**DOE/EA - 0993**

# ENVIRONMENTAL ASSESSMENT

# SHUTDOWN OF THE FAST FLUX TEST FACILITY

HANFORD SITE, RICHLAND, WASHINGTON

U.S. DEPARTMENT OF ENERGY

MAY 1995

# Glossary

## Acronyms and Initialisms

| | |
|---|---|
| ALARA | As Low As Reasonably Achievable |
| CCC | Core Component Container |
| CFR | *Code of Federal Regulations* |
| CY | Calendar Year |
| D&D | decontamination and decommissioning |
| DOE | U.S. Department of Energy |
| DOT | U.S. Department of Transportation |
| EA | Environmental Assessment |
| EBR | Experimental Breeder Reactor |
| ERPG | Emergency Response Planning Guideline |
| FFTF | Fast Flux Test Facility |
| FSF | Fuel Storage Facility |
| HCWC | Hanford Central Waste Complex |
| IDS | Interim Decay Storage |
| IEM | Interim Examination and Maintenance |
| INEL | Idaho National Engineering Laboratory |
| ISA | Interim Storage Area |
| ISC | Interim Storage Cask |
| LCF | latent cancer fatality |
| MEI | maximally exposed individual |
| NaK | sodium-potassium eutectic alloy |
| NEPA | *National Environmental Policy Act of 1969* |
| NRC | U.S. Nuclear Regulatory Commission |
| PCB | polychlorinated biphenyl |
| PFP | Plutonium Finishing Plant |
| PNL | Pacific Northwest Laboratory |
| RCRA | *Resource Conservation and Recovery Act of 1976* |
| RSB CLS | Reactor Service Building Cask Loading Station |
| SRE | Sodium Reactor Experiment |
| SSF | sodium storage facility |
| SRF | sodium reaction facility |
| SWC | Solid Waste Cask |
| TSD | treatment, storage, and/or disposal |
| TWRS | Tank Waste Remediation System |
| WAC | *Washington Administrative Code* |

## Definition of Terms

As Low As Reasonably Achievable. An approach to radiation and toxicological protection to control or manage exposures (both individual and collective to the workforce and general public) as low as social, technical, economic, practical, and public policy considerations permit.

Background radiation. That level of radioactivity from naturally occurring sources; principally radiation from cosmogenic and primordial radionuclides.

Corrosivity. A characteristic of a hazardous waste as defined in 40 *Code of Federal Regulations* 261, "Identification and Listing of Hazardous Waste."

Derived Air Concentrations. The airborne concentration that equals the annual limit on intake divided by the volume of air breathed by an average worker for a working year of 2,000 hours (assuming a breathing volume of 2,400 cubic meters [85,000 cubic feet]).

Derived Concentration Guide for Public Exposure. Those concentrations of radionuclides in air or water that would result in a maximum effective committed dose equivalent to 100 millirem per year using appropriate dose methodology under conditions of continuous exposure or use (i.e., continuously breathing or being immersed in contaminated air or exclusively drinking contaminated water).

Emergency Response Planning Guidelines No. 1 (ERPG-1). The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.

Emergency Response Planning Guidelines No. 2 (ERPG-2). The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

Emergency Response Planning Guidelines No. 3 (ERPG-3). The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.

Ignitability. A characteristic of a hazardous waste as defined in 40 *Code of Federal Regulations* 261.

Latent cancer fatality: The excess cancer fatalities in a population due to exposure to a carcinogen.

Maximally exposed individual. A hypothetical member of the public residing near the Hanford Site who, by virtue of location and living habits, could receive the highest possible radiation dose from radioactive effluents released from the Hanford Site.

NaK. A sodium-potassium eutectic alloy, liquid at room temperature, typically used in instrumentation and cooling of auxiliary systems.

NaX. A fire retardant, for alkali metal fires, consisting of nylon-coated sodium carbonate.

Person-rem. A population dose based on the number of persons multiplied by the radiation dose.

Reactivity. A characteristic of a hazardous waste as defined in 40 CFR 261.23.

rem. A unit of dose equivalent that indicates the potential for impact on human cells.

Risk. The product of the probability of occurrence of an accident and the consequences of an accident.

# Metric Conversion Chart

| If you know | Multiply by | To get |
|---|---|---|
| | Length | |
| centimeters | 0.39 | inches |
| meters | 3.28 | feet |
| kilometers | 0.62 | miles |
| | Area | |
| square kilometers | 0.39 | square miles |
| square meters | 10.76 | square feet |
| | Mass (weight) | |
| grams | 0.035 | ounces |
| kilograms | 2.204 | pounds |
| milligrams | $2.2 \times 10^{-6}$ | pounds |
| | Volume | |
| liters | 0.26 | gallons |
| cubic meters | 35.31 | cubic feet |
| | Temperature | |
| Celsius | multiply by 9/5ths, then add 32 | Fahrenheit |
| | | |
| | Pressure | |
| kilograms per-square-centimeter | 14.2 | pounds per-square-inch |

Source: *CRC Handbook of Chemistry and Physics,* Robert C. Weast, Ph.D., 70th Ed., 1989-1990, CRC Press, Inc., Boca Raton, Florida.

## Scientific Notation Conversion Chart

| Multiplier | Equivalent |
|---|---|
| $10^{-1}$ | 0.1 |
| $10^{-2}$ | .01 |
| $10^{-3}$ | .001 |
| $10^{-4}$ | .0001 |
| $10^{-5}$ | .00001 |
| $10^{-6}$ | .000001 |
| $10^{-7}$ | .0000001 |
| $10^{-8}$ | .00000001 |

# Executive Summary

The Fast Flux Test Facility (FFTF) is a sodium-cooled research reactor located in the 400 Area of the U.S. Department of Energy's (DOE) Hanford Site, near the City of Richland, Washington. DOE needs to place the FFTF in a radiologically and industrially safe shutdown condition, suitable for a long-term surveillance and maintenance phase prior to final decontamination and decommissioning (D&D). The decommissioning process for the FFTF would be accomplished in three phases: Phase I (Facility Transition), Phase II (Surveillance and Maintenance), and Phase III (Disposition). At the completion of the Phase I activities the FFTF would be turned over to the DOE Office of Environmental Restoration for an extended surveillance and maintenance phase (Phase II) and the disposition phase (Phase III). This EA addresses the actions associated with Phases I and II.

