS.

Comment Code: Organization 8-6

Location of EIS Revision(s): None required

Response: For the reasons stated in the response to Comment Code Organization 8-1, the DOE believes that subcritical experiments are a part of the historic mission of the NTS, and therefore are appropriately described as part of the No Action Alternative in this EIS. The DOE has defined No Action as a continuation of past and current activities, including subcritical experiments. This is consistent with the guidance provided by the Council on Environmental Quality (46 FR 18026, March 23, 1981). The DOE has substantial experience with these experiments, and understands the potential for environmental impacts they present. Moreover, there is nothing unique about the upcoming experiments that could result in impacts that are different from past experiments. Therefore, the DOE does not believe that continuing to conduct subcritical experiments at the NTS constitutes a new action under National Environmental Policy Act. However, the DOE has decided to complete and carefully consider this EIS before deciding whether to proceed with the subcritical experiments which have been proposed. As discussed in response to Comment Code Organization 8-3, the environmental impacts of subcritical experiments are addressed in this EIS.

Comment Code: Organization 8-7

Location of EIS Revision(s): None required

Response: In order to present as much information as possible, text changes have been made to Chapters 2, 3, and 4, Appendix A, and the Glossary, to further clarify the nature of the subcritical experiments conducted at the NTS. While certain details regarding the Lyner Complex, the precise nature of the proposed experiments, and the source terms presented in Appendix J are classified for national security reasons, the environmental impacts are unclassified and were included in Chapter 5 of the Draft NTS EIS as well as the Final NTS EIS (see response to Comment Code Organization 8-3 for specific sections). These data are also included in Chapter 6, Cumulative Impacts. Similar data from past subcritical experiments are included in Chapter 4, Affected Environment, including Sections 4.1.4.2 and 4.1.4.3.

Comment Code: Organization 8-8

Location of EIS Revision(s): None required

Response: As noted in the response to Comment Code Organization 8-1, subcritical experiments are a long standing part of the NTS's mission and the DOE believes that the provisions of the Council on Environmental Quality (CEQ) regulations regarding interim actions do not preclude the DOE from deciding whether to continue conducting these experiments at the NTS after completion of this EIS. As explained in Comment Code Organization 8-9 concerning the Stockpile Stewardship and Management Programmatic EIS, the DOE is proposing ways to augment the existing nuclear weapons Stockpile Stewardship Program for the specific purpose of accommodating the lack of underground nuclear testing, rather than reconsidering the entire Stockpile Stewardship Program. Ongoing activities, such as the subcritical experiments at the NTS, that are not affected by the decisions to be made in the Stockpile Stewardship and Management Programmatic NTS EIS process are not interim actions under the regulations. Therefore, the DOE intends to make decisions about subcritical experiments in the Record of Decision for this EIS.

Comment Code: Organization 8-9

Location of EIS Revision(s): None required

Response: The DOE is not relying on the Stockpile Stewardship and Management Programmatic EIS for any portion of the National Environmental Policy Act review of subcritical experiments at the NTS. As explained in response to Comment Code Organization 8-1, subcritical experiments are part of the historic mission of the NTS. These experiments and many other ongoing activities throughout the nuclear weapons complex (primarily at Los Alamos, Lawrence Livermore, and Sandia National Laboratories, as well as the NTS) make up the current Stockpile Stewardship Program. It is essential that these activities continue in order to ensure the safety, security, and reliability of the nuclear weapons stockpile, and the DOE is not proposing to modify these activities from a programmatic perspective. Rather, the DOE is proposing to take specific actions to augment the existing stewardship capabilities by providing additional testing capabilities at the laboratories to offset the inability to perform underground nuclear testing at the NTS. As explained in the Draft Stockpile Stewardship and Management Peogrammatic EIS, these additional laboratory facilities would provide experimental data of a specific nature, and would not be a substitute for the data and information which can only be obtained through subcritical experiments at the NTS.

Comment Code: Organization 8-10

Location of EIS Revision(s): None required

Response: The DOE does not agree with the commentor's conclusion that a revised Draft NTS EIS is required. As discussed in the response to Comment Code Organization 8-3, the DOE believes that this EIS adequately describes the environmental impacts of conducting subcritical experiments at the NTS.

Comment Code: Organization 9-1

Location of EIS Revision(s): None required

Response: The DOE agrees that this EIS contains a large amount of information. It is correct that other DOE EISs have been issued during the comment period for this EIS. The comment period for this EIS was 90 days, an extension beyond the minimum 45-day comment period noted in the Council on Environmental Quality and DOE regulations. The DOE has conducted public meetings and workshops intended to both solicit comments and to help the public understand what is in the document; and the DOE has been open to addressing, in any other way, the information needs related to this document. The DOE does not intend to extend the comment period on this EIS.

Comment Code: Organization 9-2

Location of EIS Revision(s): None required

Response: The DOE is preparing other programmatic and sitewide EISs that are considering the NTS as a potential alternative location for the proposed project. These other EISs are discussed in Chapter 1 of the NTS EIS. Alternative 3, the Expanded Use Alternative, was defined by including any project in other DOE EISs that identify the NTS as a potential alternative site, as well as the potential expansion of programs that already exist at the NTS.

The analysis of impacts under Alternative 3 includes impacts on the NTS of the proposed projects in the other EISs to the extent that this information is available at this time. However, the Record of Decision for the NTS EIS will not make a decision to select the proposed alternatives in these other EISs. Therefore, the NTS EIS can only identify land and facilities that could be used for such projects. If the Expanded Use Alternative were selected in the NTS EIS's Record of Decision, this information could be used, along with other factors, to aid the decisionmaker in selecting the location for activities in other EISs. Further, National Environmental Policy Act review would be required before a specific project would be located at the NTS. However, selection of Alternatives 1 or 2 in the NTS Record of Decision would mean that the DOE would not be able to locate additional activities at the NTS without an amendment to the Record of Decision.

For instance, the comment mentions the potential location of plutonium for storage at the NTS. The Draft Programmatic EIS for Long-Term Storage and Disposition of Weapons Useable Fissile Materials does propose the use of the P-tunnel facility or construction of a new facility at NTS for long-term storage of plutonium. However, the Record of Decision for the NTS EIS cannot make a decision to select this proposal, but can only reserve land and facilities in the event that the Record of Decision for the Programmatic EIS chooses the NTS to locate a plutonium storage facility. The impact analysis for Alternative 3 in the NTS EIS includes the impacts of plutonium storage at the NTS to the extent that information is available. If the Record of Decision for the Storage and Disposition Programmatic EIS selects the NTS for plutonium storage, further National Environmental Policy Act review would be required before plutonium could be sent to the NTS.

Comment Code: Organization 9-3

Location of EIS Revision(s): None required

Response: The initial land withdrawal which created the NTS specifically acknowledges the primary purpose of the NTS as a weapons testing site. The various secondary activities pursued by the DOE and its predecessor agencies at the NTS have been compatible with the primary purpose for which the land was withdrawn. The DOE shall consult with the Department of the Interior and engage in the appropriate process to ensure that future activities being contemplated by the DOE are undertaken in compliance with applicable federal land law and policy. See also Section 1.4 of Volume 3.

Comment Code: Organization 9-4

Location of EIS Revision(s): None required

Response: Refer to Comment Code Organization 3-1.

Comment Code: Organization 9-5

Location of EIS Revision(s): None required

Response: Chapter 5 and Table 3-5, "Summary Comparison of Environmental Impacts of the Alternatives," both indicate the expected impacts of the alternatives. The DOE did not minimize the impacts, but instead used accepted methods of analysis, and reported the results.

Comment Code: Organization 9-6

Location of EIS Revision(s): None required

Response: The comment regarding "Discontinue Operations" is noted. Section 3.2.3 describes the limitation on the relinquishment of federally withdrawn lands. In addition, please refer to the discussion in Section 1.3 and 1.8 of Volume 3.

Comment Code: Organization 9-7

Location of EIS Revision(s): None required

Response: As discussed in Chapter 2, new activities that were not considered in the NTS EIS will be evaluated on a case-by-case basis and Naational Environmental Policy Act review will be prepared by the responsible agency, if necessary. If an Environmental Assessment or a Supplemental Environmental Impact Statement is prepared, public review and comment periods are required by the National Environmental Policy Act.

Comment Code: Organization 9-8

Location of EIS Revision(s): None required

Response: The Lyner Complex is discussed in Section 5.1.1.4 of Volume 1 of this EIS, in Appendix A in Section A.1.1.1.3, and, as noted, in the classified Appendix J. The impact information in Appendix J is incorporated in the analysis in NTS EIS Chapter 5. The DOE believes, and has asked the state of Nevada to verify, that the information in Appendix J has been incorporated in Chapter 5. The State has reported their review verifying that the information has been appropriately incorporated in this EIS.

Subcritical experiments are intended to provide information that will help to maintain reliability of the remaining nuclear stockpile and support the treaty safeguards of the proposed Comprehensive Test Ban Treaty. The DOE considers these experiments an integral part of the science-based Stockpile Stewardship Program. Transparency measures would be implemented for these experiments to provide assurances that they would be consistent with the treaty provisions.

Support for the development of a hybrid alternative is noted. The NTS EIS identifies the preferred alternatives at Expanded Use (Alternative 3) plus the public education activities of Alternative 4. This preferred alternative does incorporate the preferences noted in the comment.

Comment Code: Organization 9-9

Location of EIS Revision(s): None required

Response: The DOE believes that the *Resource Management Plan* is a key element of future planning. The relationship of the Plan to this EIS is discussed in Section 1.1 of the Plan and in Section 2.3 of this EIS. In both places, the Plan is characterized as the basis for future planning and is an integral part of the National Environmental Policy Act process for the NTS. The timing regarding its status does not allow identification of alternatives to await completion of the Plan. Similarly, the Transportation Study was intended to document the current and future risks of transportation as they are known today.

Comment Code: Organization 9-10

Location of EIS Revision(s): None required

Response: The invitation to participate in the development of the *Resource Management Plan* has been extended to any interested party. Any new activity proposed for the NTS is subject to the requirements of the National Environmental Policy Act and would provide an opportunity for the public to participate in the review process.

Comment Code: Organization 9-11

Location of EIS Revision(s): None required

Response: Congress has not yet completed its action on the "interim storage" question. Without that action there is nothing that can be evaluated in this EIS or in any other document. When an action has been completed and a decision has been made then a review, either in another National Environmental Policy Act document or in some other way, will be undertaken. This circumstance is different than pending decisions within the control of the DOE. Such pending decisions have been evaluated in this EIS to the extent that they may have an impact on the NTS. As decisions are made, further National Environmental Policy Act analysis may be required.

Comment Code: Organization 10-1

Location of EIS Revision(s): None required

Response: Alternative 2, Discontinue Operations, was included in this EIS in response to public comments received during the scoping period. The inclusion of this alternative also allowed the DOE to analyze and compare a full range of use-options, including the potential impacts of not remediating the site. In the Final NTS EIS the DOE identifies Alternative 3 as the Preferred Alternative.

Comment Code: Organization 10-2

Location of EIS Revision(s): None required

Response: The primary criterion for route selection, as required by the U.S. Department of Transportation regulations is to minimize radiological risk to the public. The DOE disagrees that the DOE guidelines for transportation routing of low-level waste and mixed waste are lax; the DOE requires compliance with all the U.S. Department of Transportation regulations. Low-level waste is not an extremely hazardous material as defined in the regulations. Carriers select routes under the authority of the U.S. Department of Transportation and in full compliance with all the U.S. Department of Transportation regulations concerning the transportation of radioactive and hazardous waste. The common carriers used by the DOE to transport radioactive and hazardous waste are not only familiar with and experienced in operating under the U.S. Department of Transportation regulations, they are also liable for shipments.

Comment Code: Organization 10-3

Location of EIS Revision(s): None required

Response: The analysis of cumulative impacts has been updated to more fully address impacts of regional development and activities that are reasonably foreseeable in the next 10 years. Transportation of nuclear material to a repository at Yucca Mountain would not occur within the next 10 years; the timeframe covered by this EIS. Please refer to Chapter 6 of Volume 1 for a discussion of the cumulative impacts of radioactive materials transportation where truck transport of nuclear waste from the NTS, other DOE activities, and commercial sources are also addressed. Please refer to Chapter 5 of Volume 1 for a discussion of the environmental consequences of DOE alternatives including transportation of radioactive waste. Refer to Section 1.1 of Volume 3 for a discussion of the relationship between Yucca Mountain and the NTS.

Comment Code: Organization 10-4

Location of EIS Revision(s): None required

Response: There are currently no plans to ship low-level waste to the NTS by rail. If rail service were to become an option, it would be evaluated at that time. All applicable U.S. Department of Transportation regulations would have to be met by rail transport.

Comment Code: Organization 10-5

Location of EIS Revision(s): None required

Response: See response to Comment Code Organization 5-35.

Comment Code: Organization 10-6

Location of EIS Revision(s): None required

Response: The DOE had not yet selected a Preferred Alternative at the time the Draft NTS EIS was published. The Final NTS EIS identifies Alternative 3 plus the public education activities of Alternative 4 as the Preferred Alternative.

Comment Code: Organization 10-7

Location of EIS Revision(s): None required

Response: Legislation that is pending before Congress relating to interim storage is speculative at this point and not amenable to analysis. The DOE plans and decisions regarding an interim storage facility, including appropriate National Environmental Policy Act analysis, would be made if legislation to that effect is passed.

Comment Code: Organization 10-8

Location of EIS Revision(s): None required

Response: The categorization of greater-than-Class C low-level waste is based on the U.S. Nuclear Regulatory Commission regulations in Title 10 CFR 61.55(2)(iii) and (iv). The DOE believes that its definition is consistent with the regulations and is not "deceitful", as suggested by the comment. Please refer to Section 1.12 of Volume 3 and Chapter 2 for other information.

Comment Code: Organization 10-9

Location of EIS Revision(s): None required

Response: It is the DOE's policy to inform the public as fully as possible concerning its activities. Refer to Section 1.12 of Volume 3.

Comment Code: Organization 10-10

Location of EIS Revision(s): None required

Response: The DOE does not agree that this EIS is being prepared on a "fast track." The Notice of Intent regarding this EIS was issued in August of 1994. Though the goal of the Secretary of Energy is to complete EISs in 15 months, this EIS has taken longer than 15 months to complete. Such things as maximum comment periods, opportunities to comment on the Draft Implementation Plan, and completion of a transportation study with public participation have been efforts to maximize the two-way public dialogue on the content of this EIS. These opportunities have also resulted in extending the time needed to complete this EIS.

Comment Code: Organization 10-11

Location of EIS Revision(s): None required

Response: The DOE does not agree that this EIS is "fatally flawed" or that it should be reissued as a draft. It is acknowledged that the document is complex and that it contains much information and data about the DOE and the programs being considered into the future. Within the framework established in the Notice of Intent and Implementation Plan, the topics being considered in this sitewide document reflect the broad nature of the future actions being considered. The opportunities for public participation, both in the planning for and preparation of the document, were intended to maximize the exchange of information.

Comment Code: Organization 11-1

Location of EIS Revision(s): None required

Response: The DOE or its successors would provide security and monitoring for lands withdrawn from public use, but funding levels are dependent upon Congressional appropriations.

The concern about increased waste disposal in Nevada is noted. The DOE will continue to review the options for other additional uses for the NTS.

Comment Code: Organization 11-2

Location of EIS Revision(s): None required

Response: The potential to accept greater-than-Class C waste, including types and quantities, have not been determined. If a determination is made to accept greater-than-Class C waste, an assessment will be conducted independent of this EIS. Refer to Section 1.12 of Volume 3.

For information about colloidal movement of radionuclides, refer to Comment Code Organization 5-103.

Comment Code: Organization 11-3

Location of EIS Revision(s): None required

Response: The potential construction, operation, and closure of a Yucca Mountain repository is outside of the timeframe covered in this EIS. For further detail, please see Volume 3, Section 1.1, Exclusion of the Yucca Mountain Project.

Comment Code: Organization 11-4

Location of EIS Revision(s): None required

Response: Socioeconomic information on Pahrump is provided in Section 4.1.3 of Volume 1. A separate discussion of Pahrump appears for population, housing, public finance, public schools, police protection, and fire protection. This information was obtained from the Nye County Board of Commissioners. This EIS acknowledges that Pahrump is the largest and most rapidly growing community in Nye County, and will continue to attract new residents. Under Alternative 3, the majority of the jobs would be filled by the existing labor pool. Inmigration of 636 people to Nye County is expected as a result of Alternative 3, which would only result in a 1.7 percent increase in the total population of Nye County. This increase would not significantly affect the public services of infrastructure of any area of Nye County.

Comment Code: Organization 12-1

Location of EIS Revision(s): None required

Response: It is assumed that the commentor is referring to the off-site prospective locations for Solar Enterprise Zone facilities. The DOE is acting in coordination with the federal-grant funded Corporation for Solar Technology and Renewable Resources to develop the mission principles of the Solar Enterprise Zone. The Corporation for Solar Technology and Renewable Resources is currently engaged in analyzing suitability preparatory to selecting one or more of the two on-site locations and/or one or more of the three off-site locations for the construction of a large-capacity solar power project.

The National Environmental Policy Act requires that all responsible alternatives be analyzed. The three off-site locations have been identified as potential locations for Solar generations facilities and consequently must be analyzed in this EIS.

Comment Code: Organization 12-2

Location of EIS Revision(s): None required

Response: It is assumed the commentor is referring to the DOE activities relating to the Yucca Mountain Project. Legislation that is pending before Congress relating to interim storage is speculative at this point and not amenable to analysis. The DOE plans and decisions regarding an interim storage facility, including appropriate National Environmental Policy Act analysis, would be made if legislation to that effect is passed. Refer to Section 1.1 of Volume 3 for information on that project and its relationship with the NTS.

Comment Code: Organization 12-3

Location of EIS Revision(s): None required

Response: The DOE used accepted methodology for the analysis of impacts of transportation routes. The DOE uses common carriers who maintain full compliance with applicable Department of Transportation regulations. Refer to Volume 3, Section 1.6 for more information on transportation.

Comment Code: Organization 12-4

Location of EIS Revision(s): None required

Response: The DOE does not agree that this EIS is being prepared on a "fast track." The Notice of Intent regarding this EIS was issued in August of 1994. Though the goal of the Secretary of Energy is to complete EISs in 15 months, this EIS has taken longer than 15 months to complete. Such things as maximum comment periods, opportunities to comment on the Draft Implementation Plan, and completion of a transportation study with public participation have been efforts to maximize the two-way public dialogue on the content of this EIS. These opportunities have also resulted in extending the time needed to complete this EIS. The Record of Decision will be issued no sooner than 30 days after the issuance of the Final NTS EIS.

This Page Intentionally Left Blank

Private Citizens

Comment Code: Private Citizen 1-1

Location of EIS Revision(s): None required

Response: If the proposed Interstate 66 were constructed, waste shipments could be rerouted around St. George as the commentor proposes. However, even if the proposed Interstate 66 is not constructed, the NTS EIS shows that potential impacts from waste shipments would be small under any of the alternatives evaluated. The DOE recognizes that transportation risks are not the only concern in the transportation of waste to the NTS. Consequently, the DOE will continue to interact with the stakeholders to ensure that local concerns are brought to the attention of carriers selecting routes, and continue to conduct all operations, including shipping, in a safe manner.

Comment Code: Private Citizen 2-1

Location of EIS Revision(s): None required

Response: The expressed support for the continued use of the NTS is noted.

Comment Code: Private Citizen 2-2

Location of EIS Revision(s): None required

Response: Recognition that facilities and other resources at the NTS could be used to "dismantle" nuclear weapons is reflected in the inclusion of such an option under Alternative 3. Under Alternative 3, the modification and use of the Device Assembly Facility for the disassembly of nuclear weapons is evaluated as a future use of the NTS.

Comment Code: Private Citizen 2-3

Location of EIS Revision(s): None required

Response: Alternatives 1, 3, and 4 in the NTS EIS include continued disposal of low-level radioactive waste at the NTS. The NTS EIS does not address the long-term storage of high-level radioactive waste; please refer to Section 1.1 of Volume 3 for a discussion of the Yucca Mountain Project which is outside the scope of the NTS EIS.

Comment Code: Private Citizen 2-4

Location of EIS Revision(s): None required

Response: The DOE/NV agrees that research options at the NTS are very broad and open. Solar energy is under active consideration. The NTS EIS also describes the existing Environmental Research Park. This park has allowed for ecosystem preservation and study and is a valuable resource at the NTS. Use of the Environmental Research Park is expected to continue into the future. The Spill Test Facility is another example of non-nuclear research being conducted at the NTS.

Comment Area: Private Citizen 3-1

Location of EIS Revision(s): None required

Response: Potential human health risks as a result of proposed activities at the NTS are discussed in the Occupational and Public Health and Safety sections of Volume 1, Chapter 5 and in Volume 1, Appendix H of the NTS EIS. For all alternatives, impacts were estimated to be less than one additional fatal cancer in the surrounding population over that which would occur without the presence of these NTS activities.

Comment Code: Private Citizen 3-2

Location of EIS Revision(s): None required

Response: Waste minimization has been a very important and successful mission at the NTS in past years. Efforts are in place to reduce and eliminate waste wherever possible. Waste minimization considerations are weighed against costs, liability, and the risk to workers conducting the minimization activities. The workforce at the NTS and within the DOE/NV have received numerous national awards for efforts involving waste minimization. The vast majority of waste associated with NTS activities is relatively benign from an environmental standpoint. Information concerning waste minimization can be obtained by contacting the DOE/NV Project Manager for Waste Minimization, Angela Colarusso, at (702) 295-1218.

Comment Code: Private Citizen 4-1

Location of EIS Revision(s): None required

Response: The reuse of nuclear waste material for the purposes of power production is a subject neither considered nor covered in the NTS EIS.

Comment Code: Private Citizen 5-1

Location of EIS Revision(s): None required

Response: The opposition to the transport of nuclear materials by train is noted; rail transportation has not been addressed in the NTS EIS because it is not expected within the next 10 years. Further National Environmental Policy Act review would be required if waste or other shipments to the NTS by rail are proposed.

Comment Code: Private Citizen 5-2

Location of EIS Revision(s): None required

Response: Possible environmental impacts from the construction, operation, and eventual closure of a potential repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain, including potential cumulative impacts, will be addressed in a separate, ongoing EIS. Refer to Volume 1, Section 3.2.6.1 and Volume 3, Section 1.1 for further discussion of the relationship between Yucca Mountain and the NTS.

Comment Code: Private Citizen 5-3

Location of EIS Revision(s): None required

Response: The general opposition to all nuclear testing is noted. Please refer to the discussion in Section 1.2 of Volume 3.

Comment Code: Private Citizen 5-4

Location of EIS Revision(s): None required

Response: Future uses of the NTS for other (non-nuclear) purposes are considered within the range of options covered under Alternatives 1, 3, and 4. The non-nuclear, future use options are discussed primarily under the Nondefense Research and Development Program within each of these alternatives.

Comment Code: Private Citizen 6-1

Location of EIS Revision(s): None required

Response: The commentor was called by the DOE as requested. Information on the Radiation Exposure Compensation Program Office was provided in the form of the telephone number (1-800-729-RECP).

Comment Code: Private Citizen 7-1

Location of EIS Revision(s): None required

Response: As stated in Section 1.3, Volume 2 of the NTS EIS, the *Resource Management Plan* will not be used to select future missions. The selection of missions for the site is part of higher level planning processes, all of which will require National Environmental Policy Act review and, therefore, public involvement. Instead, an important part of the goal of the *Resource Management Plan* is to evaluate whether future missions are compatible with ongoing missions and management of resources on the NTS. Therefore, future missions should not be added as a resource issue in Table 2.1.

Comment Code: Private Citizen 7-2

Location of EIS Revision(s): None required

Response: The use of the NTS for recreation and other activities is being considered under Alternative 4 of the NTS EIS. If part or all of that alternative is selected, then those activities will be evaluated using the *Resource Management Plan* and will be incorporated into the existing missions. In addition, if through the NTS EIS evaluation it is determined that recreation should be part of the mission at the NTS, recreational resources will be added as a resource issue.

Comment Code: Private Citizen 7-3

Location of EIS Revision(s): None required

Response: The plan for developing the *Resource Management Plan* encourages feedback and open participation by the public. Public uses of the NTS that do not require security restrictions are being considered under Alternative 4 of the NTS EIS. However, by the very nature of the missions at the NTS that are proposed under Alternatives 1 and 3, it is likely that security restrictions would remain in place for some parts of the NTS.

Comment Code: Private Citizen 7-4

Location of EIS Revision(s): None required

Response: The use of the NTS as an education site is being considered under Alternative 4. If part or all of Alternative 4 is selected, educational activities would be evaluated (using the *Resource Management Plan*) and incorporated into the existing missions. In addition, if through the NTS EIS evaluation and Record of Decision, the DOE determines that educational activities should be part of the NTS mission, then educational resources may be added as a resource issue. Nye County has also proposed the development of a nuclear era museum.

Comment Code: Private Citizen 7-5

Location of EIS Revision(s): None required

Response: A public museum located at the NTS is being considered as part of Alternative 4. If that part of Alternative 4 is selected and the museum is developed, it would be an excellent location to establish a visitor's center to inform interested people about the *Resource Management Plan* and solicit their opinions about resource use on the NTS.

Comment Code: Private Citizen 8-1

Location of EIS Revision(s): None required

Response: Although not specifically identified, relocation of the site for nuclear testing was an option considered prior to scoping that was eliminated from further consideration primarily because this option represents a major policy decision beyond the scope of future uses of the existing NTS (see Section 3.2.6). Such a decision, were it to be considered, would require the preparation of an EIS specific to the action proposed prior to the decision being made.

Comment Code: Private Citizen 9-1

Location of EIS Revision(s): None required

Response: The opposition to future (nuclear) testing at the NTS is noted. Please refer to the discussion in Section 1.2 of Volume 3.

Comment Code: Private Citizen 9-2

Location of EIS Revision(s): None required

Response: The opposition to the transportation of radioactive materials over local roads, and storage of radioactive materials in Nevada is noted. Refer to the discussions in Sections 1.2 and 1.6 of Volume 3.

Comment Code: Private Citizen 9-3

Location of EIS Revision(s): None required

Response: The opposition to any further (nuclear) testing at the NTS is noted, please refer to the discussion in Section 1.2 of Volume 3.

Comment Code: Private Citizen 9-4

Location of EIS Revision(s): None required

Response: The opposition to the use of the NTS for nuclear storage is noted, please refer to the discussion in Sections 1.2 and 1.12 of Volume 3.

Comment Code: Private Citizen 9-5

Location of EIS Revision(s): None required

Response: The opposition to nuclear powered rockets at the NTS is noted. No such activities are planned for the NTS, and activities of this nature are not included in the range of possible options considered under alternative uses of the NTS evaluated in this EIS.

Comment Code: Private Citizen 9-6

Location of EIS Revision(s): None required

Response: The NTS EIS discusses possible activities for nondefense research and development, including the development of solar power technology at the Solar Enterprise Zone. The DOE actively supports alternative energy programs, such as solar energy research, as part of its ongoing mission. The DOE/NV agrees that southern Nevada is an ideal place for the development of alternative energy resources, and intends to promote the NTS for this project.

Comment Code: Private Citizen 9-7

Location of EIS Revision(s): None required

Response: Wind energy research presents possibilities for development at the NTS, but is not included in this EIS. However, the DOE is involved in wind energy technology development at other locations such as the Lawrence Livermore National Laboratory in California. Some research may be necessary to determine if the NTS is a favorable location for wind energy research, and its implementation would require additional National Environmental Policy Act documentation.

Comment Code: Private Citizen 9-8

Location of EIS Revision(s): None required

Response: Recycling and waste minimization are integral and very important parts of NTS programs. Efforts to develop new ways to recycle, reduce, and eliminate wastes wherever possible are continuing. Examples of recycled materials include scrap metals, toner cartridges, used oil, solvents, various types of paper, and aluminum cans. The workforce at the NTS and within the DOE/NV have received numerous national awards for their efforts in waste minimization.

Comment Code: Private Citizen 10-1

Location of EIS Revision(s): None required

Response: The commentor protests further use of the NTS because of detrimental health effects attributed to testing at the site for the past 40 years. As discussed in Volume 1, Chapter 3, Section 3.2.6.3, an analysis of impacts from past releases and accidents at the NTS was not conducted as part of this EIS. The DOE, with the assistance of other agencies, has initiated and participated in many in-depth investigations into these potential health and safety concerns. Congress has established a compensation program.

Potential human health risks as a result of proposed future activities at the NTS are discussed in the Occupational and Public Health and Safety sections of Volume 1, Chapter 5, and in Volume 1, Appendix H of this EIS. For all alternatives, impacts were estimated to be small, hypothetically resulting in less than one additional fatal cancer in the surrounding population over that which would occur without the presence of these NTS activities.

Comment Code: Private Citizen 10-2

Location of EIS Revision(s): None required

Response: The commentor's preference for closing the site is noted.

Comment Code: Private Citizen 11-1

Location of EIS Revision(s): None required

Response: See response to Comment Code Private Citizen 10-1.

Comment Code: Private Citizen 11-2

Location of EIS Revision(s): None required

Response: The commentor's preference for closing the NTS is noted.

Comment Code: Private Citizen 12-1

Location of EIS Revision(s): None required

Response: See response to Comment Code Private Citizen 5-2.

Comment Code: Private Citizen 12-2

Location of EIS Revision(s): None required

Response: See response to Comment Code Private Citizen 5-2.

Comment Code: Private Citizen 12-3

Location of EIS Revision(s): None required

Response: The comment opposing the closure of the NTS is noted. The alternatives in this EIS are structured to provide a range of possible scenarios for the future use of the NTS and the assessment of potential impacts, including Discontinue Operations (Alternative 2), Expanded Use (Alternative 3), and Alternate Use (Alternative 4).

Comment Code: Private Citizen 13-1

Location of EIS Revision(s): None required

Response: The comment is noted. The DOE is also concerned that its activities do not result in any danger to public health. The Human Health Risk Assessment, Appendix H, of this document discusses the associated risk to the worker and public for ongoing and future activities at the NTS and other DOE sites in Nevada.

Comment Code: Private Citizen 14-1

Location of EIS Revision(s): See list below

Response: Pahrump and/or Highway 160 will be included in the following figures appearing in the NTS EIS: S-1, 1-1, 1-2, 4-1, 4-4, 4-7, 4-8, 4-11, 4-12, 4-15, and 4-16; F-1; F-2; and F-4.

Comment Code: Private Citizen 14-2

Location of EIS Revision(s): Chapter 5, Section 5.1.1.3

Response: Text has been added to clarify the training that the DOE provides.

Comment Code: Private Citizen 14-3

Location of EIS Revision(s): None required

Response: The transportation routes evaluated in the NTS EIS were identified as being consistent with their current use and applicable regulations. The transportation analysis documented in Appendix I of the NTS EIS identifies primary and alternate routes from each waste generator site to the NTS. Highway 160 is identified as an alternate route, not a primary route. Refer to the discussion in Section 1.6 of Volume 3.

Comment Code: Private Citizen 14-4

Location of EIS Revision(s): None required

Response: First, although Nevada route NV-6 ranks high in comparison to other Nevada routes, the transportation analysis documented in Appendix I shows that the transportation risks associated with all routes are small. Second, the NTS EIS evaluates NV-6 and the routes that use Highway 160 as alternate routes, not primary routes. Please refer to comment response, Private Citizen 14-3.

Comment Code: Private Citizen 14-5

Location of EIS Revision(s): None required

Response: Transuranic radioactive wastes are currently stored on the Transuranic Waste Storage Pad at the Area 5 Radioactive Waste Management Site in accordance with a settlement agreement with the state of Nevada, signed June 23, 1992 (state of Nevada, 1992). Provisions of this agreement include permission to store transuranic waste on the pad until the Waste Isolation Pilot Plant in New Mexico, or another DOE site, is available as a treatment, storage, or disposal destination. The agreement with the state of Nevada does not allow for additional transuranic waste to be received from out of state for storage at the NTS. Consequently, none of the alternatives evaluated in this EIS consider the receipt and storage of additional transuranic wastes from DOE sources outside of Nevada.

Comment Code: Private Citizen 14-6

Location of EIS Revision(s): None required

Response: See response to Comment Code Private Citizen 5-2.

Comment Code: Private Citizen 14-7

Location of EIS Revisions(s): None required

Response: The commentor is concerned that there are no viable plans for railroads coming to the NTS. The transportation of radioactive waste by rail is not evaluated as an option in any of the alternatives in this EIS because there are no rail spurs that currently provide service to the NTS. However, Volume 1, Appendix I, Attachment F of the NTS EIS provides a summary of considerations related to rail spur development, use of truck/rail intermodal systems, and comparisons to the continued use of truck transportation systems. This section of the NTS EIS is intended to support a dialogue with Nevada stakeholders on alternative radioactive material transportation opportunities that could benefit both the community and the Federal government.

The DOE will evaluate the possible environmental impacts from the construction, operation, and eventual closure of a potential repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain, Nevada, including transportation and discussion of potential routing for these waste shipments, in a separate, ongoing EIS. Refer to Volume 1, Section 3.2.6.1 and Section 1.1 of Volume 3 for further discussion on Yucca Mountain.

Comment Code: Private Citizen 14-8

Location of EIS Revision(s): None required

Response: The DOE has not disregarded potential risks of transportation of waste. Two separate appendices: (Appendix H, Human Health Risk and Safety Impacts Study, and Appendix I, Transportation Study) contain examinations of potential risks of both normal operations and accident scenarios. These potential impacts are also summarized in Chapter 5. For further information concerning land disposal of nuclear waste, see Volume 3, Sections 1.2 and 1.12.

Comment Code: Private Citizen 14-9

Location of EIS Revision(s): None required

Response: Based on recent reports, it has been concluded that the plutonium and uranium in the tank waste at Hanford could not go critical. The tanks and the waste at Hanford remain one of DOE's high priorities for remediation and cleanup, however.

Comment Code: Private Citizen 14-10

Location of EIS Revision(s): None required

Response: Over 254,853 m^3 (9 million ft^3) of radioactive waste (both low-level and mixed) has been transported over public highways to the NTS. To date, there has been no release of any of this material and no damage to the environment or to human health. This waste is packaged and secured in the transport vehicle to reduce the possibility of contaminating the vehicle, environment, or public that comes in contact with the waste packages.

Comment Code: Private Citizen 14-11

Location of EIS Revision(s): None required

Response: The basic issue is that radionuclides may attach to colloids and be transported in water when they would otherwise not be expected to move. There have been a number of studies of the colloidal transport of radionuclides from underground nuclear testing in groundwater at the NTS. Related studies on similar radionuclides and rocks have been performed for the Yucca Mountain geologic repository project, and the DOE's Office of Subsurface Science has conducted studies on other rock types found on the NTS. Migration of tritium in groundwater at the NTS has been found to be more significant than transport of other radionuclides as colloids. Therefore, present studies focus on transport rates of radionuclides as a result of all mechanisms, not solely colloidal transport. It is also important to distinguish between groundwater flow and the much more rapid flow of water in streams on the earth's surface. Groundwater is subject to distinctly different chemical and physical processes than those applicable to surface waters.

Comment Code: Private Citizen 14-12

Location of EIS Revision(s): None required

Response: This EIS examines alterative uses of the NTS and several other DOE-controlled sites in Nevada. Reprocessing and/or reuse of nuclear wastes are beyond the scope of this EIS.

Comment Code: Private Citizen 14-13

Location of EIS Revision(s): Volume 3, Section 1.2, Appendix H

Response: The comment has been noted, please see Section 1.2 of Volume 3. In addition, Appendix H, Human Health Impacts has been extensively revised as a result of detailed comments received on human health and risk issues.

Comment Code: Private Citizen 15-1

Location of EIS Revision(s): None required

Response: The comment has been noted.

Comment Code: Private Citizen 16-1

Location of EIS Revision(s): Volume 3, Section 1.2, Appendix H

Response: The comment has been noted. See Section 1.2 of Volume 3. In addition, Appendix H, Human Health Impacts has been extensively revised as a result of detailed comments received on human health and risk issues.

Comment Code: Private Citizen 16-2

Location of EIS Revision(s): None required

Response: The commentor's opposition to nuclear testing is noted, please refer to the discussion in Section 1.2 of Volume 3.

Comment Code: Private Citizen 17-1

Location of EIS Revision(s): None required

Response: Hard-rock mineral exploitation is currently prohibited on the NTS by law and regulation. Please see Sections 1.4 and 1.8, Volume 3 for additional discussion on this subject.

Comment Code: Private Citizen 18-1

Location of EIS Revision(s): None required

Response: See Section 1.1 of Volume 3 for discussion of this subject.

Comment Code: Private Citizen 19-1

Location of EIS Revision(s): Chapter 4, Table 4-30

Response: Table 4-30 has been modified to reflect the latest list of candidate species issued by the U.S. Fish and Wildlife Service on February 28, 1996. Most of the suggested modifications to this table are for species no longer designated as candidates, and therefore are not shown in the revised Table 4-30. A change has been made, however, to reflect the possible occurrence of the threatened bald eagle in Coyote Spring Valley, as recommended in the comment.

Comment Code: Private Citizen 20-1

Location of EIS Revision(s): None required

Response: Chapter 5, "Environmental Consequences," includes descriptions of the environmental impacts and the public safety and health risks associated with Defense Program activities, including the subcritical experiments conducted at the Lyner Complex in Area 1. Appendix J contains classified material quantities and design concepts. This information is classified by the DOE for nonproliferation and national security reasons.

Comment Code: Private Citizen 20-2

Location of EIS Revision(s): None required

Response: Gas Core Reactor and Particle Bed Reactor Propulsion Tests are not part of the planned activities for the NTS; the environmental effects of similar historic activities are discussed only in Chapter 4, Existing Environments, of this EIS.

Comment Code: Private Citizen 20-3

Location of EIS Revision(s): None required

Response: Figures within the NTS EIS clearly depict the location of Area 13 on the Nellis Air Force Range (NAFR) Complex. The site additionally is located partially in Nye and Lincoln counties. The accuracy of these locations is further enhanced by text in Chapter 4 of the NTS EIS.

Comment Code: Private Citizen 20-4

Location of EIS Revision(s): None required

Response: Restricted airspaces 4808 and 4809 are controlled by the DOE. These restricted airspaces are flight-controlled by the NAFR Complex. As a result, these airspaces are scheduled for ongoing use by the NAFR Group for DOE and DoD activities.

The roads identified by the commentor are used as entrance and exit ways for the NTS employees and users of the NAFR Complex. The power lines identified are used by the DOE and DoD for ongoing operations on the NTS and NAFR Complex.