The need for the proposed action arises from a determination made by DOE that no combination of missions for the FFTF has a reasonable probability of financial viability over the next 10 years. Disposition of the associated radioactive and hazardous materials is necessary to place the facility in a safe shutdown condition with reduced risk to plant workers, the public, and the environment, while achieving the desired cost savings.

The following activities would be necessary for shutdown of the FFTF:

- The reactor fuel would be transferred to existing sodium storage by use of standard FFTF refueling equipment and operating procedures. The irradiated fuel would be replaced with nonfuel components (e.g., reflectors and control rods), to maintain the structural integrity of the core. The sodium-wetted fuel would be washed in existing facilities within the reactor complex, to slowly react residual sodium in a controlled manner. The cleaned irradiated fuel would be transferred to above-ground dry cask interim storage near the FFTF, pending final disposition. The total inventory of fueled components includes 371 fuel assemblies and pin containers.

- Thirty-two unirradiated fuel assemblies, which are presently in sodium storage, would be washed. The unirradiated fuel would be loaded into existing approved shipping containers, and transferred to storage at the Hanford Site's Plutonium Finishing Plant.

- Seven sodium-bonded metal fuel assemblies plus sodium-bonded pins (metal and carbide) would be washed and loaded into appropriate containers. The containers would be transferred to interim storage. The storage location would be dependent upon the outcome of the *Final Environmental Impact Statement: Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs*.

- The metallic sodium would be maintained in a molten state until the fuel assemblies were removed from their respective storage locations. The molten sodium would be transferred to a new sodium storage facility, which would be constructed and operated as part of the proposed action. Minor plant modifications would be required to closely couple the new sodium storage facility to the FFTF complex, and support sodium drain operations. The sodium would be drained into tanks located in the proposed sodium storage facility, to the maximum practical extent, by pressure transfer. Residual alkali metal would be accommodated to a stabilized condition so that long-term monitoring and surveillance of the FFTF could be conducted in a safe and environmentally sound manner. The current concept for accommodating residuals would be to maintain an inert gas atmosphere to prevent any chemical reactions during long-term surveillance and maintenance.

- The inventory of the bulk metallic sodium would undergo appropriate excess evaluations to determine if alternative sponsors and/or uses were available. Current planning is that the sodium will be converted to sodium hydroxide for use at Hanford by the Tank Waste Remediation System (TWRS) Pretreatment Program. The conversion of the FFTF sodium represents approximately 950,000 kilograms (2.1 million pounds) of sodium hydroxide. Final TWRS Pretreatment Program definition is anticipated during Calendar Year 1998. A reaction facility would be designed, constructed, and operated for conversion of the bulk sodium to sodium hydroxide. In the event the 1998 evaluation determines the sodium use at TWRS is not viable, the sodium hydroxide would be converted to an acceptable stable form (e.g., sodium sulfate). The sodium sulfate would be dried, collected into containers, and transported to an appropriate facility on the Hanford Site for disposal.

General plant support for the FFTF during the first 4 years of the transition to shutdown would be comparable to that required for maintaining the plant in its current safe configuration because prior to draining the sodium, approximately 90 percent of the plant systems are required to support hot sodium circulation. As systems become no longer necessary to support plant deactivation activities, the need for general maintenance and plant support would be reduced. Essentially all of the plant systems would be deactivated at final shutdown, placing the FFTF into a long-term surveillance and maintenance phase.

Alternatives have been considered in this analysis. Along with the No-Action Alternative, alternatives associated with storage of irradiated and unirradiated fuel, sodium storage and disposition, and accommodation of residual or sodium metals were considered. Major differences between the proposed action and the alternatives include potential additional worker and public exposure, transportation requirements, and economic considerations.

The potential for significant individual and cumulative environmental impacts due to the conduct of the proposed action has been analyzed. No substantial increase in Hanford Site's environmental impacts is expected from the proposed action. The proposed action is not expected to impact the climate, flora and fauna, air quality, geology, hydrology and/or water quality, land use, or the population. The maximum risk to the workers, as a result of the proposed action, is calculated to be less than the average occupational radiological exposure at FFTF, since 1984, of 1.2 person-rem (based on 200 FFTF radiation workers exposed to radiation at an average annual rate of 6 millirem per year). This radiological dose could result in 0.0005 latent cancer fatalities (LCF). The offsite population exposure from 1993 Hanford Site operations was 0.4 person-rem. The proposed action is not expected to increase this estimated dose.

Hazardous materials (e.g., solvents, glycols, polychlorinated biphenyls, asbestos) which may be removed or stabilized would be managed and reused, recycled, or disposed of in accordance with applicable federal and state regulations.

Environmental impacts from postulated accident scenarios also were evaluated, and indicated that the risks associated with the proposed action would be small. The risk is the product of the probability of occurrence of an accident and the consequences of an accident. A postulated maximum FFTF shutdown accident (a large leak from a sodium-storage tank and subsequent fire) could result in a maximum onsite worker dose of 0.0003 rem, which equates to 0.0001 LCFs. The offsite population consequences of such an event are estimated to be 0.02 LCFs. The offsite toxicological consequences of the hypothetical maximum event are approximately 10 percent of emergency response and planning guidelines established for a sodium fire. Workers could experience toxicological health effects if exposed to the visible plume for more than 1 hour.

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# 1.0 Purpose and Need for Agency Action

The U.S. Department of Energy (DOE) needs to place the Hanford Site's Fast Flux Test Facility (FFTF) in a radiologically and industrially safe shutdown condition, suitable for a long-term surveillance and maintenance phase prior to final decontamination and decommissioning (D&D).

The need for the proposed action arises from a determination made by DOE that no combination of missions for the FFTF has a reasonable probability of financial viability over the next 10 years. Disposition of the associated radioactive and hazardous materials is necessary to place the facility in a safe shutdown condition with reduced risk to plant workers, the public, and the environment, while achieving the desired cost savings.

# 2.0 Background

The FFTF is a liquid-metal cooled research reactor located in the 400 Area of DOE's Hanford Site near the City of Richland, Washington (Figure 1). The *Environmental Statement for the Fast Flux Test Facility, Richland, Washington* (AEC 1972), and the *Summary Description of the Fast Flux Test Facility* (HEDL 1980) provide details regarding the physical description and operation of the FFTF. Reactor operations ceased in April 1992. The sodium systems have been maintained in a molten state to retain the capability for sodium offload. The fuel has decayed, and a substantial reduction in associated fission products and noble gases has occurred.

Approximately 980,000 liters (260,000 gallons) of bulk sodium coolant are contained within various systems throughout the FFTF. Sodium-potassium eutectic alloy (NaK) also is present (approximately 2,300 liters [600 gallons]), and is used for cooling of auxiliary systems and components.

The FFTF's reactor core, In-Vessel Storage, Interim Decay Storage (IDS), and Fuel Storage Facility (FSF) contain 371 fueled components, which are comprised of predominantly mixed oxides of plutonium and uranium. One additional fueled component is stored in the Test Assembly Conditioning Station, in an inert atmosphere. The fuel is predominantly mixed plutonium-uranium oxides, which are encapsulated in stainless steel. There are 250 nonfuel irradiated core component hardware and research test articles.

In December, 1993, DOE determined that no combination of missions for the FFTF has a reasonable probability of financial viability over the next 10 years (Appendix A). Therefore, shutdown of the facility was ordered with a goal to accomplish the shutdown effort in approximately 5 years. The *Fast Flux Test Facility Transition Project Plan* (WHC 1994a) provides additional details regarding overall shutdown activities and requirements.

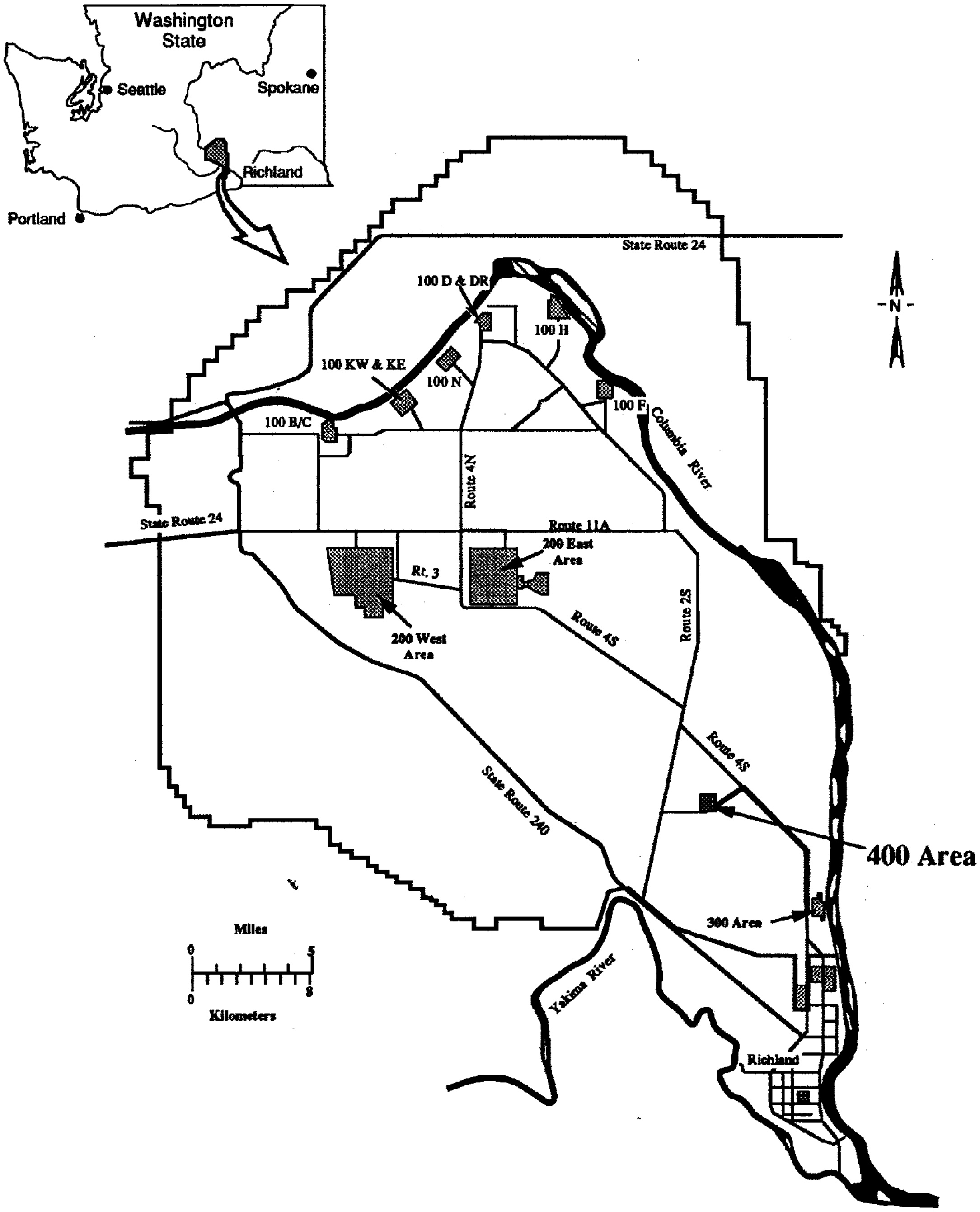

Figure 1. Hanford Site.