Comment Code: Private Citizen 20-5

Location of EIS Revision(s): None required

Response: The National Environmental Policy Act process allows for EISs that address classified proposals to be safeguarded and restricted from public dissemination. In order to make as much government information available to the public as possible, agencies are encouraged (in some cases mandated) to separate classified information from unclassified, and produce a classified appendix when necessary. The DOE accomplished this with the NTS EIS. While Appendix J contains classified information on the nature of the activities to be conducted at the Lyner Complex, the environmental impacts of these activities are not classified, and are presented in Chapter 5 of the EIS.

Comment Code: Private Citizen 21-1

Location of EIS Revision(s): None required

Response: The reuse of nuclear waste material for the purposes of power production is not a subject considered nor covered in the NTS EIS. The DOE in the past has been involved in reprocessing nuclear fuel. The DOE and its National Laboratories are exploring transmutation technologies. These programs are scientific endeavors in their early stages of exploration. Components of the research and development effort of the technologies will be to assess feasibility, implementation, sighting and cost effectiveness.

Comment Code: Private Citizen 22-1

Location of EIS Revision(s): None required

Response: The comment regarding closure of the NTS is noted.

Comment Code: Private Citizen 23-1

Location of EIS Revision(s): Chapter 4, Section 4.3 and Section 4.8 and Appendix A, Section A.3.1.8

Response: The detonation depth of the underground test at the Project Shoal Area was listed on the Draft NTS EIS as 411 m (1,350 ft) and 402 m (1,350 ft) below ground. These depths are incorrect (Gardner and Nork, 1970). The underground test at the Project Shoal Area was actually detonated at 367 m (1,205 ft) below ground. The Final NTS EIS has been revised to reflect the correct depth. The reference containing the correct depth is also cited.

Comment Code: Private Citizen 24-1

Location of EIS Revision(s): None required

Response: The commentor's opposition to storage or transportation of nuclear waste is noted. Please refer to the discussion in Section 1.2 of Volume 3.

Comment Code: Private Citizen 25-1

Location of EIS Revision(s): None required

Response: The development of this EIS has been in progress for more than a year. The budget for last year was approximately $5 million. This year has not been completed, but the target is about the same level of funding. The total budget is not expected to exceed $10 million.

Comment Code: Private Citizen 25-2

Location of EIS Revision(s): None required

Response: The commentor's opposition tot he transport of material from other states to the NTS is noted. Refer to the discussion in Section 1.2 of Volume 3.

Comment Code: Private Citizen 26-1

Location of EIS Revision(s): None required

Response: The comment regarding closure of the NTS is noted.

Comment Code: Private Citizen 27-1

Location of EIS Revision(s): None required

Response: The commentor's support for keeping the NTS open is noted. Alternatives 1, 3 and 4 would keep the NTS open for other purposes and testing.

Comment Code: Private Citizen 28-1

Location of EIS Revision(s): None required

Response: Concerns regarding transportation along U.S. Highway 93 and across Hoover Dam have been noted by the DOE. The DOE concurs that a bypass around Las Vegas would provide a way to transport hazardous and radioactive materials without going through the city. Refer to the discussion in Section 1.6 of Volume 3.

Comment Code: Private Citizen 28-2

Location of EIS Revision(s): None required

Response: The comment is noted. Refer to Section 1.6 of Volume 3.

Comment Code: Private Citizen 29-1

Location of EIS Revision(s): None required

Response: The commentor's support for defense and nondefense research and development and testing activities is noted.

Comment Code: Private Citizen 30-1

Location of EIS Revision(s): None required

Response: The commentor's support for not losing the site is noted.

Comment Code: Private Citizen 31-1

Location of EIS Revision(s): None required

Response: The commentor's support for the NTS and current programs, as well as expanded use activities, is noted.

Comment Code: Private Citizen 32-1

Location of EIS Revision(s): None required

Response: The commentor's support for keeping the NTS open is noted.

Comment Code: Private Citizen 33-1

Location of EIS Revision(s): None required

Response: The commentor's support for keeping the site open is noted.

Comment Code: Private Citizen 34-1

Location of EIS Revision(s): None required

Response: Concerns regarding transportation across Hoover Dam have been noted by the DOE. Refer to the discussion in Section 1.6 of Volume 3.

Comment Code: Private Citizen 35-1

Location of EIS Revision(s): None required

Response: Support for the NTS and current programs, as well as expanded use activities, is noted.

Comment Code: Private Citizen 36-1

Location of EIS Revision(s): None required

Response: Support for the NTS and current programs, as well as expanded use activities, is noted.

Comment Code: Private Citizen 37-1

Location of EIS Revision(s): None required

Response: Support for the NTS and current programs, as well as expanded use, is noted.

Comment Code: Private Citizen 38-1

Location of EIS Revision(s): None required

Response: The commentor's support for the NTS and current programs, as well as expanded use activities, is noted.

Comment Code: Private Citizen 39-1

Location of EIS Revision(s): None required

Response: Concerns regarding transportation of hazardous material across the Hoover Dam have been noted by the DOE. Refer to the discussion in Section 1.6 of Volume 3.

Comment Code: Private Citizen 40-1

Location of EIS Revision(s): None required

Response: The commentor's opinion that nuclear testing is overemphasized is noted. The range of alternatives that the DOE is considering shows the variety of activities that could occur at the NTS.

Comment Code: Private Citizen 41-1

Location of EIS Revision(s): None required

Response: The comment is noted concerning transportation of hazardous materials and waste across Boulder Dam and through Boulder City. Refer to discussion in Section 1.6 of Volume 3.

Comment Code: Private Citizen 42-1

Location of EIS Revision(s): None required

Response: Refer to discussion in Section 1.6 of Volume 3.

Comment Code: Private Citizen 43-1

Location of EIS Revision(s): None required

Response: A great deal of work has been done to better understand the distribution and abundance of desert tortoises on the NTS. Summaries of this work are cited in Section 4.1.6. Within the range of the desert tortoise on the NTS (see Figure 4-43), the abundance of tortoises is very low and they are absent or very rare throughout much of this area. It is therefore impossible at this time to determine how much of the 3,105 acres proposed for disturbance within the range of the desert tortoise actually have tortoises living there. Searches for desert tortoises have been and will continue to be conducted before any areas on the NTS are disturbed.

Specific mitigation actions to be taken to protect desert tortoises will be developed during consultation with the U.S. Fish and Wildlife Service, as required under the Endangered Species Act and described in Section 7.6.

Comment Code: Private Citizen 43-2

Location of EIS Revision(s): None required

Response: The new Solar Enterprise Zones will not be located in the Project Shoal Area or in the Central Nevada Test Area. The only ground-disturbing activity that would generate PM_{10} are related to the Environmental Restoration Program. This program will result in a disturbance of 10 acres of land at the Project Shoal Area (see Section 5.1.3.7) and a disturbance of 44 acres at the Central Nevada Test Area (see Section 5.1.4.7). Water will be applied to the disturbed areas to minimize the production of fugitive dust. Since PM_{10} will be relatively low from these small sources, the PM_{10} air quality standards will not be violated, and air monitoring will not be required.

Comment Code: Private Citizen 43-3

Location of EIS Revision(s): None required

Response: Off-site nuclear testing is not considered in any of the alternatives.

Comment Code: Private Citizen 43-4

Location of EIS Revision(s): Summary

Response: Off-site locations are included in the DOE Environmental Restoration Program. A description of Environmental Restoration programs at off-site locations included in this program can be found in Appendix A, Section A.3, "Nevada Environmental Restoration Program."

Because exposure to the contamination is based on the projected land use for each specific Corrective Action Unit (grouping of environmental restoration sites), it is necessary to determine the levels and extent of contamination. Therefore, specific investigations and risk assessments are being conducted for each Corrective Action Unit.

With the exception of temporary storage of investigation and remediation-derived wastes, there will be no waste storage at the off-site locations. These wastes would be transported to approved treatment, storage, or disposal sites.

The sentence referring to continued testing at off-site locations has been rewritten to reflect that no further testing will be conducted at the off-site locations.

Comment Code: Private Citizen 43-5

Location of EIS Revision(s): None required

Response: While Alternatives 3 and 4 have many similar non-defense research and development aspects, under Alternative 4 the DOE would discontinue all defense-related and Work for Others activities at the NTS, while under Alternative 3 these programs would expand. The relinquishing of land under Alternative 4 would also preclude many of the proposed and continuing activities mentioned as a part of Alternative 3. The alternatives have been designed to allow the DOE to analyze and compare the potential environmental effects of a wide range of use options. The Final NTS EIS identifies Alternative 3 plus the public education activities of Alternative 4 as the preferred alternative.

Comment Code: Private Citizen 43-6

Location of EIS Revision(s): None required

Response: The commentor's support for bringing radioactive and hazardous materials to the NTS is noted. The NTS EIS, Sections A.3.1.7 and A.3.1.8, includes environmental restoration objectives for the off sites located in the state of Nevada. Radioactive wastes generated during characterization or remediation activities at the off sites would be disposed of either at the NTS or at other licensed radioactive waste disposal facilities. Toxic Resource Conservation and Recovery Act wastes are not disposed of at the NTS. When generated at the NTS these wastes are disposed of at licensed hazardous waste disposal facilities and would be similarly disposed of if generated at the off sites.

Comment Code: Private Citizen 43-7

Location of EIS Revision(s): None required

Response: The proposed Solar Enterprise Zone projects are currently not defined enough to determine if revegetation is feasible. Environmental impacts are dependent on the specific technology selected. As these projects become more clearly defined and a site is selected, the DOE will consider appropriate mitigation measures through site-specific National Environmental Policy Act reviews.

Comment Code: Private Citizen 43-8

Location of EIS Revision(s): None required

Response: Chapters 3 and 4 and Appendix A provide detailed descriptions of current operations.

Comment Code: Private Citizen 43-9

Location of EIS Revision(s): None required

Response: The suggestion that the tables be used for statistics and ratios and not for narrative comparison is noted. The text does contain the comparison of alternatives as suggested, but a method to consolidate and summarize the comparison resulted in the creation of the tables. The format of the Final NTS EIS may help alleviate the confusion identified.

Comment Code: Private Citizen 43-10

Location of EIS Revision(s): None required

Response: The suggestion that pictures of sites and facilities be included is appreciated, and it would help to illustrate complex issues. As noted in the comment, however, the cost of including them at this time would be high and would expand an already large document.

Comment Code: Private Citizen 44-1

Location of EIS Revision(s): None required

Response: The comment in opposition to further nuclear testing is noted. Refer to the discussion in Section 1.2 of Volume 3.

Comment Code: Private Citizen 45-1

Location of EIS Revision(s): None required

Response: A study performed by CH_2MHill (1993) assessed the range of impacts that could be of concern for transportation of hazardous materials across the Hoover Dam. The reasonable worst-case impacts were found to be associated with a release of flammable liquids, such as gasoline, which could cause loss of life and long-term disruption of power generation by Hoover Dam. The report stated that other classes of hazardous materials would be less likely to produce this type of impact to the dam or its facilities. Although the report did not specifically address radioactive materials, historical data from radioactive material transportation accidents indicate that an accident at the Hoover Dam involving low-level waste would be less likely and would be expected to have less impact than a release of flammable liquids.

Comment Code: Private Citizen 45-2

Location of EIS Revision(s): None required

Response: An accident at the Hoover Dam involving low-level waste would not be expected to affect the electrical generator systems at the dam. See response to Comment Code Private Citizen 45-1.

Comment Code: Private Citizen 45-3

Location of EIS Revision(s): None required

Response: The NTS EIS covers the 10 years from 1996 to 2005, and transportation operations will occur throughout this period.

Comment Code: Private Citizen 45-4

Location of EIS Revision(s): None required

Response: The DOE makes every effort to ensure the quality of the carriers, drivers, and equipment used to transport DOE materials. The DOE has a Motor Carrier Evaluation Program to assist DOE field office and contractor transportation personnel in selecting carriers to transport radioactive and/or hazardous materials. The DOE and its contractor transportation specialists review the following information on the carriers: experience with hazardous and radioactive cargo, safety and regulatory compliance record, driver employment policies, equipment maintenance programs and procedures, emergency response capabilities, driver training programs, and financial stability.

In addition to the DOE's evaluation program, carriers are subject to Federal Highway Administration inspections, and the U.S. Department of Transportation issues a safety fitness rating for the carrier. The U.S. Department of Transportation also funds the Motor Carrier Safety Assistance Program which provides information about accident statistics, roadside inspection results, and compliance reviews at the carrier's principal place of business. The DOE contractor transportation specialists study all of this information to evaluate carrier eligibility.

Comment Code: Private Citizen 45-5

Location of EIS Revision(s): None required

Response: The low-level waste is packaged in the U.S. Department of Transportation-approved packages which prevent the material from being dispersed. All packages are loaded and transported in closed vehicles. Packaging, loading, and unloading are all conducted in accordance with site-specific handling procedures which further ensure safe transport.

Empty vehicles undergo radiological surveys when leaving the waste disposal facility. Additionally, radiation monitors are located at the main gate of the NTS.

Comment Code: Private Citizen 45-6

Location of EIS Revision(s): None required

Response: Packaging and shipping requirements for transport of low-level waste are established by the U.S. Department of Transportation. All waste shipments made by the DOE are in accordance with the U.S. Department of Transportation regulations. The regulations are designed to ensure that there is no release of radioactive material from its packaging under normal shipping conditions. As shown by the analysis documented in the NTS EIS, the potential human health risk associated with transportation accidents are low and do not warrant more stringent safeguards than those currently required by law.

Comment Code: Private Citizen 45-7

Location of EIS Revision(s): None required

Response: Regulations promulgated by the U.S. Department of Transportation require that the type and amount of radioactive material be determined prior to shipment. The regulations identify various levels of packaging and labeling requirements based on the type and amount of radioactive material to be shipped.

Comment Code: Private Citizen 45-8

Location of EIS Revision(s): None required

Response: All vehicles transporting the low-level waste are clearly labeled and marked in accordance with the U.S. Department of Transportation regulations at 49 CFR 100-177. These regulations require the vehicle to clearly display the word "RADIOACTIVE" along with the yellow and black trefoil symbol of radioactivity. The symbol must be a minimum of 625 cm^2 (100 $in.^2$) and shall be displayed on the front, back, and both sides of the vehicle.

Comment Code: Private Citizen 45-9

Location of EIS Revision(s): None required

Response: Although some potential for human error will always exist, operations are planned to reduce the possibility of human error and its consequences as much as possible. Written, approved procedures are used and quality checks are maintained to ensure that waste shipped to the NTS is properly packaged and transported according to all safety, environmental, and transportation requirements. To achieve this, the DOE and its contractor transportation specialists visit carrier's corporate offices and maintenance facilities on a regular basis to determine how well they comply with the U.S. Department of Transportation standards.

Comment Code: Private Citizen 46-1

Location of EIS Revision(s): None required

Response: Although the meeting was held in Las Vegas, it was hosted by Lincoln County. Lincoln County requested that the meeting be held on the University of Nevada, Las Vegas campus to allow access to University of Nevada, Las Vegas staff.

Comment Code: Private Citizen 46-2

Location of EIS Revision(s): Chapter 3, Section 3.2.6.1

Response: Refer to the discussion in Section 1.1 of Volume 3.

Comment Code: Private Citizen 46-3

Location of EIS Revision(s): None required

Response: Ongoing activities at the NTS as well as this EIS include and consider Yucca Mountain site characterization activities. As mentioned in Volume 2, *Framework for Resource Management Plan*, Section 1.3, of the Draft NTS EIS, the Yucca Mountain Site Characterization Office has been granted permission by the DOE/NV for the exclusive use of a portion of the NTS for the Yucca Mountain Site characterization activities. A memorandum of agreement between the DOE/NV and the Yucca Mountain Site Characterization Office assures that land use planning and resource management will be coordinated between the two entities. For further explanation of the relationship between the Yucca Mountain Project and the NTS EIS, please see Volume 1, Chapter 3, Section 3.2.6.1 and Section 1.1 of this Volume.

Comment Code: Private Citizen 46-4

Location of EIS Revision(s): None required

Response: The routes evaluated are not proposed routes; they were chosen as representative routes for evaluation. Non-existent potential roadways cannot be evaluated. See Section 1.6 of Volume 3. Exclusion of the Yucca Mountain Project from this EIS is discussed in Section 1.1 of Volume 3.

Comment Code: Private Citizen 46-5

Location of EIS Revision(s): None required

Response: Refer to the discussion in Section 1.6 of Volume 3.

Comment Code: Private Citizen 46-6

Location of EIS Revision(s): None required

Response: The characterization activities at Yucca Mountain were included in Chapter 6, Cumulative Impacts. The construction, operation, and closure of a Yucca Mountain repository will be addressed in a separate EIS which will assess the cumulative impacts of Yucca Mountain and the NTS. Refer to the discussion in Section 1.1 of Volume 3.

Comment Code: Private Citizen 46-7

Location of EIS Revision(s): None required

Response: Please refer to the response to Comment Code Private Citizen 46-6.

Comment Code: Private Citizen 46-8

Location of EIS Revision(s): Volume 1, Appendix I, Section F.1.1.2

Response: The text was revised to clarify the description of the second route.

Comment Code: Private Citizen 46-9

Location of EIS Revision(s): None required

Response: The roads referred to by the commentor are paved on the portions of land controlled by the DOE. These roads are used by both the DOE and DoD for ongoing and future activities. The portion of the road that is unpaved is on land administered by the Department of the Interior and the DOE does not have the authority or responsibility to perform any upgrades to their roads.

Comment Code: Private Citizen 46-10

Location of EIS Revision(s): None required

Response: The section of Mercury Highway from Rainier Mesa Road to the gate in the northeast corner of the NTS was not considered to be a key, onsite roadway segment and was not included in the on-site traffic impact analysis.

The trip distribution and traffic assignment portions of the analysis had to take various assumptions into consideration. One of these assumptions was that all off-site trips (i.e., those with an end-point off the NTS), with the exception of some trips in Area 25, would pass through the main gate in Mercury. This assumption was necessary because there are no available traffic studies that address employee distribution and vehicle counts at the gates. Therefore, the on-site traffic impact analysis is provided with a conservative analysis by concentrating most commuters at the main gate in Mercury.

Comment Code: Private Citizen 46-11

Location of EIS Revision(s): Summary

Response: The DOE concurs. The Readers Guide has been moved to the front of the Summary document.

Comment Code: Private Citizen 46-12

Location of EIS Revision(s): Summary

Response: The DOE concurs and has made the correction. Area 13 is within Nye and Lincoln Counties.

Comment Code: Private Citizen 46-13

Location of EIS Revision(s): None required

Response: The DOE is not involved in the actions taken by other government agencies in managing the resources assigned to them and has no answer to this question. The withdrawal of land does go through a public participation process in which questions like this one can be answered.

Comment Code: Private Citizen 46-14

Location of EIS Revision(s): Summary

Response: The distance to Las Vegas has been changed to 72 kilometers (km) (45 miles [mi]). The sentence describing "designated wilderness management area" has been revised for clarification.

Comment Code: Private Citizen 46-15

Location of EIS Revision(s): None required

Response: The statement referenced in the Draft NTS EIS is correct. Coyote Spring Valley, Dry Lake Valley, and Eldorado Valley basins are all part of the Colorado River drainage system which ultimately discharges to the Gulf of California.

Comment Code: Private Citizen 46-16

Location of EIS Revision(s): None required

Response: Following the Air Force's testing of the carbonate aquifer well in 1981, there have been additional water developments in the Muddy Springs area. While the Air Force conclusions were consistent with the result of their tests at that time, they may not be extrapolated to the present-day situation without taking new developments into account.

Comment Code: Private Citizen 46-17

Location of EIS Revision(s): None required

Response: The DOE notes this comment that man should have first priority and that technology development and related economic development should be emphasized. These priorities are reflected in the DOE's goal for exiting missions (Section 4.1), which includes technology development, and in the goal for socioeconomics (Section 4.11).

Comment Code: Private Citizen 46-18

Location of EIS Revision(s): None required

Response: The DOE does not plan to manage the NTS primarily as an environmental showcase. The U.S. Congress has identified the primary use of the NTS to be held in reserve weapons testing, and that will continue until the DOE is directed otherwise. Because of the extensive, taxpayer-funded infrastructure available on this site, the DOE thinks it makes economic sense to continue to use and develop this site. However, the DOE also is committed to minimizing its impacts on the natural resources on the NTS, as reflected in the Land- and Facility-Use Management Policy. By implementing this policy through the development of the *Resource Management Plan*, the DOE will attempt to balance the protection of the natural environment on the NTS with its primary missions. The approach the DOE has used and will continue to use for maintenance of healthy populations of sensitive species is very similar to that described by the commentor.

Comment Code: Private Citizen 46-19

Location of EIS Revision(s): None required

Response: The DOE does take each activity on a case-by-case basis as part of the National Environmental Policy Act process. Ecosystem management is a set of principles that will be used during the evaluation of impacts of these activities.

Comment Code: Private Citizen 46-20

Location of EIS Revision(s): None required

Response: No Soil Conservation Service soil survey has been done for the NTS or adjacent areas.

Comment Code: Private Citizen 46-21

Location of EIS Revision(s): None required

Response: Subsurface water is any water that occurs below the land surface; i.e., groundwater, without regard for the depth. The depth to groundwater is presented in the hydrology section of the description of the affected environment for each geographic area covered by the NTS EIS. The DOE's presentation of the concept of interbasin flow is based upon the many published reports on the water resources of Nevada, the Great Basin, and other individual basins. The specific references are cited within the appropriate sections of the NTS EIS.

Comment Code: Private Citizen 46-22

Location of EIS Revision(s): Volume 2, *Resource Management Plan*, 2.1, Step 3

Response: The Community Advisory Board will be added to the list of parties consulted in the development of the *Resource Management Plan.*

Comment Code: Private Citizen 46-23

Location of EIS Revision(s): None required

Response: The approach suggested in this comment is very similar to that proposed in the *Resource Management Plan*. Work has been done, and continues to better understand the distribution of plant and animal populations on the NTS and identify the land resources needed to maintain the viability of those populations. To better protect the land resources needed by plants and animals, and still promote the development of existing and future activities, an additional goal will be added to Section 4.4 (Land) that reflects the DOE's goal to site activities on or near existing disturbed areas and leave remote areas undisturbed.

One species of the genus *Halogeton* occurs on the NTS. That species, *H. glomeratus,* is an introduced plant that is relatively common in and around disturbed areas in the bottom of enclosed basins such as Frenchman and Yucca Flat.

Comment Code: Private Citizen 46-24

Location of EIS Revision(s): None required

Response: The DOE agrees that natural resources on the NTS have had few economic, recreational, or social benefits because people have not been allowed on the NTS. Access has been restricted because of DOE's primary mission.

Comment Code: Private Citizen 46-25

Location of EIS Revision(s): None required

Response: Maps identifying facilities and other infrastructure features were available in the October 1994 revision of the NTS Technical Site Information (RSN, 1994). This document is located in the Administrative Record.

Comment Code: Private Citizen 46-26

Location of EIS Revision(s): None required

Response: When land is withdrawn from public use and reserved for a federal purpose, the Government's right to appurtenant water is implied. As noted in the NTS EIS in Section 4.1.1.1, the NTS is on withdrawn land, and jurisdiction is assigned to the DOE, a federal agency.

Comment Code: Private Citizen 46-27

Location of EIS Revision(s): None required

Response: The DOE's primary mission activities are defined in Section 2.4.1 of the NTS EIS. The five program areas are Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. A description of program projects and activities are described in Appendix A.

Comment Code: Private Citizen 46-28

Location of EIS Revision(s): None required

Response: Future water needs for a facility or project are determined by the engineering design criteria for that specific facility or project. The engineering design criteria take into consideration all processes that will be conducted, as well as the resource requirements for a project. The sum projected water use for all facilities or projects that are planned to be operating, at some future date, would determine the future water requirements.

Comment Code: Private Citizen 46-29

Location of EIS Revision(s): None required
Response: The decision to retain, reallocate, or dispose of special-use airspace presently delegated to the DOE for NTS activities will be based on current and future DOE and Nellis Air Force Base requirements and the Federal Aviation Administration's review of these requirements relative to national airspace system needs.

Comment Code: Private Citizen 46-30

Location of EIS Revision(s): Volume 2, Chapter 4, Section 4.11

Response: Incorrect text has been deleted, and clarification has been added. The DOE has recognized in previous responses, the location of the Area 13 in Lincoln and Nye Counties. The DOE has not however, taken any actions that would affect viewsheds in Nye or Lincoln Counties.

Comment Code: Private Citizen 46-31

Location of EIS Revision(s): None required

Response: The *Resource Management Plan* deals with resources located on the NTS. Transportation of materials to the NTS is beyond the scope of the plan. The Transportation Protocol Working Group was established to facilitate discussion of transportation issues relating to the NTS. The DOE has met with the Transportation Protocol Working Group and will continue to meet three times each year to discuss these and other transportation issues.

Comment Code: Private Citizen 47-1

Location of EIS Revision(s): None required

Response: The DOE believes that the range of alternatives considered in this EIS bounds the alternative suggested. An entire spectrum of activities was evaluated, including the commentor's suggested activities. Section 3.2.4 provides more information on "Other Alternatives Within the Range of Alternatives Considered." Section 3.2.1 describes "Site Uses Defined by Program," other alternatives eliminated from consideration because the DOE needs a multiuse site that can support evolving missions.

Comment Code: Private Citizen 47-2

Location of EIS Revision(s): None required

Response: Non-radioactive chemicals will be included in present and future studies at the NTS. However, in 1992 the Secretary of Energy called for a fundamental shift in the DOE's waste generation and management policy from pollution control to pollution prevention. As a result, the DOE instituted a Waste Minimization and Pollution Prevention Program comprised of four main principles: source reduction, recycling, waste treatment, and disposal. If non-radioactive chemicals need to be used at the NTS, every effort will be made to use the principles identified above so that impacts from any of these materials can be mitigated. For example, the DOE has implemented effective recycling programs for steam-cleaning materials to recycle solvents. In addition, the DOE uses process modification for washing parts that completely eliminate the need for a hazardous material. The DOE also substitutes more environmentally friendly products for hazardous ones.

Should the DOE need to use a product that contains hazardous materials, and cannot employ any of the methods described above, the DOE will comply with existing environmental regulations. The DOE is committed to protecting the environment and public health, while securing cost savings through its waste minimization programs.

Comment Code: Private Citizen 47-3

Location of EIS Revision(s): None required

Response: Based on process knowledge from the testing operations, data from limited newly installed monitoring wells, annual data collected from all NTS potable water wells, and future volatile organic compound analysis (which includes trichloroethylene), specific trichloroethylene analysis is not planned for all water studies done at the NTS. Annual volatile organic compound analysis will be continued for all NTS potable water wells.

Comment Code: Private Citizen 47-4

Location of EIS Revision(s): None required

Response: Hazardous wastes that are stored on the NTS prior to on-site or off-site treatment are fully characterized and logged into the NTS waste-tracking database. The characterization data along with the location of the waste package are maintained in the facilities operating record and are subject to inspection by the Nevada Division of Environmental Protection.

Mixed waste and transuranic waste packages are placed in storage containers that are stored in the Transuranic Waste Storage building. The storage containers are tracked as to their location in the Waste Storage building and the cumulative contents of each container. The contents of many of the packages in the storage containers have not been fully characterized. These particular packages must be breached and analyzed to determine their contents. This activity, due to the presence of a radioactive component, must occur in a controlled area. As presented in the NTS EIS under Alternative 3, Appendix A, Section A.2.3.2, the DOE is planning to construct a Waste Examination Complex to provide a safe, environmentally protective facility to breach and sample these particular packages. As the contents of each package is determined, these data will be maintained in the facility's operating record.

Comment Code: Private Citizen 47-5

Location of EIS Revision(s): None required

Response: Storage of waste at the NTS is conducted in controlled areas with secondary containment, leak detection capabilities, and emergency response equipment. As new technologies are developed, their applicability to the NTS storage facilities are evaluated.

Comment Code: Private Citizen 47-6

Location of EIS Revision(s): None required

Response: For more than 45 years, the primary mission of the DOE, and its predecessor agencies, has been to produce nuclear weapons and to promote energy security and peaceful use of nuclear power. This resulted in the generation of a wide variety of radioactive and hazardous wastes. To reflect the changing priorities of our Nation, this mission has been refocused from weapons production to energy research, and environmentally conscious technology development. One new and important focus of the DOE is the cleanup of previously generated waste, and the reduction of newly generated waste at all DOE sites.

In a memorandum dated August 20, 1992 (Watkins, 1992), the Secretary of Energy called for a fundamental shift in the DOE's waste generation and management policy from pollution control to pollution prevention. This was established to avoid or reduce the generation of hazardous substances, pollutants, wastes, and contaminants at the source; recycle or reuse pollutants which cannot be eliminated; treat the remaining waste to reduce volume, toxicity, or mobility before storage or disposal; and dispose of residual waste in an environmentally sound manner.

The DOE has made significant progress in establishing its waste minimization and pollution prevention program. In addition, a continuous effort will be made by the DOE to improve and expand this program. The DOE is committed to protecting the environment and public health, while securing cost savings for taxpayers through its waste minimization programs.

Comment Code: Private Citizen 47-7

Location of EIS Revision(s): None required

Response: The DOE, in accordance with the Pollution Prevention Act of 1990 and relevant DOE policies, has developed complex-wide waste minimization plans and programs to eliminate or minimize the generation of waste. As a result of this process, the Annual Report on Waste Generation and Waste Minimization Progress is prepared by the DOE (DOE/NV, 1992). This report provides a discussion of the DOE's progress in improving the management of its wastes.

In a memorandum dated August 20, 1992 (Watkins, 1992), the Secretary of Energy called for a fundamental shift in the DOE's waste generation and management policy from pollution control to pollution prevention. A waste minimization hierarchy, consistent with the Pollution Prevention Act of 1990, was established. This hierarchy includes the implementation of such practices as source reduction, recycling, waste treatment, and if necessary, residual waste disposal.

Specifically, neutralization is considered part of the treatment process. The DOE treats its wastes, whenever and wherever feasible, to change the physical, chemical, or biological character or composition of the waste to (a) render it non-hazardous; (b) safely transport, store, or dispose of it; (c) reduce its volume; or (d) recover energy or material resources from it.

The DOE is committed to protecting the environment and public health while securing cost savings for taxpayers through its waste minimization programs.

Comment Code: Private Citizen 47-8

Location of EIS Revision(s): None required

Response: Much work remains to be accomplished before environmental restoration criteria and standards can be established. Cleanup levels are established through a number of mechanisms. In some cases, these are defined by statute or regulation. In others, agreements with regulatory agencies establish the criteria. The DOE anticipates that many cleanup levels will be established through the land use planning process as potential future uses are defined. This, in turn, will feed into the Federal Facility Agreement and Consent Order process. That process will include a complex risk evaluation. The Federal Facility Agreement and Consent Order requires the development of a Corrective Action Decision Document which will provide the rationale for the selected clean-up level based on investigation activities, costs, and risk to receptors based in conjunction with potential future land uses. Appendix V of the Federal Facility Agreement and Consent Order contains additional information on the methods for continually providing information and for actively seeking public input concerning DOE and DoD activities undertaken pursuant to the Agreement. Public participation objectives include working with the Community Advisory Board on specific Environmental Management issues, conducting public meetings for specific remediation activities, providing more opportunities for public interaction through planned outreach activities, increasing opportunities for the public to comment on important documents, and others. As the commentor notes, public debate has already commenced and will assist in eventually defining restoration criteria and standards.

Comment Code: Private Citizen 47-9

Location of EIS Revision(s): None required

Response: Any need by the DOE to reclaim returned lands would require a new withdrawal process. If the DOE decides to relinquish some of the NTS, the applicable Department of the Interior procedures, as well as DOE property-disposal regulations would be followed. As caretaker of the public lands, the Department of the Interior would have to accept the lands prior to redistribution to another entity.

Comment Code: Private Citizen 47-10

Location of EIS Revision(s): None required

Response: The DOE typically prepares site-wide EISs to analyze 5- to 10-year timeframes because the DOE believes that potential programs and projects planned for that far in the future are reasonably capable of being defined and analyzed. Environmental restoration of the NTS will take approximately 30 years to complete. Projects not completed or begun within the 5- to 10-year period will be completed in the ensuing decades.

Comment Code: Private Citizen 47-11

Location of EIS Revision(s): Figure S-1, Figure 4-1, Appendix H (Figure 1-1), and Appendix I (Figure 1-2)

Response: The figures have been revised to include Pahrump and Amargosa Valley.

Comment Code: Private Citizen 47-12

Location of EIS Revision(s): Summary

Response: The comment is correct, and the word "and" will be removed.

Comment Code: Private Citizen 47-13

Location of EIS Revision(s): None required

Response: Defense Program activities are assigned responsibility for weapons testing, which is the primary mission of the NTS. There are no plans to change this responsibility.

Comment Code: Private Citizen 47-14

Location of EIS Revision(s): None required

Response: The DOE estimated that it would take about 2 years to develop a *Resource Management Plan* because of the large number of resource issues included in the plan, and the extensive coordination required with other agencies.

Comment Code: Private Citizen 47-15

Location of EIS Revision(s): None required

Response: The amount of time required varies. The DOE missions are defined by the U.S. Congress and the president based on national priorities. Potential environmental impacts that could result from changes in missions will be assessed in compliance with the National Environmental Policy Act.

Comment Code: Private Citizen 47-16

Location of EIS Revision(s): None required

Response: The *Resource Management Plan* deals with resources available on the NTS. Discussion of the technologies required for existing and proposed missions is beyond the scope of the plan; however, if development and testing of waste management technologies is selected as a mission for NTS, the resources on the site required for that mission will be included in the *Resource Management Plan*. Transport of materials to the NTS is beyond the scope of the *Resource Management Plan*.

Comment Code: Private Citizen 47-17

Location of EIS Revision(s): None required

Response: The Emergency Response Team is considered an existing mission on the NTS. The resources required by that mission will be considered during development of the *Resource Management Plan* as described in Section 4.1 of the *Resource Management Plan*.

Comment Code: Private Citizen 47-18

Location of EIS Revision(s): None required

Response: According to Beatley (1976), about 125 species of plants on the NTS (about 12 percent of all plant species found on the NTS) are exotic species. An exotic species is one that did not evolve or originate on or in the region around the NTS. Most exotic species found on the NTS are Eurasian. Some of the most common are red brome (*Bromus rubens*), tumbleweed (*Salsola iberica*), stork's bill (*Erodium cicutarium*), and tumble mustard (*Sisymbrium altissimum*).

Comment Code: Private Citizen 47-19

Location of EIS Revision(s): None required

Response: Indian lands are not federal lands. Indian lands are all lands within the exterior boundaries of any Indian reservation or dependent Indian community. Federal lands are any lands (other than Indian lands) which are controlled or owned by the United States. The DOE has no information about the previous ownership of private lands.

Comment Code: Private Citizen 47-20

Location of EIS Revision(s): None required

Response: There have been studies conducted to characterize the invertebrate fauna on the NTS, but there has never been a requirement, nor has it been a priority, for the DOE to characterize invertebrate fauna well enough to determine if there are any species unique to the NTS. Step 4 of Section 2.1 includes a description of how the DOE will prioritize future data collection needs.

Comment Code: Private Citizen 47-21

Location of EIS Revision(s): None required

Response: Levels of radiation in game animals and potential health risks will be considered before hunting is ever allowed on the NTS.

Comment Code: Private Citizen 47-22

Location of EIS Revision(s): None required

Response: Section 3.3.3 of the *Resource Management Plan* states: goals will be selected based on appropriate timeframes so that long-term impacts can be adequately evaluated and mitigated, if possible. For example, to minimize land disturbances that will take long periods to recover, the DOE is adding a goal in Section 4.4 ("Land") to minimize disturbances of previously undisturbed land.

Comment Code: Private Citizen 47-23

Location of EIS Revision(s): None required

Response: The partnership list only contains one example, not a complete list of partnerships or groups with which the DOE must communicate. The DOE will strive to communicate with interested and affected governments such as Lincoln and Nye Counties. To avoid conflicts and development of mutually exclusive goals by different partnerships, the DOE will use the National Environmental Policy Act process to evaluate the impacts of its actions so that all interested parties will have an opportunity to influence the decisionmaking process. In the example cited by the commentor, the DOE would take appropriate actions under Federal Land Use Policy.

Comment Code: Private Citizen 47-24

Location of EIS Revision(s): None required

Response: The DOE has not identified the member requirements of the interdisciplinary team required to implement the *Resource Management Plan* and ecosystem management on the NTS. It is likely that it will include representatives from a variety of disciplines representing nearby land managers and other interested parties. The DOE will consider all comments received concerning the composition of this team.

Comment Code: Private Citizen 47-25

Location of EIS Revision(s): None required

Response: The risk assessments, which will be developed by the DOE, will identify the areas that are of greatest importance. The DOE will consider requests by the Community Advisory Board or other organizations for review of those risk assessments.

Comment Code: Private Citizen 47-26

Location of EIS Revision(s): None required

Response: The management actions described in this Plan can be modified as soon as changes are identified. The actions necessary to implement changes to the Plan may be constrained by available funding. The Plan will be reviewed and modified in accordance with the DOE's National Environmental Policy Act policy (10 CFR 1021) as described in Section 1.4. That process will include public participation.

Comment Code: Private Citizen 47-27

Location of EIS Revision(s): None required

Response: The *Resource Management Plan* will be used to evaluate the impacts of activities proposed in other EISs, as stated in Section 1.3.4. If new missions discussed in those EISs are selected for the NTS, their resource requirements will be added as described in Section 4.1.

Comment Code: Private Citizen 47-28

Location of EIS Revision(s): None required

Response: When land is withdrawn from public use and reserved for a federal purpose, the government's right to water is conveyed as an accompaniment to the withdrawal. As noted in the NTS EIS in Section 4.1.1.1, the NTS is on withdrawn land and jurisdiction is assigned to the DOE, a federal agency. The DOE expects to continue to be the responsible federal agency into the future and no change in the water rights is anticipated.

Comment Code: Private Citizen 47-29

Location of EIS Revision(s): None required

Response: Mining is not being considered under any of the alternatives of the NTS EIS. The NTS has been withdrawn from all appropriation under the public land laws, including mining and mineral leasing laws. If the DOE relinquishes land, it would be transferred to the Department of the Interior. The Department of the Interior would administer those lands according to appropriate federal land-use policies.

Comment Code: Private Citizen 47-30

Location of EIS Revision(s): None required

Response: The preferred alternative does not include any land releases. Should any land be designated for release in the future, it would be transferred to the Department of the Interior. The Department of the Interior would administer those lands according to appropriate federal land-use policies.