# 3.0 Alternatives Including the Proposed Action

## 3.1 Proposed Action

The proposed action would permanently shut down the FFTF by removing fuel, draining and de-energizing the systems, removing the stored radioactive and hazardous materials, and performing other actions to place the facility in a radiologically and industrially safe shutdown state. Appropriate surveillance and maintenance would be performed to prevent unacceptable risks to persons or the environment until final D&D of the facility is completed. To safely accomplish this shutdown, several actions would be required (WHC 1994a), and are discussed in the following sections.

The proposed action, projected to require approximately seven years for completion, is estimated to cost a total of approximately $397,000,000. This would result in placing the facility into a minimum surveillance and maintenance mode, pending final decontamination and decommissioning (D&D), with an annual estimated cost of $1,000,000 - $2,000,000 (after completion of transition activities). Additional details regarding the overall transition activities, including costs, is provided in the *Fast Flux Test Facility Transition Project Plan* (WHC 1994a).

The safe shutdown of the FFTF would result in surplus materials which would be managed in a manner consistent with waste minimization requirements, including the *Pollution Prevention Act of 1990*, State of Washington requirements (i.e., WAC 173-303, Dangerous Waste Regulations), and DOE Orders and policies (e.g., DOE Order 5400.1, *General Environmental Protection Program*; and DOE Order 5820.2A, *Radioactive Waste Management*). Compliance with the aforementioned laws and orders requires waste minimization programs and practices, a pollution prevention awareness program, and annual waste reduction reports and goals. A synopsis of materials which would be dispositioned as part of the proposed action is provided in Table 1.

The decommissioning process for the FFTF would be accomplished in three phases: Phase I (Facility Transition), Phase II (Surveillance and Maintenance), and Phase III (Disposition). At the completion of the Phase I activities the FFTF would be turned over to the DOE Office of Environmental Restoration for an extended surveillance and maintenance phase (Phase II) and the disposition phase (Phase III). This EA addresses the actions associated with Phases I and II. Final D&D, which likely would encompass the existing FFTF Reactor Complex and the new facilities associated with the proposed action, is not within the scope of this EA, and would be addressed in separate *National Environmental Policy Act of 1969* (NEPA) documentation.

# Table 1.
# FFTF Materials Inventory

| MATERIAL | INVENTORY(1) | PROPOSED DISPOSITION |
|---|---|---|
| Primary Sodium | 140,000 gallons (530,000 liters) with the following radioactivity level as of 1993:<br>Na-22 $5.2 \times 10^{-7}$ curies/gram<br>Cs-137 $1.0 \times 10^{-10}$ curies/gram<br>Total alpha (Pu-239) $1.2 \times 10^{-17}$ curies/gram<br>Tritium $1.6 \times 10^{-7}$ curies/gram | Tank Waste Remediation System (TWRS) High Level Waste Tank Sludge Pretreatment Program |
| Fuel Storage Facility | 31,000 gallons (117,000 liters) with a radioactivity level conservatively assumed to be the same as the primary sodium (actual level will be substantially less, but no sample data is available). | TWRS High Level Waste Tank Sludge Pretreatment Program |
| Interim Decay Storage Vessel | 23,000 gallons (87,000 liters) with a radioactivity level conservatively assumed to be the same as the primary sodium (actual level will be substantially less, but no sample data is available). | TWRS High Level Waste Tank Sludge Pretreatment Program |
| Secondary Sodium | 66,000 gallons (250,000 liters) with the following radioactivity level as of 1993:<br>Tritium $5.5 \times 10^{-8}$ curies/gram | TWRS High Level Waste Tank Sludge Pretreatment Program |
| Sodium-Potassium Alloy (NaK) | 600 gallons (2300 liters) | Intermix with the sodium for TWRS High Level Waste Tank Sludge Pretreatment Program |
| Sodium Reactor Experiment (SRE) Sodium | 6,720 gallons (25,850 kilograms/56,870 pounds)(2) currently stored in 158 55-gallon drums in the 200 Area of the Hanford Site. As of January 1989, the nuclide content was:<br>Na-22 $3.53 \times 10^{-11}$ curies/gram<br>Cs-137 $1.29 \times 10^{-9}$ curies/gram<br>Ba-137m $1.22 \times 10^{-9}$ curies/gram | This sodium may be converted to sodium hydroxide at the FFTF Sodium Reaction Facility for use by the TWRS Program |
| Hallam Reactor Sodium | 42,120 gallons (161,820 kilograms/356,000 pounds) currently stored in five tanks in the 200 Area of the Hanford Site. As of July 1975, the nuclide content was:<br>Mn-54 $3 \times 10^{-12}$ curies/gram<br>Co-60 $8 \times 10^{-14}$ curies/gram<br>Zn-65 $2.7 \times 10^{-12}$ curies/gram<br>Ru-106 $1 \times 10^{-12}$ curies/gram<br>Cs-134 $8 \times 10^{-14}$ curies/gram<br>Cs-137 $1.2 \times 10^{-12}$ curies/gram<br>Ba-137m $1.2 \times 10^{-12}$ curies/gram | This sodium may be converted to sodium hydroxide at the FFTF Sodium Reaction Facility for use by the TWRS Program |