Comment Code: Private Citizen 47-31

Location of EIS Revision(s): None required

Response: Live air drops are possible as part of the Work for Others Program and defense-related research and development, under Alternatives 1 and 3, as described in Appendix A, Section A.5. Restrictions would be implemented over contaminated areas for military flights and operations to prevent resuspension of contaminated soils, and minimize impacts on existing and proposed missions. Additional restrictions may result from safety and hazard assessments conducted for specific activities.

Comment Code: Private Citizen 47-32

Location of EIS Revision(s): Chapter 4, Section 4.11

Response: Nye County was included only as one example of the local governments with which the DOE will cooperate. However, the DOE agrees that other counties and communities should be mentioned because they also may be affected. The text will be modified to mention other surrounding communities.

Comment Code: Private Citizen 47-33

Location of EIS Revision(s): None required

Response: Community Reuse Organizations have been established at various DOE sites. The Community Reuse Organization for the NTS is called the NTS Development Corporation; however, because it is a Community Reuse Organization, it will be labeled as such in this document.

Comment Code: Private Citizen 47-34

Location of EIS Revision(s): Appendix A, Sections A.4.1.3, A.4.3.3 and A.4.4.3; Chapter 3, Sections 3.1.3.4 and 3.1.4.4; and Chapter 5, Sections 5.1, 5.3.1.6, and 5.4

Response: The project identified by the commentor is the Alternative Fuels Demonstration Project. Under Alternatives 1, 3, and 4, the DOE would continue to support the 16 DOE-owned vehicles already converted to compressed natural gas, and continue developing a formal proposal for the conversion of the original manufacturer's equipment in the vehicle fleet. Under Alternative 3, the DOE would also construct a fueling facility for converted vehicles at the NTS. The DOE would further develop partnerships geared to study other alternative fuel and energy sources.

Comment Code: Private Citizen 47-35

Location of EIS Revision(s): None required

Response: If Alternative 4 is selected, the DoD would have to select another location for conventional weapons demilitarization activities.

Comment Code: Private Citizen 47-36

Location of EIS Revision(s): None required

Response: If the DOE decides to relinquish some of the NTS lands, the applicable Department of the Interior laws and regulations as well as DOE property disposal regulations would be complied with.

Comment Code: Private Citizen 47-37

Location of EIS Revision(s): None required

Response: The nuclear era museum is a potential project included under Alternative 4. Current conceptions of this museum would involve existing facilities used during aboveground and underground testing. No construction on the NTS is anticipated. Nye County has proposed an off-site museum and has requested DOE partnership.

Comment Code: Private Citizen 47-38

Location of EIS Revision(s): None required

Response: The DOE would most likely continue to provide free transportation to the NTS for DOE-sponsored field trips. The current health and safety constraints would continue to apply. Under Alternative 4, there would be no defense-related activities at the NTS, and therefore security would focus on prevention of damage to the property infrastructure and exclusion from contaminated areas. Field trips would present minimal impact to the security operations envisioned under Alternative 4.

Comment Code: Private Citizen 47-39

Location of EIS Revision(s): None required

Response: Public use of the Timber Mountain Caldera could only happen if the DOE relinquished land to the Department of the Interior. The Department of the Interior would then be responsible for managing those lands, and for providing services to the public using those lands, if the Department of the Interior makes the land available for public use. Currently, the DOE does not specifically monitor referenced petroglyphs, but remains committed to protecting cultural resources at the NTS.

Comment Code: Private Citizen 47-40

Location of EIS Revision(s): None required

Response: Activities such as car races were identified as alternative public uses of the NTS lands. Public activities on the NTS would be subject to appropriate environmental, safety, security, and health requirements.

Comment Code: Private Citizen 47-41

Location of EIS Revision(s): None required

Response: Activities such as foot or bicycle races were identified as alternative public uses of NTS lands. Under Alternative 4, public activities on the NTS would be subject to appropriate environmental, safety, security, and health requirements.

Comment Code: Private Citizen 47-42

Location of EIS Revision(s): Chapter 3, Section 3.2.2

Response: With updated work on the baselining process, this date has been changed to 2035. This date was derived from a consideration of several parameters and is driven by the schedule for the Underground Test Areas characterization work and associated model development. The only remediation activity excluded is remediation of the underground nuclear test cavities. The ending date is based on current funding levels of $60 million per year. Reduced funding levels would cause the end date to move further out. Remediation levels were not accounted for in the calculation since they have not yet been determined. A timetable for

Comment Code: Private Citizen 53-7

Location of EIS Revision(s): None required

Response: The sentence conveys the meaning intended; that is, impacts will be minimized. Therefore, no textual change is required.

Comment Code: Private Citizen 53-8

Location of EIS Revision(s): None required

Response: The NTS EIS examines a 10-year planning period to be able to discuss both short-term (up to 5 years) and long-term (5 to 10 years) potential projects. However, the NTS EIS and the *Resource Management Plan* will be reviewed in five years from the publication of the *Record of Decision*, and every five years thereafter, according to DOE policy (10 CFR 1021). The "Affected Environment" section (Chapter 4) of this EIS presents current conditions at the NTS and its associated sites, including changes in resources that have occurred since the previous NTS EIS was published.

Comment Code: Private Citizen 53-9

Location of EIS Revision(s): None required

Response: The scope of the NTS EIS includes only those sites inside the state of Nevada where DOE is considering programmatic changes. This includes the NTS, the Tonopah Test Range, portions of the Nellis Air Force Range Complex, and the proposed Solar Enterprise Zone sites at the NTS, Dry Lake Valley, Eldorado Valley, and Coyote Spring Valley. The facilities located in Las Vegas and at Nellis Air Force Base are included in the NTS EIS as part of the programs they support. Many of the site support activities are discussed in Volume 1, Appendix A, Section A.6. Facilities outside of the state of Nevada are not within the scope of this EIS.

Comment Code: Private Citizen 53-10

Location of EIS Revision(s): None required

Response: Waste management strategies for remediation waste from the Nevada Environmental Restoration Projects, other than those located in Nevada, should not have been discussed in the *Implementation Plan for the Nevada Test Site Environmental Impact Statement* due to the lack of characterization data. These data must be obtained to determine the quantity, type, and disposition of any waste. The potential to generate waste is too speculative at this time and, therefore, this is not presented in the Final NTS EIS.

of stockpile stewardship policies is discussed in Section 2.2 of the NTS EIS. Further discussion on the relationship of treaties to the Stockpile Stewardship Program is contained in Section 2.2, "National Security Policy Consideration," of the Draft Programmatic EIS for Stockpile Stewardship and Management.

Section 2.4 of the Draft Programmatic EIS for Stockpile Stewardship and Management states, "The United States has stopped the development and production of new design nuclear weapons."

Comment Code: Private Citizen 53-4

Location of EIS Revision(s): None required

Response: This bullet remains in place in the Final NTS EIS. The NTS is under consideration for a solar energy production facility.

The Alternative Fuels Demonstration Project is also underway, and could be expanded under Alternative 3.

Comment Code: Private Citizen 53-5

Location of EIS Revision(s): None required

Response: The DOE withdrew its Defense Programs Home Page from the World Wide Web on March 20, 1996. This action was in response to the discovery that part of the information from the Office of Research and Inertial Fusion came from a number of sources, some of which were badly out of date. From the information provided, it could be construed that the DOE nuclear weapons laboratories, contrary to currently stated policy, are presently investigating major changes to existing nuclear warheads, as well as new weapons designs.

The DOE has no requirement to design or produce new weapons and is not performing such activities. It is charged with preserving the safety and reliability of existing nuclear weapons and maintaining the capability to design new weapons, if requested by the DoD. The DOE's current Stockpile Stewardship project is fully described in the Draft Stockpile Stewardship and Management Programmatic EIS, dated February 1996 (DOE, 1996a).

Comment Code: Private Citizen 53-6

Location of EIS Revision(s): None required

Response: The DOE/NV is not being held responsible for waste management operations in other states. Some wastes that are generated at other DOE-approved facilities across the United States are transported to, and managed at, the NTS.

assessments will define the levels and extent of contamination, ascertain the potential human health or environmental exposure to the contamination, and compare the exposure to established standards for protection of human health and the environment.

Comment Code: Private Citizen 50-1

Location of EIS Revision(s): None required

Response: The commentor's recommendation that Alternative 2 be adopted is noted.

Comment Code: Private Citizen 51-1

Location of EIS Revision(s): None required

Response: Refer to the discussion in Section 1.2 of Volume 3.

Comment Code: Private Citizen 52-1

Location of EIS Revision(s): None required

Response: Support for closure of the NTS is noted.

Comment Code: Private Citizen 53-1

Location of EIS Revision(s): None required

Response: The size of the NTS is correct as written. In many places in the NTS EIS, the size has been rounded to the nearest 100.

Comment Code: Private Citizen 53-2

Location of EIS Revision(s): None required

Response: The DOE does not agree that other facilities need to be mentioned on this summary page. Facilities in other states were excluded because as stated in Chapter 1 Introduction, the scope of the NTS EIS includes only activities in Nevada.

Comment Code: Private Citizen 53-3

Location of EIS Revision(s): None required

Response: Subcritical experiments are part of the Stockpile Stewardship Program which is intended to assure the continued reliability of the nuclear weapons stockpile. The relationship of the NTS activities in support

Comment Code: Private Citizen 49-4

Location of EIS Revision(s): None required

Response: The DOE agrees with the commentor and has programs in place that evaluate the risks to any water supplies in potentially affected areas. Las Vegas water supplies are not drawn from areas impacted by the actions at the NTS, thus no specific evaluations are planned.

Comment Code: Private Citizen 49-5

Location of EIS Revision(s): None required

Response: The DOE agrees with the commentor and has programs in place that continue to conduct field investigations and modeling to improve the understanding of the groundwater flow regime. Many of the actions considered within the NTS EIS will provide valuable new information.

Comment Code: Private Citizen 49-6

Location of EIS Revision(s): None required

Response: The DOE is required by their internal orders to establish site-level safety limits for the public, the environment, and the workers at each site where radioactive waste is disposed. These site-level safety limits are enforced by setting radionuclide concentration limits on a per-pit, trench, or subsidence crater basis. The DOE tracks waste volumes from each of their generators, and the quantities of waste placed in each disposal unit. They document how they are meeting these safety limits in the disposal site's performance assessment. The performance assessment contains information on the site hydrogeology and geology, as well as information on how radionuclides could be transported through the soil by liquid, vapor, or gas. The information in the performance assessment is continually updated for waste quantities and site-monitoring information on a periodic basis. The adverse impact from disposal of radioactive waste is a permanent removal of land from future use. There are no known long term or wide-spread effects beyond this permanent withdrawal of land. No contamination of the groundwater is expected.

Comment Code: Private Citizen 49-7

Location of EIS Revision(s): None required

Response: Contaminated sites have been identified and are the subject of ongoing site characterization. The existing information is included in this EIS. Several contaminated sites have already been closed as part of the Environmental Restoration Program, and others are being worked on at the present. The DOE is committed to the goal of remediating contaminated sites to ensure that risks to the environment and to human health and safety are either eliminated or reduced to protective levels. A description of Environmental Restoration Program activities can be found in Volume 1, Appendix A, Section A.3.

Specific investigations and risk assessments are being conducted for each corrective action unit (grouping of environmental restoration sites) located at the following sites: the NTS, the Nellis Air Force Range Complex, the Tonopah Test Range, Central Nevada Test Area, and the Project Shoal Area. These investigations and

Comment Code: Private Citizen 48-1

Location of EIS Revision(s): None required

Response: The commentor's request for a copy of the Final NTS EIS has been noted.

Comment Code: Private Citizen 49-1

Location of EIS Revision(s): None required

Response: A cooperating agency may be any federal, state, or local agency other than the lead agency that has jurisdiction by law or special expertise with respect to environmental impacts expected to result from a proposal (40 CFR 1501.6). American Indian tribes are sovereign nations, not federal, state or local agencies. Four federal agencies and one local agency served as cooperation agencies with the DOE/NV: the DoD, the U.S. Air Force Base; the DoD, Defense Nuclear Agency; the Department of Interior, the U.S. Fish and Wildlife Service; the Department of Interior, Bureau of Land Management; and Nye County. The contribution of cooperating agencies is discussed in Chapter 8 of the NTS EIS.

Although American Indian tribes are not cooperating agencies in this EIS, the DOE believed it was important for these groups to participate in the preparation of the NTS EIS. One March 17-19, 1995, representatives of the Consolidated Group of Tribes and Organizations (CGTO) met with DOE/NV personnel. The CGTO recommended that two representatives from the Western Shoshone, Owens Valley Paiute, and Southern Paiute be appointed to write the American Indian perspective for the NTS EIS. Richard Arnold, executive director of the Las Vegas Indian Center, coordinated the activities of the American Indian Writers Subgroup. The DOE/NV accepted this recommendation, offering to compensate the writers for their services and travel expenses, and to provide the American Indian Writers Subgroup with the funding, technical assistance, and resources needed to write the American Indian perspective on the NTS EIS. The sections prepared by this group appear in italics where appropriate in the NTS EIS and also appear in Appendix G. Chapter 8 and Appendix G contain details of the coordination effort between the DOE/NV and the CGTO.

Comment Code: Private Citizen 49-2

Location of EIS Revision(s): None required

Response: See response to Comment Code Private Citizen 56-5.

Comment Code: Private Citizen 49-3

Location of EIS Revision(s): None required

Response: The DOE agrees with the commentor and will be evaluating the effect of groundwater contamination on Amargosa Valley and Death Valley through the hydrology monitoring program.

discrete activities has been identified for 1996 through 2001. For 1996 through 1998, activities are defined, for 1999 through 2001 they are proposed, and beyond 2001 they are projected. The projection beyond 2001 is based on estimated Corrective Action Sites completed per fiscal year. As the extent of contamination is determined, these estimates will be refined.

Comment Code: Private Citizen 47-43

Location of EIS Revision(s): Chapter 2, Sections 2.5.6.1 and 2.5.6.2

Response: It is the nature of the subsidence craters that the radioactive contamination is largely contained in the immediate vicinity of the cavity, several hundred feet below the ground. Site characterization activities at Area 3 include drilling into the rubble zone leading between the disposal cavity and the surface, and taking samples for radioactive contamination. These samples are also analyzed for porosity, water content, and other characteristics to further understand how water passes through the underground environment. In addition, a monitoring system will be established to monitor beneath the disposal cell for evidence of radionuclide migration.

The disposal containers (the NTS does not refer to the waste containers as storage containers because they are not intended to be retrieved) are subject to disposal site requirements such as strength and size, and additional U.S. Department of Transportation packaging requirements for strong, tight containers carrying radioactive materials. These requirements ensure the safety of the package during transportation and handling. There are no specific criteria for disposal of containers in contaminated soil, because the containers are not being placed in contaminated soil.

It is soil moisture, not radioactive contaminants that cause the decomposition of the disposal container. Since the containers will eventually decompose, the risks are calculated using no container at all so that the model is calculated on a worst-case scenario. As mentioned above, the containers are subject to the U.S. Department of Transportation requirements that ensure safe shipping and handling of radioactive materials.

Comment Code: Private Citizen 47-44

Location of EIS Revision(s): None required

Response: With the natural drainage pattern restored, the water will flow into Yucca Lake, where it will be absorbed into the ground or evaporate.

Comment Code: Private Citizen 47-45

Location of EIS Revision(s): None required

Response: Groundwater taken from a limited number of wells during the Underground Test Area Project has been analyzed for volatiles, including tichloroethylene; however, Underground Test Area Project wells have not been drilled in Area 5. Monitoring wells have been drilled around the Radioactive Waste Management Site in Area 5. Analysis of these samples has not provided any indication of the presence of radioactive nor hazardous constituent (including trichloroethylene) contamination in the groundwater. Wells in Area 5 are sampled, and analyzed for hazards that could reasonably be expected, on a regular basis.

Comment Code: Private Citizen 53-11

Location of EIS Revision(s): None required

Response: Activities at the off-site locations range from long-term monitoring to ongoing characterization and remediation. Local community involvement varies with the type and intensity of activity which is occurring. As projects move into the characterization and remediation phases, extensive involvement with state and local levels is implemented. At the local level, this is accomplished through public meetings, circulation of draft plans, and one-on-one discussions with those most affected and interested.

Required National Environmental Policy Act analysis and documentation is completed at the appropriate time and level (i.e., categorical exclusion, environmental assessment, or environmental impact statement) for the off-site locations, before work begins. Preliminary surveys for threatened and endangered species, flood plains and wetlands, and cultural resources have been completed for most of the off-site locations. As more work is planned for each site, any necessary additional levels of these surveys would be completed.

Comment Code: Private Citizen 53-12

Location of EIS Revision(s): None required

Response: As stated in Chapter 1, " Introduction," the scope of the NTS EIS includes only those sites inside the state of Nevada where DOE is considering programmatic changes. This includes the NTS, the Tonopah Test Range, portions of the Nellis Air Force Range Complex, and the proposed Solar Enterprise Zone sites at the NTS, Dry Lake Valley, Eldorado Valley, and Coyote Spring Valley. The facilities located in Las Vegas and at Nellis Air Force Base are included in the NTS EIS as a part of the programs they support. Many of the site support activities are discussed in Volume 1, Appendix A, Section A.6. Facilities outside the state of Nevada are not within the scope of this EIS.

Comment Code: Private Citizen 53-13

Location of EIS Revision(s): None required

Response: The intent of Figure 4-3 is to depict lands that were withdrawn for DOE use in connection with the NTS. As stated in the NTS EIS, lands withdrawn under Public Land Order 1662 are used by the DoD for their ongoing operations and are not considered in this EIS for any alternative use by the DOE.

Comment Code: Private Citizen 53-14

Location of EIS Revision(s): None required

Response: Figure S-1 and similar maps in the NTS EIS are drawn to a very large scale and are not intended to show precise boundaries.

Comment Code: Private Citizen 53-15

Location of EIS Revision(s): None required

Response: Figure S-1 and similar maps in the NTS EIS are drawn to a very large scale and are not intended to show precise boundaries. The boundary between the NTS and Pahute Mesa is shown on the more detailed maps in Chapter 3 of the NTS EIS.

Comment Code: Private Citizen 53-16

Location of EIS Revision(s): None required

Response: The DOE's missions on the NTS are decided by the U.S. Congress and the DOE, based on national priorities. Changes in mission will be made in compliance with the procedures of the National Environmental Policy Act. However, the DOE is also committed to minimizing its impacts on the natural resources of the NTS, as reflected in the Land- and Facility-Use Management Policy. By implementing this policy through the development of the *Resource Management Plan*, the DOE will attempt to balance protection of the natural environment on the NTS with its primary missions.

Comment Code: Private Citizen 53-17

Location of EIS Revision(s): None required

Response: See response to Comment Code Private Citizen 53-5.

Comment Code: Private Citizen 53-18

Location of EIS Revision(s): None required

Response: The text states that NTS serves as a "disposal site for low-level waste generated by DOE-approved generators and as a storage site for a limited amount of transuranic mixed waste." The amount of transuranic mixed waste stored on the Area 5 Transuranic Waste Storage Pad is limited to the current NTS inventory and transuranic waste generated as a result of on-site environmental restoration. There are no plans for additional transuranic waste storage capacity at this time.

Comment Code: Private Citizen 53-19

Location of EIS Revision(s): None required

Response: Section 2.4.2 acknowledges that classified waste is managed at the NTS. Please note that referring to a waste as "classified" denotes low-level waste weapons components and assemblies designated by the U.S. Government, pursuant to executive orders, statutes, or regulations that require protection against unauthorized information or material disclosure for reasons of national security. Additional security and safeguards management activities are required in the handling of these materials. In all other characteristics, this waste is similar in radionuclide content and physical makeup to the other waste accepted for disposal.

The estimated volumes of classified low-level waste to be managed at the NTS are included in the estimates for low-level waste. The location of this waste is included in the analyses for the Radioactive Waste Management sites. Specifics regarding the amount for each radionuclide may be classified and are not available for publication in the sitewide EIS.

Comment Code: Private Citizen 53-20

Location of EIS Revision(s): Glossary (see Comment Code State Government 2-58)

Response: The following definition has been added to the Glossary as requested:

Protective levels are defined as those levels which would meet acceptable human health and risk factors based on future land uses, as established through the Federal Facility Agreement and Consent Order process.

The techniques to achieve protective levels would vary with respect to the type of site, contaminant(s), technology, and other factors which would be taken into consideration at the time remediation plans are being developed. The length of time that protective measures would need to be maintained is similarly dependent on the preceding factors. Consequently, closure techniques and their required duration are more appropriately identified and discussed when site-specific remediations are being developed.

Comment Code: Private Citizen 53-21

Location of EIS Revision(s): Summary, "Purpose and Need"

Response: Text has been added to this section to identify the Nevada Environmental Restoration Project. The documentation and references associated with this ongoing project are too numerous to mention in this EIS, and particularly in the Summary. However, the DOE maintains public reading rooms in which the documentation and references for the Environmental Restoration Program are located. The list of locations of the public reading rooms is in Appendix C, "Public Participation Meetings and Public Reading Rooms," for the *Implementation Plan for the Nevada Test Site Environmental Impact Statement.*

Comment Code: Private Citizen 53-22

Location of EIS Revision(s): None required

Response: The DOE's mission priorities are mandated by statute, Presidential direction, and Congressional authorization and appropriation to ensure that the DOE serves the nation's needs. However, Alternatives 2 and 4 assume the total or partial cessation of current activities at the NTS.

Comment Code: Private Citizen 53-23

Location of EIS Revision(s): None required

Response: Alternative 2 was added in response to comments received during the public scoping period. It also provides a lower bound for the range of alternatives that the DOE is considering, by enabling the DOE to analyze the impact of not performing environmental restoration work in contrast to the alternatives that identify the impact of performing the work.

Comment Code: Private Citizen 53-24

Location of EIS Revision(s): None required

Response: The alternative selected for implementation by the DOE in the Record of Decision for this EIS, which may consist of a hybrid of the specific options evaluated for the various alternatives, will be adhered to. The Record of Decision will define the DOE and interagency programs, activities, and operations that will be implemented under the preferred alternative, and the mitigation measures, monitoring, or other conditions that are adopted as part of the DOE's decision. The DOE, like any other federal agency, is held accountable under the principles of federal administrative law, for carrying out the actions set forth in the Records of Decision. An agency must comply with its own decisions and regulations once they are adopted. In addition, implementation of specific programs, activities, and operations evaluated in this document may also be subject to further review under the National Environmental Policy Act.

Comment Code: Private Citizen 53-25

Location of EIS Revision(s): None required

Response: The maps are correct and reflect present and future planning zones for planned DOE activities at the NTS. As indicated in response to Comment Code Private Citizen 53-13, this area is presently being used by the DoD for ongoing operations and is not considered in this EIS for any alternative use by the DOE.

Comment Code: Private Citizen 53-26

Location of EIS Revision(s): Chapter 1, Section 1.4

Response: The comment concerning the continued use of Pahute Mesa by the DOE is noted. A statement has been added to Section 1.4 under "Nellis Air Force Range Complex EIS" that DOE operations on Pahute Mesa could be affected by decisions associated with the Nellis Range EIS.

Comment Code: Private Citizen 53-27

Location of EIS Revision(s): None required

Response: Past and present land use provide a baseline and a basis for projecting the impacts of the No Action Alternative. A range of other land uses are addressed in the other alternatives.

Comment Code: Private Citizen 53-28

Location of EIS Revision(s): None required

Response: Refer to Comment Code Private Citizen 53-19.

Comment Code: Private Citizen 53-29

Location of EIS Revision(s): None required

Response: Under Alternative 2, the DOE would discontinue the Waste Management Program after the NTS waste-generating activities are completely shut down. The DOE acknowledges that legal agreements, state and federal laws, and regulations may need to be changed to implement this alternative.

Comment Code: Private Citizen 53-30

Location of EIS Revision(s): None required

Response: The underground test areas on the NTS have been joined together as the Underground Test Area Corrective Action Unit. This was done because most of the tests were located in physically close groupings and are geographically related on the NTS and its groundwater systems. They are logically addressed together for funding, planning, and characterization purposes. The two off-site locations in Nevada as well as those in the other states are physically and hydrogeologically separated and would be characterized individually. Project Shoal is a separate Corrective Action Unit and the Central Nevada Test Area is being planned as two Corrective Action Unit, one applying to the underground aspects and the other to the surface contamination issues. Consideration is being given to a similar division at the other state offsites.

The reason for the transfer from the Comprehensive Environmental Response, Compensation, and Liability Act regulatory framework to the Resource Conservation and Recovery Act regulatory framework is that the Environmental Protection Agency deferred action on the DOE's Hazard Ranking System scoring package. Without action on the scoring package, there is no decision regarding listing of the sites on the National Priorities List. Therefore, the state has gained regulatory authority. The Environmental Protection Agency could, at any time, decide to evaluate the package. If the listing threshold were found to be exceeded, and the National Priorities List occurred, then a new agreement between the DOE, the state, and the Environmental Protection Agency would be negotiated.

Comment Code: Private Citizen 53-31

Location of EIS Revision(s): Table S-1, "Environmental Restoration," Alternatives 3 and 4
Table S-3, "Environmental Restoration," Alternatives 3 and 4

Response: The first statement is redundant and is removed from the Final NTS EIS.

Comment Code: Private Citizen 53-32

Location of EIS Revision(s): Table S-1, "Environmental Restoration," Alternatives 3 and 4
Table S-3, "Environmental Restoration," Alternatives 3 and 4

Response: The Central Nevada Test Area appears on the table in the Final NTS EIS.

Comment Code: Private Citizen 53-33

Location of EIS Revision(s): None required

Response: "Dipole Hail" and "Cut and Cover" are described in Appendix A in Section A.5.1.3.

Comment Code: Private Citizen 53-34

Location of EIS Revision(s): None required

Response: Airspace was identified as an issue in the *Implementation Plan for the Nevada Test Site Environmental Impact Statement* (DOE/NV 1995d). After analysis of input from the U.S. Air Force, DOE concluded that the continued use of this airspace by all parties would not result in adverse impacts.

Comment Code: Private Citizen 53-35

Location of EIS Revision(s): None required

Response: The DOE does not consider the inclusion of a detailed listing of other government agencies and contract information as necessary for a complete understanding of the impacts of program activities as they are described in the NTS EIS. The list of contracts and agreements is lengthy and can be provided if there is a request for the list. Such information can be provided by the Contract Management Division at (702) 295-3206.

Comment Code: Private Citizen 53-36

Location of EIS Revision(s): None required

Response: The discussion of site support activities is not intended to replace the discussion of the disposition of withdrawn lands. Rather, site support is an additional category of information analyzed in the NTS EIS. The concept of relinquishing certain NTS lands is considered part of Alternative 4.

Comment Code: Private Citizen 53-37

Location of EIS Revision(s): None required

Response: The concept of relinquishing certain NTS lands is considered in the analysis of Alternative 4. Please refer to the discussion in Section 1.8 of Volume 3.

Comment Code: Private Citizen 53-38

Location of EIS Revision(s): None required

Response: According to Public Law 99-606, the Secretary of the Interior can either accept or decline Air Force lands, such as Pahute Mesa, that have been contaminated by past DOE activities. Relinquishment of Pahute Mesa, however, was not considered in the Draft NTS EIS under Alternative 2 because this area will be examined in the upcoming EIS on the renewal of the withdrawal for the Nellis Air Force Range Complex.

Comment Code: Private Citizen 53-39

Location of EIS Revision(s): Chapter 3, Section 3.1.2

Response: The DOE does not intend to move any NTS activities to the Tonopah Test Range. Section 3.1.2.1, "Defense Program" under Alternative 2, is revised to indicate that activities would continue at the Tonopah Test Range.

Comment Code: Private Citizen 53-40

Location of EIS Revision(s): None required

Response: In many places in the NTS EIS, numbers have been rounded for convenience. Thus, the appropriate values are so noted. Restricted area 4808 is controlled (assigned to) by the DOE, as is R-4809. Both of the restricted areas are flight-controlled by the NAFR Complex. As such, this airspace is scheduled through the NAFR Group for use by the DOE and DoD.

Comment Code: Private Citizen 53-41

Location of EIS Revision(s): Summary, "Affected Environments"

Response: The sentence stating that the Project Shoal Area was returned to the U.S. Bureau of Land Management was in error and has been deleted from the text.

Comment Code: Private Citizen 53-42

Location of EIS Revision(s): None required

Response: Please note that referring to a waste as "classified" denotes low-level waste weapons components and assemblies designated by the U.S. Government, pursuant to executive orders, statutes or regulations, that require protection against unauthorized information or material disclosure, for reasons of national security. Additional security and safeguards management activities are required in the handling of these materials. In all other characteristics, this waste is similar in radionuclide content and physical makeup to the other waste accepted for disposal.

The volume of the classified transuranic waste at the Area 5 Radioactive Waste Management Site is 54 cubic meters (m^3) (71 cubic yards [yd^3]) and is stored in 295 drums. The radioisotopes that contaminate the waste are uranium-235, plutonium-238, and plutonium-239. Please refer to Comment Code Private Citizen 53-19.

Comment Code: Private Citizen 53-43

Location of EIS Revision(s): None required

Response: The suggested rewording was reviewed but was not adopted because it did not improve the clarity or accuracy of the sentence.

Comment Code: Private Citizen 53-44

Location of EIS Revision(s): None required

Response: The suggested rewording was not adopted because it did not improve the clarity or accuracy of the sentence.

Comment Code: Private Citizen 53-45

Location of EIS Revision(s): None required

Response: The referenced inventory of remaining radioactivity is based on experimental data collected over a number of years. This information is discussed in Section 4.1.4.3 of Volume 1 in more detail.

Comment Code: Private Citizen 53-46

Location of EIS Revision(s): None required

Response: Table S-2 lists the <u>remaining</u> radionuclide inventory on the NTS, not the total radionuclides that were emitted during the history of operations. A detailed discussion of the original releases from atmospheric testing is provided in 4.1.4.3 of the NTS EIS. As noted in that discussion, the Office of Technology

Assessment reported that there were about 60 billion curies released during atmospheric testing at the NTS (decay corrected for 12 hours after the detonations).

Comment Code: Private Citizen 53-47

Location of EIS Revision(s): None required

Response: The suggested rewording was reviewed but was not adopted. Generic rather than specific, descriptions were used to identify "source or Radioactivity." The "Type of Area" described general uses of areas, not specific locations.

Comment Code: Private Citizen 53-48

Location of EIS Revision(s): None required

Response: Subsidence craters are formed when underground nuclear detonations create underground cavities into which the overlying soil and rock above the cavity then collapse. The final result is a crater on the surface. The text refers to "Test-induced subsidence crater" which describes the crater is an indirect result of the underground nuclear detonation.

Comment Code: Private Citizen 53-49

Location of EIS Revision(s): None required

Response: Table S-2 in the Draft NTS EIS presents a summary of remaining radioactivity at the NTS. Nuclear excavation experiments are included in Table S-2 under the category, "Shallow Borehole Tests."

Comment Code: Private Citizen 53-50

Location of EIS Revision(s): None required

Response: The suggested rewording was reviewed but was not adopted because the intent was to provide information on types of wastes and isotopes, not a complete listing.

Comment Code: Private Citizen 53-51

Location of EIS Revision(s): None required

Response: The suggested rewording was reviewed but was not adopted because the intent was to provide information on major types of wastes and isotopes, not a comprehensive listing that included estimated inventories.

Comment Code: Private Citizen 53-52

Location of EIS Revision(s): None required

Response: The distance from an underground nuclear test where groundwater is contaminated is highly variable, being primarily dependant on test yield, device working point, and the local hydrogeologic conditions. Nimz and Thompson (1992) describe locations where no contamination has been detected immediately next to, or immediately below, expended underground nuclear tests; however, they also document cases where contamination has been detected at distances greater than 305 meters (m) (1,000 feet [ft]) from the test locations. Therefore, replacing the term "immediate vicinity" with "within a 305 m (1,000 ft) radius" in the sentence, "Underground nuclear testing has resulted in contamination of groundwater within the immediate vicinity of a number of tests," was not done. The sentence, as written, conveys the inherent uncertainty associated with contaminant migration from underground nuclear tests.

The number of tests that have contaminated groundwater is not known. As discussed above, the distance contamination is found from a nuclear test depends on a number of highly variable factors. Given the large number of shots that were conducted below the water table, and those tests with cavities that intersect the groundwater table, a specific number of tests that have contaminated the groundwater cannot be estimated. The Underground Test Area Subproject is being conducted to better define the impacts of underground nuclear testing on the groundwater (refer to Chapter 4, "Radiologic Sources in Groundwater," for more information).

Comment Code: Private Citizen 53-53

Location of EIS Revision(s): None required

Response: The quality of the groundwater has been impacted in certain areas, but has not been destroyed. "Destroyed" implies that the groundwater will never be suitable for any use, present or future. Studies to date indicate that there is radioactive contamination present in the area of some of the underground tests; however, contamination levels range from very low to high. Even groundwater contaminated above drinking water standards would have other uses, such as industrial. No change will be made in the NTS EIS text.

Comment Code: Private Citizen 53-54

Location of EIS Revision(s): None required

Response: An estimate of the area within which groundwater was impaired was not provided. The response to comment Private Citizen 53-52 indicates the inaccuracy that would be associated with using a fixed radius of 305 m (1000 ft). The answer to comment Pivate Citizen 53-55 explains why estimates from sites out of Nevada are inappropriate.

Comment Code: Private Citizen 53-55

Location of EIS Revision(s): None required

Response: As stated in Chapter 1, Introduction, the scope of the NTS EIS includes only those sites inside the state of Nevada. This includes the NTS, the Tonopah Test Range, portions of the Nellis Air Force Range Complex, and the proposed Solar Enterprise Zone sites at the NTS, Dry Lake Valley, Eldorado Valley, and Coyote Spring Valley. This EIS does not address the sites in Mississippi, Colorado, and Alaska. Additional information regarding the two sites in central Nevada (Project Shoal and Central Nevada Test Area) can be found in Volume 1, Chapter 4, Sections 4.3 and 4.4, respectively.

Comment Code: Private Citizen 53-56

Location of EIS Revision(s): None required

Response: Lead and other heavy metals have been utilized in conjunction with underground nuclear tests. To date, however, there has been no evidence of pervasive problems with lead in the groundwater. Lead has a low solubility in alkaline waters and this undoubtedly contributes to its apparent lack of mobility at the NTS. All groundwater analyses have indicated lead or other heavy metal contaminants to be below Safe Drinking Water Act threshold levels. The Underground Test Area Subproject would continue characterization of the near-field environment and would be anticipated to detect any lead or other heavy metal contaminant migration which may exist.

Comment Code: Private Citizen 53-57

Location of EIS Revision(s): None required

Response: The sentence in question, "To date no radioactive contamination has been detected in on-site water supply wells or in off-site monitoring wells," is technically correct and has not been revised. Well UC-1-P-2SR is located on the Central Nevada Test Area. The well is what is called a reentry or postshot well; i.e., a well that is completed within the nuclear explosion cavity for the purpose of extracting melt sample from the detonation. Because it is within the explosion cavity, radioactive contamination would be expected.

The other sites referred to in the comment are not in Nevada and are consequently not within the scope of this EIS.

Although requested by the commentor, the sentence was not modified to say, ". . .contamination may start showing up, in some of the supply wells several decades from now." Presently, there are not sufficient data to support such a statement. Site-specific groundwater velocities, flow paths, and contaminant mobility are not well known. Information being gathered as part of the Underground Test Area Subproject may help fill these data gaps.

Comment Code: Private Citizen 53-58

Location of EIS Revision(s): None required

Response: The Underground Test Area Subproject is being conducted to better define the impacts of underground nuclear testing on the hydrologic regime of the NTS. Increased tritium in UE-5n is thought to be the result of a radionuclide migration experiment conducted near the well. Results of this study, and other wells with tritium, will be used by the Underground Test Area subproject to better understand testing impacts.

Comment Code: Private Citizen 53-59

Location of EIS Revision(s): None required

Response: Areas contaminated by past nuclear weapons testing will be excluded from public access for as long as these areas remain a hazard to health and safety.

Comment Code: Private Citizen 53-60

Location of EIS Revision(s): None required

Response: A detailed discussion about the inclusion of potential activities and operations in future NTS use alternatives that are viewed as inconsistent with the original purpose and use of the withdrawn lands is provided in Volume 3, Chapter 1, Section 1.4.

Comment Code: Private Citizen 53-61

Location of EIS Revision(s): None required

Response: Chimneys formed as the result of nuclear testing can be more or less permeable than the surrounding rock, depending on the original rock type. For example, chimneys in the volcanic tuff may result in rubble zones with enhanced permeability, whereas those in alluvium may result in reduced permeability because of compaction. Existing data discussed in Chapter 5 of Volume 1 shows that the permeability in the chimney is equal to or greater than the surrounding soils. Thus, the downward movement of material is not expected to occur. However, in no case could contaminated groundwater migrate up a chimney higher than the top of the water table owing to a lack of driving pressure.

Comment Code: Private Citizen 53-62

Location of EIS Revision(s): None required

Response: The report to which the commentor refers, "Evaluation of Groundwater Monitoring at Offsite Nuclear Test Areas, March 1991 (Chapman and Hokett, 1991)," discusses well location, construction, and hydrogeology and also provides recommendations for monitoring at eight off-site locations, two of which, the Central Nevada Test Area and the Shoal Project Area are covered by this EIS. This response is limited to the Central Nevada Test Area and the Shoal Project Area.

Central Nevada Test Area (the Faultless test): There are five monitoring points (four wells and a spring) at the Faultless site. Wells HTH-1 and HTH-2 are thought to be in the best position to detect the migration of contaminants from the Faultless test. These wells are closest to the test site (within a mile), are completed in the hydrologic unit intercepted by the event cavity, and are hydraulically downgradient from the test (Chapman and Hokett, 1991). Of the two remaining wells, one well is also downgradient; the spring and the fourth well may not be appropriately located in the flow system to monitor contaminants. Therefore, at the Faultless site, the two wells closest to the test appear to be quite suitable for monitoring contaminant migration.

Project Shoal Area: There are six monitoring points (five wells and a spring) near the Shoal site. There are a number of uncertainties regarding groundwater flow in the Shoal area. At present, only one well, HS-1, is thought to be in a position to intercept groundwater from the event cavity although it is several miles from the test. Additional hydrologic data needs to be gathered before a groundwater flow direction for the area can be determined.

To date, no radioactive contamination has been detected in any of the wells or springs used to monitor groundwater at the two sites. The need for further study at both sites to reduce hydrologic uncertainty will be determined through the Environmental Restoration subproject for each site.

Comment Code: Private Citizen 53-63

Location of EIS Revision(s): None required

Response: The "Contaminated Areas Report" has been provided to the commentor to supply information relative to his requests. This report contains information on the posted areas, sign types at these areas, and definitions of the signs. The information requested is far too detailed for a site-wide EIS and would needlessly contribute to the length of the document. Its inclusion would not affect the analysis nor the decision-making process. Any existing planned remediation actions for individual sites either have been or will be provided to the state for concurrence. As required in the Federal Facility Agreement and Consent Order, recently signed by the DOE and the state of Nevada, remediation actions for these sites will be jointly prioritized, developed, and approved.

Comment Code: Private Citizen 53-64

Location of EIS Revision(s): None required

Response: The most recent study of tritium migration from the Project Shoal Area was performed by Chapman et al. (1995). Because of uncertainties in the direction of groundwater flow near the Project Shoal Area, Chapman et al. performed calculations for both eastward and westward groundwater flow. Peak tritium concentrations were calculated at the eastern and western boundaries of the Project Shoal Area, where no public well currently exists, and at the nearest public wells. The results of this modeling are presented in Volume 1, Appendix H, Section 5.1 of the NTS EIS.

Comment Code: Private Citizen 53-65

Location of EIS Revision(s): Summary Page S-25, line 22-23

Response: The date and distance were changed in the Final NTS EIS.

Comment Code: Private Citizen 53-66

Location of EIS Revision(s): Summary

Response: The sentence referred to by the commentor has been revised for clarity. The purpose of this EIS is to provide an evaluation of the potential environmental impacts resulting from actions that could occur in the next 10 years. The benchmark to which future actions must be compared is the No Action Alternative. For the NTS EIS, the No Action Alternative is Alternative 1, in which current operations are continued. Changes in the environment that have resulted from past activities are included as part of this benchmark. The DOE has recognized that past activities have resulted in contamination of the environment. The Environmental Restoration Program, which is described in detail in Appendix A of this EIS, has been established to remediate contaminated sites.

The National Environmental Policy Act also requires the identification of unavoidable adverse effects. As discussed in the Summary and in Chapter 5, impacts resulting from conducting underground nuclear tests, if the DOE is so directed, remain the largest, unavoidable adverse effects of the management of the NTS. To minimize these unavoidable impacts, the DOE will continue to adhere to siting criteria for underground testing to ensure that radioactive contaminants from underground testing are contained (see Chapter 7, "Mitigations").

Comment Code: Private Citizen 53-67

Location of EIS Revision(s): None required

Response: The DOE believes that use of the word "but" draws the proper contrast between the presence of local impacts and the absence of offsite impacts. Therefore, the sentence will not be revised.

Comment Code: Private Citizen 53-68

Location of EIS Revision(s): Summary

Response: The referenced sentence refers to construction of new facilities, not the operation of existing facilities, such as the Lyner Complex. The sentence is accurate and has not been changed. However, as stated in Section 5.5.1.1 with regards to subcritical experiments in the Lyner Complex, "Irreversible effects would include the deposition of radiological material within and near the cavity mined in the subsurface." The text in the Summary under "Unavoidable Adverse Impacts" has been revised accordingly.

Comment Code: Private Citizen 53-69

Location of EIS Revision(s): Summary

Response: The sentence indicated has been revised to indicate that some off-site impacts would occur but they would not be significant. Chapter 5 of the NTS EIS discusses the off-site impacts from construction-related traffic and air quality impacts from vehicles driven by construction workers commuting between the Las Vegas Metropolitan Area and the NTS. The impacts shown in Chapter 5 are now more clearly summarized in the Summary document.

Comment Code: Private Citizen 53-70

Location of EIS Revision(s): None required

Response: The DOE is in the process of declassifying information relating to past activities at the NTS. However, due to national and international security concerns, some material will necessarily remain classified.

Exact nuclear yields for all past tests are not essential for the proper evaluation of environmental impacts resulting from underground nuclear weapons testing at the NTS. The estimated total amount of radioactivity remaining from underground testing at the NTS is explained in Chapter 4, Section 4.1.5.2, and clarifying text has been added in response to other commentors.

The DOE is committed to performing the studies required under the Federal Facility Agreement and Consent Order to responsibly characterize the nature and extent of testing impacts.

Presently, the DOE Environmental Restoration Program is conducting a near-field drilling project involving the drilling of groundwater monitoring and characterization wells adjacent to expended underground nuclear weapons tests. The location of each well with respect to the explosion cavity is not restrained by the fear of revealing classified information, but instead by scientific, technical, and health and safety considerations. Other wells have been drilled into explosion cavities, and the groundwater contamination data from those wells is not restricted.

Section 4.1.5.2 has been expanded to explain the use of Defense Program source-term data by the Environmental Restoration Program. While the Environmental Restoration Program has full access to the data, it remains classified and is not available to the public. However, data remains available to those appropriately-cleared organizations and individuals having a need to know. In the past this has included representatives of the state of Nevada.

Comment Code: Private Citizen 53-71

Location of EIS Revision(s): None required

Response: The use of the word "level" in place of "quantity" in the following sentence, "The quantity of radioactivity remaining in the subsurface media can be estimated based on the half-life of the fission products," would make the sentence less clear. The word "level" could be misconstrued by the reader to mean depth below ground surface which is not what the sentence intends to convey.

Comment Code: Private Citizen 53-72

Location of EIS Revision(s): None required

Response: Section 4.1.5.2 states that, "Following the detonation, most of the metals are either vaporized or undergo neutron activation and are accounted for in the radionuclide inventory. The fate of the organic compounds and drilling fluids is not fully understood." No estimates are available concerning the total quantity of these materials that may still remain in the subsurface at the NTS. No accurate representation of the contents of these cavities is available; however, the Environmental Restoration Program at the NTS is in the process of assessing the occurrence and distribution of contaminants in the vicinity of expended nuclear tests.

Comment Code: Private Citizen 53-73

Location of EIS Revision(s): Chapter 4

Response: The estimate was based upon the best available unclassified information and there is nothing deceptive concerning either the estimate presented or the manner in which the estimate was developed. The presentation of material concerning specific radionuclides on a test-by-test basis is classified. A more detailed description of the methods used in developing the estimates has been added to Chapter 4 in response to other comments.

Comment Code: Private Citizen 53-74

Location of EIS Revision(s): None required

Response: As the commentor notes, some underground tests did vent radioactive materials, but as the NTS EIS states, surface contamination of the NTS was due primarily to atmospheric tests. Section 4.1.4.3 of Volume 1 discusses this in more detail.

Comment Code: Private Citizen 53-75

Location of EIS Revision(s): None required

Response: The sentence, "Additionally, safety tests conducted at the surface from 1954 to 1963 resulted in the radioactive contamination of the soil," is accurate and appropriate for the Summary. The intent of these tests was to determine the behavior (safety) of nuclear devices in an accident, not to disperse plutonium. More detailed discussions of these tests and resulting soil contamination, including numerous maps of plutonium contamination, are provided in Section 4.1.4.3.

Comment Code: Private Citizen 53-76

Location of EIS Revision(s): None required

Response: The commentor is correct. The radiologic source terms of almost all underground nuclear tests are classified—consequently, a meaningful, quantitative estimate of the radiologic source-term activity contained in underground cavities at the NTS cannot be prepared for this document. However, such a detailed inventory is not needed for an analysis. Data in Table 4-1, "Summary of remaining radioactivity on the NTS," and Table 4-7, "Remaining isotope inventory under or within 100 m (330 ft) of the water table," provide estimates of the radioactivity from deep underground testing. Examination of Table 4-1 shows the preponderance of radioactivity at the NTS is from underground testing—other sources are minor in comparison.

Table 4-1, "Summary of remaining radioactivity on the NTS," shows the remaining radioactivity from underground testing is four orders of magnitude greater than the remaining radioactivity contained in the dry-packaged, low-level and mixed waste now at the NTS. Assuming that the waste disposed in the future at the NTS will be comparable in activity to the low-level and mixed waste now at the NTS, radioactivity contained in the future waste will indeed be incremental to the radioactivity remaining from underground testing.

Comment Code: Private Citizen 53-77

Location of EIS Revision(s): None required

Response: A performance assessment is currently being conducted for Area 3. Section 2.5.6 provides the currently available information.

Comment Code: Private Citizen 53-78

Location of EIS Revision(s): None required

Response: The performance assessment process has developed scenarios that are used to evaluate the potential for public exposure to radionuclides from the disposed waste. The only scenarios that cannot be dismissed are the inadvertent intruder scenarios. Therefore, these limiting scenarios must be considered in establishing design, operation, closure, and waste acceptance criteria for the waste management facilities.

Comment Code: Private Citizen 53-79

Location of EIS Revision(s): None required

Response: The requirement to evaluate the performance of a disposal site for such a long period of time is based on the fact that the waste presents a long-lived hazard to human health. Predictions are made on the site specific peak dose to an individual that inadvertently comes in contact with the waste. These predictions are made per recommendations in the performance assessment guidance. The evaluation is performed regardless of the probability of inadvertent encounter with the waste after loss of institutional control.

Comment Code: Private Citizen 53-80

Location of EIS Revision(s): None required

Response: The comprehensive, detailed map that has been requested does not exist. The contaminated areas which may cause the disturbance are scattered throughout the NTS and the Tonopah Test Range. The sites range in size and complexity from discarded lead-acid vehicle batteries to the plutonium-contaminated soil sites associated with the safety tests. The locations of those sites on the Nellis Air Force Range Complex (Area 13, Small Boy, and Double Tracks) have been noted in the NTS EIS. The requested description about why each piece of property is being restored is, in many cases, premature and not necessary to complete this EIS analysis. The reasons vary according to the regulatory driver and will be developed as the DOE and state of Nevada move through the Federal Facility Agreement and Consent Order process. The 10,000-acre figure is intended to be bounding, and it may eventually be determined that some sites may not be restored. Refer to Table 2-1, "Factors related to prioritization of Environmental Restoration Program activities," for a list of the factors which would be considered in developing the reasons for restoring or not restoring specific contaminated sites.

The request to identify what the restoration activity is expected to involve at each site is similarly, in many cases, premature and beyond the scope of this EIS. The site-specific restoration activity would be developed through the Federal Facility Agreement and Consent Order process and would be dependent on the reasons for restoring each site as well as the results of characterization activities which are yet to be performed. Restoration activities have been performed for a number of years at many of the contaminated NTS sites. The results of these past restoration activities are expressed cumulatively in the "Description of the Affected Environment" section of the NTS EIS (Section 4.0), which is the appropriate level of detail for a site-wide EIS.

Comment Code: Private Citizen 53-81

Location of EIS Revision(s): Appendix A, Volume 1

Response: The text has been changed in the NTS EIS to reflect the terms in the Federal Facility Agreement and Consent Order between the DOE and the state of Nevada, which was signed between publication of the Draft NTS EIS and the Final NTS EIS. This agreement establishes a process for defining cleanup levels which could include use of land in an unrestricted manner.

Comment Code: Private Citizen 53-82

Location of EIS Revision(s): None required

Response: Details regarding the Nevada Environmental Restoration Program are available from numerous documents available in the DOE public reading rooms. The progress made by the program is reflected cumulatively in the NTS EIS, Section 4.0, "Description of the Affected Environment." Adding the details and "numerous references" as requested is beyond the scope of a sitewide EIS such as this.

Comment Code: Private Citizen 53-83

Location of EIS Revision(s): None required

Response: Alternative 2, Discontinue Operations, was included in the NTS EIS in response to public comments received during the scoping period. The inclusion of this Alternative also allowed the DOE to analyze and compare a full range of use options for the NTS, including that of not conducting site restoration.

Comment Code: Private Citizen 53-84

Location of EIS Revision(s): None required

Response: The Summary presented in the NTS EIS provides a brief overview of the contents of the document. Detailed information on the Work for Others Program can be found in the Appendix A, to Section A.5.

Comment Code: Private Citizen 53-85

Location of EIS Revision(s): None required

Response: The commentor's recommended edit of the sentence is noted; however, this sentence is correct as it appears.

Comment Code: Private Citizen 53-86

Location of EIS Revision(s): None required

Response: The commentor's suggestions are appreciated, but this sentence is not revised in the Final NTS EIS. While the DOE acknowledges that tens of billions of curies were released after nuclear tests, the quantity of radioactivity drops by 3 orders of magnitude in 12 hours. Total remaining radioactivity from all underground nuclear testings is discussed in Chapter 4, Section 4.1.4.2, in the subsection entitled "Subsurface Radiological Sources." The hazardous materials were not mentioned in this summary sentence because of their relative unimportance when compared to the radioactivity. Following the detonation, most of the metals are either vaporized or undergo neutron activation and are accounted for in the radionuclide inventory. The fate of the organic compounds and the drilling fluids is less well known, and is currently under investigation under the Environmental Restoration Program.

Comment Code: Private Citizen 53-87

Location of EIS Revision(s): None required

Response: The environmental consequences of conducting one nuclear test far exceed the environmental consequences of conducting multitudes of dynamic tests and hydrodynamic experiments.

Chapter 5, "Environmental Consequences," describes all environmental impacts associated with all programs identified in the NTS EIS, including subcritical experiments discussed in the classified Appendix J.

Comment Code: Private Citizen 53-88

Location of EIS Revision(s): None required

Response: Appendix J is classified because it contains material quantities and design concepts associated with nuclear weapons that are classified by the DOE for nonproliferation and national security reasons. However, the environmental impacts of activities associated with the Lyner Complex are unclassified, and are included in the environmental analyses presented in Chapter 5.

As stated in the state of Nevada's comments on the Draft NTS EIS: "A review of the classified appendix of the NTS EIS was undertaken by a qualified state official, and it was determined that the impact analyses of certain classified activities at the Lyner facility were incorporated in the overall evaluation of impacts assessed in the NTS EIS. The analyses of potential long-term impacts of classified activities to the vadose zone are representative of the analysis presented in the NTS EIS for other proposed defense testing activities at the site. In reference to potential human health and safety impacts associated with activities at the Lyner complex, the risk assessment for the Defense Assembly Facility (DAF) adequately bounds the potential above-ground risks and impacts."

Comment Code: Private Citizen 53-89

Location of EIS Revision(s): Summary, Table S-3

Response: The text referred to in the comment has been deleted. Table S-3 has been modified to indicate the amount of land devoted to various land uses under each alternative (i.e., industrial, weapons testing, etc.).

Comment Code: Private Citizen 53-90

Location of EIS Revision(s): Summary, Table S-3

Response: Table S-3 has been modified. See response to Comment Code Private Citizen 53-89.

Comment Code: Private Citizen 53-91

Location of EIS Revision(s): None required

Response: The Notice of Intent published in August of 1994 (refer to Volume 1, Appendix B) defined the scope of the analysis in this EIS. It did not include facilities or locations outside Nevada and it did not include the North Las Vegas facility or the Remote Sensing Laboratory. Both of those facilities have recently had National Environmental Policy Act documents published for them, and their addition to this EIS would not change the analysis for them.

Comment Code: Private Citizen 53-92

Location of EIS Revision(s): None required

Response: The non-Nevada facilities referred to in the comment are examined in other DOE National Environmental Policy Act documents. The scope of the NTS EIS is limited to DOE areas of interest in Nevada, as shown in the Summary on Figure S-1 and in Chapter 4 on Figure 4-1.

Comment Code: Private Citizen 53-93

Location of EIS Revision(s): Summary

Response: This statement is not reflective of Alternative 2. Under Alternative 2, the DOE would discontinue the Environmental Restoration Program, but would not turn the land back to public domain. As stated in Section 3.1.2, "Control of the NTS would be maintained by the DOE."

The sentence in question is revised in the Final NTS EIS to indicate that closure without environmental restoration may not meet agreements signed by the DOE and the state of Nevada, and may also violate state and federal laws.

Comment Code: Private Citizen 53-94

Location of EIS Revision(s): None required

Response: No decisions have been made regarding the location of facilities relating to the Solar Enterprise Zone projects. The NTS is still under consideration as a possible location for a solar energy facility.

Comment Code: Private Citizen 53-95

Location of EIS Revision(s): None required

Response: The buffer zones envisioned under Alterative 4 are simply prudent measures to guarantee the safety of the public if this alternative were to be implemented.

Comment Code: Private Citizen 53-96

Location of EIS Revision(s): None required

Response: Alternative 4 is described in a programmatic way. Providing detailed plans concerning the location of fences and other security measures associated with Alternative 4, and the effect of these security measures on the size of the turn-back area is beyond the scope of this EIS.

Comment Code: Private Citizen 53-97

Location of EIS Revision(s): Summary, Table S-3

Response: Table S-3 has been modified. See response to Comment Code Private Citizen 53-89.

Comment Code: Private Citizen 53-98

Location of EIS Revision(s): Summary, Table S-3

Response: The text referred to in the comment has been deleted. Table S-3 has been modified to indicate the amount of land devoted to various land uses under each alternative (i.e., industrial, weapons testing, etc.). Also, please refer to Section 1.4 of Volume 3.

Comment Code: Private Citizen 53-99

Location of EIS Revision(s): None required

Response: The qualitative statement in the Summary that a reduction would occur is sufficient. Refer to Section 5.2.1.1.2 for more details on airspace use.

Comment Code: Private Citizen 53-100

Location of EIS Revision(s): None required

Response: Restricted areas R-4808 and R-4809 are controlled by the DOE and are scheduled for use by the DOE and DoD. At a minimum, it is anticipated that current levels of DoD flight activity would continue.

Comment Code: Private Citizen 53-101

Location of EIS Revision(s): None required

Response: The decision to retain, reallocate, or release special-use airspace is made by the Federal Aviation Administration during its annual review process based on the stated needs of the agency that uses the airspace. The U.S. Air Force uses parts of the airspace over the NTS. Decisions to relinquish this airspace would be made through this process.

Comment Code: Private Citizen 53-102

Location of EIS Revision(s): None required

Response: Restricted area R-4808 has been delegated by the Federal Aviation Administration to the DOE, based on DOE requirements. Air traffic control responsibilities for this restricted airspace has been assigned to the Nellis Air Force Base. Any changes to the delegation and control of this airspace will be based on the Federal Aviation Administration's review of DOE and DoD current and future requirements.

Comment Code: Private Citizen 53-103

Location of EIS Revision(s): None required

Response: The decision to retain, reallocate, or dispose of special-use airspace presently delegated to the DOE for NTS activities will be based on current and future DOE and Nellis Air Force Base requirements and the Federal Aviation Administration's review of these requirements relative to national airspace system needs.

Comment Code: Private Citizen 53-104

Location of EIS Revision(s): None required

Response: The suggested revisions were not adopted because they may be inaccurate. The quantities of contaminated soils are not massive. Actions unrelated to testing will not result in soils being contaminated with plutonium. Refer to the discussion in Section 4.1.4.3 for greater detail.

Comment Code: Private Citizen 53-105

Location of EIS Revision(s): None required

Response: Table S-3 indicates that most impacts under Alternative 4 are less than those under Alternative 1.

Comment Code: Private Citizen 53-106

Location of EIS Revision(s): None required

Response: Present technologies and economics do not favor remediation of underground nuclear test cavities. For reasons of safety and security, the DOE would retain restrictions on access to and use of the deep subsurface for the foreseeable future. This would be true for all alternatives. It is the DOE's intention to address the issue of surface contamination for its sites in Nevada through the Corrective Action process established in the recently signed Federal Facility Agreement and Consent Order. Under this process, the Corrective Action would be based on potential future land uses. It is anticipated that the surface would be available for uses that range from unrestricted public uses to various levels of restriction.

Any remaining restrictions on public access to surface areas of the NTS would generally be instituted because of program requirements, not because of contamination. Text has been changed in the NTS EIS to reflect the range of anticipated availability in public access and use of the surface, and to clarify that in Alternative 2, as in all alternatives, the subsurface would remain restricted for the foreseeable future. In Alternative 2, no remediation of surface contamination would occur and areas with presently restricted human access would remain restricted.

Comment Code: Private Citizen 53-107

Location of EIS Revision(s): None required

Response: Historic underground testing altered the drainage paths and surface areas of portions of the NTS. The discussion in Table S-3 is with respect to testing that would be conducted under Alternative 1, not historic testing. The alterations to drainage paths is expected to be minimal because the anticipated scale of possible testing is substantially less than historic levels.

Comment Code: Private Citizen 53-108

Location of EIS Revision(s): None required

Response: Recent studies of the Death Valley groundwater flow system have concluded that the recharge rate may be appreciably higher than originally estimated. The perennial yield of a basin is defined as that quantity of water that can be removed from a basin on an annual basis without undesirable impacts. There are still large areas within Yucca Flat where uncontaminated groundwater can be withdrawn without resulting in an undesirable impact.

Comment Code: Private Citizen 53-109

Location of EIS Revision(s): None required

Response: The location, figuration, and water-use requirements for the Solar Enterprise Zone (or zones), have not yet been fully defined, but the goal of the Corporation for Solar Technology and Renewable Resources is still to facilitate the construction and operation of 1000 megawatts of solar generation in southern Nevada. The water-use estimates are still preliminary and represent a worst-case evaluation for the purposes of evaluating the potential impacts of the proposed action. There has been no decision made concerning the location of the zone (or zones) and the NTS remains a candidate. There is no conflict of interest with respect to a Solar Enterprise Zone.

Comment Code: Private Citizen 53-110

Location of EIS Revision(s): None required

Response: The volume of water used for dust control is not large; water use for waste management under Alternatives 1, 3, and 4 ranges from 80,176 to 259,031 cubic meters per year (m^3/yr) (65 to 210 acre-feet per year [ac ft/yr]) for all purposes, including dust control. The impacts of surface water drainage controls have an insignificant effect on the runoff of the basins in which the waste management facilities are located.

Comment Code: Private Citizen 53-111

Location of EIS Revision(s): None required

Response: The selection of sites for storage or disposal of radioactive waste requires careful consideration of a number of factors, the most important being public health and safety. The DOE published a *Draft Waste Management Programmatic EIS* for managing the treatment, storage, and disposal of radioactive and hazardous waste in August 1995 (DOE, 1995c). That document discusses the need for transportation of waste over long distances and the impacts of such transportation. Although fuel usage is an important issue alone, it is a minor impact when other impacts are taken into consideration. The NTS EIS analyzes the human health risks and accident risks from long distance transportation, but the fuel usage is considered to be negligible in the context of nationwide use of fuel. The health impacts of vehicle exhaust emissions has been analyzed and is included in the Final NTS EIS.

Comment Code: Private Citizen 53-112

Location of EIS Revision(s): None required

Response: Analysis of environmental impacts associated with the consumption of fossil fuels is contained in the baseline environmental analysis sections in Chapters 4 and 5. The nonradiological risk to human health from emissions during transportation operations has been added to Appendix I.

Comment Code: Private Citizen 53-113

Location of EIS Revision(s): None required

Response: Under Alternative 2, the workforce supporting the NTS would drop to 86 persons, who would be involved solely in site support activities. The duration of employment for this caretaker workforce is unknown. This EIS only addresses the next 10 years. In compliance with DOE policy, the impact of the NTS programs would be re-evaluated every five years.

Comment Code: Private Citizen 53-114

Location of EIS Revision(s): None required

Response: The referenced statement in Table S-3 is made with respect to areas of surface contamination which, if not restored, will result in a continued threat to groundwater. The statement does not refer to the deep subsurface contamination in the underground testing areas.

Comment Code: Private Citizen 53-115

Location of EIS Revision(s): None required

Response: The suggested change was reviewed but was not adopted because the DOE believes it is inaccurate. The effects of individual underground tests are localized, not regional.

Comment Code: Private Citizen 53-116

Location of EIS Revision(s): None required

Response: The DOE disagrees. As discussed in Section 4.1.4.2 and Section 5.1.1.4 of Volume 1, the effects of individual underground tests are localized.

Comment Code: Private Citizen 53-117

Location of EIS Revision(s): None required

Response: The suggested change was reviewed but was not adopted because the DOE believes it is inaccurate. There are no monitoring exclusion zones at the NTS. The definition of contamination in the underground testing areas is a focus of the DOE's Environmental Restoration Program with a primary emphasis on the drilling and monitoring of new characterization wells.

Comment Code: Private Citizen 53-118

Location of EIS Revision(s): None required.

Response: The proposed actions also include the restoration of the disturbed areas through regarding and revegetation. The overall impacts will be minimal and will result in the restoration of resource values for an area that would otherwise be irretrievably lost as a natural resource.

Comment Code: Private Citizen 53-119

Location of EIS Revision(s): None required

Response: The transfer of NTS activities to the Tonopah Test Range is not an alternative being considered under the NTS EIS.

Comment Code: Private Citizen 53-120

Location of EIS Revision(s): Summary

Response: This text has been deleted from the table.

Comment Code: Private Citizen 53-121

Location of EIS Revision(s): Summary

Response: The text of the NTS EIS has been modified to indicate that the geologic media is contaminated and that the groundwater is contaminated.

Comment Code: Private Citizen 53-122

Location of EIS Revision(s): None required

Response: The term "unavailable for use" as used in the sentence "At the Project Shoal Area and Central Nevada Test Area, geologic media and groundwater contaminated by radionuclides would remain contaminated and unavailable for use" means that groundwater and subsurface geologic media contaminated cannot be used beneficially at the present time without remediation. Present technologies and economics do not favor remediation of underground nuclear test cavities. The sentence is technically correct and will not be modified.

The NTS EIS is intended to support, not supplant, decisionmaking regarding land use at a given geographic location. The document examines existing and potential environmental impacts that have resulted, or could result, from current and future DOE operations in Nevada over the next 10 years. At present, administrative controls imposed by the DOE are used to restrict subsurface access to the Project Shoal Area and Central Nevada Test Area; future administrative controls have not been decided upon. Therefore, no additional information has been added to the NTS EIS regarding availability and future administrative controls for the Project Shoal Area and the Central Nevada Test Area.

Comment Code: Private Citizen 53-123

Location of EIS Revision(s): None required

Response: The sentence conveys the meaning intended. "Giant" is a very subjective term; therefore, its use is inappropriate. The second sentence is correct as is. Therefore, no textual change is required.

Comment Code: Private Citizen 53-124

Location of EIS Revision(s): None required

Response: The DOE agrees that the loss of desert tortoises and their habitat would be minuscule under Alternative 2. It was assumed that some level of DOE security, environmental monitoring, and associated vehicular traffic would be conducted on the NTS under all alternatives, but that this activity would be minor and insignificant in its impact on desert tortoises even under Alternative 3. Therefore, this one activity was only mentioned in Alternative 2 to indicate that minimal DOE activity could still result in the take of this threatened species. The text of the Final NTS EIS was not altered as recommended.

Comment Code: Private Citizen 53-125

Location of EIS Revision(s): None required

Response: "Extensive" is a subjective term and its use would not add to the analysis in the NTS EIS. The areal extent of contamination, as compared to the areal extent of the Tonopah Test Range, is not large (reference Section 4.2, Tonopah Test Range). The contamination referred to includes Resource Conservation and Recovery Act type materials in addition to the plutonium-contaminated soils; therefore, the changes which the commentor suggests would be inaccurate. The quantities of plutonium involved are not germane to the analysis. Soil concentrations are important when it comes to remediation. Studies are ongoing at all of the plutonium-contaminated soil sites, including those on the NAFR Complex, to determine the nature, extent, and concentration of the contamination. These studies also address the issue of the best technology to utilize as well as reclamation requirements.

Comment Code: Private Citizen 53-126

Location of EIS Revision(s): None required

Response: Alternative 2, Discontinue Operations, was included in the NTS EIS in response to public comments received during the scoping period. The inclusion of this alternative also allowed the DOE to analyze and compare a full range of use options. In the Final NTS EIS, the DOE identifies Alternative 3 plus the public education activities of Alternative 4 as the Preferred Alternative.

Comment Code: Private Citizen 53-127

Location of EIS Revision(s): None required

Response: The phrase "geologic media" in the sentence, "At the Project Shoal and Central Nevada Test Area, geologic media and groundwater contaminated by radionuclides would remain contaminated and unavailable for use" is technically correct. The term "massive quantities" is undefined and adds nothing to the clarity of the summary. Therefore, the sentence was not revised.

Comment Code: Private Citizen 53-128

Location of EIS Revision(s): None required

Response: Refer to response to Comment Code Private Citizen 53-122.

Comment Code: Private Citizen 53-129

Location of EIS Revision(s): Summary

Response: The text has been modified to reflect that Alternative 3 impacts, while similar to those of Alternative, 1 would be greater.

Comment Code: Private Citizen 53-130

Location of EIS Revision(s): None required

Response: Chapter 4, "Affected Environments," describes the current condition of the NTS. Chapter 5, "Environmental Consequences," describes the impacts of the four alternatives. The DOE has used this impact analysis to design mitigation measures to minimize environmental impacts resulting from DOE missions and activities mandated by statute, Presidential direction, and Congressional authorization and appropriation.

Comment Code: Pivate Citizen 53-131

Location of EIS Revision(s): None required

Response: No decisions have been made regarding the location of facilities relating to Solar Enterprise Zone projects. The NTS is still under consideration as a possible location for a solar energy facility.

Comment Code: Pivate Citizen 53-132

Location of EIS Revision(s): None required

Response: As defined in Alternative 4, no Defense Program activities at the NTS would be transferred to the Tonopah Test Range. Therefore, the sentence, "The unavoidable adverse impacts to the Tonopah Test Range from DOE/NV activities associated with Alternative 4 would be similar to those for Alternative 1," is correct as written.

Comment Code: Private Citizen 53-133

Location of EIS Revision(s): None required

Response: The comment has been noted; however, there are also recent publications by PAL Consultants (1995) and D'Agnese (1994) that suggest that recharge rates may be appreciably higher. The DOE, in conducting evaluations for the NTS EIS used the planning numbers currently used by the Nevada Division of Water Resources, the agency governing water use in Nevada.

Comment Code: Private Citizen 53-134

Location of EIS Revision(s): Summary

Response: The statement in the Summary on page S-44, line, as written in the Draft NTS EIS, allows a reader to mix definitions of "siting criteria" and "containment" associated with underground testing in the Defense Program with definitions of "Siting" and "Containment" used in addressing the Waste Management Program (Summary: Page S-44, line 2-4).

Appendix A, Section A.1.1.1.2-Underground Nuclear Weapons Testing, page A-2 defines "siting criteria" and "containment" in the context of underground nuclear weapons testing. In this context, "...complete containment... is a dominant consideration in nuclear test operations." The DOE Containment Evaluation Panel reviews the proposed nuclear test to ensure each containment design is one that will provide reasonable assurance of satisfactory containment of radioactivity or release of radioactivity only under controlled conditions in compliance with all treaty constraints and under health and safety guidelines established by the Secretary of Energy. Satisfactory containment means a test that results in no radioactivity off site measurable by normal monitoring equipment and no unanticipated release of radioactivity on site. "Siting" in this context means selection of an existing or new site for a drill hole for a specific event. The Containment Evaluation Panel considers "siting" (the location of the emplacement site) as a part of its detailed review of containment design (siting criteria). The composition of the Containment Evaluation Panel is described in Appendix A, page A-3.

Comment Code: Private Citizen 53-135

Location of EIS Revision(s): None required

Response: The DOE recognizes that even with implementation of the "siting criteria" established for underground nuclear weapons testing that adverse impacts from such tests are unavoidable (see Volume 1, Chapter 5.5, Unavoidable Adverse Impacts). This condition was also recognized in the *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977). Satisfactory containment under these siting criteria means a test that results in no radioactivity off site measurable by normal monitoring equipment and no unanticipated release of radioactivity on site.

Comment Code: Private Citizen 53-136

Location of EIS Revision(s): None required

Response: The DOE Containment Evaluation Panel reviews the proposed nuclear test to ensure each containment design is one that will provide reasonable assurance of satisfactory containment of radioactivity or release of radioactivity only under controlled conditions in compliance with all treaty constrains and under health and safety guidelines established by the Secretary of Energy. Satisfactory containment means a test that results in no measurable radioactivity off site by normal monitoring equipment and no unanticipated release of radioactivity on site. While the effect on groundwater of underground tests detonated in or near the water table remain to be determined, any contamination in excess of regulatory levels would mean the unavoidable long-term unavailability of the affected water. As a result, on-site and select off-site wells are monitored for select radionuclides and in accordance with the Safe Drinking Water Act and the Nevada Administrative Code Regulations. Additionally, the state of Nevada performs independent monitoring. Analytical results for all monitoring activities are published in the DOE's *Annual Site Environmental Reports.*

Comment Code: Private Citizen 53-137

Location of EIS Revision(s): None required

Response: The six existing NTS groundwater monitoring programs, described in Section 4.1.5.2, "Monitoring Programs," provide a historical record of the effectiveness of the physical and administrative (institutional) controls in place at the NTS. Analytical results for all monitoring activities are published in the DOE's *Annual Site Environmental Reports.* The history of institutional controls at sites in Mississippi, Colorado, Alaska, and New Mexico are not included because as stated in Chapter 1 Introduction, the scope of the NTS EIS includes only those sites in Nevada.

Comment Code: Private Citizen 53-138

Location of EIS Revision(s): None required

Response: Refer to response to Comment Code Private Citizen 53-88.

Comment Code: Private Citizen 53-139

Location of EIS Revision(s): None required

Response: In order to present as much information as possible, text changes have been made to Chapters 2, 3, 4 and Appendix A, and the Glossary to further clarify the nature of these subcritical experiments conducted at the NTS. While the precise nature of the Lyner Complex, experiments, and the source terms in Appendix J are classified for national security reasons, the environmental impacts are unclassified and were included in Chapter 5 of the Draft NTS EIS as well as the Final NTS EIS (see response to Comment Code Organization 8-3 for specific sections). These data are also included in Chapter 6, Cumulative Impacts. Similar data from past subcritical experiments are included in Chapter 4, Affected Environments, including Sections 4.1.4.2 and 4.1.4.3.

Comment Code: Private Citizen 53-140

Location of EIS Revision(s): Table of Contents, Volume 1, Part A, and Part B

Response: The NTS EIS has been revised to include Appendix J in the Table of Contents for Volume 1, Parts A and B.

Comment Code: Private Citizen 53-141

Location of EIS Revision(s): None required

Response: Section 4.4.1, "Land Use," states, "The Central Nevada Test Area was obtained by the Atomic Energy Commission for the purpose of developing potential alternative sites for nuclear testing activities."

Comment Code: Private Citizen 53-142

Location of EIS Revision(s): None required

Response: The figure S-1 of the Summary shows the areas of interest that are examined in the NTS EIS. Lands withdrawn for the DOE by Public Land Order 1662 are not considered in any alternative use by the DOE and are therefore not addressed in this EIS. Other facilities owned by DOE are not shown for the same reason; they are not areas of interest and are not considered in any alternative use by the DOE within this EIS.

Comment Code: Private Citizen 53-143

Location of EIS Revision(s): None required

Response: Refer to Comment Code Private Citizen 53-142.

Comment Code: Private Citizen 53-144

Location of EIS Revision(s): None required

Response: At the time this EIS was prepared, the requirement for an Implementation Plan was part of the DOE regulations. It is acknowledged that there is a proposal to change the regulations that will make the Implementation Plan optional. The changes to the regulations have not been published in the *Federal Register* as final regulations; thus, no change is made in the NTS EIS.

Comment Code: Private Citizen 53-145

Location of EIS Revision(s): Volume 2, Section 1.3

Response: This sentence refers to information about facilities and infrastructure. The text has been changed to clarify this.

Comment Code: Private Citizen 53-146

Location of EIS Revision(s): None required

Response: The text has been modified to clarify that this sentence refers to facilities and infrastructure. Refer to response to Comment Code Private Citizen 53-145. The purpose of the Environmental Restoration Program is to characterize and remediate, if necessary, contaminated sites on the NTS. The Underground Test Area subproject is specifically designed to reduce the uncertainties pertaining to contaminant migration in groundwater associated with underground nuclear tests.

Comment Code: Private Citizen 53-147

Location of EIS Revision(s): None required

Response: The NTS Technical Site Information (RSN, 1994) describes improvements planned for existing missions. However, it does not include proposals for missions at the NTS that have not yet been approved.

Comment Code: Private Citizen 53-148

Location of EIS Revision(s): None required

Response: The NTS Technical Site Information (RSN, 1994) contains the DOE's best information about existing and planned facilities and infrastructure. This document is available to the public.

Comment Code: Private Citizen 53-149

Location of EIS Revision(s): None required

Response: The goal for existing missions applies to the resource requirements of all missions approved for the NTS and does not reflect the desire for any specific, future missions on the NTS.

Comment Code: Private Citizen 53-150

Location of EIS Revision(s): Volume 2, Section 1.3

Response: The DOE agrees that the Draft NTS EIS text was confusing. The text has been modified to make it consistent with Section 2.1, Step 6 of Volume 2 (*Framework for the Resource Management Plan*).

Comment Code: Private Citizen 53-151

Location of EIS Revision(s): None required

Response: The various ways that stakeholders can participate in the decisionmaking process are described throughout Volume 2, such as in Sections 1.3, 1.6, 2.1, 3.3.4, and 4.0. The DOE notes this commentor's interest in access to information using the Internet and is working to improve the availability of information on that system. Source documents used to develop the NTS EIS are available to the public. These will be the primary sources of information used to develop the *Resource Management Plan.*

Comment Code: Private Citizen 53-152

Location of EIS Revision(s): None required

Response: As described in Sections 2.1 (Step 3), Section 3.3.4, and Section 3.3.5, an interdisciplinary team, which will include environmental scientists, tribal representatives, and other interested and affected groups, will assist in identifying management actions needed for wise resource use and sound ecosystem management. However, ultimate responsibility for this site has been assigned by Congress to the DOE.

Comment Code: Private Citizen 53-153

Location of EIS Revision(s): None required

Response: The intent of all the figures including maps in this EIS are to depict the correct and most current information for activities and uses by the DOE for their mission. In reference to Figure 4-3, the intent of this figure is to depict lands that were withdrawn for DOE use in connection with the NTS. As stated in the NTS EIS, lands withdrawn under Public Land Order 1662 are used by the DoD for their ongoing operations and are not considered in this EIS for any alternative use by the DOE.

Comment Code: Private Citizen 53-154

Location of EIS Revision(s): Volume 2, Section 4.0

Response: The DOE agrees that the cancellation of a proposed mission is a possible solution and has modified the NTS EIS text to reflect that.

Comment Code: Private Citizen 53-155

Location of EIS Revision(s): None required

Response: Uses of the NTS are selected through strategic planning processes such as the NTS EIS. If the alternative use suggested by the commentator is selected through those processes, the resource requirements of that use will be incorporated into the *Resource Management Plan* as indicated in the goals in Section 4.1.

Comment Code: Private Citizen 53-156

Location of EIS Revision(s): None required

Response: Refer to response to Comment Code Private Citizen 53-140.