# Table 1 (Cont'd)
# FFTF Materials Inventory

| MATERIAL | INVENTORY(1) | PROPOSED DISPOSITION |
|---|---|---|
| Highly Radioactive Fuel<br>>100 rem/hour at 1 meter unshielded | 329 components<br>Included in this inventory is the following special fuel components: | 322 components stored in ISCs at the ISA |
| | 2 delayed neutron monitor fuel | Encapsulate failed pin(s) in IEM Cell |
| | Sodium-Bonded Fuel (7 irradiated/1 unirradiated. The latter is not included in the above inventory) | Consolidate with Idaho National Engineering Laboratory sodium-bonded fuel, or store in ISCs at the ISA |
| Moderately Radioactive Fuel<br>>15≤100 rem/hour at 1 meter unshielded | 4 components | Intermix one each with 5 or 6 highly radioactive components in an ISC and store at the ISA |
| Slightly Radioactive Fuel<br>≤15 rem/hour at 1 meter unshielded | 7 components | Interim storage in an ISC at the Plutonium Finishing Plant |
| Unirradiated Fuel | 32 components | Interim storage in ISCs at the Plutonium Finishing Plant |
| Open Test Assembly Instrument Stalks | 22 stalks (e.g., upper hardware removed during disassembly of special test assemblies) | Leave in place or remove, wash, appropriately package and dispose |
| Ethylene Glycol | 94,000 gallons (356,000 liters) | Filter for reuse at the Hanford Site |
| Polychlorinated Biphenyl Electrical Transformer Oil | 8,500 gallons (32,000 liters) | Disposed of as hazardous waste |
| Cooling Tower Chemicals | Quantity dependent on chemicals remaining at the time of shutdown of the cooling towers | Return to vendor |
| Freon R-12 and R-22 | 29,000 pounds (13,180 kilograms) | Return to vendor or reuse at Hanford Site |
| Sulfuric Acid | 1,500 gallons (5700 liters) | Recycle |
| Depleted Ion Exchange Resin | 300 cubic feet (8.5 cubic meters) | Disposal at Hanford as low level radioactive solid waste |
| Fuel Oil | 99,000 gallons (375,000 liters) | Reuse at Hanford Site |
| Mobiltherm Oil | 2,000 gallons (7600 liters) | Return to vendor |

(1) Volumes are approximate

(2) Metallic sodium has a melting point of approximately 98°C (208°F). The material is presently in solid form. Therefore, it is appropriate to discuss quantities of sodium in both mass (i.e., solid) and liquid (volume).

### 3.1.1 Reactor Fuel

The reactor core would be defueled to the IDS and the FSF by use of standard FFTF refueling equipment and operating procedures. The fuel would be replaced with irradiated nonfuel core components (e.g., reflectors and control rods); thirteen new nonfuel core components; and three new Simulated Core Assemblies that otherwise would have been excessed. Use of these components would result in cost and schedule advantages, and would provide waste minimization. This approach would reposition the fuel to the IDS and the FSF, and reposition most of the irradiated nonfuel core components to the reactor vessel. This defueling activity is an extension of routine fuel movement activities (AEC 1972).

The irradiated fuel assemblies and pin containers would be (1) transferred from the IDS and the FSF to the Interim Examination and Maintenance (IEM) Cell for residual sodium removal, (2) loaded into a Core Component Container (CCC) (Figure 2), (3) transferred to the Reactor Service Building Cask Loading Station (RSB CLS) for placement into an Interim Storage Cask (ISC) (Figure 3), and (4) transferred to storage at the Interim Storage Area (ISA) (Figure 4). Each fuel assembly or pin container would be limited (administratively) to a nominal decay heat value of 250 watts for fuel offload handling. That is, the decay heat values would be determined for each irradiated fuel assembly, and each CCC load would be selected based on the total decay heat value to ensure the design limit of 1.5 kilowatts for the entire load would be met. At this decay heat value, no active cooling would be required, and many of the fission products and noble gases would have decayed substantially.

Due to low- to moderate-radioactivity levels, eleven fueled components would require additional safeguards and security measures. That is, per DOE Order 5633.3B, *Control and Accountability of Nuclear Materials* (DOE 1994a), there would be insufficient radioactivity levels for the assemblies to be self-protecting. Therefore, the proposed action would consider intermixing one of these fueled components with five or six highly-radioactive fueled components in a single ISC. This concept, along with cask arrangement within the ISA, would provide sufficient safeguards and security protection. Alternatively, these low- to moderately-radioactive fueled components (or a combination thereof) may be stored in ISCs within the Hanford Site's Plutonium Finishing Plant (PFP) protected area.

The 32 unirradiated fuel assemblies presently stored in IDS would be (1) transferred to the IEM Cell for washing and drying, (2) loaded into existing approved shipping containers, and (3) transferred to appropriate storage at the Hanford Site's PFP.

Two fuel assemblies that experienced a breach in the fuel cladding during irradiation, several fuel assemblies that are known gas leakers, and seven sodium-bonded metal fuel assemblies plus sodium-bonded pins would require slightly different disposition (see Sections 3.1.1.6 and 3.1.1.7).