Comment Code: Private Citizen 53-157

Location of EIS Revision(s): None required

Response: Chapter 5, "Environmental Consequences," describes all environmental impacts associated with all programs described in the NTS, including subcritical experiments described in the classified Appendix J. Refer to response to Comment Code Private Citizen 53-139.

Comment Code: Private Citizen 53-158

Location of EIS Revision(s): None required

Response: See response to Comment Code Private Citizen 53-140.

Comment Code: Private Citizen 53-159

Location of EIS Revision(s): None required

Response: The legal action taken by the state of Nevada against DOE regarding NEPA compliance for the NTS is discussed in the introduction to Chapter 1 of Volume 1. That discussion indicates that DOE had decided to prepare this EIS prior to the filing of the State's complaint.

Comment Code: Private Citizen 53-160

Location of EIS Revision(s): None required

Response: See response to Comment Code Private Citizen 53-176.

Comment Code: Private Citizen 53-161

Location of EIS Revision(s): None required

Response: See response to Comment Code: Private Citizen 53-19.

Comment Code: Private Citizen 53-162

Location of EIS Revision(s): None required

Response: The DOE's stated need for a multipurpose facility to support evolving DOE missions does not lock the DOE into recent historical uses. Mission priorities are mandated by statute, Presidential direction, and Congressional authorization and appropriation. These reviews ensure that the DOE serves the nation's needs.

Comment Code: Private Citizen 53-163

Location of EIS Revision(s): None required

Response: In this sentence, "This" refers to current Bureau of Land Management policies and regulations.

Comment Code: Private Citizen 53-164

Location of EIS Revision(s): None required

Response: The state of Nevada's lawsuit against the DOE is discussed in the Introduction to Chapter 1. Refer to Section 1.4 of Volume 3 for a discussion of the use of withdrawn lands for purposes other than testing.

Comment Code: Private Citizen 53-165

Location of EIS Revision(s): None required

Response: There are numerous areas within the NTS and the Nellis Air Force Range Complex where classified activities are conducted by both the DOE and DoD. Access to and information on these operations is prohibited. The latest general agreement governs all interaction between the DOE and DoD for operations on the NTS and the NAFR Complex.

Comment Code: Private Citizen 53-166

Location of EIS Revision(s): None required

Response: The scope of the NTS EIS is limited to DOE areas of interest in the state of Nevada as defined in the August 1994 Notice of Intent and as shown on Figures S-1 and 4-1. The sites discussed in this EIS include all sites for past, ongoing, and future activities within the state of Nevada that the DOE may use for the completion of its mission. The non-Nevada facilities referred to in this comment have been and will be examined in other DOE National Environmental Policy Act documents. As stated in this EIS under Public Land Order 1662, lands withdrawn for DOE are used by the DoD for their ongoing operations and are not considered in this EIS for any alternative use by the DOE.

Comment Code: Private Citizen 53-167

Location of EIS Revision(s): Chapter 4, Section 4.3

Response: The sentence stating that the Project Shoal Area was returned to the U.S. Bureau of Land management was in error and has been deleted from the text.

Comment Code: Private Citizen 53-168

Location of EIS Revision(s): None required

Response: The title of Figure 4-3 is correct as written. This figure illustrates the lands that are withdrawn for DOE use in connection with the NTS. As stated in the NTS EIS, lands withdrawn under Public Land Order 1662 are used by the DoD for their ongoing operations and are not considered in this EIS for any alternative use by the DOE. With regard to the second part of the comment, the possible development of the Yucca Mountain site as a nuclear waste repository will be examined by the DOE in a separate EIS. The only withdrawal associated with the Yucca Mountain site is for 4,225 acres of public land. The withdrawal is shown in Figure 4-4 of the this EIS.

Comment Code: Private Citizen 53-169

Location of EIS Revision(s): None required.

Response: The intent of Figure 4-3 is to depict lands that were withdrawn for DOE use in connection with the NTS. As stated in the NTS EIS, lands withdrawn under Public Land Order 1662 are used by the DoD for their ongoing operations and are not considered in this EIS for any alternative use by the DOE.

Comment Code: Private Citizen 53-170

Location of EIS Revision(s): None required

Response: The difference between the words "is available" and the commentor's request to change it to "is used for..." has no significance to the analysis of environmental consequences. Replacing the word "dynamic" with "subcritical hydronuclear" would be incorrect. Subcriticals are an element of dynamic experiments. By definition, no self-sustaining nuclear chain reactions will occur with the conduct of subcriticals, as certified by peer-reviewed processes.

Comment Code: Private Citizen 53-171

Location of EIS Revision(s): None required

Response: Subcritical experiments conducted on the surface using hazardous materials would require an extensive containment vessel development effort. In some instances, these experimental setups will not lend themselves to vessel configurations. Furthermore, the subcritical experiments will exercise Test Readiness mandates as delineated by the President.

Comment Code: Private Citizen 53-172

Location of EIS Revision(s): None required

Response: The DOE believes the use of the words "may" and "hazardous materials" are appropriate.

Comment Code: Private Citizen 53-173

Location of EIS Revision(s): None required

Response: Radioactive materials are considered hazardous under the Comprehensive Environmental Response Compensation and Liability Act.

Section 5.1.1.4, "Geology and Soils," states, "Irreversible effects would include the deposition of radiological material within and near the cavity mined in the subsurface." Actual quantities of special nuclear materials used in subcritical tests are classified.

Comment Code: Private Citizen 53-174

Location of EIS Revision(s): None required

Response: The table is broken into two parts because that was the manner in which the original estimates were made and presented. Detailed information of the kind requested by the comment are not needed to perform the analysis of impacts. The estimate presented in the NTS EIS is for the NTS only and does not include any offsite locations. As part of the Environmental Restoration Program, the DOE will be developing detailed computer models of the underground testing areas.

Comment Code: Private Citizen 53-175

Location of EIS Revision(s): Glossary

Response: The terms listed were considered and many were added to the Glossary of the NTS EIS.

Comment Code: Private Citizen 53-176

Location of EIS Revision(s): None required

Response: The glossary and sidebar text in Chapter 2, Section 2.4.2 explains the reason that some waste must be classified. These reasons are pursuant to a number of legal authorities, executive orders, statutes or regulations too numerous to list, which require the wastes to be in more secure containers and further require it to be disposed of in a more secure area. The radionuclides in classified waste are non-distinguishable from the unclassified waste.

The non-classified information on the classified waste is retained at the Area 5 Radioactive Waste Management site. The classified information is maintained by the DOE/NV Safeguards and Security Division. Efforts are currently underway to declassify this information.

Comment Code: Private Citizen 53-177

Location of EIS Revision(s): Index

Response: The terms listed were considered and many were added to the Index of the NTS EIS.

Comment Code: Private Citizen 53-178

Location of EIS Revision(s): None required

Response: Because of the ongoing introduction of information into the document and the technical limitations of the software, many updates and changes were not reflected in the Index.

Comment Code: Private Citizen 54-1

Location of EIS Revision(s): None required

Response: Support for the closure of the NTS is noted.

Comment Code: Private Citizen 55-1

Location of EIS Revision(s): None required

Response: The Council on Environmental Quality regulations for implementing the National Environmental Policy Act state that the text of Environmental Impact Statements "for proposals of unusual scope or complexity shall normally be less than 300 pages." However, as the commentor points out, the nature of this EIS is very different from most EISs. The DOE has made every attempt to make the discussion of the alternatives being considered and the potential environmental impacts comprehensive and understandable.

Comment Code: Private Citizen 55-2

Location of EIS Revision(s): None required

Response: The DOE agrees with this comment. The "Summary" has been prepared as a reflection of the organization of the body of the NTS EIS. Information has been condensed and presented so that a reader can capture the major content, and issues of the NTS EIS. The "Summary" for the Final NTS EIS has been prepared in the same fashion.

Comment Code: Private Citizen 55-3

Location of EIS Revision(s): Summary

Response: More detail has been added to the Socioeconomics section of the summary.

Comment Code: Private Citizen 55-4

Location of EIS Revision(s): Summary

Response: More detail has been added to the Socioeconomics section of the summary.

Comment Code: Private Citizen 56-1

Location of EIS Revision(s): None required

Response: The DOE used extensive monitoring data to analyze the impact of the Waste Management Program. The DOE believes the risks are adequately described. Extensive characterization studies, monitoring, and evaluations are contained in the Performance Assessment for Area 5, the Annual Site Environmental Report, and in numerous references cited in those reports. The commentor is referred to these documents for further information.

Comment Code: Private Citizen 56-2

Location of EIS Revision(s): None required

Response: The DOE agrees that the unsaturated zone is important. However, providing details of the vadose zone characterization and analyses performed in support of the Radioactive Waste Management Site Performance Assessments is beyond the level of detail required for the NTS EIS. The commentor is directed to the cited references for extensive details of these characterization studies. The DOE acknowledges that public access to some monitoring reports can be improved.

Experimental monitoring systems in place at the Area 5 Radioactive Waste Management Site have been used to monitor for releases in the vadose zone. Decisions regarding the need for vadose zone and groundwater monitoring systems at the Area 3 Radioactive Waste Management Site are under consideration at this time. DOE has collected characterization data from the vadose zone at both Area 3 and Area 5 waste management sites. There is no indication that contamination from waste disposal activities are migrating to the groundwater. In addition to vadose zone sampling, pilot wells have been installed at the Area 5 Radioactive Waste Management Site. These wells are sampled periodically and there has been no indication of contamination in the groundwater. The closure caps to be used on the waste disposal units at both sites will restrict the amount of moisture that would be available to flow through the waste and into the zone below the disposal units.

The depth to groundwater at the Area 3 Radioactive Waste Management Site is significantly greater than the depth to groundwater at the Area 5 Radioactive Waste Management Site. Determinations on the applicability of Area 5 Radioactive Waste Management Site characterization information to the waste management site in Area 3 will be reviewed and verified by future research on the characterization of the geology at, and under, the Area 3 Radioactive Waste Management Site. Angle boreholes have been drilled under the subsidence craters used for disposal at the Area 3 Radioactive Waste Management Site. The samples from these boreholes provide information on the characteristics of the soil and are analyzed for contaminants. The current analyses indicate that no contamination has been introduced to the vadose zone from disposed waste.

The Area 3 and Area 5 Radioactive Waste Management Sites and the Beatty site are not analogous because of: 1) the thicker vadose zone at the NTS; 2) the absence of liquid waste disposal at the NTS; and 3) the accumulation of precipitation in trenches at Beatty owing to the length of time the pits remained open.

Comment Code: Private Citizen 56-3

Location of EIS Revision(s): None required

Response: The summary discussion on groundwater contamination has been clarified in response to other comments. Nimz and Thompson (1992) report that out of thousands of wells drilled on the test site in support of weapons testing, most of which were in active testing areas, only 5 were found where groundwater transport of radionuclides other than tritium were documented. A further 3 wells could have been expected to be contaminated owing to their proximity to tests, but were not. The discussion of the three wells with tritium contamination has been modified to take into account other reported contamination of the groundwater by tritium.

The findings concerning the transport of radionuclides in groundwater and the conclusion regarding the lack of a groundwater pathway for a surface based disposal site are independent of each other. The statements concerning groundwater transport are for releases <u>directly</u> into the saturated zone that resulted from underground nuclear testing. The conclusions regarding the Area 5 site are based upon an extensive characterization of the unsaturated zone under the shallow land burial site. The disposal of radioactive wastes and hazardous wastes is done at sites that are quite small relative to the entire NTS.

Comment Code: Private Citizen 56-4

Location of EIS Revision(s): None required

Response: There was no assumption that the groundwater was static. The statement that is referenced by the commentor was based on extensive field and laboratory experiments conducted by the DOE. These studies indicate that releases via leaching from the melt glass and chimney rubble continue for a given groundwater volume (the cavity volume) until equilibrium is reached. As additional groundwater comes into contact with the soluble radioactive materials, equilibrium will not be reached unless there are enough remaining soluble radionuclides. In either case, once dissolved, the radionuclides are available for migration through groundwater flow.

Comment Code: Private Citizen 56-5

Location of EIS Revision(s): None required

Response: The DOE included the four federal agencies and Nye County as cooperating agencies during the early stages of the development of this EIS in accordance with the Council on Environmental Quality regulations for implementing the National Environmental Policy Act (Title 40 CFR Part 1501.6). These agencies were included because of their jurisdiction and specific expertise with regard to environmental issues which are discussed in the NTS EIS. The DOE sought their cooperation to identify potential impacts to lands owned, administered, or managed by these agencies as a result of implementing the proposed alternatives. The DOE did not want the alternatives evaluated in the NTS EIS to be in conflict with the programs and policies of these agencies.

The U.S. Geological Survey is a source of information, but the agency does not have jurisdiction over the NTS or surrounding property. Although the DOE did not request that the U.S. Geological Survey be a cooperating agency, agency personnel were contacted during the preparation of this EIS and, as the comment states, various U. S. Geological Survey documents were used in developing the environmental baseline and analyzing the potential environmental effects of the proposed alternatives.

Comment Code: Private Citizen 56-6

Location of EIS Revision(s): None required

Response: Extensive characterization studies, monitoring, and evaluations are contained in the Performance Assessment for Area 5 (Shott et al., 1995), the Annual Site Environmental Report, and in numerous references cited in those reports. The commentor is referred to those documents for further information.

The alternative suggested by the commentor was considered, but was eliminated from further consideration because it falls within the range of the four alternatives evaluated in this EIS. The DOE believes that the range of alternatives considered in this EIS bounds the responders suggested alternative.

Comment Code: Private Citizen 57-1

Location of EIS Revision(s): None required

Response: In the development of the NTS EIS, every effort was made to evaluate a reasonable inventory of activities that might be conducted at the NTS. During this process, there was no indication that a program with the name "FALCON" was something that should be included. As with all programs proposed for the NTS, appropriate National Environmental Policy Act reviews would take place prior to any activity.

Comment Code: Private Citizen 58-1

Location of EIS Revision(s): None required

Response: The 1977 EIS (ERDA, 1977) is the most recent EIS which describes the activities and programs conducted at the Nevada Test Site. To that extent, it does contain information and impact analyses which are valuable for inclusion in this EIS. However, the environmental information and data presented in this EIS updates previous information and describes impacts for the future activities being considered. Based on the new information and analyses, DOE does not believe that undue reliance has been placed on the 1977 EIS.

Comment Code: Private Citizen 58-2

Location of EIS Revision(s): None required

Response: The Final NTS EIS identifies Alternative 3, plus the public education activities of Alternative 4, as the Preferred Alternative.

Comment Code: Private Citizen 58-3

Location of EIS Revision(s): None required

Response: The DOE recognizes the potential difficulties in achieving the goals proposed in Volume 2. Potential conflicts between the goals and mission requirements will be identified and proposed resolutions evaluated during the National Environmental Policy Act review process. At that time, interested parties will be able to comment on the conflicts and proposed resolutions.

Comment Code: Private Citizen 58-4

Location of EIS Revision(s): None required

Response: The commentor has pointed out the difficulty of making decisions when information is lacking. The Council on Environmental Quality has recognized this in its regulations, and has provided guidance for agencies in preparing National Environmental Policy Act documents. It is important not to foreclose options when data are not available. In these cases the NTS EIS has provided bounding analyses; that is, they have used very conservative assumptions to ensure that any adverse impacts that were measured, when more data are available, would not be likely to be more severe than the estimated impacts with limited data. When more data are available for a specific project, additional National Environmental Policy Act analysis would be tiered from this EIS.

Comment Code: Private Citizen 58-5

Location of EIS Revision(s): None required

Response: The commentor's general statement applies specifically to the section entitled "Unavoidable Adverse Impacts" in the Summary. Unavoidable adverse impacts are defined as substantial adverse changes to the existing environmental conditions that cannot be fully mitigated. Examples of unavoidable adverse impacts are water withdrawals and air quality degradation. This section has been clarified in the Final NTS EIS.

Comment Code: Private Citizen 58-6

Location of EIS Revision(s): None required

Response: The Solar Enterprise Zone Concept was established to create a sustaining solar manufacturing infrastructure through construction of a utility-scale solar-generating facility in southern Nevada. Although the words; Solar Enterprise Zone, do not appear in the Notice of Intent, the operation is mentioned. In the Background section of the Notice of Intent, one of the primary responsibilities of the NTS is to:

> *"Demonstrate the capability to provide alternative energy sources to meet power needs for the Southwestern United States. This would include research activities in solar and other alternative energy source technologies."*

Solar energy research is considered a continuing operation at the NTS. The current activity, as described in Appendix A, Section A.4.1.1, is the preparation of plans for an initial 100 megawatt solar generator program. Under Alternative 3, new initiatives would be pursued, including production and research facilities.

The DOE is acting in close coordination with the Corporation for Solar Technology and Renewable Resources to develop mission principles of the Solar Enterprise Zone. The Corporation for Solar Technology and Renewable Resources is currently engaged in selecting one or more of the prospective locations (two on-site, and three off-site) for the construction of a large-capacity solar power project. Upon selection, appropriate additional National Environmental Policy Act reviews will be conducted.

Comment Code: Private Citizen 58-7

Location of EIS Revision(s): None required

Response: There continues to be an extensive radiation monitoring network both on and off the Nevada Test Site. Changes have been made in the network, and it is correct that some stations have been relocated and others closed. The remaining network has been designed to provide the continuity of historic data mentioned by the commentor as well as to continue to provide the best information for use in defining the status of the environment for discussion in the *Annual Site Environmental Report*. The Yucca Mountain Stations have been included in the consideration of the monitoring network design.

Comment Code: Private Citizen 58-8

Location of EIS Revision(s): None required

Response: The source of contamination for Areas 11 and 13 was from the safety shots described in Section 4.1.4.3, Volume 1, Chapter 4. The safety shot information is contained as the second item in Table 4-1, Volume 1, Chapter 4; therefore, the contamination in Areas 11 and 13 is included in Table 4-1.

Comment Code: Private Citizen 58-9

Location of EIS Revision(s): None required

Response: The presentation of this well data is lengthy and is not needed for the analysis contained in the NTS EIS. The Long Term Hydrologic Monitoring Program monitors 36 wells on the NTS, and another 23 wells off of the facility. The results of this monitoring are presented each year in the NTS Annual Site Environmental Report.

Comment Code: Private Citizen 58-10

Location of EIS Revision(s): None required

Response: The DOE is committed to the goal of remediating contaminated sites to ensure that risk to the environment and to human health and safety are either eliminated or reduced to protective levels. A description of Environmental Restoration Program activities can be found in Appendix A, Section A.3, Nevada Environmental Restoration Program. An ongoing assessment to identify and remediate contamination will continue in pursuit of these goals. Protective levels are determined through site conditions, risk assessments, and consultation with federal and state regulatory authorities.

Specific investigations and risk assessments are being conducted for each corrective action unit (grouping of environmental restoration sites). These investigations and assessments will determine the levels and extent of contamination, ascertain the potential human health or environmental exposure to the contamination, and compare the exposure to established standards for protection of human health and the environment.

Surveys conducted to date by the Environmental Restoration Project as part of the Decontamination and Decommissioning Subproject indicate that many NTS facilities have limited areas of radioactive contamination and little or no hazardous constituent contamination. Much of the contamination within the facilities could feasibly and economically be removed to levels acceptable for public use. Studies conducted by the Environmental Restoration Project indicate that most of the radioactive contamination, such as plutonium contamination, from historic testing is mostly confined to the upper 5 centimeters (cm) (2 inches [in.]) of soil. Conventional soil removal equipment, such as bulldozers and excavators, can successfully remove the contaminated soil, thereby cleaning the site to acceptable levels for other uses, such as construction of industrial facilities. The intent of the Environmental Restoration Program is to allow immediate use of lands and facilities based on acceptable risk levels. Field activities are being conducted as a result of the Environmental Restoration Program's mission to determine existing levels of contamination and cost-effective methods of decontamination or clean-up to restore buildings and lands to useable condition.

Comment Code: Pivate Citizen 58-11

Location of EIS Revision(s): None required

Response: The Solar Enterprise Zone concept analyzed in this EIS includes development of solar energy facilities at both the NTS and other alternative sites. Alternative Solar Enterprise Zone sites may be used in conjunction with the NTS to minimize infrastructure improvements required and to improve access to power markets (Appendix A, Section A.4.3.1) The Eldorado Valley, the Dry Lake Valley, and the Coyote Spring Valley sites were identified as potentially feasible sites for such facilities by the Corporation for Solar Technology and Renewable Resources, the entity that would actually develop a solar energy facility, and thus evaluation of the impacts of development of these sites is required as part of the DOE's National Environmental Policy Act process.

Comment Code: Private Citizen 58-12

Location of EIS Revision(s): None required

Response: The DOE does not agree that the there is a discrepancy between the two sections. As stated in the NTS EIS, the DOE will continue to evaluate potential off-site impacts, and is developing a regional groundwater flow model to serve as a tool for impact evaluation. Preliminary models of the impacts of water development for Alternative 3 have indicated that the area of influence of a well field for the proposed Solar Enterprise Zone will not extend beyond the boundaries of the NTS.

Comment Code: Private Citizen 58-13

Location of EIS Revision(s): Chapter 5, Section 5.3.1.6

Response: Rare and vulnerable plants and animals are those listed by the U. S. Fish and Wildlife Service as threatened, endangered, or candidates. The text has been changed to make this clear. As required by the Endangered Species Act, the DOE/NV would consult with the Fish and Wildlife Service to evaluate the effect of the Alternative Energy Project, if any, on these species. The only such species expected to be impacted is the desert tortoise.

Comment Code: Private Citizen 58-14

Location of EIS Revision(s): Chapter 5, Section 5.3.1.5.2

Response: The DOE agrees and the text has been corrected to reflect this commentor's observation.

Comment Code: Private Citizen 58-15

Location of EIS Revision(s): Chapter 5, Section 5.3.1.5.2

Response: The DOE agrees that a discussion of groundwater mining is appropriate. The following text has been added to the discussion:

There may not be a one-to-one correspondence between the quantity of water withdrawn in excess of the perennial yield, and the reduction in underflow to downgradient basins. The results of preliminary modeling of the groundwater withdrawals indicates that the groundwater level impacts will be localized within the vicinity of the well, and most impacts will be upgradient. It is likely that some groundwater will be removed from storage, a process referred to as groundwater mining, and there will be a corresponding decrease in the impact on downgradient discharge rates. The results presented herein are preliminary, and are adequate for the purposes of this EIS. More detailed evaluations will be performed as more detailed information on water use by the facility become available, and will be presented in lower-tiered National Environmental Policy Act documents prior to the development of the water.

Comment Code: Private Citizen 59-1

Location of EIS Revision(s): None required

Response: The DOE believes it is important for American Indian groups to participate in the preparation of the NTS EIS. On March 17-19, 1995, representatives of the CGTO met with the DOE/NV personnel. The CGTO represents 19 Indian Tribes and official Indian groups that have traditional cultural and historic ties to the NTS region. It consists of individuals selected by the various Tribal governments and official Indian groups to represent the tribes and report back to the tribal governments and groups on issues affecting Indian people. The DOE/NV accepted the CGTO recommendation to appoint two representatives from the Western Shoshone, Owens Valley Paiute, and Southern Paiute to write the American Indian perspective on the alternatives contained in the NTS EIS. The sections prepared by this group appear in italics, where appropriate, in this EIS and also appear in Appendix G. Chapter 8. Appendix G contains details of the coordination effort between the DOE/NV and the CGTO.

Consultation with the CGTO and their participation in the preparation of the NTS EIS satisfied National Environmental Policy Act requirements as well as Executive and DOE Order requirements regarding American Indian Tribal Government Policy.

Comment Code: Private Citizen 59-2

Location of EIS Revision(s): None required

Response: Consultation with appropriate American Indian groups was undertaken by the DOE for this program in compliance with the National Environmental Policy Act, American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, and the National Historic Preservation Act. Consultation with representatives of the CGTO was initiated by the DOE for this program in March 1995. As indicated in the revised Appendix G, "American Indian Assessments, A Native American Resource Document," consultation with the CGTO has been, and is, continuing. Numerous project-specific consultations have occurred, including inventory and evaluation of American Indian cultural resources and compliance with the American Indian Religious Freedom Act, and the Native American Graves Protection and Repatriation Act (Appendix G, "Executive Summary"). Ongoing consultation has resulted in the establishment of mutual cooperation and working relationships between American Indian groups and the DOE.

Comment Code: Private Citizen 59-3

Location of EIS Revision(s): None required

Response: The DOE agrees and has begun a comprehensive study of the potential social and cultural effects of the transportation of low-level and mixed waste on affected American Indian tribes. The DOE is also committed to having full government-to-government consultation on transportation issues with affected American Indian tribes.

Comment Code: Private Citizen 59-4

Location of EIS Revision(s): Appendix I, Attachment F

Response: The location of the Moapa Paiute Indian Reservation has been added to Figures F-2 and F-4 in Attachment F.

Comment Code: Private Citizen 59-5

Location of EIS Revision(s): None required

Response: Executive Policy Memorandum: Government-to-Government Relations with Native American Tribal Governments is cited in Section 1.1 of the NTS EIS.

Comment Code: Private Citizen 59-6

Location of EIS Revision(s): None required

Response: DOE Order 1230.2 regarding American Indian Tribal Government Policy is cited in the Executive Summary of Appendix G of the NTS EIS.

Comment Code: Private Citizen 59-7

Location of EIS Revision(s): None required

Response: See response to Comment Code Private Citizen 59-3.

Comment Code: Private Citizen 59-8

Location of EIS Revision(s): None required

Response: The Las Vegas Indian Center is a Pan-tribal organization and does represent American Indians with traditional lands located elsewhere. However, these groups represented by the Las Vegas Indian Center have established historical ties to the area. The historical basis for these ties has been previously discussed in "American Indians and Nuclear Waste Storage: The Debate at Yucca Mountain, Nevada" by Richard Stoffle and J.M. Evans (specifically Pages 253-255), published in *Native Americans and Public Policy*, 1992 (Stoffle and Evans, 1992).

Original discussions for the Final NTS EIS have been provided by the American Indian Writers Subgroup on social and economic issues (incorporated into the Socioeconomic sections), possible health effects (incorporated into the Occupational and Public and Safety/Radiation sections), and environmental justice (incorporated into the Environmental Justice sections). The affected environments and environmental consequences for these sections are also presented in the revised Appendix G, "American Indian Assessments, A Native American Resource Document."

Appendix G represents the collective opinions of the CGTO as prepared by the selected representatives comprising the American Indian Writers Subgroup. The CGTO consists of seven separate tribes of the Southern Paiutes, four tribes of the Western Shoshones, five tribes of the Owens Valley Paiutes and Shoshones, and three other official Indian Organizations (Appendix G, "Executive Summary"). In March 1995, a CGTO recommendation to create the American Indian Writers Subgroup was made and implemented. The American Indian Writers Subgroup is basically comprised of two representatives each from the Southern Paiutes, the Western Shoshones, the Owens Valley Paiutes and Shoshones, and a coordinator (Appendix G, "Executive Summary"). Each phase of the consultation process from the initial meetings to the formation of the American Indian Writers Subgroup to the review of all prepared text has received the full approval of the CGTO. The Tribal Governments have been fully apprised of each step

As a result of a previous comment received by the CGTO, the language in the American Indian EIS sections prepared by the American Indian Writers Subgroup was reviewed by the CGTO. The CGTO recommended minor corrections, but have retained the original voice. EIS sections prepared by the American Indian Writers Subgroup have received only minor formatting and terminology editing during DOE production.

Public Hearing Transcript

Comment Code: Public Hearing Transcript 1-1

Location of EIS Revision(s): None required

Response: The NTS EIS shows that potential impacts from waste shipments would be small under any of the alternatives evaluated. The DOE recognizes that transportation risks are not the only concern in the transportation of waste to the NTS. Consequently, the DOE will continue to interact with the stakeholders to ensure that local concerns are brought to the attention of carriers selecting routes and continue to conduct all operations, including shipping, in a safe manner. The impacts of proposed waste shipments to the NTS are discussed in the Sections 5.1.1.2, 5.2.1.2, 5.3.1.2, and 5.4.1.2 of Volume 1, Chapter 5 and Volume 1, Appendix I, Transportation Study. Also see Section 1.6 of Volume 3.

Comment Code: Public Hearing Transcript 1-2

Location of EIS Revision(s): Volume 1, Chapter 6

Response: Volume 1, Chapter 6 has been rewritten to evaluate the impacts of a *Resource Management Plan* and economic and demographic projections as the source of non-NTS information. In addition, Section 6.4.2 addresses cumulative transportation impacts. In particular, all NTS-related shipments under the expanded use would be expected to contribute 0.002 percent of the total vehicular incidents to the nation's highways. Not all of these shipments would use Interstate 15 or other routes of concern of the commentor.

Comment Code: Public Hearing Transcript 1-3

Location of EIS Revision(s): None required

Response: The DOE recognizes that the transportation of radioactive materials and related issues are of significant concern to the general public and other interested parties. For additional discussion and information on transportation and related issues, please refer to the response to Comment Code Public Hearing Transcript 1-1 and Section 1.6 of Volume 3.

Comment Code: Public Hearing Transcript 1-4

Location of EIS Revision(s): None required

Response: The comment favoring a combination of Alternatives 3 and 4 has been noted.

Comment Code: Public Hearing Transcript 1-5

Location of EIS Revision(s): None required

Response: The vast majority of the low-level and mixed wastes described in the NTS EIS comes from the decontamination and decommissioning of DOE plants and facilities, remediation of contaminated sites, and disposal of residual waste from past activities both on the NTS and at other DOE and DoD sites across the United States. The waste problems that exist across the DOE Complex at this time are the result of historical activities and practices that are no longer employed. DOE sites now have very stringent waste management controls in effect through the implementation of waste minimization and pollution prevention programs. Cleanup and remediation efforts are under way at nearly every DOE site that has radioactive and/or mixed-waste contamination areas.

Comment Code: Public Hearing Transcript 1-6

Location of EIS Revision(s): None required

Response: Under scenarios other than a total shutdown of activities at the NTS, some low-level, mixed, and hazardous wastes are likely to be generated and would require management. The DOE has an active waste-minimization and management program focused on controlling the amount of waste generated; treating and disposing of wastes in a manner that minimizes impacts to the environment; and protecting the health and safety of the public and the on-site workforce.

Comment Code: Public Hearing Transcript 1-7

Location of EIS Revision(s): None required

Response: The vast majority of the low-level and mixed wastes covered in the NTS EIS comes from the decontamination and decommissioning of DOE plants and facilities, remediation of contaminated sites, and disposal of residual waste from past activities both on the NTS and at other DOE and Defense sites across the United States. Very little (less than 5 percent) of this waste comes from new activities and projects. The list of some of the sites that contributed to the volume of low-level waste considered in the NTS EIS is located in Volume 1, Section 4.1.2.3.

Comment Code: Public Hearing Transcript 1-8

Location of EIS Revision(s): None required

Response: Many of the activities that make up the options under Alternatives 1, 3, and 4 have the potential to result in adverse impacts of various magnitudes on geology and soil. The DOE shares the concern about environmental degradation of geology and soils. The DOE has programs in place that are intended to cleanup existing contamination while assuring the continued safety of the environment. These are discussed in Volume 1, Chapters 3 and 4 of the NTS EIS. It is not possible to eliminate every threat to the geology and soils when conducting any substantial activity on the land surface or within the subsurface.

Comment Code: Public Hearing Transcript 1-9

Location of EIS Revision(s): None required

Response: The *Resource Management Plan* being developed for the NTS emphasizes and supports ecosystem management and conservation of biodiversity. Goals for the management of those resources are being developed with help from the public and reflect the DOE's commitment for managing and conserving resources. These goals will be used as standards against which the DOE will judge the impact of its actions. This philosophy is reflected in Volume 2.

Comment Code: Public Hearing Transcript 1-10

Location of EIS Revision(s): None required

Response: The Solar Enterprise Zone, as a concept to create a sustaining solar manufacturing infrastructure through construction of utility-scale, solar-generating facilities, is described in Appendix A, Section A.4.1.1. More specific information on the current status of programs under review by the Solar Enterprise Task Force can be found in Appendix A, Section A.4.3.1, "Alternative Energy." Sections 4.5, 4.6, and 4.7 of Volume 1 of the NTS EIS discuss the environment at sites currently under consideration for the location of solar-generating facilities. Volume 1, Sections 5.3.5, 5.3.6, and 5.3.7 of the NTS EIS discuss the potential environmental impacts of solar technology development at these sites.

Comment Code: Public Hearing Transcript 1-11

Location of EIS Revision(s): None required

Response: The comment raises concerns about potential disposal of wastes at Yucca Mountain. Possible environmental impacts from the construction, operation, and eventual closure of a potential repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain, including potential cumulative impacts, will be addressed in a separate, ongoing EIS. Refer to Volume 1, Section 3.2.6.1 and Volume 3, Section 1.1 for a discussion of the relationship between Yucca Mountain and the NTS.

Comment Code: Public Hearing Transcript 1-12

Location of EIS Revision(s): None required

Response: The NTS EIS includes consideration of transportation of low-level radioactive waste. Spent nuclear fuel and high-level radioactive waste transportation will be addressed in a separate, ongoing EIS for a potential repository at Yucca Mountain, and will include an analysis of different types of shipping casks, including the sealed cask mentioned in your comment that may be used for spent nuclear fuel and high-level radioactive waste. See Section 1.1 of Volume 3 for more information.

Comment Code: Public Hearing Transcript 1-13

Location of EIS Revision(s): None required

Response: The DOE is concerned about the health of both the public and the environment. The principal focus of analyses contained in the NTS EIS sections on Occupational and Public Health and Safety is directed toward assessment of impacts to the human population, both workers at the NTS and the general population offsite. These analyses have shown that the principal health risks to workers at the NTS are occupational injuries and fatalities that are similar to risks to workers employed in other "safe" industries. For the general off-site population, impacts were estimated to be less than one additional fatal cancer in the surrounding population over that which would occur without the presence of these NTS activities.

Comment Code: Public Hearing Transcript 1-14

Location of EIS Revision(s): None required

Response: The Radiation Exposure Compensation Act of 1990, as amended (refer to Volume 1, Chapter 3), states that members of the public who reside within the geographic boundaries and time period therein defined may be eligible for monetary benefits as compensation for illness or damage related to specific diseases and death. However, none of the alternatives considered in this EIS involve the resumption of atmospheric weapons testing. For more information regarding claims for past damages resulting from atmospheric testing, please see Volume 1, Section 3.2.6.3.

Comment Code: Public Hearing Transcript 1-15

Location of EIS Revision(s): None required

Response: The commentor's opposition to nuclear testing and support of closure of the NTS is noted.

Comment Code: Public Hearing Transcript 1-16

Location of EIS Revision(s): Chapter 4, Section 4.1.12, Appendix G

Response: The loss of, or reduced access to specific American Indian resources, such as burial grounds, has been indirectly discussed in the American Indian sections under "Cultural Resources." The American Indian Writers Subgroup has prepared additional sections concerning issues of Environmental Justice (Section 4.1.12). Impacts to these American Indian concerns were also provided by the American Indian Writers Subgroup and are incorporated into this EIS under each alternative. The effect this loss or lack of access creates has been identified in these sections.

Comment Code: Public Hearing Transcript 1-17

Location of EIS Revision(s): None required

Response: The waste intended for burial at the NTS, whether it comes from onsite or offsite, must meet very specific DOE/NV waste-acceptance criteria prior to disposal at the NTS. In addition to the waste-acceptance criteria, operational actions are taken to contain any contamination, including gases, that could escape from waste-disposal packages. Waste that is expected to generate gases after disposal, is placed in landfill cells that are constructed and designed to contain and limit the amount of gas that escapes and, subsequently, could come in contact with people. These actions are taken to provide the safest practical working environment for NTS waste-disposal workers, and to ensure that there is no release of radioactivity or contaminants from the NTS.

Comment Code: Public Hearing Transcript 1-18

Location of EIS Revision(s): None required

Response: The comment relative to returning the NTS to the public is noted. As a point of clarification, it must be recognized that the DOE cannot relinquish withdrawn lands directly to the public, states, or other entities for their use. The land is withdrawn from public use under the provisions of the Federal Land Management and Policy Act. Upon expiration of the withdrawal the DOE may reapply for a continuation or extension of the withdrawal or return the land to the Department of the Interior.

Comment Code: Public Hearing Transcript 1-19

Location of EIS Revision(s): None required

Response: The comment has been noted.

Comment Code: Public Hearing Transcript 1-20

Location of EIS Revision(s): None required

Response: The impacts of proposed waste shipments to the NTS are discussed in Volume 1, Section 5.1.1.2, 5.2.1.2, 5.3.1.2, 5.4.1.2 and Appendix I. The transport routes evaluated in the transportation study are limited to existing highways. If the proposed Interstate 66 were constructed, waste shipments could be rerouted around St. George, Utah, as the commentor proposes. However, even if the proposed Interstate 66 is not constructed, the NTS EIS shows that potential impacts from waste shipments would be small under any of the alternatives evaluated. The DOE recognizes that transportation risks are not the only concern in the transportation of waste to the NTS. Consequently, the DOE will continue to interact with the stakeholders to ensure that local concerns are brought to the attention of carriers selecting routes and will continue to conduct all operations, including shipping, in a safe manner.

Comment Code: Public Hearing Transcript 1-21

Location of EIS Revision(s): None required

Response: Among other issues, the commentor raises concerns about potential transportation of nuclear wastes to a repository at Yucca Mountain. Possible environmental impacts from the construction, operation, and eventual closure of a repository for spent nuclear fuel and high level radioactive waste at Yucca Mountain, including transportation and discussions of potential routing for these waste shipments will be addressed in a separate ongoing EIS. Please refer to Section 1.1 and 1.6 of Volume 3.

Comment Code: Public Hearing Transcript 1-22

Location of EIS Revision(s): None required

Response: Public comments received during the scoping process recommended both cleaning up the site, followed by closure, and simply closing and securing the site without further action. The alternatives selected for evaluation in this EIS include cleaning up and not cleaning up the site and closure, continued operations at the current or expanded level, and alternative uses. This range of alternatives is considered to include all reasonably foreseeable actions, including cleaning up the site followed by closure.

Comment Code: Public Hearing Transcript 1-23

Location of EIS Revision(s): None required

Response: Your comment is noted. The Human Health Risk Assessment, Appendix H, identifies risk associated with ongoing and future activities at the NTS including the risk from underground testing.

Comment Code: Public Hearing Transcript 1-24

Location of EIS Revision(s): None required

Response: The DOE believes it is important for American Indian groups to participate in the preparation of this EIS. Consultation with the Consolidated Group of Tribes and Organizations was initiated for this project in 1995 and is an ongoing process. Consideration of American Indian resources and general concerns has been a part of the DOE planning process since 1985.