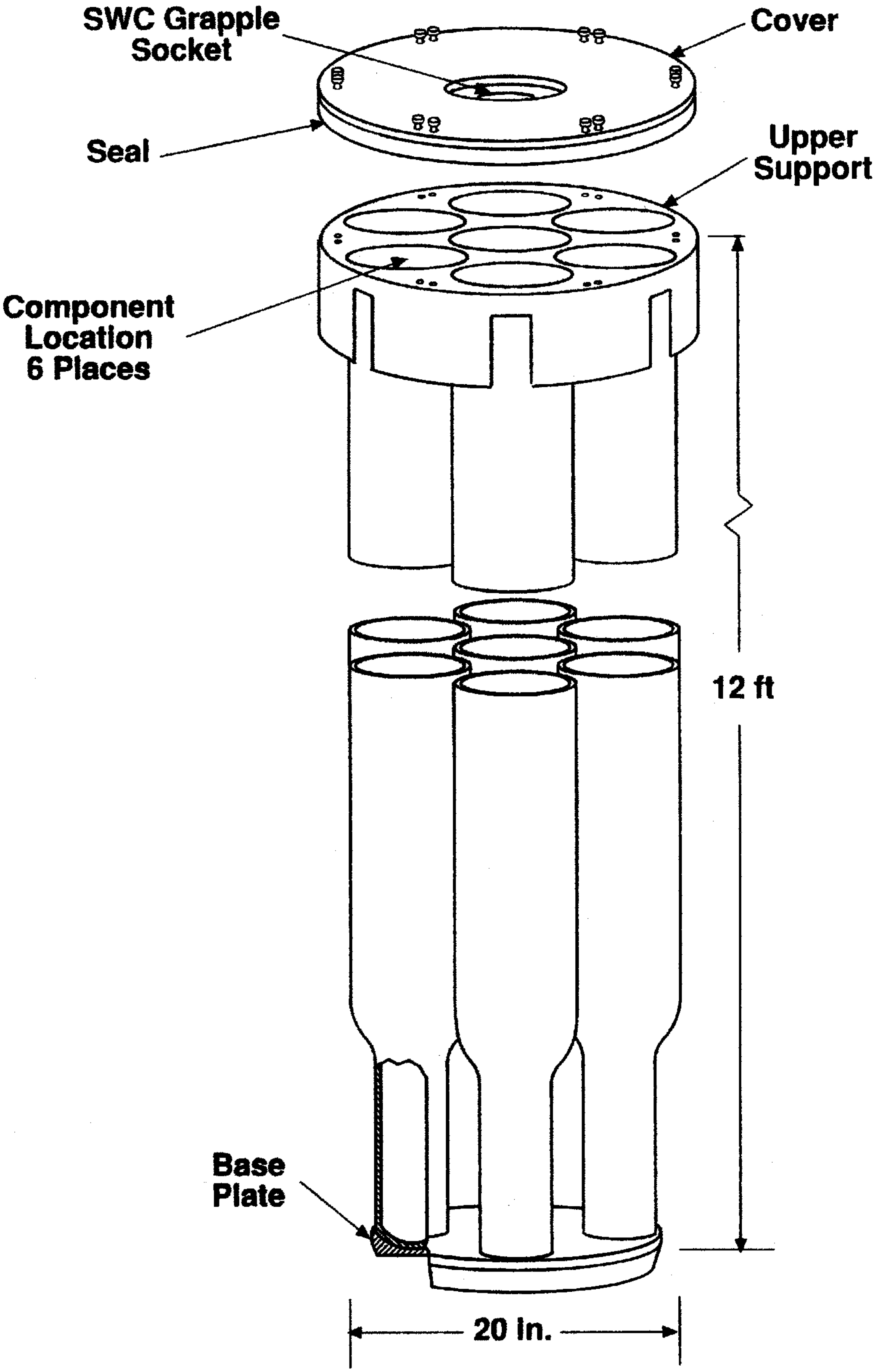

Figure 2. Core Component Container.

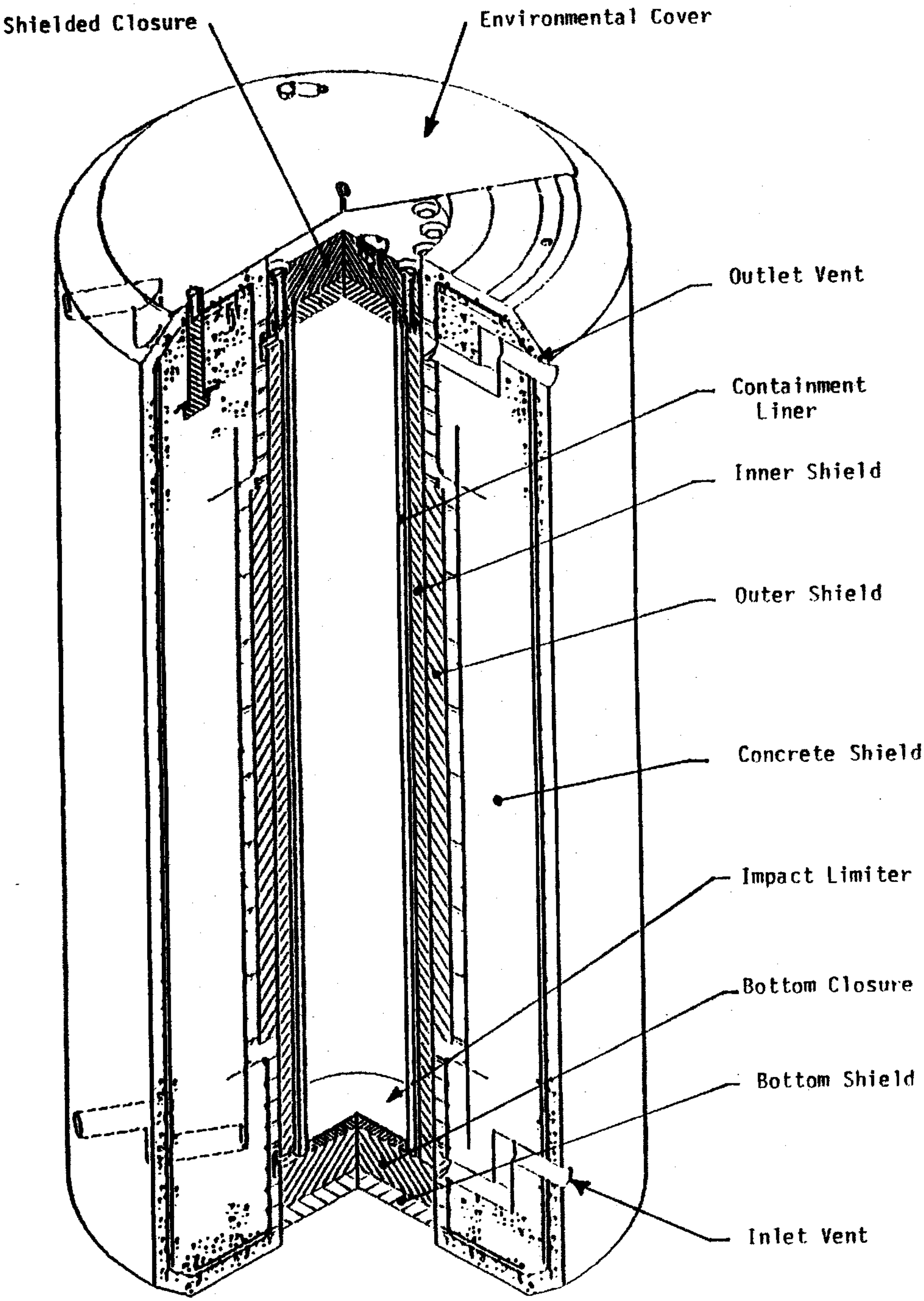

Figure 3. Interim Storage Cask.