Although in many instances viewpoints of the American Indians differ widely from the DOEs, ongoing consultation serves to provide a better understanding of American Indian issues. It may be unlikely that all areas of concern will be resolved in the future; however, through ongoing consultation, the DOE continues to work toward acceptable compromises and solutions to American Indian concerns.

Comment Code: Public Hearing Transcript 1-25

Location of EIS Revision(s): None required

Response: The comment has been noted.

Comment Code: Public Hearing Transcript 1-26

Location of EIS Revision(s): None required

Response: A primary objective of the DOE's ongoing Environmental Restoration Program at the NTS is to identify, characterize, and remediate contaminated sites in accordance with the requirements of the responsible regulatory agencies. It should be noted, however, that the DOE cannot relinquish withdrawn lands directly to the public, states, or other entities for their use. The land is withdrawn from public use under the provisions of the Federal Land Management and Policy Act. Upon expiration of the withdrawal, the DOE may reapply for a continuation or extension of the withdrawal or return the land to the Department of the Interior.

Comment Code: Public Hearing Transcript 1-27

Location of EIS Revision(s): None required

Response: The continued use of the NTS to support the DOE Waste Management Program efforts at current levels and under expanded use are options evaluated in this EIS. The potential impacts of using the NTS as an interim or long-term storage location for nuclear weapons and components is evaluated under Alternative 3. Each of these options has been evaluated considering the existing environment, potential impacts, and the characteristics and attributes of the NTS as a suitable storage location. Refer to Section 1.1 of Volume 3 for a discussion of the relationship between Yucca Mountain and the NTS.

Comment Code: Public Hearing Transcript 1-28

Location of EIS Revision(s): None required

Response: The commentor's objection to the transport of low-level waste on highways, and the disposal of this waste at the NTS, has been noted.

Comment Code: Public Hearing Transcript 1-29

Location of EIS Revision(s): None required

Response: The comment in opposition to the continued operation of waste-management units at the NTS is noted. The closure of all waste-management units at the NTS, as well as the continued use of the NTS to support DOE Waste Management Program efforts at current levels and under expanded use, are options evaluated under the range of alternatives addressed in this EIS.

Comment Code: Public Hearing Transcript 2-1

Location of EIS Revision(s): None required

Response: The comments concerning the location of the NTS in Nye County and that some waste shipments would be routed through Pahrump under the various alternatives have been noted.

Comment Code: Public Hearing Transcript 2-2

Location of EIS Revision(s): None required

Response: The DOE agrees with the commentor that groundwater monitoring is critical. Toward that end, the DOE has begun an extensive program to characterize the groundwater under the NTS. This program will provide additional locations for monitoring as part of the program detailed in Volume 1, Section 4.1.5.2 of the NTS EIS.

Comment Code: Public Hearing Transcript 2-3

Location of EIS Revision(s): None required

Response: The NTS is one of four potential sites being considered for development of renewable solar energy resources. The selection of the site or sites for development of the Solar Enterprise Zone facility will be principally based on factors related to the engineering feasibility (e.g., required infrastructure improvements and proximity to the power grid) and potential environmental impacts at the sites being considered, not the potential employment benefits which might result. The DOE does not set or direct the hiring practices of its contractors; however, the DOE will continue to encourage its contractors to notify appropriate Nye County agencies of available positions to maximize the opportunity for Nye County residents to be hired to fill positions on DOE projects at the NTS.

Comment Code: Public Hearing Transcript 2-4

Location of EIS Revision(s): None required

Response: The NTS, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley have been identified as potential sites where the Solar Enterprise Zone could deploy its generating facilities. These sites were included in the NTS EIS because the National Environmental Policy Act requires the analysis of all reasonable alternatives. The DOE acknowledges comments regarding increased employment due to nondefense research and development and has analyzed its potential positive and negative effects on the communities which may be implicated.

Comment Code: Public Hearing Transcript 2-5

Location of EIS Revision(s): None required

Response: The comments regarding the creation of jobs for Nye County have been noted.

Comment Code: Public Hearing Transcript 2-6

Location of EIS Revision(s): None required

Response: The NTS EIS discusses possible activities for nondefense research and development, including the development of solar power at the Solar Enterprise Zone. The DOE actively supports alternative energy programs, such as solar energy research, as part of its ongoing mission. The DOE/NV agrees that southern Nevada is an ideal place for the development of alternative energy resources and intends to promote the NTS for this project.

Comment Code: Public Hearing Transcript 2-7

Location of EIS Revision(s): None required

Response: Direct-funded environmental safety and health training will continue to be made available to state regulators, educators, the public, and agencies (law enforcement, fire fighters, and emergency medical personnel) within the state of Nevada. Also see Section 1.6 of Volume 3.

Comment Code: Public Hearing Transcript 2-8

Location of EIS Revision(s): None required

Response: The comment is noted with respect to the transportation of hazardous materials on the roadways, especially in rural towns and communities. Please refer to Section 1.6 of Volume 3.

Comment Code: Public Hearing Transcript 2-9

Location of EIS Revision(s): None required

Response: The routes identified in the NTS EIS may not be the actual routes that would be used in the future. Although in-Nevada route, NV-6, ranks high in comparison to other in-Nevada routes, the transportation analysis documented in Appendix I shows that the transportation risks associated with all routes are small. Further, the NTS EIS evaluates NV-6 and the routes that utilize Highway 160 as alternate routes, not primary routes.

The DOE recognizes that transportation risks are not the only concern in the transportation of waste to the NTS. Consequently, the DOE will continue to interact with the stakeholders to ensure that local concerns are brought to the attention of carriers selecting routes, and continue to conduct all operations, including shipping, in a safe manner.

Comment Code: Public Hearing Transcript 2-10

Location of EIS Revision(s): None required

Response: The NTS currently has a transuranic waste storage pad with over 1,500 55-gallon drums of mixed transuranic waste. Under Alternative 3 of the NTS EIS, transuranic waste would be received for certification purposes prior to shipment to an off-site disposal location. The Draft Waste Management Programmatic EIS identifies the NTS as a treatment and storage site under the No Action and Decentralized alternatives (DOE, 1995c). These alternatives include the treatment of transuranic waste at 11 and 16 sites, respectively.

At this time, the only planned increase of transuranic waste at the Area 5 Radioactive Waste Management Site is 0.02 cubic meters (m^3) (0.03 cubic yards [yd^3]), anticipated to be shipped to the NTS for storage from Energy Technology Engineering Center, Canoga Park, California. Additional transuranic waste that would be stored at the NTS under Alternative 3 of the NTS EIS has not been estimated, pending future programmatic decisions. There may be additional National Environmental Policy Act documents prepared for actions concerning the shipment of transuranic waste to the NTS for certification purposes. Under Alternatives 1 and 4, the volume of transuranic waste would decrease as waste is certified and sent off site.

Comment Code: Public Hearing Transcript 2-11

Location of EIS Revision(s): None required

Response: Refer to Comment Code Public Hearing Transcript 1-11 and Section 1.6 of Volume 3 for a discussion of the relationship between Yucca Mountain and the NTS.

Comment Code: Public Hearing Transcript 2-12

Location of EIS Revision(s): None required

Response: The commentor is concerned that there are no viable plans for railroads coming to the test site. The transportation of radioactive waste by rail is not evaluated as an option in any of the alternatives in this EIS because there are no rail spurs that currently provide service to the NTS. However, Volume 1, Appendix I, Attachment F of the NTS EIS provides a summary of considerations related to rail spur development, use of truck/rail intermodal systems, and comparisons to the continued use of truck transportation systems. This section of the NTS EIS is intended to support a dialogue with Nevada stakeholders on alternative radioactive material transportation opportunities that could benefit both the community and the federal government.

The DOE will evaluate the possible environmental impacts from the construction, operation, and eventual closure of a potential repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain, Nevada, including transportation and discussion of potential routing for these waste shipments, in a separate, ongoing EIS. Refer to Volume 1, Section 3.2.6.1 and Volume 3, Section 1.1 for a discussion of the relationship between Yucca Mountain and the NTS.

Comment Code: Public Hearing Transcript 2-13

Location of EIS Revision(s): None required

Response: Pahrump is the largest and most rapidly growing community in Nye County. It is discussed in Volume 1, Section 4.1.3 with respect to population, housing stock, housing demand, vacancy rate, public finance, and public services.

Comment Code: Public Hearing Transcript 2-14

Location of EIS Revision(s): Volume 1, Appendix H

Response: Your comment has been noted. See Section 1.2 of Volume 3. In addition, Appendix H, Human Health Impacts has been extensively revised as a result of detailed comments received on human health and risk issues.

Comment Code: Public Hearing Transcript 2-15

Location of EIS Revision(s): None required

Response: Based on recent reports, it has been concluded that the plutonium and uranium in the tank waste at Hanford could not go critical. The tanks and the waste at Hanford remain one of DOE's high priorities for remediation and cleanup, however.

Comment Code: Public Hearing Transcript 2-16

Location of EIS Revision(s): None required

Response: No environmental damage is expected as a result of incident-free transport of any radioactively contaminated material/waste. Not every accident would result in a release, in addition, releases would be limited by the form of the material (solid) and only a small fraction of the amount released would be transported (by air, soil, or water); therefore, the area affected would be limited. The expected number of latent cancer fatalities in the maximally exposed population due to accidental releases under Alternative 3 is 0.00041 in 10 years. To put this risk in perspective, consider that the annual cancer death rate from all causes in Nevada is around 2,500.

Comment Code: Public Hearing Transcript 2-17

Location of EIS Revision(s): None required

Response: There have been a number of studies of the colloidal transport of radionuclides from underground nuclear testing in groundwater at the NTS. Related studies on similar radionuclides and rocks have been performed for the Yucca Mountain Geologic Repository Project, and the DOE's Office of Subsurface Science has conducted studies on other rock types found on the NTS. Migration of tritium in groundwater at the NTS has been found to be more significant than transport of other radionuclides as colloids. Therefore, present studies focus on transport rates of radionuclides as a result of all mechanisms, not solely colloidal transport. It is also important to distinguish between groundwater flow and the much more rapid flow of water in streams on the earth's surface. Groundwater is subject to distinctly different chemical and physical processes than those applicable to surface waters.

Comment Code: Public Hearing Transcript 2-18

Location of EIS Revision(s): None required

Response: Monitoring of the vadose zone occurs at both of the NTS disposal sites and will continue for some time. There is no contamination detected from either disposal site on the NTS that is migrating toward the groundwater. The DOE/NV employs a stringent waste-acceptance criteria that requires generators to prepare their waste so that it is in an acceptable form prior to disposal. Extraction of radioactive nuclides from waste material is very rarely done due to the extremely low level of radioactivity and the prohibitive cost of purifying waste material to product-quality levels. Transformation of radioactive nuclides through the use of reactions or any other method to something benign is not technologically and cost feasible at this time. The DOE is continually looking for implementable opportunities in waste minimization and pollution prevention.

Comment Code: Public Hearing Transcript 2-19

Location of EIS Revision(s): None required

Response: The comment is noted. The NTS waste disposal sites do not accept waste that requires deactivation.

Comment Code: Public Hearing Transcript 2-20

Location of EIS Location(s): None required

Response: The radiological risks associated with transportation of low-level waste nationally are very low; less than one expected latent cancer fatality (0.075) and less than one radiation-induced detriment (0.035) in 10 years under Alternative 3, as compared to the average annual cancer death rate in Nevada of approximately 2500. Risks are even lower under Alternative 1.

Comment Code: Public Hearing Transcript 2-21

Location of EIS Revision(s): None required

Response: Among other issues, your comment raises concerns about potential disposal of wastes at Yucca Mountain, which is not within the scope of the NTS EIS. Possible environmental impacts from the construction, operation, and eventual closure of a potential repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain, including potential cumulative impacts, will be addressed in a separate, ongoing EIS. Refer to Volume 1, Section, 3.2.6.1 and Volume 3, Section 1.1 for further explanation on why Yucca Mountain is outside the scope of the NTS EIS.

Comment Code: Public Hearing Transcript 2-22

Location of EIS Revision(s): None required

Response: The comment raises concerns about potential disposal of wastes at Yucca Mountain. Possible environmental impacts from the construction, operation, and eventual closure of a potential repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain, including potential cumulative impacts, will be addressed in a separate, ongoing EIS. Refer to Volume 1, Section 3.2.6.1 and Volume 3, Section 1.1 for a discussion of the relationship between Yucca Mountain and the NTS. Information pertaining to groundwater and movement of material underground at Yucca Mountain will be discussed in the repository EIS.

Comment Code: Public Hearing Transcript 2-23

Location of EIS Revision(s): None required

Response: Potential human-health risks as a result of belowground contamination created by past underground weapons testing are discussed in the Occupational and Public Health and Safety Section of Volume 1, Chapter 5, and in Volume 1, Appendix H, of the NTS EIS. Groundwater modeling for underground test areas within the NTS boundaries have consistently indicated that there will be no migration of tritium contamination at levels above EPA guidelines outside the current boundaries of the NTS and the U.S. Air Force-controlled areas. Further, the most recent results from the Environmental Restoration Project predict no detectable tritium contamination above natural background levels outside controlled areas.

Comment Code: Public Hearing Transcript 2-24

Location of EIS Revision(s): None required

Response: The NTS has been withdrawn from all appropriation under public land laws, including mining and mineral leasing laws. As the NTS mission changes, modifications to the withdrawal orders may become necessary and mineral development may become part of the consideration. These types of issues will likely become part of the process; interest through participation in that effort should be continued.

Comment Code: Public Hearing Transcript 2-25

Location of EIS Revision(s): None required

Response: Refer to Response Comment Code Public Hearing Transcript 2-22 and Section 1.1 of Volume 3.

Comment Code: Public Hearing Transcript 2-26

Location of EIS Revision(s): None required

Response: The DOE shares the concern for human health and makes every effort to assure a safe environment for both workers and the public. Appendix H discusses the potential health impacts of proposed activities. Please refer to Section 1.2 for information on DOE's policy toward public health.

Comment Code: Public Hearing Transcript 2-27

Location of EIS Revision(s): None required

Response: It is difficult for an organization to create a sense of trust in the public. In the process of developing this EIS, the DOE has tried to be open in discussing issues and in inviting a review and evaluation of what is being presented. In that regard the DOE is trying to build the level of public trust.

Comment Code: Public Hearing Transcript 2-28

Location of EIS Revision(s): None required

Response: The incident referred to was not on the NTS and involved no DOE wastes. The waste-acceptance criteria used for waste to be disposed of at the Beatty site was not the same as that used for waste intended for disposal on the NTS. The DOE/NV waste-acceptance criteria is very stringent and requires generators of waste intended for disposal on the NTS to prepare and control their waste and document the characterization of the waste in an acceptable manner. These criteria include site-specific requirements deemed necessary for safe operation and waste management on the NTS. One of the DOE/NV waste-acceptance criteria in place to prevent the situation that evidently has occurred at the Beatty site is the restriction on free liquids in waste accepted. The criteria also limits the amount of allowable total moisture content within the waste material.

Geologic characteristics of the Beatty site that are different from those at the NTS disposal sites would also be expected to contribute to differences in the potential for contamination of the groundwater. Monitoring of the vadose zone at both NTS disposal sites has taken place, and will continue to take place. There is no detected contamination from either disposal site on the NTS that is migrating toward the groundwater.

Comment Code: Public Hearing Transcript 2-29

Location of EIS Revision(s): None required

Response: As noted in Chapter 4 of the Draft NTS EIS, one of the unavoidable consequences of past testing actions at the NTS has been the contamination of the deep subsurface environment with radionuclides. The commentor is correct in noting that fracturing of the glass formed by the detonations may increase the potential for leaching of radionuclides over periods of hundreds or thousands of years. The DOE has sponsored a great deal of research to determine the fate of the radionuclides released during weapons tests and will continue to investigate the potential for future releases via leaching from the melt glasses that remain under the NTS.

Comment Code: Public Hearing Transcript 3-1

Location of EIS Revision(s): Volume 1, Section 4.1.1.5

Response: Classified waste accepted for disposal at the NTS is classified primarily because of the shape of the articles that make up the waste material. The general nuclide content and chemical form is not specifically classified in nature and is basically the same as other low-level waste. This waste is disposed of in separate trenches, owing to the extra security measures needed. There are no environmental or human-health risks associated with the disposal of classified waste that are not also attributed to other low-level wastes.

Comment Code: Public Hearing Transcript 3-2

Location of EIS Revision(s): None required

Response: The scope of the NTS EIS includes only those sites inside the state of Nevada where DOE is considering programmatic changes. This includes the NTS, the Tonopah Test Range, portions of the Nellis Air Force Range Complex, and the proposed Solar Enterprise Zone sites at the NTS, Dry Lake Valley, Eldorado Valley, and Coyote Spring Valley. The facilities located in Las Vegas and at Nellis Air Force Base are included in the NTS EIS as part of the programs they support. Many of the site support activities are discussed in Volume 1, Appendix A, Section A.6. Facilities outside of the state of Nevada are not within the scope of this EIS.

Comment Code: Public Hearing Transcript 3-3

Location of EIS Revision(s): None required

Response: Sites located outside of Nevada are not within the scope of this EIS. Please see the response to Comment Code Public Hearing Transcript 3-2 for further detail.

Comment Code: Public Hearing Transcript 3-4

Location of EIS Revision(s): Volume 1, Section 1.1

Response: Each subcritical experiment will have unique impacts. They are described in Chapter 5, "Environmental Consequences." These impacts were derived from Appendix J which contains classified material quantities and design concepts. This information is classified by the DOE for nonproliferation and national security reasons. Volume 1, Section 1.1 has been revised to classify the information in each portion of the NTS EIS.

Comment Code: Public Hearing Transcript 3-5

Location of EIS Revision(s): None required

Response: The test will be performed at the Lyner Complex in Area 1 of the NTS. The Lyner Complex is described in detail in the Final NTS EIS, Appendix A, Section A.1.1.1.3.

Comment Code: Public Hearing Transcript 3-6

Location of EIS Revision(s): None required

Response: Information on material quantities and design concepts are classified by the DOE for nonproliferation and national security reasons, but the expected environmental impacts of subcritical tests were included in Chapter 5, Environmental Consequences.

Comment Code: Public Hearing Transcript 3-7

Location of EIS Revision(s): None required

Response: Appendix A, Section A.1.1.1.3, describes the Lyner Complex in detail and also describes its use for conducting the subcritical experiments.

Comment Code: Public Hearing Transcript 3-8

Location of Revision(s): None required

Response: The intent of Volume 1, Figure 4-3 is to depict lands that were withdrawn for DOE use in connection with the NTS. As stated in the NTS EIS, lands withdrawn under Public Land Order 1662 are used by the DoD for their ongoing operations and are not considered in this EIS for any alternative use by the DOE.

Comment Code: Public Hearing Transcript 3-9

Location of EIS Revision(s): None required

Response: According to the Council on Environmental Quality, the No Action Alternative consists of continuing with the present course of action until that action is changed (46 FR 18026; March 23, 1981). Therefore, Alternative 1 (Continue Current Operations) was considered the No Action Alternative for this EIS.

Comment Code: Public Hearing Transcript 3-10

Location of EIS Revision(s): None required

Response: Under Alternative 1, activities in the five program categories would continue in the same manner and degree as they have within the past 3 to 5 years. Construction of new facilities would only occur in Alternative 3, not Alternative 1 as the comment suggests.

Comment Code: Public Hearing Transcript 3-11

Location of EIS Revision(s): None required

Response: Refer to Section 1.1, Volume 3 and Section 3.2.6.1 of Volume 1, for a discussion of the relationship between the Yucca Mountain and the NTS. Legislation that is pending before Congress, relating to interim storage of spent nuclear fuel from commercial power reactors is speculative at this point. The location of such a facility at the NTS is not considered a reasonable foreseeable event suitable for consideration in the NTS EIS.

Comment Code: Public Hearing Transcript 3-12

Location of EIS Revision(s): None required

Response: Please refer to Section 1.1 of Volume 3.

Comment Code: Public Hearing Transcript 3-13

Location of EIS Revision(s): None required

Response: Please see Section 1.2 of Volume 3.

Comment Code: Public Hearing Transcript 3-14

Location of EIS Revision(s): None required

Response: The comment relative to Alternative 4 is noted. As a point of clarification, it should be recognized that Alternative 4 represents the alternate use of withdrawn lands and is not a No Action Alternative.

Comment Code: Public Hearing Transcript 3-15

Location of EIS Revision(s): None required

Response: Support for return of lands to the public is noted. Alternative 4 evaluates the potential turn-back of lands. The DOE does not have the authority to relinquish lands for disposition to any entity other than the Department of the Interior. Please refer to Section 1.8 of Volume 3.

Comment Code: Public Hearing Transcript 3-16

Location of EIS Revision(s): None required

Response: The DOE acknowledges that underground nuclear tests and subcritical hydrodynamic tests utilizing special nuclear material would represent, in large part, an irreversible and irretrievable commitment of the subsurface for any subsequent uses. A description of the irreversible and irretrievable effects can be found in Volume 1, Chapter 5, Section 5.7, "Irreversible and Irretrievable Commitment of Resources."

A description of the subsurface environment subject to the effects of underground nuclear tests and subcritical hydrodynamic tests utilizing special nuclear material can be found in Volume 1, Section 4.1.4.2.

Comment Code: Public Hearing Transcript 3-17

Location of EIS Revision(s): Summary; Volume 1, Section 5.5

Response: Unavoidable adverse impacts of past underground nuclear-testing activities refer to the impacts created to the subsurface environment during those activities, and are applicable to Alternatives 1, 2, 3, and 4. A sentence referring to the unavoidable adverse impacts of past underground nuclear testing has been added to the introduction of Volume 1, Section 5.5.

Comment Code: Public Hearing Transcript 3-18

Location of EIS Revision(s): None required

Response: Any tests conducted by the DOE would have impacts, as described in Chapter 5. The sentence in the transcript is not correctly quoted from the NTS EIS. The sentence which appears in the summary section entitled, Unavoidable Adverse Impacts, has since been modified, and now reads "other testing and experimental activity including subcritical experiments in support of stockpile stewardship programs would have smaller impacts." This sentence does not include any reference to nuclear yields and it actually refers to hydrodynamic tests and dynamic experiments.

Comment Code: Public Hearing Transcript 3-19

Location of EIS Revision(s): None required

Response: The DOE/NV believes that it is important to have one that addresses both manmade and natural resources. By considering both types of resources in the same planning process, a more comprehensive analysis of efficiency and impacts can be conducted.

It is true that natural resources are not the primary management focus of DOE's NTS missions. It has been decided at the highest levels of the federal government that the NTS should be dedicated to specific missions, none of which focus primarily on natural resources. However, the is designed to ensure that natural resources are considered during mission planning. As stated in Volume 2, Section 4-1, if there are conflicts between the use of manmade resources and natural resources, they will be identified and evaluated as part of the National

Environmental Policy Act process. Therefore, use of manmade resources will not "prevail" over natural resources without thorough evaluation and public input.

Comment Code: Public Hearing Transcript 3-20

Location of EIS Revision(s): None required

Response: The DOE/NV realizes and acknowledges that the long-term impacts of many NTS activities on both the natural environment and social groups such as American Indians are not well understood. To better protect the natural environment, the effects of DOE activities on natural resources will be monitored and adaptively managed (as described in Volume 2, Section 2.1, Step 7, and Section 3.3.6) to ensure that unidentified or poorly understood impacts are detected and evaluated. To better understand impacts on social groups, the DOE is actively pursuing comments and participation from American Indian groups and others that may value the resources on the NTS. The social values of those groups and their perspective on ecosystem management will be incorporated into the .

Comment Code: Public Hearing Transcript 3-21

Location of EIS Revision(s): None required

Response: As stated in the second paragraph of Volume 2, Chapter 4 and elsewhere in the document, the DOE will consider modifying a mission if that mission conflicts with one of the resource management goals of the.

Comment Code: Public Hearing Transcript 3-22

Location of EIS Revision(s): None required

Response: As stated in Volume 2, Section 3.3.3, the timeframe for evaluating impacts on natural resources will be much longer than the 10-year planning framework. This will be accomplished by selecting goals that reflect longer, more appropriate timeframes for the management of natural resources.

Comment Code: Public Hearing Transcript 3-23

Location of EIS Revision(s): None required

Response: When possible, changes in or impacts on resources should be monitored directly instead of via models. However, models will be necessary to predict future impacts of activities and to evaluate impacts that are otherwise impossible to measure. All models will be tested and peer-reviewed to ensure they are adequate.

Comment Code: Public Hearing Transcript 3-24

Location of EIS Revision(s): None required

Response: Rather than a goal of the not be achieved, it has been noted that Citizen Alert would prefer that missions be modified. Citizen Alert will have opportunities to comment on missions for which this may occur during the National Environmental Policy Act planning process for those missions.

Comment Code: Public Hearing Transcript 3-25

Location of EIS Revision(s): None required

Response: The identification of new missions that interfere with critical operations of existing missions or create extra costs for these missions will be done as part of the National Environmental Policy Act process. The NTS EIS contains this type of information for projects currently under consideration. Impacts of activities proposed in the future will be discussed in the environmental assessments or environmental impact statements for those projects.

Comment Code: Public Hearing Transcript 3-26

Location of EIS Revision(s): None required

Response: The DOE believes the goal for site-support activities and facilities should remain separate from the goal for health and safety so that a thorough analysis of each resource issue can be made independently for each activity. One of the purposes of the is to ensure all resource issues are considered when making land-use decisions. The DOE believes this satisfies the commentor's concern for the integration of resource-issue goals.

Comment Code: Public Hearing Transcript 3-27

Location of EIS Revision(s): None required

Response: The DOE appreciates the support of the commentor and agrees that proper planning must take into account suitable slopes, drainages, and other factors.

Comment Code: Public Hearing Transcript 3-28

Location of EIS Revision(s): None required

Response: As noted in the description of the affected environments (Volume 1, Section 4.1.5.2 of the NTS EIS), the available water supply for the NTS is based upon the estimated perennial yields of the basins that comprise the facility. While surface water supplies in the region have been gauged and thus measured, it is only possible to estimate the volume of water that is held in storage and the flow of that water through the subsurface. The DOE has adopted the perennial yield estimates of the Nevada State Engineer as these values form the basis for water-management planning in the state. The purpose is to provide the framework for resource management; in this case the goals for water are presented in Volume 1, Section 5.5 of the NTS EIS. The baseline conditions are presented in Chapter 4 of Volume 1 of the NTS EIS.

The commentor is correct in observing that the desert has a very low recharge rate. With respect to the question as to when the water will run out, there is no clear-cut answer. As long as pumping rates do not exceed the perennial yields of the basin, water may be withdrawn in perpetuity. In those cases where basins are over-drafted, the economics of water will be the largest factor in determining when the supplies will have been diminished to unusable levels.

Comment Code: Public Hearing Transcript 3-29

Location of EIS Revision(s): Chapter 4, Section 4.1.3, Appendix G

Response: The DOE also believes it is important for American Indian groups to participate in the evaluation of activities at the NTS. Consultation with the Consolidated Group of Tribes and Organizations has been underway since 1985. The American Indian Writers Subgroup, have prepared portions of this EIS. Consultation on this EIS and other subjects will continue into the future.

Comment Code: Public Hearing Transcript 3-30

Location of EIS Revision(s): None required

Response: The purpose of the is to establish a framework and process to assume that there is a balance between mission objectives and resource concerns. If there are impacts, mitigation measures would be considered.

Comment Code: Public Hearing Transcript 3-31

Location of EIS Revision(s): Volume 2, Section 4.8

Response: Text has been changed to delete the word "superior." The NTS is located within the Nevada Intrastate Air Quality Control Region. The region has been designated as an attainment area with respect to the National Ambient Air Quality Standards. Information on the National Ambient Air Quality Standards can be found in Volume 2, Section 4.1.7, "Air Quality and Climate." An area is designated by the EPA as being in attainment for a specific criteria pollutant if ambient concentrations of that pollutant are below the National Ambient Air Quality Standards.

The DOE maintains a network of air sampling stations for radiological parameters. Some radioactivity detected by on-site air monitoring stations is attributed to the resuspension of soil contaminated from past aboveground nuclear weapons testing that was conducted between 1951 and 1962. Monitoring of airborne particulate matter, noble gases, and tritiated water vapor on the NTS in 1993 indicated on-site levels that were consistent with background concentrations. The external-exposure monitoring network indicated a stable level of gamma radiation levels from year to year. Airborne releases of radioactivity have occurred from past aboveground weapons testing, but in recent years, no radioactivity from operations at the NTS has been detected at any off-site monitoring station.

Comment Code: Public Hearing Transcript 3-32

Location of EIS Revision(s): None required

Response: The comment correctly states that plutonium is a contaminant in the soils at the NTS. See the response to Comment Code Public Hearing Transcript 3-31.

Comment Code: Public Hearing Transcript 3-33

Location of EIS Revision(s): None required

Response: Not all of the areas at the NTS are contaminated. Mineral resources that are outside the bounds of the underground nuclear testing zones could be open to exploration with certain restrictions consistent with the Framework of the and the land withdrawal orders.

Comment Code: Public Hearing Transcript 3-34

Location of EIS Revision(s): None required

Response: Refer to Section 1.12 of Volume 3.

Comment Code: Public Hearing Transcript 3-35

Location of EIS Revision(s): None required

Response: Please refer to Section 1.6 of Volume 3.

Comment Code: Public Hearing Transcript 4-1

Location of EIS Revision(s): None required

Response: The use of today's climatic conditions for the purpose of analyzing impacts expected during the 10-year timeframe covered by this EIS is justified. Available evidence obtained from the geologic record of the NTS, which spans a much larger timeframe than 10,000 years, is used for other studies such as the Performance Assessment for the Area 5 Radioactive Waste Management Site at the NTS. Studies such as the Area 5 Performance Assessment are used in conjunction with environmental assessments to determine the impacts from conducting projects and activities at the NTS.

Comment Code: Public Hearing Transcript 4-2

Location of EIS Revision(s): Volume 1, Section 1.4

Response: Related EISs, including DOE programmatic EISs, are discussed in Volume 1, Section 1.4. Additional information has been added to clarify the relationship to other DOE EISs.

Comment Code: Public Hearing Transcript 4-3

Location of EIS Revision(s): None required

Response: Public comment opportunities for DOE programs in general occurred during the public comment period for the programmatic EISs. The public comment period for the NTS EIS included an opportunity to comment on sites selected for certain activities if that activity is sited at the NTS through a decision in a programmatic Record of Decision. Public comment on project-specific EISs will also occur during the public comment period for that EIS. Please see response to Comment Code Public Hearing Transcript 4-2.

Comment Code: Public Hearing Transcript 4-4

Location of EIS Revision(s): Volume 1, Section 2.4.2

Response: Volume 1, Section 2.4.2 now clearly indicates the DOE's waste management objective for the NTS and includes the disposal of wastes generated at other DOE sites.

Comment Code: Public Hearing Transcript 4-5

Location of EIS Revision(s): None required

Response: The DOE does not agree that this EIS is being prepared on a "fast track." The Notice of Intent regarding this EIS was issued in August of 1994. Though the goal of the Secretary of Energy is to complete EIS's in 15 months, this EIS has taken longer than 15 months to complete. Such things as maximum comment periods, opportunities to comment on the Draft Implementation Plan, and completion of a transportation study with public participation have been efforts to maximize the two-way public dialogue on the content of the NTS EIS. These opportunities have also resulted in extending the time needed to complete the NTS EIS. The Record of Decision will be issued no sooner than 30 days after the issuance of the Final NTS EIS.

Comment Code: Public Hearing Transcript 4-6

Location of EIS Revision(s): None required

Response: As discussed in Volume 1, Section 5.1.1.12 "Environmental Justice," analysis involves two tiers of investigation. One is the determination of significant and adverse impacts as a result of the alternative. The other is an evaluation of whether a minority or low-income population is disproportionately affected by these significant and adverse impacts. If there are no significant and adverse impacts, there would be no significant, disproportionately high and adverse impacts experienced by minority and low-income populations.

The region of influence for the Environmental Justice analysis includes Clark, Nye, and Lincoln counties. Using a geographic information system, the transportation routes were layered over census block groups as shown in Figures 4-49 and 4-50. The geographic information system indicated the total mileage of transportation routes per county and how many miles of these routes went through areas of minority and/or low-income populations.

The comment is correct when it states that some of the routes that are considered in the transportation study actually go through areas where there are high proportions of minority or low-income groups. Total mileage of the designated transportation routes in the three counties in the Environmental Justice region of influence are 336 km (209 mi) in Clark County, 546 km (339 mi) in Nye County, and 275 km (171 mi) in Lincoln County. The total mileage of designated highways that run through areas of low-income or minority populations are 6 km (4 mi) (1.91 percent) in Clark County, 10 km (6 mi) (0.02 percent) in Nye County, and 0 km (0 mi) in Lincoln County.

Each county has less than 2 percent of its designated highways that run through areas of low-income or minority populations. Using a threshold of 50 percent to indicate a disproportionate effect, this analysis indicates that minority and/or low-income populations would not be disproportionately affected by transportation routes even if they represented a significant and adverse impact.

Comment Code: Public Hearing Transcript 4-7

Location of EIS Revision(s): None required

Response: The NTS EIS examined transportation issues both in Volume 1, Chapter 5 of the NTS EIS and in a separate appendix (Volume 1, Appendix I). The selection of an alternative, which will appear in the Record of Decision, will include a review of all the effects of the alternative, including transportation issues.

Comment Code: Public Hearing Transcript 4-8

Location of EIS Revision(s): None required

Response: See Section 1.6 of Volume 3 and B.1.2 of Attachment B to Appendix I.

Comment Code: Public Hearing Transcript 4-9

Location of EIS Revision(s): None required

Response: Not all accidents result in a release. Although it is true that the accident rate is higher in urban areas, the accidents are less severe, meaning fewer releases would be expected. A release in an urban area would expose more people than a release in a rural area. Routes are chosen by the carrier under the U.S. Department of Transportation regulations. The primary criterion is to minimize radiological risk. This is accomplished by minimizing the distance traveled, using roads in good condition (which have lower accident rates), and avoiding densely populated areas whenever possible.

Comment Code: Public Hearing Transcript 4-10

Location of EIS Revision(s): None required

Response: Alternative 2 is presented to evaluate the closure of the NTS. Other Alternatives evaluated clean-up of the NTS. Following review of the comments, Alternative 3 was identified as the preferred Alternative.

Comment Code: Public Hearing Transcript 4-11

Location of EIS Revision(s): None required

Response: Transportation of low-level and mixed waste has been taken very seriously and analyzed very carefully to estimate the risks to workers and the public for each Alternative in this EIS. Transportation issues of concern to the local public are discussed in detail in Volume 1, Appendix I. In addition, a detailed risk analysis has been conducted; the results are summarized in Appendix I.

Comment Code: Public Hearing Transcript 4-12

Location of EIS Revision(s): None required

Response: Please see response to Comment Code Public Hearing Transcript 4-11.

Comment Code: Public Hearing Transcript 4-13

Location of EIS Revision(s): None required

Response: Immediate emergency response is provided by local emergency response personnel. The DOE responds only at the request of competent state authority. Oversight is provided by defining waste acceptance criteria for the types of waste that can be shipped to the NTS. The NTS would be aware of when shipments are expected to arrive, and would probably also know the route being taken. Please see Section 1.6 of Volume 3 for a discussion of route selection.

Comment Code: Public Hearing Transcript 4-14

Location of EIS Revision(s): None required

Response: The Yucca Mountain Project and related waste-transportation issues would occur outside of the 10-year timeframe of the NTS EIS. For additional discussion on the relationship between Yucca Mountain and the NTS, please refer to Volume 3, Section 1.1, and Volume 1, Section 3.2.6.1. Additional information with regard to transportation can be found in Appendix I of this EIS and Volume 3, Section 1.6.

Comment Code: Public Hearing Transcript 4-15

Location of EIS Revision(s): None required

Response: The comment regarding return of the NTS to the Western Shoshone Nation is noted. Please refer to Volume 3, Section 1.3 and Section 3.2.3 for a discussion regarding the Ruby Valley Treaty of 1863.

Comment Code: Public Hearing Transcript 4-16

Location of EIS Revision(s): None required

Response: Refer to Volume 1, Section 3.2.2.

Comment Code: Public Hearing Transcript 4-17

Location of EIS Revision(s): None required

Response: Refer to Comment Code Public Hearing Transcript 4-15.

Comment Code: Public Hearing Transcript 4-18

Location of EIS Revision(s): None required

Response: As stated in Volume 1, Section 2.4.3, of the Draft NTS EIS, "The DOE is committed to the goal of remediating contaminated sites in accordance with the requirements of the responsible agencies." Under Alternatives 1, 3, and 4, the DOE/NV would perform environmental cleanup and restoration at the NTS to ensure that risks to the environment and to human health and safety, as posed by inactive and surplus facilities and sites, are either eliminated or reduced to protective levels.

Comment Code: Public Hearing Transcript 4-19

Location of EIS Revision(s): None required

Response: The use of the NTS tunnels for the storage of hydrogen is not considered in the NTS EIS. No current or proposed NTS activities would require an underground hydrogen-storage location.

Comment Code: Public Hearing Transcript 4-20

Location of EIS Revision(s): None required

Response: Chapter 3 of Volume 2 of the NTS EIS, "*Framework for the Resource Management Plan*," describes the DOE's understanding of ecosystem management. That chapter, and the DOE's approach to ecosystem management on the NTS, were developed by a knowledgeable and qualified team of ecologists who have worked on the NTS for many years and are familiar with the ecosystems at that site. Prior to developing the *Framework for the Resource Management Plan*, they conducted an exhaustive review of the literature and contacted experts and other government agencies to learn about current ecosystem management philosophies and practices. Information gained from that review was incorporated into DOE's approach for ecosystem management. As part of the review process for the NTS EIS, the *Framework for the Resource Management Plan* is being reviewed by experts within other agencies. The ideas also will be incorporated into the *Resource Management Plan* and DOE's approach for ecosystem management on and around the NTS.

Comment Code: Public Hearing Transcript 4-21

Location of EIS Revision(s): None required

Response: As described in Volume 2, Section 1.6, the *Resource Management Plan* will be developed with the participation of the public and other interested parties. The DOE is seeking ideas from public participants that will help define the content of the *Resource Management Plan*, identify information needs, and develop a process for making decisions based on ecosystem management. The commentor is invited to join in the process to ensure that her concerns are addressed.

Comment Code: Public Hearing Transcript 4-22

Location of EIS Revision(s): Volume 1, Section 4.4.11

Response: One of the purposes of the Environmental Restoration Project at the Central Nevada Test Area is to characterize its groundwater system and to design a monitoring program that is consistent with the characterization results. Recent study results have indicated that the hydrologic situation at this site is more complex than formerly thought. The NTS EIS text has been modified to reflect this latest information more clearly. Monitoring results are published annually in the Annual Site Environmental Report, and characterization studies are published upon completion. There are no undisclosed migration rates.

Although the hydrologic complexity has implications bearing on the design of the nearfield monitoring system, the potential consequences beyond the immediate vicinity, are not significant in terms of human health and safety or in terms of exposure of the accessible environment to contaminants. The risk assessments presented in the NTS EIS are based on the latest validated information. As new data are developed, they will be considered in monitoring, future environmental analyses, and in determining the appropriate degree of subsurface access restrictions.

Comment Code: Public Hearing Transcript 4-23

Location of EIS Revision(s): None required

Response: Radioactive waste-disposal management of the Beatty site was not a DOE function. The waste-acceptance criteria used for waste to be disposed of at the Beatty site was not the same as that used for waste intended for disposal on the NTS. The DOE/NV waste-acceptance criteria is very stringent and requires generators of waste intended for disposal on the NTS to prepare and control their waste and document the characterization of the waste in an acceptable manner. These criteria include site-specific requirements deemed necessary for safe operation and waste management on the NTS. One of the DOE/NV waste-acceptance criteria in place to prevent the situation that evidently has occurred at the Beatty site is the restriction on free liquids in waste accepted. The criteria also limits the amount of allowable total moisture content within the waste material.

Geologic characteristics of the Beatty site that are different from those at the NTS disposal sites would also be expected to contribute to differences in the potential for contamination of the groundwater. Monitoring of the vadose zone at both NTS disposal sites has taken place, and will continue to take place. There is no detected contamination from either disposal site on the NTS that is migrating toward the groundwater.

Comment Code: Public Hearing Transcript 4-24

Location of EIS Revision(s): None required

Response: The potential effects to humans are described in Appendix H, Health and Safety, and in Section 5 of Volume 1.

Comment Code: Public Hearing Transcript 4-25

Location of EIS Revision(s): None required

Response: The suggestion to close the NTS is noted. Volume 1, Section 3.2.2 discusses this issue further.

Comment Code: Public Hearing Transcript 4-26

Location of EIS Revision(s): None required

Response: The NTS currently provides disposal capability for NTS-generated waste and other DOE-approved waste generators. The use of the NTS for future disposal of DOE waste will be made in conjunction with the Waste Management Programmatic EIS. The NTS is under consideration for the central or regional management of DOE wastes. Thirteen other sites are also being considered (Volume 1, Section 1.4). The DOE has not yet made a programmatic decision on regional or centralized management.

Comment Code: Public Hearing Transcript 4-27

Location of EIS Revision(s): None required

Response: The commentor's support for site closure is noted.

Comment Code: Public Hearing Transcript 4-28

Location of EIS Revision(s): None required

Response: See response to Comment Code Public Hearing Transcript 4-2.

Comment Code: Public Hearing Transcript 4-29

Location of EIS Revision(s): Volume 1, Section 1.4

Response: While the Final NTS EIS evaluates the impact of storing weapons-grade fissile material, including plutonium, the decision to designate the NTS as a storage site will be made in association with the Stockpile Stewardship and Management Programmatic EIS and the Storage and Disposition of Weapons-Usable Fissile Materials EIS currently in draft. The Record of Decision for the NTS will be issued in 1996, well before the Programmatic EISs are completed.

Comment Code: Public Hearing Transcript 4-30

Location of EIS Revision(s): None required

Response: See response to Comment Code Public Hearing Transcript 4-2.

Comment Code: Public Hearing Transcript 4-31

Location of EIS Revision(s): None required

Response: See response to Comment Code Public Hearing Transcript 4-2.

Comment Code: Public Hearing Transcript 4-32

Location of EIS Revision(s): None required

Response: The *Resource Management Plan* is being developed as a tool to be used for future National Environmental Policy Act documents and planning decisions and was never intended for use on the current NTS EIS. As stated in Section 1.4 of Volume 2, it would not be possible to complete the *Resource Management Plan* before the NTS EIS was completed. The *Resource Management Plan* will take one or more additional years to complete and the NTS EIS could not be delayed that long because a comprehensive evaluation of current and proposed activities is needed now in order to develop a coordinated plan for use of the NTS.

Comment Code: Public Hearing Transcript 4-33

Location of EIS Revision(s): None required

Response: The DOE disagrees that the NTS EIS is being finished in a hurry.

Because the Council on Environmental Quality believes that prescribed, universal time limits for preparing an EIS are too inflexible, each federal agency is encouraged to set time limits appropriate to individual actions.

However, in practice, EIS preparation often takes longer depending on the complexity of the action, the scope of the alternatives and impacts being evaluated, and the extent of internal agency review. The objective of the

Secretary of the DOE for writing and producing EISs is 15 months. The preparation of this EIS, which began in August 1994 with the publication of the Notice of Intent, has taken longer than 15 months. The size of the actions and areas involved and the time required to obtain relevant information have resulted in an increase in the time required.

In addition, the DOE has increased the public participation process through maximum comment periods and other means. For example, generally a lead agency must allow at least 45 days for comment on a Draft EIS; however, this period may be extended by the lead agency (40 CFR 1506.10). In this case, the DOE requested that the comment period be extended to 90 days to facilitate the receipt of comments. Thus, this EIS has not been rushed to completion.

Comment Code: Public Hearing Transcript 4-34

Location of EIS Revision(s): None required

Response: It is assumed that the portion of the *Resource Management Plan* being referred to in this comment is the following text found under Step 3 of Volume 2, Section 2.1:

> "The third step in developing this *Resource Management Plan* will be to identify and list the management actions that the DOE/NV will take during land-use planning and resource management to meet the goals for each resource issue and constraint ... DOE/NV will endeavor to expand existing working relationships and to enter into other agreements with public agencies, business and environmental organizations, and other interested parties."

The NTS Development Corporation is the name of the local Community Reuse Organization that has received DOE grant money. This is only one of many DOE-funded Community Reuse Organizations throughout the country that represent business communities near DOE facilities. Wherever possible, the DOE is committed to promoting the economic stability and growth of communities impacted by the DOE's facility operations, and such reuse organizations serve to further this commitment. A clearly stated goal of the Land and Facility-Use Management Policy is to develop land and facility uses on the NTS that "... support the Department's critical missions, stimulate the economy, and protect the environment" (Volume 2, Section 1.3). Therefore, input from the NTS Development Corporation would be valuable in helping to meet this goal.

The DOE wants to include as many stakeholders as possible in the process of establishing *Resource Management Plan* goals. Therefore, as stated in the plan, the DOE/NV will continue to pursue avenues whereby other citizens, interest groups, and organizations can provide recommendations regarding economic sustainability and growth within their community.

Comment Code: Public Hearing Transcript 4-35

Location of EIS Revision(s): None required

Response: The DOE appreciates the recommendation. Specific National Environmental Policy Act analysis will occur on a project-by-project basis. This analysis will reference (or tier from) the NTS EIS to avoid unnecessary duplication and paperwork, as recommended by the Council on Environmental Quality.

Comment Code: Public Hearing Transcript 4-36

Location of EIS Revision(s): None required

Response: Support for maintaining capabilities is noted. Alternatives 1, 3, and 4 evaluate operations at the NTS that would likely result in the continued use of the skilled NTS workforce.

Comment Code: Public Hearing Transcript 4-37

Location of EIS Revision(s): None required

Response: Routes are selected by the carrier in strict accordance with the U.S. Department of Transportation regulations that require minimizing the radiological risk. The risk along any of the routes inside Nevada has been calculated to be extremely small (on the order of less than one latent cancer fatality in 10 years compared to the average annual number of cancer deaths in Nevada from all causes of around 2,500). Refer to Section 1.6 of Volume 3.

Comment Code: Public Hearing Transcript 4-38

Location of EIS Revision(s): None required

Response: Your comment is noted concerning the positive aspect of rail transportation.

Comment Code: Public Hearing Transcript 4-39

Location of EIS Revision(s): None required

Response: The statement in the NTS EIS that the NTS is probably the most geologically well known large area is well based on the thousands of technical reports that have been issued not only through DOE publications, but also by such highly respected organizations as the Nevada Department of Conservation and Natural Resources, the U.S. Geological Survey, the Geological Society of America, and the National Academy of Sciences. The wealth of published information is supported by data drawn from extensive characterizations of both the surficial geology and the subsurface conditions. In fact, the DOE is considered by many to be at the forefront of investigations into many areas because of the detailed investigations and sophisticated testing that have been and continue to be done under its sponsorship at the NTS.

Comment Code: Public Hearing Transcript 4-40

Location of EIS Revision(s): None required

Response: The geologic community, including scientists from the national laboratories, universities, and federal and state agencies, have been studying the geology of the NTS for over four decades. Under Alternatives 1, 3, and 4, the National Environmental Research Park will continue to provide an avenue for the geologic community to study the geologic environment of the NTS.

Comment Code: Public Hearing Transcript 4-41

Location of EIS Revision(s): None required

Response: See response to Comment Code Public Hearing Transcript 4-39.

Comment Code: Public Hearing Transcript 4-42

Location of EIS Revision(s): None required

Response: Alternative 2 and Alternative 4 were identified as possible alternatives during the public scoping process for the NTS EIS. These alternatives were added to provide an analysis of a full range of alternatives. Alternative 3, which includes underground nuclear tests, along with the public education activities of Alternative 4, is identified as the Preferred Alternative in the Final NTS EIS.

Comment Code: Public Hearing Transcript 4-43

Location of EIS Revision(s): None required

Response: The DOE is committed to environmental restoration with the purpose of minimizing, managing, and cleaning up contamination, including PCBs, at DOE sites and ensuring that risks to human health and safety are eliminated or reduced to levels prescribed by Federal and State regulations. The DOE established the Office of Environmental Restoration/Waste Management for this purpose. Funding and schedules for environmental restoration at DOE facilities are outlined in the Baseline Environmental Management Report scheduled for publication in early summer this year.

Comment Code: Public Hearing Transcript 4-44

Location of EIS Revision(s): None required

Response: The DOE has maximized the public input process for this complex NTS EIS and a second draft is not necessary. It is acknowledged that the document is complex and that it contains much information and data about the DOE and the programs being considered into the future. Within the framework established in the Notice of Intent and Implementation Plan, the topics being considered in this sitewide document reflect the broad nature of the future actions being considered. The opportunities for public participation, both in the planning for and preparation of the document, were intended to maximize the exchange of information.

Comment Code: Public Hearing Transcript 4-45

Location of EIS Revision(s): None required

Response: The location of an interim spent nuclear fuel storage facility at the NTS is considered speculative, and is not a reasonably foreseeable activity appropriate for inclusion in the NTS EIS. Should such a facility be considered for location at the NTS in the future, suitable environmental documentation will be prepared under the National Environmental Policy Act, and include consideration of public comments.

Comment Code: Public Hearing Transcript 4-46

Location of EIS Revision(s): None required

Response: The DOE is acting in close coordination with the federal-grant funded Corporation for Solar Technology and Renewable Resources. The inclusion of the three possible Solar Enterprise Zone sites located off of the NTS enabled preliminary National Environmental Policy Act review to occur. The Solar Enterprise Zone concept analyzed in this EIS includes development of solar energy facilities at both the NTS and other alternative sites. Alternative Solar Enterprise Zone sites may be used in conjunction with the NTS to minimize infrastructure improvements required and to improve access to power markets (Appendix A, Section A.4.3.1). The Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley sites were identified as potentially feasible sites for such facilities by the Corporation for Solar Technology and Renewable Resources. The DOE placed financial grants with the Corporation for Solar Technology and Renewable Resources to promote development of solar energy technology. Since development of these sites could be considered a connected action to development of solar energy by the DOE and the DOE facilities at the NTS, programmatic evaluation of the impacts of development of these sites is required by the DOE (as part of its) National Environmental Policy Act process.

Comment Code: Public Hearing Transcript 4-47

Location of EIS Revision(s): None required

Response: The Council on Environmental Quality regulations do not require the selection of a Preferred Alternative in a Draft EIS. Alternative 3 plus part of Alternative 4 has been selected as the Preferred Alternative in the Final NTS EIS.

Comment Code: Public Hearing Transcript 4-48

Location of EIS Revision(s): None required

Response: The Final NTS EIS identifies Alternative 3 plus the public educational activities of Alternative 4 as the DOE Preferred Alternative.

Comment Code: Public Hearing Transcript 4-49

Location of EIS Revision(s): None required

Response: The DOE disagrees that the public will not have input on any proposed revisions before the issuance of a Record of Decision.

After preparing an EIS, at the time of its decision, a federal agency must prepare a Record of Decision, a written public record explaining why it has taken a particular course of action. The Record of Decision must be made available to the public through appropriate public notice.

The Record of Decision will include a statement explaining the decision, and explanation of alternatives that were considered and those that are environmentally preferable, factors considered by the agency in making the decision, and explanation of which mitigation measures were adopted (and if mitigation measures were not adopted, an explanation of why not), and monitoring and enforcement programs for any adopted mitigation measures.

Any interested party may comment on the Record of Decision and has 30 days to do so.

Following completion of the Record of Decision, the DOE will prepare a *Mitigation Action Plan* that addresses mitigation commitments expressed in the Record of Decision. The Plan will explain how the corresponding mitigation measures, designed to mitigate adverse environmental impacts associated with the course of action directed by the Record of Decision, will be planned and implemented.

Comment Code: Public Hearing Transcript 4-50

Location of EIS Revision(s): None required

Response: The commentor's request for a second Draft NTS EIS is noted. Please see response to Comment Code Public Hearing Transcript 4-44.

Comment Code: Public Hearing Transcript 4-51

Location of EIS Revision(s): None required

Response: The Final NTS EIS identifies Alternative 3 plus the public education activities of Alternative 4 as the DOE Preferred Alternative.

Comment Code: Public Hearing Transcript 4-52

Location of EIS Revision(s): None required

Response: The National Environmental Policy Act process allows for EISs that address classified proposals to be safeguarded and restricted from public dissemination. In order to make as much government information available to the public as possible, agencies are encouraged (in some cases mandated) to separate classified information from unclassified, and produce a classified appendix when necessary. The DOE accomplished this with the NTS EIS. "Restricted Data" is information concerning the design, manufacture, or utilization of atomic weapons; the production of Special Nuclear Material; or the use of Special Nuclear Material in the production of energy. The classified appendix has been withheld in its entirety under Exemption 3 of the Freedom of Information Act, using the Atomic Energy Act of 1954, as amended, as the statutory basis.

Comment Code: Public Hearing Transcript 4-53

Location of EIS Revision(s): None required

Response: The commentor is correct in stating that a nuclear rocket program has been studied. The Space Nuclear Thermal Propulsion Program was never implemented, thus there is no discussion about it in the NTS EIS.

Comment Code: Public Hearing Transcript 4-54

Location of EIS Revision(s): None required

Response: Because of the similarities between all the safety test areas (source of the soils plutonium contamination), information for all these sites, including the Area 13 site, is presented under NTS soils, Volume 1, Section 4.1.4.3 of the NTS EIS. The Environmental Restoration Program is the only DOE program which has activities scheduled for this area; therefore, it is the only area on the NAFR Complex covered in this EIS.

Comment Code: Public Hearing Transcript 4-55

Location of EIS Revision(s): None required

Response: It is clearly in DOE's interest to present relevant information in this EIS pertaining to current activities (such as Double Tracks) and future DOE efforts such as Area 13 on the Nellis Air Force Range Complex. In addition, as identified in the text of this EIS and in public hearings, the environmental impacts associated with the classified appendix, (Volume 1, Appendix J), have been included in the overall evaluation of impacts associated with DOE areas of interest.

Comment Code: Public Hearing Transcript 4-56

Location of EIS Revision(s): None required

Response: The support for solar energy research is noted. Under Alternatives 1, 3, and 4, the DOE would support a Solar Enterprise Zone concept. Under Alternatives 3 and 4, the DOE would construct and operate solar energy production facilities.

Comment Code: Public Hearing Transcript 4-57

Location of EIS Revision(s): None required

Response: The commentor's support for cleanup of the NTS, and continued employment for the workforce, is noted.

Comment Code: Public Hearing Transcript 4-58

Location of EIS Revision(s): None required

Response: Subcritical tests are intended to provide information that will help to maintain the reliability of the remaining nuclear stockpile and support treaty safeguards of the proposed Comprehensive Test Ban Treaty. The Secretary considers these tests part of the Science-based Stockpile Stewardship Program. The DOE does not believe that the tests jeopardize the treaty negotiations.

Comment Code: Public Hearing Transcript 4-59

Location of EIS Revision(s): None required

Response: Alternative 2 is defined as the discontinuation of the DOE/NV and interagency programs and operations at the NTS. The commentor's support for the discontinuation of operations (Alternative 2) at the NTS is noted.

Comment Code: Public Hearing Transcript 4-60

Location of EIS Revision(s): None required

Response: The support of solar energy research is noted. Under Alternatives 1, 3, and 4, the DOE would support the Solar Enterprise Zone concept. Under Alternatives 3 and 4, the DOE could construct and operate solar energy production facilities.

Comment Code: Public Hearing Transcript 4-61

Location of EIS Revision(s): None required

Response: Should it be determined that the NTS, or portions thereof are no longer required for the purpose for which it was reserved, the lands must be returned to the Department of the Interior. If the lands are accepted for return to the public domain, the U.S. Bureau of Land Management will determine the subsequent disposition of the lands. For additional information, please refer to Sections 1.3 and 1.8 of Volume 3.

Comment Code: Public Hearing Transcript 4-62

Location of EIS Revision(s): None required

Response: The comment regarding cleanup of the NTS is noted. Environmental restoration activities are ongoing and will continue under Alternatives 1, 3, and 4 and could be accelerated under Alternatives 3 and 4.

Comment Code: Public Hearing Transcript 4-63

Location of EIS Revision(s): None required

Response: Support for maintaining capabilities is noted. Among the major responsibilities of the DOE at the NTS is to maintain a nuclear testing capability. Under Alternatives 1 and 3, the DOE would maintain the readiness and capability to conduct nuclear tests within 2 to 3 years, if directed by the President of the United States. Tests would be performed in vertical drill holes at Yucca Flat and Pahute Mesa. Therefore, under Alternatives 1 and 3, Yucca Flat and Pahute Mesa would continue to be designated as nuclear test zones.

Comment Code: Public Hearing Transcript 4-64

Location of EIS Revision(s): None required

Response: Opposition to Alternative 3, Expanded Use, is noted.

Comment Code: Public Hearing Transcript 4-65

Location of EIS Revision(s): None required

Response: The DOE believes that the range of alternatives considered in this EIS bounds the alternative suggested. An entire spectrum of activities was evaluated, including the commentor's suggested activities. Volume 1, Section 3.2.4 provides more information on "Other Alternatives Within the Range of Alternatives Considered."

Comment Code: Public Hearing Transcripts 4-66

Location of EIS Revision(s): None required

Response: The DOE has not proposed the Expanded Use Alternative as a continued pursuit of the Cold War. Rather, it is proposed as an alternative that would make maximum use of a valued national resource, the NTS, while preserving the safeguards included in International Treaties related to arms reductions.

Comment Code: Public Hearing Transcripts 4-67

Location of EIS Revision(s): None required

Response: The DOE has noted that new nuclear weapons are not being designed. Tests are proposed to confirm the safety and adequacy of the existing nuclear stockpile. The risks of performing these tests are discussed in the NTS EIS.

Comment Code: Public Hearing Transcripts 4-68

Location of EIS Revision(s): None required

Response: The DOE has not proposed the Expanded Use Alternative as a continued pursuit of the Cold War and does not believe that the risk of nuclear war would be increased. Rather, it is proposed as an alternative that would make maximum use of a valued national resource, the NTS, while preserving the safeguards included in International Treaties related to arms reductions. In that way, the risk of nuclear war may in fact be reduced.

Comment Code: Public Hearing Transcript 4-69

Location of EIS Revision(s): Throughout text

Response: A consistency check of the document has been performed. In most instances, metric units are presented first, followed by the equivalent English units. However, some discussions, such as those involving noise, radiation, land, or weight, use only the system in common usage. The units are consistently presented in the Final NTS EIS.

Comment Code: Public Hearing Transcript 4-70

Location of EIS Revision(s): None required

Response: The DOE concurs with the commentor's expression of public involvement in the NTS EIS. Toward this goal, the public comment period was increased from the required 45 days to 90 days and numerous public hearings and public workshops were held to enable as many people as possible to comment on the NTS EIS. The Draft NTS EIS did not state a Preferred Alternative because the DOE did not have one at that time. The Preferred Alternative identified in the Final NTS EIS is Alternative 3 plus the public education activities of Alternative 4.

Comment Code: Public Hearing Transcript 4-71

Location of EIS Revision(s): None required

Response: Your concern for NTS workers is noted. The DOE has selected Alternative 3 plus the public education activities of Alternative 4 as the preferred alternative. Alternative 3 would result in the highest levels of employment at the NTS.

Comment Code: Public Hearing Transcript 4-72

Location of EIS Revision(s): None required

Response: Radioactive wastes which would be transported to the NTS as part of Alternative 1, 3 and 4 would not require the use of a cask. In the unlikely event of an accident with a release of material, the first responder would be the local fire, police, or emergency response personnel. The DOE provides first-responder emergency training to emergency personnel in all Nevada counties along potential routes. The DOE will also assist in responding to the emergency and in containment and clean-up activities upon request from the state authorities.

Comment Code: Public Hearing Transcript 4-73

Location of EIS Revision(s): None required

Response: It is true that clean-up budgets have been decreased in the last few years. Congress has directed that greater efficiencies be achieved while maintaining the high priorities on the restoration and cleanup programs. The DOE has been focusing much effort on conducting cleanup in a more efficient and effective manner, resulting in cost savings while maintaining the schedules and high priorities on cleanup. The DOE continues to look for better and cheaper ways to accomplish important programs in these areas of interest.

Comment Code: Public Hearing Transcript 4-74

Location of EIS Revision(s): None required

Response: Clean-up levels across the DOE complex are being defined in terms of potential future land uses. These clean-up levels not only vary by site, but also by location within each site. At the NTS, past clean-up efforts have been accomplished to levels agreed upon by the DOE and state regulators. The DOE is currently committed to environmental restoration with the purpose of minimizing, managing, and cleaning up contamination at DOE sites; and ensuring that risks to human health and safety are eliminated or reduced to levels prescribed by federal and state regulations. Where regulations do not currently exist, final clean-up levels will be determined through the process established in the Federal Facility Agreement and Consent Order. That process includes a complex risk evaluation. The Federal Facility Agreement and Consent Order requires the development of a Corrective Action Decision Document which will provide the rationale for the selected clean-up levels based on investigation activities, costs, and risk to receptors based in conjunction with potential future land uses. Detailed information is being provided to the commentor regarding clean-up levels at NTS and other DOE sites.

Comment Code: Public Hearing Transcript 5-1

Location of EIS Revision(s): None required

Response: Disposal of waste in land disposal units is deemed the preferred option in the United States for most wastes that cannot be treated to remove the hazard. The preference for land disposal applies to low-level waste and has been chosen by the DOE as the option to be followed.

Comment Code: Public Hearing Transcript 5-2

Location of EIS Revision(s): None required

Response: Aboveground waste storage is a temporary solution and does not remove the potential for harm to humans from interaction with the waste. Waste disposal in landfill units is a more safe and secure method than aboveground storage. Waste that has been disposed of in landfills can also be monitored and retrieved if necessary. The elimination of waste radionuclides from the earth is either technologically not feasible or cost prohibitive.

Comment Code: Public Hearing Transcript 5-3

Location of EIS Revision(s): Section 1.4 of Volume 1

Response: The activities associated with the storage and disposition of weapons-usable fissile material and stockpile stewardship and management are defined to the extent necessary for a sitewide NTS EIS. Additional information on these activities is provided in other DOE programmatic EISs, particularly the Draft Programmatic EIS for Stockpile Stewardship and Management, and the Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic EIS. The relationship of the NTS EIS with these and other statements is explained in Section 1.4 of the NTS EIS. A sentence has been added to the section to further clarify this subject.

Comment Code: Public Hearing Transcript 5-4

Location of EIS Revision(s): None required

Response: All involved parties, including Congressional representatives, have access to information presented in this and other related DOE National Environmental Policy Act reviews. The DOE disagrees with the inference that the transportation of up to one million cubic meters of low-level waste will "destroy our quality of life."

The DOE has been transporting radioactive material and waste around the country by truck and rail for over 40 years with an excellent safety record. Although the logistics of moving such a large amount of material may seem daunting, the transportation will occur over 10 years, not all at once, and the technology is very well known and reliable. Incident-free transportation of low-level waste is not expected to lower the quality of life or affect the environment along the routes. The radiological risks associated with accidental releases are estimated to be much less than one for latent cancer fatalities (0.00041 in 10 years) and even less than that for radiation-induced detriment, as compared to the average annual number of cancer deaths from all causes in Nevada of around 2,500.

Comment Code: Public Hearing Transcript 5-5

Location of EIS Revision(s): None required

Response: The DOE and its national laboratories are exploring transmutation technologies. These programs are scientific endeavors in their early stages of exploration. Components of the research and development effort of the technologies will be to assess feasibility, implementation, sitings, and cost effectiveness.

Comment Code: Public Hearing Transcript 5-6

Location of EIS Revision(s): Appropriate maps have been modified to include State Route 160 and Pahrump.

Response: Three of the in-state routes evaluated for the transportation risk study do use State Route 160 through Pahrump, and the road and the city are shown on the maps for those routes. The other figures in the NTS EIS have been modified to show Pahrump where appropriate.

Comment Code: Public Hearing Transcript 5-7

Location of EIS Revision(s): None required

Response: Pahrump, as the commentor suggests, is the largest and most rapidly growing community in Nye County. The DOE disagrees that the federal government is totally unaware of the demographics of Pahrump. Demographics are discussed in Volume 1, Chapter 4, Section 4.1.3 with respect to population, housing stock, housing demand, vacancy rate, public finance, and public services.

Pahrump has a town board form of government. The unincorporated town mechanism allows the Board of County Commissioners or the residents of an area to define their geographic area; the DOE would not be responsible for a survey of a town.

Comment Code: Public Hearing Transcript 5-8

Location of EIS Revision(s): None required

Response: The commentor is correct in noting that the Pahrump Valley has a good aquifer. The Pahrump Valley is not hydraulically linked to the basins that encompass the NTS. Thus, the definition of the baseline hydrologic conditions in that valley is not required for the analyses presented in the NTS EIS.

Comment Code: Public Hearing Transcript 5-9

Location of EIS Revision(s): Volume 1, Sections 4.1.13 and 5.1.1.3

Response: The comment continues in this paragraph to discuss the dearth of hazardous materials training for volunteer firefighters and sheriffs in Pahrump. Text has been added to clarify the hazardous material training that the DOE provides. Trained firefighters could access accidents on U.S. Highway 95 from Las Vegas. There would be no need to drive through Pahrump.

Comment Code: Public Hearing Transcript 5-10

Location of EIS Revision(s): None required

Response: Refer to Section 1.9 of Volume 3.

Comment Code: Public Hearing Transcript 5-11

Location of EIS Revision(s): Waste volumes and truck trip estimates have been revised. These are summarized in Appendix A and Appendix I.

Response: Under Alternative 3 in the NTS EIS, approximately 1.0×10^6 cubic meters (m^3) (1.3×10^6 cubic yards [yd^3]) of low-level waste would be disposed of at the NTS. This value is consistently used throughout the NTS EIS and its Appendices. The 1.8×10^7 m^3 (2.4×10^7 yd^3) (actually 18,560.937 m^3 [24,246,796 yd^3] in Appendix I) over the next 75 years is an estimate of the amount of environmental restoration waste that could be generated throughout the entire United States. This estimate was extracted from the DOE 1995 *Baseline Environmental Management Report* (DOE, 1995d). The 75-year timeframe of the 1995 *Baseline Environmental Management Report* is outside the timeframe considered in the NTS EIS. These estimates have been revised in the Final NTS EIS due to consistency checks between Appendix A (Description of Projects and Activities) and Appendix I (Transportation Study).

Comment Code: Public Hearing Transcript 5-12

Location of EIS Revision(s): None required

Response: This information is not relevant to the NTS EIS. However, based on recent reports, it has been concluded that the plutonium and uranium in the tank waste at Hanford could not go critical. The tanks and the waste at Hanford remain one of DOE's high priorities for remediation and cleanup, however.

Comment Code: Public Hearing Transcript 5-13

Location of EIS Revision(s): None required

Response: The NTS currently has a transuranic waste storage pad with over 1500, 55-gallon drums of mixed transuranic waste. Under Alternative 3, the NTS could receive transuranic waste for the purpose of certifying it prior to shipment to an off-site disposal location. The NTS will not store transuranic waste beyond the capacity of the Transuranic Waste Storage Pad.

Comment Code: Public Hearing Transcript 5-14

Location of EIS Revision(s): None required

Response: There are no projects or activities concerning the storage of high-level nuclear waste on the NTS under any of the alternatives discussed in the NTS EIS. If a decision were made to pursue this activity, a separate environmental assessment would have to be done prior to conducting the activity. The topic of high-level waste and the potential Yucca Mountain Project are discussed in Section 1.1 of Volume 3.

Comment Code: Public Hearing Transcript 5-15

Location of EIS Revision(s): None required

Response: The impacts of proposed waste shipments to the NTS are discussed in the Transportation sections of Volume 1, Chapter 5 and Volume 1, Appendix I. The NTS EIS shows that potential impacts from waste shipments would be small under any of the alternatives evaluated. The DOE interprets the commentor's reference to "the pristine Pahrump Valley and Nye County" to mean an area generally free of environmental contaminants, such as man-made radioactive and hazardous materials. In the entire history of radioactive material transportation, there have been very few accidents that resulted in any release of radioactivity from the shipping container. In the few instances where a release from packaging has occurred, the release was localized and resulted in no long-term environmental impacts.

Comment Code: Public Hearing Transcript 5-16

Location of EIS Revision(s): None required

Response: Nevada does generate radioactive waste. Radioactive waste is generated at most major medical facilities in the country, including those in the state of Nevada. Approximately half of the total amount of radioactive waste disposed of at the NTS originated from the NTS. Most of this debris came from the cleanup of atmospheric test locations. There will also be large quantities of radioactive waste generated during the cleanup of environmental restoration sites that are not only on the NTS but within the state as well.

The NTS does generate a significant quantity of hazardous waste. Almost all of the NTS hazardous waste is sent to treatment and disposal facilities out of the state of Nevada.

This Page Intentionally Left Blank

Workshop Notes

Comment Code: Workshop Notes 1-1

Location of EIS Revision(s): None required

Response: The DOE does understand the stakeholder's concerns about the issues associated with transportation of hazardous materials and waste. Each recommendation from the Protocol Working Group was identified as a comment and the appropriate response was prepared by the DOE. Chapter 7, "Mitigation Measures," presents the mitigation measures related to transportation. The mitigation measures that are accepted by the DOE will be identified in the Mitigation Action Plan. Refer to the discussion in Section 1.6 of Volume 3.

Comment Code: Workshop Notes 1-2

Location of EIS Revision(s): None required

Response: Refer to the response in Comment Code Workshop Notes 1-1 for more details of the mitigations measures that may be implemented by the DOE and to Section 1.6 of Volume 3.

Comment Code: Workshop Notes 1-3

Location of EIS Revision(s): None required

Response: The DOE is not required to provide notification for low-level waste shipment activities. However, the state of Nevada, Clark County, the city of Las Vegas, and the city of North Las Vegas require carriers hauling hazardous materials (including radioactive materials) to notify them when entering their jurisdictions. It is DOE policy to require carriers to comply with all state and local regulatory requirements. For additional information on transportation, refer to Chapter 1, Section 1.6 of Volume 3.

Comment Code: Workshop Notes 1-4

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 of Volume 3.

Comment Code: Workshop Notes 1-5

Location of EIS Revision(s): None required

Response: Mechanisms for providing this information are being addressed. Refer to Section 1.6 of Volume 3.

Comment Code: Workshop Notes 1-6

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 of Volume 3 for more information on transportation.

Comment Code: Workshop Notes 1-7

Location of EIS Revision(s): Volume 1, Sections 4.1.3 and 5.1.1.3

Response: Text has been added to clarify the training that the DOE provides and the responsibilities that the DOE has. For additonal information concerning transportation, refer to Section 1.6 of Volume 3.

Comment Code: Workshop Notes 1-8

Location of EIS Revision(s): None required

Response: Communication systems and optical devices are standard items for routine responders to incidents involving hazardous materials including radioactive materials, explosives, poisons, flammable materials, etc. It is not DOE's policy to provide such items.

Comment Code: Workshop Notes 1-9

Location of EIS Revision(s): None required

Response: Local public safety and emergency response agencies are candidates for the distribution of DOE surplus equipment. The DOE/NVpresently is reviewing inventories of surplus radiation detection equipment for possible distribution to local communities.

Comment Code: Workshop Notes 1-10

Location of EIS Revision(s): None required

Response: Refer to Comment Code Workshop Notes 1-7.

Comment Code: Workshop Notes 1-11

Location of EIS Revision(s): None required

Response: Refer to Comment Code Workshop Notes 1-7.

Comment Code: Workshop Notes 1-12

Location of EIS Revision(s): None required

Response: Refer to Comment Code Workshop Notes 1-7.

Comment Code: Workshop Notes 1-13

Location of EIS Revision(s): None required

Response: It is DOE policy to comply with state and local transportation regulations. All Class 7 materials are shipped at a minimum, in strong, tight containers that preclude aerosol disbursement in compliance with applicable regulations.

Comment Code: Workshop Notes 1-14

Location of EIS Revision(s): None required

Response: The DOE understands the stakeholders' concerns and will make parking space available within the secured area of the NTS.

Comment Code: Workshop Notes 1-15

Location of EIS Revision(s): None required

Response: There is no regulatory requirement to have two drivers present at all times during the transportation of Class 7 waste. If the U.S. Department of Transportation or the Nuclear Regulatory Commission makes this mandatory in the future, the DOE will comply.

Comment Code: Workshop Notes 1-16

Location of EIS Revision(s): None required

Response: Carriers respond to driver advisories and notifications of delays and adjust their route plans accordingly. Refer to Section 1.6 of Volume 3 for additional information.

Comment Code: Workshop Notes 1-17

Location of EIS Revision(s): None required

Response: Commercial Vehicle Safety Alliance inspections are not required for low-level waste shipments; it is DOE's policy to use the Motor Carrier Evaluation Program to ascertain carrier worthiness. The U.S. Department of Transportation and local law enforcement agencies already have enforcement authority; law enforcement can pull over and inspect any vehicle. Vehicles are inspected prior to shipment as well as through the evaluation program (mentioned above), which uses the Commercial Vehicle Safety Alliance standards. No additional inspection is necessary.

Comment Code: Workshop Notes 1-18

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 of Volume 3.

Comment Code: Workshop Notes 1-19

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 of Volume 3.

Comment Code: Workshop Notes 1-20

Location of EIS Revision(s): None required

Response: The commentor's concern is noted. The U.S. Department of Transportation provides the authority for safe haven identification, time of day, holiday, and peak traffic period limitations to individual states. The Nevada Department of Transportation has not initiated any of these restrictions; if they did adopt these programs, the DOE would comply.

Comment Code: Workshop Notes 1-21

Location of EIS Revision(s): None required

Response: Any methodology used for selecting routes that complies with the U.S. Department of Transportation regulations [49 CFR 397.101(a)] is acceptable. Under these regulations, carriers are required to select their routes based on the route selection criteria. The primary criteria of route selection is to minimize radiological risk to the public. See Section 1.6 of Volume 3 for more information.

Comment Code: Workshop Notes 1-22

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 of Volume 3. Any process or methodology for selecting routes that complies with the U.S. Department of Transportation regulations is acceptable.

Comment Code: Workshop Notes 1-23

Location of EIS Revision(s): None required

Response: Each carrier or route does not have an individual risk analysis. The transportation risk analysis documented in the Transportation Study for the NTS EIS serves as a tool for evaluation of potential risks of representative routes. The U.S. Department of Transportation regulations require that the driver have the route plan in his or her immediate possession.

Comment Code: Workshop Notes 1-24

Location of EIS Revision(s): None required

Response: Refer to Comment Code Workshop Notes 1-20.

Comment Code: Workshop Notes 1-25

Location of EIS Revision(s): None required

Response: Refer to Comment Code Workshop Notes 1-14.

Comment Code: Workshop Notes 2-1

Location of EIS Revision(s): None required

Response: The development of this EIS has been in progress for more than a year. The budget for last year was approximately $5 million. This year's budget has not been completed, but the target is about the same level of funding. The total budget is not expected to exceed $10 million.

Comment Code: Workshop Notes 2-2

Location of EIS Revision(s): None required

Response: The DOE Waste Management Programmatic EIS will provide a complex-wide evaluation of management alternatives for treating, storing, and disposing of radioactive and hazardous waste. Decisions on the management, transport, and disposal of DOE-generated wastes will be based upon the evaluation of impacts of on-site and off-site disposal operations. The Final NTS EIS and the Programmatic EIS will both include the impact evaluations.

Comment Code: Workshop Notes 2-3

Location of EIS Revision(s): None required

Response: The DOE/NV has written to ask the Bureau of Reclamation if they can stop hazardous truck traffic across Hoover Dam.

Comment Code: Workshop Notes 2-4

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 of this Volume. Routes would be selected by the carrier in accordance with the U.S. Department of Transportation regulations [49 CFR 397.101 (a)]. Under these regulations, carriers are required to select their routes based on the route selection criteria. The primary criterion of route selection is to minimize radiological risk to the public. The DOE understands the local concern regarding specific routes.

Comment Code: Workshop Notes 3-1

Location of EIS Revision(s): None required

Response: The scope of the NTS EIS includes only those sites inside the state of Nevada where the DOE is considering programmatic changes. This includes the NTS, the Tonopah Test Range, portions of the Nellis Air Force Range Complex, and the proposed Solar Enterprise Zone facility sites at the NTS, Dry Lake Valley, Eldorado Valley, and Coyote Spring Valley. The facilities located in Las Vegas and at Nellis Air Force Base are included in the NTS EIS as part of the programs they support. Many of the site support activities are discussed in Volume 1, Appendix A, Section A.6. Transportation alternatives focus mainly on risks associated with waste transport. The routes evaluated in the NTS EIS transportation risk analysis are not proposed routes. These routes were chosen as representative routes for evaluation.