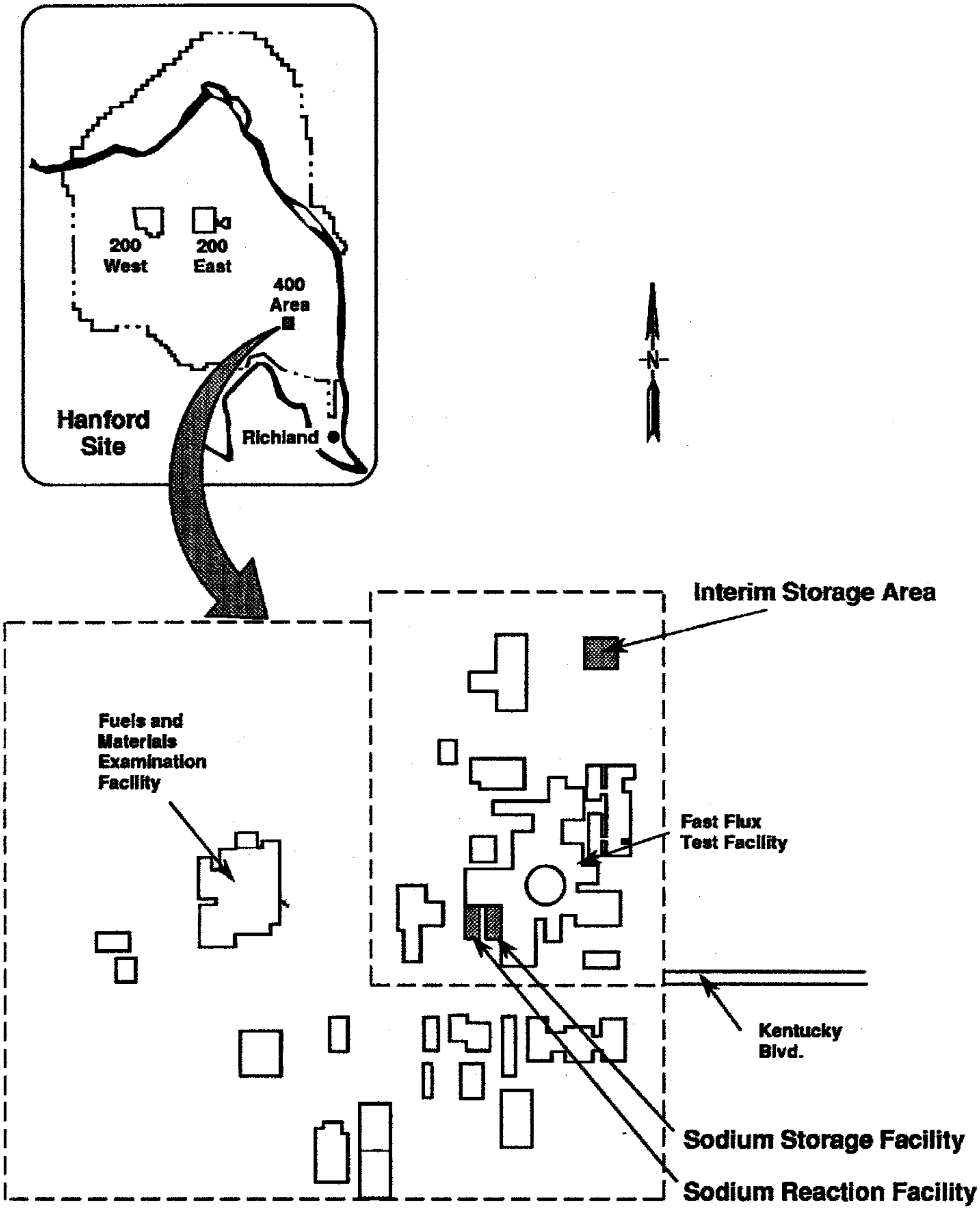

Figure 4. Fast Flux Test Facility; Associated Facilities Locations.

### 3.1.1.1 Core Component Container

The CCC would accommodate six or seven fuel assemblies or pin containers, and ultimately would be stored in an ISC. This would provide the necessary handling capability for future irradiated fuel removal operations. The CCC would be a closed container, and would provide the primary confinement boundary for the 50-year design life of a dry storage system. It would be fabricated from stainless steel and Inconel®[1] to provide corrosion resistant fuel storage. The CCC would provide handling capability and long-term geometry control (i.e., criticality considerations) for the FFTF's irradiated fuel assemblies and pin containers. Each individual fuel assembly or pin container would be washed in the IEM Cell Sodium Removal System, and loaded in its assigned CCC location.

A typical CCC to ISC offload sequence would start with an empty CCC being located inside the IEM Cell. Six or seven washed, irradiated fuel assemblies (or pin containers) would be loaded into the CCC. The CCC closure lid would be attached, and the CCC would be leak tested. The CCC would be transferred out of the IEM Cell to the RSB CLS using the Solid Waste Cask (SWC). In addition to providing shielding and a secondary barrier, the SWC is used to transport the CCC. At the RSB CLS, the CCC would be transferred into an awaiting, empty ISC. The ISC would be sealed, and the double metallic seals on the ISC would be tested to assure long-term leaktight integrity. The ISC then would be transferred to the interim storage pad.

### 3.1.1.2 Interim Storage Cask

The primary function of the ISC would be to provide interim, above ground, dry, shielded storage for the FFTF's irradiated fuel for several decades, if necessary, pending final disposition. The casks would be designed to meet applicable requirements (e.g., shielding, thermal loading, pressure, seismic and wind-loading events) per DOE Order 6430.1A, *General Design Criteria* and 10 *Code of Federal Regulations* (CFR) 72, "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste." The ISC would provide sufficient shielding to limit the surface dose rate to 2 millirem per hour. The casks would be modeled after an approved U.S. Nuclear Regulatory Commission (NRC) design. The cask design includes considerations for potential on-site transportation; however, the cask would not be formally licensed because, at this time, there is no need to transport the casks over public highways.