Comment Code: Workshop Notes 3-2

Location of EIS Revision(s): None required

Response: The DOE/NV and Yucca Mountain Site Characterization Office will continue to work together and coordinate the key issues with respect to their respective EISs. The DOE will evaluate the possible environmental impacts from the construction, operation, and eventual closure of a potential repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain; including transportation and discussion of potential routing for these waste shipments, in a separate, ongoing EIS. The Yucca Mountain Repository EIS is not within the scope of the NTS EIS. See Section 3.2.6.1 and Section 1.1 of this Volume for further explanation on why the Yucca Mountain Repository EIS is outside the scope of this EIS.

It is not necessarily true that the routes deemed appropriate and designated under the U.S. Department of Transportation regulations for low-level waste shipments are the same routes that will be deemed appropriate for future high-level radioactive waste shipments, when they occur. Even if a repository is eventually developed at Yucca Mountain (and, as discussed in the response to State Government comment 2-30, there are several preconditions that must be fulfilled before a repository can be developed), the earliest that shipments of high-level radioactive waste are anticipated is the year 2010. This is beyond the timeframe of actions addressed by this EIS. The DOE will follow the Department of Transportation's routing regulations that are in effect at that time to cover shipments of spent nuclear fuel and high-level radioactive waste.

Comment Code: Workshop Notes 3-3

Location of EIS Revision(s): None required

Response: The DOE understands the local concern regarding Craig Road. Refer to Section 1.6 of Volume 3 for additional information.

Comment Code: Workshop Notes 3-4

Location of EIS Revision(s): None required

Response: Refer to Comment Code Workshop Notes 3-3.

Comment Code: Workshop Notes 3-5

Location of EIS Revision(s): None required

Response: Refer to Comment Code Workshop Notes 2-4.

Comment Code: Workshop Notes 3-6

Location of EIS Revision(s): None required

Response: Any methodology that meets the requirements of the U.S. Department of Transportation regulations is acceptable. The primary criterion for selecting routes is to minimize radiological risk and any risk analysis for route selection would have to take local conditions into account. Refer to Section 1.6 of Volume 3 for additional information.

Comment Code: Workshop Notes 3-7

Location of EIS Revision(s): None required

Response: The transportation model HIGHWAY was one of many models used for transportation impact analysis. Local constraints, such as avoiding certain route segments, were used as input to the software code HIGHWAY to account for local conditions. Other appropriate models were used for more detailed planning.

Comment Code: Workshop Notes 3-8

Location of EIS Revision(s): None required

Response: The routing regulations for hazardous radioactive materials and waste are issued by the U.S. Department of Transportation, not the DOE. Regulations pertaining to the transportation of radioactive high level waste are found in 49 CFR, Part 397, Subpart D, *"Routing of Class 7 (Radioactive) Materials."* The regulations pertaining to the transportation of hazardous, low-level radioactive materials and waste are found in 49 CFR Part 107 *"Hazardous Material Program Procedures."* It is the DOE's policy to comply with all applicable regulations.

It is not necessarily true that the routes deemed appropriate and designated (under the U.S. Department of Transportation regulations) for low-level waste shipments are the same routes that will be deemed appropriate for future high-level radioactive waste shipments, when they occur. Even if a repository is eventually developed at Yucca Mountain the earliest that shipments of high-level radioactive waste are anticipated to begin is the year 2010 which is beyond the timeframe of actions addressed by this EIS. The DOE will follow the U.S. Department of Transportation's routing regulations that are in effect at the time to cover shipments of spent fuel and high-level radioactive waste. For additional information on why Yucca Mountain is outside the scope of the NTS EIS, refer to Volume 1, Section 3.2.6.1, and Volume 3, Sections 1.1 and 1.6.

Comment Code: Workshop Notes 3-9

Location of EIS Revision(s): None required

Response: Refer to Section 1.9 of Volume 3.

Comment Code: Workshop Notes 3-10

Location of EIS Revision(s): None required

Response: Refer to Comment Code Workshop Notes 2-4.

Comment Code: Workshop Notes 3-11

Location of EIS Revision(s): None required

Response: The DOE maintains an emergency response capability that is prepared to assist in any event involving radioactive materials. This capability exists to support its own operations as well as to assist local and state governments should that assistance be needed. As long as operations continue at the NTS, the emergency response capability will be maintained.

Comment Code: Workshop Notes 3-12

Location of EIS Revision(s): None required

Response: The Transportation Protocol Working Group was established to facilitate discussion of transportation issues relating to the NTS. This organization will continue to meet several times a year.

Comment Code: Workshop Notes 3-13

Location of EIS Revision(s): None required

Response: Refer to Comment Code Workshop Notes 1-3.

Comment Code: Workshop Notes 3-14

Location of EIS Revision(s): None required

Response: Refer to response in Section 1.6 of Volume 3.

Comment Code: Workshop Notes 3-15

Location of EIS Revision(s): None required

Response: The primary criterion for route selection under the U.S. Department of Transportation regulations for route selection [49 CFR 397.101(a)] is to minimize the total radiological risk. Carriers are aware of this and must meet that criterion when selecting routes. For more information see Section 1.6 of Volume 3.

Comment Code: Workshop Notes 3-16

Location of EIS Revision(s): None required

Response: Nevada-specific accident rate data were used for the in-state risk calculations. Site-specific accident rate data were not available to the analyst at the time the analysis was performed. The extremely low results obtained by using state-specific data indicate that the effort to collect and use site-specific data is not necessary. The U.S. Department of Transportation regulations [49 CFR 397.101(a)] already require carriers to consider population density and accident rates when selecting routes. These are all factors that would affect the total risk of the transport, which, by regulation, must be minimized when selecting routes. For more information see Section 1.6 of Volume 3.

Comment Code: Workshop Notes 3-17

Location of EIS Revision(s): None required

Response: It is important to understand that the routes evaluated in the transportation risk analysis are not proposed routes, but were chosen as representative routes for evaluation only. The carrier will choose the route prior to shipment. Routes will be selected in accordance with the U.S. Department of Transportation [49 CFR397.101(a)]. Refer to Section 1.6 of Volume 3 for additional information.

Comment Code: Workshop Notes 3-18

Location of EIS Revision(s): None required

Response: Refer to Comment Code Workshop Notes 3-17.

Comment Code: Workshop Notes 3-19

Location of EIS Revision(s): None required

Response: Conditions such as highway construction are factors that a carrier would have to take into consideration in order to select a route that would minimize radiological risk. Refer to Section 1.6 of Volume 3.

Comment Code: Workshop Notes 3-20

Location of EIS Revision(s): None required

Response: Refer to the discussion in Section 1.9 of Volume 3.

Comment Code: Workshop Notes 3-21

Location of EIS Revision(s): None required

Response: The U.S. Department of Transportation regulations [49 CFR 397.101(a)] require that route selection take into account factors such as population density. For more information see Section 1.6 of Volume 3.

Comment Code: Workshop Notes 3-22

Location of EIS Revision(s): None required

Response: The DOE would be governed by the same regulations that the carriers are: The U.S. Department of Transportation regulations [49 CFR 397.101(a)]. The comment assumes contract vs. common carrier permits route selection on DOE's part. This is not true—see Section B.1.2 of the Transportation Study (Appendix I). Refer also to Section 1.6 of Volume 3.

Comment Code: Workshop Notes 3-23

Location of EIS Revision(s): None required

Response: Refer to Comment Code Workshop Notes 3-13 and Section 1.6 of Volume 3 for additional information.

Comment Code: Workshop Notes 3-24

Location of EIS Revision(s): None required

Response: Section 1.6 of Volume 3 provides additional information on this subject. Notification and planning requirements for shipments of low-level, mixed, and hazardous wastes are under the control of the U.S. Department of Transportation. The DOE will continue to fully comply with these regulations. The driver of each vehicle is required to have a route plan in his immediate possession. This route plan also contains contingency plans for deviations from the planned route.

Comment Code: Workshop Notes 3-25

Location of EIS Revision(s): Chapter 4, Sections 4.1.3. and 5.1.1.3

Response: Text has been added to clarify the training that the DOE provides and the responsibilities that the DOE has. For additional information on transportation, refer to Section 1.6 of Volume 3.

Comment Code: Workshop Notes 4-1

Location of EIS Revision(s): None required

Response: Information concerning significant faults is summarized in Chapter 4, Section 4.1.1, Geology and Soils. A detailed discussion of regional seismic activity is characterized in Vortman (1991). Other recent studies are available from the U.S. Geological Survey.

Comment Code: Workshop Notes 4-2

Location of EIS Revision(s): None required

Response: The sequences that are part of the regional carbonate aquifer are shown in Volume 1, Figure 4-21. On this figure, the hydrogeologic units are listed in the second column while the corresponding geologic formations are shown under the heading "Geologic Formations."

Comment Code: Workshop Notes 4-3

Location of EIS Revision(s): None required

Response: The aquifers and aquitards that comprise the regional carbonate aquifer system are discussed in the section titled "Hydrogeologic Units" in Volume 1, Section 4.1.5.

Comment Code: Workshop Notes 4-4

Location of EIS Revision(s): None required

Response: A detailed discussion of the entire geologic history of the NTS is not required for the purposes of the NTS EIS. Additional detail is available in the references noted and in the DOE Technical Library.

Comment Code: Workshop Notes 4-5

Location of EIS Revision(s): None required

Response: A detailed discussion of the entire geologic history of the NTS with respect to mineralization is not required for the purposes of the NTS EIS since it is unlikely that this resource would be affected by proposed NTS activities.

Comment Code: Workshop Notes 4-6

Location of EIS Revision(s): None required

Response: A detailed discussion of the entire geologic history of the NTS with respect to present-day aquifers is not required for the purposes of the NTS EIS. The regional aquifer is described in Volume 1, Section 4.1.5.

Comment Code: Workshop Notes 4-7

Location of EIS Revision(s): None required

Response: The map presented in Volume 1, Figure 4-24 is a generalized map that was included to support the discussion on recent seismicity. Many other mapped faults exist on the NTS which are either inappropriate to display at the scale shown or are no longer active.

Comment Code: Workshop Notes 4-8

Location of EIS Revision(s): None required

Response: A discussion of the particular structural plates involved in nuclear testing is not generally required for the analysis of environmental impacts evaluated in the NTS EIS. Site-specific criteria such as the specific structural plate in which a test was conducted are being considered in DOE's environmental restoration investigations at underground testing areas.

Comment Code: Workshop Notes 4-9

Location of EIS Revision(s): None required

Response: Test wells on the NTS were not drilled for the purposes of petroleum exploration, but most were logged by contract geophysical logging firms active in the petroleum industry. The qualifications of the individuals performing the environmental analysis are listed in Chapter 9 of the NTS EIS.

Comment Code: Workshop Notes 4-10

Location of EIS Revision(s): None required

Response: The findings concerning hydrocarbon resources are based upon the cited references and include the definition of hydrocarbon resource potential by the Nevada Bureau of Mines and Geology.

Comment Code: Workshop Notes 4-11

Location of EIS Revision(s): None required

Response: Test wells on the NTS were not drilled for the purposes of petroleum exploration, and were not required to be overseen by petroleum geologists.

Comment Code: Workshop Notes 4-12

Location of EIS Revision(s): Chapter 4, Section 4.1.5.2

Response: The relationship between the stratigraphic units present at the NTS and the groundwater aquifers is discussed in the section titled "Hydrogeologic Units," summarized in Volume 1, Table 4-24, and presented graphically on Figure 4-21. A reference to Table 4-24 has been added to the NTS EIS discussion.

Comment Code: Workshop Notes 5-1

Location of EIS Revision(s): None required

Response: The NTS Development Corporation has been tasked with bringing new business to the NTS and Tonopah Test Range. This corporation includes representation by Nye County. In addition, the Bechtel Nevada Business Development Office has also been tasked with bringing in new work.

Comment Code: Workshop Notes 5-2

Location of EIS Revision(s): None required

Response: The region of influence for the socioeconomics discussion in the NTS EIS is discussed in Section 4.1.3. The region of influence is defined as the area in which the principal direct and secondary socioeconomic effects are likely to occur, and are expected to be of the most consequence to local jurisdictions. Most employees of the DOE, contractor personnel, and supporting government agencies live in Clark County (90 percent) or Nye County (7 percent). The remaining 3 percent live in other areas including Lincoln and Esmeralda counties. It was assumed that this past trend would continue based on past and predicted settlement patterns, and that the majority of socioeconomic impacts would occur to jurisdictions in the counties analyzed.

Comment Code: Workshop Notes 5-3

Location of EIS Revision(s): None required

Response: The DOE included the four federal agencies and Nye County as cooperating agencies during the early stages of the development of this EIS in accordance with the Council on Environmental Quality regulations for implementing the National Environmental Policy Act (Title 40 CFR Parts 1500.5 and 1500.6). These agencies were included because of their jurisdiction and specific expertise with regard to environmental issues which are discussed in the NTS EIS. The DOE sought their cooperation to identify potential impacts to lands owned, administered, or managed by these agencies as a result of implementing the proposed alternatives. The DOE did not want the alternatives evaluated in the NTS EIS to be in conflict with the programs and policies of these agencies.

Although the DOE did not request other federal, state, or local agencies to be cooperating agencies, the DOE did contact numerous agencies during the preparation of this EIS and sent copies of the Draft NTS EIS to local governments throughout Nevada, including Esmeralda County, for their review and comment; not just Clark, Lincoln, and Nye counties. The input provided by these agencies during scoping, and in comments on the Draft NTS EIS has been a very valuable component in the overall process. The DOE is committed to working with local governments in Nevada in implementing the Preferred Alternative, and will continue to seek their input regarding issues related to the NTS.

The DOE has not excluded Esmeralda County from activities involving the NTS. The DOE mailing lists for the NTS include several Esmeralda County agencies and officials, including the County Commission, County Clerk, and School Superintendent. The mailing lists also include the public libraries in Goldfield and Dyer. The DOE also has published public notices regarding NTS activities in the *Tonopah Times*. In March 1995, the DOE held a meeting on transportation issues in Goldfield, which was attended by several Esmeralda County officials; and a scoping meeting for the NTS EIS was held in nearby Tonopah in September 1994.

Comment Code: Workshop Notes 5-4

Location of EIS Revision(s): None required

Response: The commentor is correct when stating that both low-income populations and minority populations are considered when evaluating environmental justice concerns. The NTS EIS identifies census blocks in

Clark County (Volume 1, Figure 4-49) and Nye County (Volume 1, Figure 4-50) that have a large percentage of low-income residents and minority populations compared to other census blocks in Clark and Nye counties.

Comment Code: Workshop Notes 5-5

Location of EIS Revision(s): None required

Response: The NTS EIS does consider environmental justice effects on low-income populations. The NTS EIS identifies census blocks in Clark County (Figure 4-49) and Nye County (Figure 4-50) that have a large percentage of low-income residents compared to other census blocks in Clark and Nye counties.

Comment Code: Workshop Notes 5-6

Location of EIS Revision(s): None required

Response: Refer to Comment Code Workshop Notes 5-4.

Comment Code: Workshop Notes 5-7

Location of EIS Revision(s): None required

Response: The NTS EIS is one of a series of "tiered" documents, as defined by the National Environmental Policy Act. The NTS EIS is more specific than DOE's Programmatic EIS documents, which discuss nationwide programs and their effects, and is less specific than environmental documentation that would occur for a specific project. The tiering process is meant to avoid a duplication of effort and paperwork. Therefore, if a new project were proposed in the future, the NTS EIS would be incorporated by reference, and only the analysis specific to the project would be performed. The DOE is required under the Endangered Species Act to ensure that activities do not affect endangered, threatened, or candidate species. Development or construction is possible if appropriate mitigation measures are practiced, as approved by the U.S. Fish and Wildlife Service.

Comment Code: Workshop Notes 6-1

Location of EIS Revision(s): None required

Response: Alternative 3, the Expanded Use Alternative, would provide the greatest employment opportunity.

Comment Code: Workshop Notes 6-2

Location of EIS Revision(s): None required

Response: The definition of low-level waste is provided in Volume 1, Section 2.4:

Low-Level Waste—Radioactive waste not classified as high-level waste, transuranic waste, or spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic elements is less than 100 nCi per gram.

Comment Code: Workshop Notes 6-3

Location of EIS Revision(s): None required

Response: Refer to Section 1.6 of Volume 3.

Comment Code: Workshop Notes 6-4

Location of EIS Revision(s): None required

Response: The immediate response would be by local emergency response personnel. If they felt DOE's presence was required, a competent state authority can request the DOE to assist with the emergency response and they are responsible for any clean-up. Radiological Assistance Teams are available within each DOE region.

Comment Code: Workshop Notes 6-5

Location of EIS Revision(s): None required

Response: The DOE has an excellent transportation safety record. The DOE has been transporting radioactive material across the United States for over 40 years with no serious accidents.

Comment Code: Workshop Notes 6-6

Location of EIS Revision(s): None required

Response: It is the DOE's policy to afford, to the maximum extent possible, the opportunity to all interested parties to participate in the competition process for new contracts and business solicitations. Interested parties can list their name on a bidders' list by contacting the DOE Contract Management Division at (702) 295-3206 or by contacting the Small Business Specialist at (702) 295-1506.

CHAPTER 4
REFERENCES

REGULATION, ORDER, LAW

10 CFR 61	U.S. Nuclear Regulatory Commission (NRC), "Energy, Licensing Requirements for Land Disposal of Radioactive Waste," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
10 CFR 1021	U.S. Department of Energy (DOE), "Energy: National Environmental Policy Act Implementing Procedures," *Code of Federal Regulations*, Office of Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.
40 CFR 191	U.S. Environmental Protection Agency (EPA), "Protection of the Environment: Environmental Standards for the Management and Disposal of Spent Nuclear Fuel High-Level and Transuranic Radioactive Wastes," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1992.
40 CFR 761	EPA, "Protection of the Environment: Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," *Code of Federal Regulations*, Office of Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.
40 CFR 1500	EPA, "Protection of the Environment: Purpose, Policy and Mandate," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
40 CFR 1501	EPA, "National Environmental Policy Act (NEPA) and Agency Planning: Council on Environmental Quality," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
40 CFR 1502	EPA, "Protection of the Environment: Environmental Impact Statement," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.
40 CFR 1506	EPA, "Protection of the Environment: Other Requirements of NEPA," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.

49 CFR 100-177	U.S. Department of Transportation (DOT), "Transportation," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1990.
49 CFR 397	DOT, "Transportation: Transportation of Hazardous Materials; Driving and Parking Rules," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1995.
DOE Order 430.1	DOE, "Life-Cycle Asset Management," Washington, DC, 1995.
46 FR 18026	Council on Environmental Quality (CEQ), "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," Federal Register, Vol. 46, No. 55, Washington, DC, 1981.
60 FR 13424	DOE, "Strategy for Management and Disposal of Greater-Than-Class C Low-Level Radioactive Waste," *Federal Register*, Vol. 60, No. 48, Washington, DC, 1995.
60 FR 40164	DOE, "Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada," *Federal Register*, Vol. 60, No. 151, Washington, DC, 1995.
61 FR 7596	U.S. Fish and Wildlife Service, "Endangered and Threatened Wildlife and Plants: Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species," *Federal Register*, Vol. 61, No. 40, Washington, DC, 1996.
PL Order 103-160	National Defense Authorization Act as found in Public Law Order No. 103-160 Sec. 3135 (107 STAT. 1946), signed November 30, 1993, Washington, DC.
PL Order 805	Public Land Order (PL Order), "Withdrawing Public Lands for Use of the U.S. Atomic Energy Commission; Partial Revocation of Executive Orders Nos. 8578 and 9019," *Federal Register*, Vol. 17, Bureau of Land Management, U.S. Department of the Interior, Washington, DC, 1952.
PL Order 1662	PL Order, "Withdrawing Public Lands for Use of the U.S. Atomic Energy Commission in connection with the Nevada Test Site, Additional to Those Withdrawn by Public Land Order No. 805 of February 12, 1952," *Federal Register*, Vol. 125, Bureau of Land Management, U.S. Department of the Interior, 1958.
PL Order 2568	PL Order, "Transferring Lands from Department of the Air Force to Atomic Energy Commission," *Federal Register*, Doc. 61-12179, Bureau of Land Management, U.S. Department of the Interior, Washington, DC, 1961.
PL Order 2771	PL Order, "Withdrawing Lands for Use of Atomic Energy Commission," *Federal Register*, Doc. 62-9076, U.S. Department of the Interior, Washington, DC, 1962.

PL Order 2834 — PL Order, "Alaska, Colorado and Nevada: Correcting Certain Public Land Orders; Amending Public Land Order No. 2771 of September 6, 1962," *Federal Register*, Doc. 62-12191, U.S. Department of the Interior, Washington, DC, 1962.

PL Order 3759 — PL Order, "Withdrawal for Atomic Energy Commission," Bureau of Land Management, U.S. Department of the Interior, *Federal Register,* August 27, 1965.

PL Order 6802 — PL Order, "Withdrawal of Public Land to Maintain the Physical Integrity of the Subsurface Environment, Yucca Mountain Project; Nevada," *Federal Register*, Vol. 55, No. 186, U.S. Bureau of Land Management, Department of the Interior, Washington, DC, 1990.

GENERAL

Andricevic, 1994 — Andricevic, R., J.I. Daniels, and R.L. Jacobson, "Radionuclide migration using a travel time transport approach and its application on risk analysis," *Journal of Hydrology*, 1994.

Battelle, 1994 — Battelle-Pacific Northwest Laboratory, *Final Report of Vitrification Development Studies for Fernald CRU-4 Silo Wastes*, Richland, WA, 1994.

Beatley, 1976 — Beatley, J.C., *Vascular Plants of the Nevada Test Site and Central-Southern Nevada: Ecologic and Geographic Distributions,* TID-26881, 1976.

Benjamin, 1995 — Memorandum from T.M. Benjamin to M. Pankratz, "Selected NTS Underground Inventory Data," June 23, 1995.

Blomquist et al., 1995 — Blomquist, K.W., T.A. Lindeman, G.E. Lyon, D.C. Steen, C.A. Wills, S.A. Flick, and W.K. Ostler, *Current Distribution, Habitat, and Status of Category 2 Candidate Plant Species On and Near the U.S. Department of Energy's Nevada Test Site,* EG&G Energy Measurements, Las Vegas Area Operations, Las Vegas, NV, 1995.

Borg et al., 1976 — Borg, I.Y., R. Stone, H.B. Levy, and L.D. Ramspott, *Information Pertinent to the Migration of Radionuclides in Ground Water at the Nevada Test Site, Part 1: Review and Analysis of Existing Information,* UCRL-52078 Pt. 1, Lawrence Livermore National Laboratory, Livermore, CA, 1976.

Burbey and Prudic, 1991 — Burbey, T.J. and D.E. Prudic, *Conceptual Evaluation of Regional Ground-Water Flow in the Carbonate-Rock Province of the Great Basin, Nevada, Utah, and Adjacent States*, U.S. Geological Survey Professional Paper 1409-D, U.S. Government Printing Office, Washington, DC, 1991.

CH2MHill, 1993 — CH2MHill, *Hazardous Material Truck Safety Study, U.S. Highway 93 at Hoover Dam,* Final Report, submitted to U.S. Department of the Interior, Bureau of Reclamation, Lower Colorado Region, Sacramento, CA, 1993.

Chapman et al., 1995 — Chapman, J.B., K. Pohlmann, and R. Andricevic, *Exposure Assessment of Groundwater Transport of Tritium from the Shoal Site,* Publication No. 45132, Water Resources Center, Desert Research Institute, Las Vegas, NV, 1995.

Chapman and Hokett, 1991 — Chapman, J.B. and S.L. Hokett, *Evaluation of Groundwater Monitoring at Offsite Nuclear Test Areas,* Publication #45085, Water Resources Center, Desert Research Institute, Las Vegas, NV, 1991.

Clary et al., 1995 — Clary, S.L., D.R. McClary, R. Whitney, and D.D. Reeves, *Water Resources Data Nevada, Water Year 1994,* U.S. Geological Survey Water-Data Report NV-94-1, 1995.

Cox et al., 1977 — Cox, D.N., D.L. Stoneman, and T.S. Gibson, *Soil Inventory of Tonopah Range Environmental Impact Statement Area: Selected Areas within Nye County,* prepared for the Bureau of Land Management by Earth Environmental Consultants, Inc., Albuquerque, NM, 1977.

D'Agnese, 1994 — D'Agnese, F.A., *Using Geoscientific Information Systems for Three-Dimensional Modeling of Regional Ground-Water Flow Systems, Death Valley Region, Nevada and California,* unpublished Ph.D Dissertation, Colorado School of Mines, 1994.

Daniels et al., 1993 — Daniels, J.I., L.R. Anspaugh, and R.L. Jacobson, "Risk-Based Screening Analysis of Ground Water Contaminated by Radionuclides Introduced at the Nevada Test Site (NTS)," in the *Pilot Study Risk Assessment for Selected Problems at the Nevada Test Site (NTS),* UCRL-LR-113891, Lawrence Livermore National Laboratory, Livermore, CA, 1993.

DoD, 1982 — U.S. Department of Defense (DoD), Memorandum of Understanding Between the Department of the Air Force Tactical Air Command Tactical Fighter Weapons Center and DOE/NV, DE-AI08-82NV10283, Las Vegas, NV, 1982.

DOE, 1988 — DOE, *Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada,* DOE/RW-0199, Office of Civilian Radioactive Waste Management, Washington, DC, 1988.

DOE, 1992 — DOE, *Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements*, NVO-325 (Rev. 1), prepared by DOE Nevada Field Office and Reynolds Electrical & Engineering Co., Inc.'s Waste Management Department, Las Vegas, NV, 1992.

DOE, 1993a — DOE, *Operable Unit 4 Treatability Study Report for the Vitrification of Residues from Silos 1, 2, and 3*, Fernald Environmental Management Project, Fernald, OH, 1993.

DOE, 1993b — DOE, *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements,* Office of NEPA Oversight, Washington, DC, 1993.

DOE, 1995a DOE, *Final Environmental Assessment for Solid Waste Disposal, Nevada Test Site, Nye County, Nevada,* DOE/EA-1097, Washington, DC, 1995.

DOE, 1995b DOE, "Control of Nuclear Test Areas," Nevada Test Site Standard Operating Procedure, Chapter 6405, Nevada Test Site Office, Las Vegas, NV, 1995.

DOE, 1995c DOE, *Draft Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*, DOE/EIS-0200-D, Office of Environmental Management, Washington, DC, 1995.

DOE, 1995d DOE, *Estimating the Cold War Mortgage: The 1995 Baseline Environmental Management Report, Vol I, II, and Executive Summary*, DOE/EM-0232, 1995.

DOE, 1996a DOE, *Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management,* Summary, Volume 1, DOE/EIS-0236, Office of Fissile Materials Disposition, Washington, DC, 1996.

DOE, 1996b DOE, Storage and Disposition of Weapons-Usable Fissile Materials Draft Programmatic Environmental Impact Statement, Volume 1, DOE/EIS-0229-D, Office of Fissile Materials Disposition, Washington, DC, 1996.

DOE/EM, 1996 Department of Energy, Office of Environmental Management (DOE/EM), *Charting the Course: The Future Use Report*, DOE/EM-0283, Washington DC, 1996.

DOE/NV, 1982a U.S. Department of Energy, Nevada Operations Office (DOE/NV), *Documentation of Greater Confinement Disposal Technology: 1981-1982, A Progress Report on Milestone E of the DOE Low-Level Waste Management Program,* DOE/NV-10253-6, Carson City, NV, 1982.

DOE/NV, 1982b DOE/NV, *Comparative Assessment of Disposal of TRU Waste in a Greater Confinement Disposal Facility,* DOE/NV-00410-68, Carson City, NV, 1982.

DOE/NV, 1992 DOE/NV, *Annual Report on Waste Generation and Waste Minimization Progress,* Nevada Field Office, Las Vegas, NV, 1992.

DOE/NV, 1995a DOE/NV, *Nevada Test Site Annual Site Environmental Report-1994,* DOE/NV-11432-175 UC-600, prepared by Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV 1995.

DOE/NV, 1995b DOE/NV, *The DOE/NV Radiological Assistance Program: Notification Procedure Manual*, DOE/NV-362, DOE/NV Emergency Management and Nonproliferation Division, Las Vegas, NV, 1995.

DOE/NV, 1995c DOE/NV, *Implementation Plan for the Nevada Test Site Environmental Impact Statement (Draft)*, DOE/NV-390, Las Vegas, DC, 1995.

DOT, 1992	U.S. Department of Transportation (DOT), *Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Radioactive Materials*, DOT/RSPA/HMS/92-02, Washington, DC, 1992.
EG&G/EM, 1995	EG&G Energy Measurements (EG&G/EM), *Basic Environmental Compliance and Monitoring Program Fiscal Year 1995* Progress Report, submitted to DOE/NV on September 21, Las Vegas, 1995.
ERDA, 1977	U.S. Energy Research and Development Administration (ERDA), *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada*, ERDA-1551, Las Vegas, NV, 1977.
Faunt, 1994	Faunt, C.C., *Characterization of the Three-Dimensional Hydrogeologic Framework of the Death Valley Region, Nevada and California*, unpublished Ph.D Dissertation, Colorado School of Mines, 1994.
Friesen, 1992	Friesen, H. N., *Summary of the Nevada Applied Ecology Group and Correlative Program*, prepared by Raytheon Services Nevada, DOE/NV-357 (Version 1), Las Vegas, NV, 1992.
Gardner and Nork, 1970	Gardner, M.C., and W.E. Nork, *Evaluation of the Project Shoal Site, Fallon, Nevada, for Disposition, Including Identification of Restrictions*, Part 1, NVO-1229-105, Palo Alto Laboratories, Palo Alto, CA, 1970.
GeoTrans, Inc. 1995a	GeoTrans, Inc., *A Stochastic Advective-Dispersive Transport Code for Multiple Constituents in Dual Porosity or Fractured Geological Media*, prepared for DOE/NV, Las Vegas, NV, 1995.
GeoTrans, Inc., 1995b	GeoTrans, Inc., *A Fracture/Porous Media Model of Tritium Transport in the Underground Weapons Testing Areas, Nevada Test Site*, prepared for DOE/NV, Las Vegas, NV, 1995.
Harrill et al., 1988	Harrill, J.R., J.S. Gates, and J.M. Thomas, *Major Ground-Water Flow Systems in the Great Basin Region of Nevada, Utah and Adjacent States*, Hydrological Investigations Atlas HA-694-C Scale:1,000,000, U.S. Geological Survey, Denver, CO, 1988.
Ho et al., 1986	Ho, D.M., R.L. Sayre, and C.L. Wu, *Suitability of Natural Soils for Foundations for Surface Facilities at the Prospective Yucca Mountain Nuclear Waste Repository*, SAND 85-7107, prepared by Bechtel National, Inc., for Sandi National Laboratories, San Francisco, CA, for Sandia National Laboratories, Albuquerque, NM, 1986.
Hunter, 1981	Hunter, P.H., "The Criteria and Technical Concept for Demonstrating Greater Confinement Disposal of Radioactive Wastes at Arid Western Sites," in the *Proceedings of the Third Annual Information Meeting DOE Low-Level Waste Management Program*, New Orleans, LA, 1981.

Hunter, 1994	Hunter, R.B. (compiler), *Status of the Flora and Fauna on the Nevada Test Site, 1993,* DOE/NV 11432-162, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1994.
Hunter, 1995	Hunter, R.B. (compiler), *Status of the Flora and Fauna on the Nevada Test Site, 1994,* DOE/NV 11432-195, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1995.
ICRP, 1991	International Commission on Radiological Protection (ICRP), *1990 Recommendations of the International Commission on Radiological Protection,* Publication 60, Pergamon Press, Oxford, England, 1991.
Krebs, 1985	Krebs, C.J., *Ecology: The Experimental Analysis of Distribution and Abundance,* Third Edition, Institute of Animal Resource Ecology, the University of British Columbia, Harper & Row (publishers), New York, 1985.
Lehman and Associates, 1994	Lehman, L. and T.P. Brown, *Updated Analysis of Water Levels in Devil's Hole, Nevada,* prepared by Lehman and Associates, Inc. for the DOE/NV, Burnsville, MN, 1994.
McArthur, 1991	McArthur, R.D., "Radionuclides in Surface Soil at the Nevada Test Site," DOE/NV-10845-02, U.S. Department of Energy, Las Vegas, NV, 1991.
McDonald and Harbaugh, 1988	McDonald, M.G., and A.W. Harbaugh, *A Modular Three-Dimensional Finite-Difference Ground-Water Flow Model,* U.S. Geological Survey, 1988.
NAC, 1992	Nevada Administrative Code (NAC), "Sanitation: Facilities for the Management of Hazardous Waste," Chapter 444, The Bureau of National Affairs, Inc., Washington, DC, 1992.
NDAA, 1992	National Defense Authorization Act (NDAA) for Fiscal Year 1993, U.S. Senate, Committee on Armed Services, 192d Congress, Report 102-352, Washington, DC, 1992.
Nimz and Thompson, 1992	Nimz, G. J. and J. L. Thompson, *Underground Radionuclide Migration at the Nevada Test Site,* DOE/NV-346, Reynolds Electrical and Engineering Company, Inc., Las Vegas, NV, 1992.
Nixon and Brezhnev, 1974	Treaty Between the United States of America and the Union of the Soviet Socialist Republics on the Limitation of Underground Nuclear Weapon Tests, signed in Moscow on July 3, 1974.
ORNL, 1981	Oak Ridge National Laboratory (ORNL), *Proceedings of the Third Annual Information Meeting DOE Low-Level Waste Management Program, Convened by the DOE Low-Level Waste Management Program,* November 4-6, 1981, New Orleans, LA, ORNL/NFW-81/34, 1981.
ORNL, 1991	ORNL, *Radiological Performance Assessment U3ah/at Low-Level Waste Disposal Unit Nevada Test Site,* Revision 1, prepared for the U.S. Department of Energy, Nevada Field Office, Las Vegas, NV, 1991.

OTA, 1989	Office of Technology Assessment (OTA), *The Containment of Underground Nuclear Explosions*, OTA-ISC-414, U.S. Government Printing Office, Washington, DC, 1989.
PAL Consultants, 1995	PAL Consultants, *A Conceptual Model of the Death Valley Ground-Water Flow System, Nevada and California*, prepared for U.S. Department of the Interior, National Park Service, 1995.
Pollock, 1994	Pollock, D.W., *User's Guide for MODPATH/MODPATH-PLOT, Version 3: A particle tracking post-processing package for MODFLOW, the U.S. Geological Survey finite-difference ground-water flow model*, U.S. Geological Survey, Reston, VA, 1994.
RSN, 1994	Raytheon Services Nevada (RSN), *Nevada Test Site Technical Site Information*, prepared for the DOE/NV, Las Vegas, NV 1994.
Schmeltzer et al., 1993	Schmeltzer, J.S., J.J. Miller, and D.L. Gustafson, *Flood Assessment at the Area 5 Radioactive Waste Management Site and the Proposed Hazardous Waste Storage Unit, DOE/Nevada Test Site, Nye County, Nevada*, Raytheon Services Nevada, Las Vegas, NV, 1993.
Schwer, 1995	Schwer, R.K., *U.S. Economic Outlook: 1995*, Center for Business and Economic Research, University of Nevada, Las Vegas, NV, 1995.
Scott et al., 1971	Scott, B.R., T.J. Smales, F.E. Rush, and A.S. Van Denburgh, *Water for Nevada (Nevada's Water Resources)*, Water Planning Report 3, Nevada Department of Conservation and Natural Resources, Division of Water Resources, State of Nevada, Carson City, NV, 1971.
Shott et al., 1995	Shott, G.J., C.J. Muller, L.E. Barker, D.E. Cawlfield, F.T. Lindstrom, D.G. Linkenheil, M.J. Sully, D.J. Thorne, and L. McDowell-Boyer, *Performance Assessment for the Area 5 Radioactive Waste Management Site at the Nevada Test Site, Nye County, Nevada*, Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV, 1995.
State of Nevada, 1992	State of Nevada, *Settlement Agreement for Transuranic (TRU) Mixed Waste Storage Issues at the Nevada Test Site (NTS)*, State of Nevada, Division of Environmental Protection, Carson City, NV, 1992.
State of Nevada, 1996	State of Nevada, Federal Facility Agreement and Consent Order, Department of Conservation and Natural Resources, Division of Environmental Protection, Carson City, NV, 1996.
Stoffle and Evans, 1992	Stoffle, R.W., and M.J. Evans, "American Indians and Nuclear Waste Storage: The Debate at Yucca Mountain, Nevada," in *Native Americans and Public Policy*, Fremont J. Layden and Lyman H. Legters (eds.), pp. 243-262, University of Pittsburgh Press, Pittsburgh, PA, 1992.

Turnipseed, 1995	Turnipseed, R. M., State Engineer, "In the Matter of Applications 55450 and 58269 Filed to Appropriate Waters from an Underground Source in the Muddy River Springs Area (219) Clark County, Nevada Ruling #4243," Office of the State Engineer of the State of Nevada, Division of Water Resources, Department of Conservation and Natural Resources, Carson City, NV, 1995.
U.S. Air Force, 1994	U.S. Air Force, *Environmental Assessment for Supersonic Flight Operations over the Nellis Range Complex*, Nellis Air Force Base, Las Vegas, NV, 1994.
U.S. Fish and Wildlife Service, 1992	U.S. Fish and Wildlife, *Biological Opinion on Nevada Test Site Activities*, U.S. Department of the Interior, Reno, NV, May 20, 1992.
U.S. Fish and Wildlife Service, 1996	U.S. Fish and Wildlife Service, *Draft Programmatic Biological Opinion for Nevada Test Site Activities*, U.S. Department of the Interior, Reno, NV, May 20, 1996.
Van Cleave, 1996	Van Cleave, K.K., letter report to Stephen A. Millington, Acting Director for the Nevada Operations Waste Management Division, regarding the potential for groundwater recharge below UE3ax/bl, Las Vegas, NV, 1996.
Vortman, 1991	Vortman, L.J., *An Evaluation of the Seismicity of the Nevada Test Site and Vicinity,* SAND86-7006, Sandia National Laboratories, Albuquerque, NM, 1991.
Walker and Eakin, 1963	Walker, G.E. and T.E. Eakin, "Geology and Ground Water of Amargosa Desert, Nevada-California" in *Ground-Water Resources -- Reconnaissance Series, Report 14*, prepared cooperatively by the Geological Survey, U.S. Department of the Interior and the State of Nevada Department of Conservation and Natural Resources, Carson City, NV, 1963.
Watkins, 1992	Watkins, J.D., Memorandum for All Department Elements, "Department of Energy Policy on Waste Minimization and Pollution Prevention," the Secretary of Energy, Washington, DC, 1992.

This Page Intentionally Left Blank

 *U.S. GOVERNMENT PRINTING OFFICE: 1996-785-718