The ISC would be designed to protect the public, environment, and operating personnel from exposure during handling and storage in compliance with DOE and DOE-contractor guidelines. Above ground, dry cask storage is currently used both nationally (by Virginia Power at the Surrey and North Anna plants), and internationally (e.g., nuclear power plants in Canada and Europe). The concept has been thoroughly studied and documented. Additional details pertaining to this mode of operation for interim storage may be found in the *Final Version Dry Cask Storage Study* (DOE 1989). Storage would be on an interim basis pending the final disposition to be discussed in the *Final Environmental Impact Statement: Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs* (DOE 1995).

The ISC design would be a passively ventilated concrete and steel shielded cask. The vent would be provided to help remove the decay heat generated by the fuel from the concrete. The design would include a carbon steel secondary containment boundary. An impact limiter, located at the bottom of the internal cavity of the ISC, would protect the irradiated fuel if an inadvertent drop of the CCC occurred

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[1] Inconel is a Registered Trademark of Inco Alloys International, Incorporated.

during loading. After the fuel was placed in the ISC, it would be sealed by bolting down the shielded cover, and then tested to ensure that the metal seal is functional. The ISC design would provide sufficient shielding to limit the surface dose rate (at contact) to 2 millirem per hour. The ISC would be inerted and periodically monitored for structural integrity.

### 3.1.1.3 Sodium Removal Process

The sodium-wetted fuel assemblies would be transferred, one at a time, to the IEM Cell for washing, using an existing FFTF process and equipment. The fuel would be subjected to a moist argon atmosphere to slowly react residual sodium in a controlled manner. The initial reaction would be followed by several water rinses and, subsequently, the fuel would be dried. Enhanced plant capability for this process would be provided by installing an ion-exchange system for wash water recycle, and would result in substantial waste minimization.

The ion-exchange system would reduce potential radioactive-liquid waste water from approximately 700,000 liters (185,000 gallons) to less than 7,600 liters (2,000 gallons). Approximately 8.5 cubic meters (300 cubic feet) of radioactive solid waste (i.e., spent ion-exchange resin) would be generated as a result of washing the entire inventory of fuel. The material would be appropriately packaged and disposed of. Additional waste volume reduction of the resin could be achieved by incineration and compaction at a licensed offsite commercial facility. The wastewater remaining in the system at the completion of the fuel offload washing evolution would be disposed of as low-level radioactive waste at existing Hanford Site waste management facilities.

The IEM Cell sodium removal system vents through the existing FFTF's contaminated gas processing equipment before being released to the environment. No modifications would be required to support fuel washing shutdown activities. The effluent release levels (i.e., tritium) are expected to be below historical combined exhaust releases (PNL 1994).

As discussed in Section 3.1.1.1, the washed fuel would be placed in a clean CCC, and sealed for transfer out of the cell into the ISC. The ISC (containing irradiated fuel) would be transferred to the ISA for interim storage.

The rate at which fuel could be cleaned and transferred to an ISC would be limited by the time it takes to wash the irradiated fuel assemblies. The estimated throughput rate is based on current operation of the refueling and IEM Cell equipment. However, fuel washing operations would be continuous (round-the-clock, 7 days a week) during the offload period. It would take approximately 8 days to complete each cycle of washing and transferring six fuel components. Since the IEM Cell activities (i.e., transfers, washing, and drying) have been performed routinely as part of the FFTF experiment processing cycle, the rate estimates are presented with a high degree of confidence. Assuming a conservative availability factor of 50 percent, 135 components could be washed each year. At this rate, the current inventory of sodium-wetted fuel assemblies and pin containers would be washed in approximately 3 years.

### 3.1.1.4 Interim Storage Area

The loaded ISC would be transferred to the ISA. The ISA would be a modified existing concrete pad, approximately 36 meters (120 feet) long, by 27 meters (90 feet) wide, that is located on the northeast corner of the FFTF complex. This pad would be modified by installing a fence with locked access that would permit controlled loading, unloading, and inspection of the ISCs. Concrete crash barriers would be located around the perimeter of the storage pad in road access areas to prevent cask damage that might result from an unlikely vehicle collision. Lighting would be provided for the area, and would be designed to ensure sufficient capacity for the existing FFTF fuel inventory, which would require approximately 60 ISCs.

Flexibility would be incorporated into the ISA design to allow future accommodation of additional interim dry-cask storage. For example, prior to final decisions pertaining to other Hanford Site fuels (DOE 1995), considerations may be given to interim storage of approximately ten additional casks at the ISA. The casks would be transported from the Hanford Site's 300 Area, and stored, pending future disposition. This potential action would be evaluated under separate NEPA review.

As stated in Section 3.1.1.2, the ISC design would provide sufficient shielding to limit the surface dose rate (at contact) to 2 millirem per hour. This would ensure that the potential radiation exposure at the ISA fence would be limited to no more than 0.05 millirem per hour.

### 3.1.1.5 Unirradiated Fuel

Shutdown activities would include interim disposition of 32 unirradiated fueled assemblies, as defined in DOE Order 5633.3B, *Control and Accountability of Nuclear Materials* (DOE 1994), and the washing and transportation of unirradiated assemblies to a modified storage portion of the existing PFP for interim storage. As with irradiated fuel, the unirradiated assemblies would be washed in the IEM Cell. The assemblies would be stored on qualified racks (provided as part of the proposed action) within an appropriate vault at the PFP. In addition to the rack storage concept, other options (including two vertical storage configurations on a concrete slab located either adjacent to, or within the PFP, or use of the ISC within the PFP protected area) are being explored. The studies will determine the most environmentally sound, programmatically efficient, and cost-effective arrangement in concert with PFP's current mission. However, the proposed storage option (i.e., rack storage with other FFTF unirradiated fuel assemblies) is expected to provide the bounding environmental impacts associated with storage of this fuel.

### 3.1.1.6 Special Fuel

There are currently two intact assemblies that produced a delayed neutron-monitoring signal while in the reactor, which indicates that a breach occurred in the fuel cladding. These assemblies would be disassembled in the IEM Cell. The failed pin(s) would be encapsulated, placed in pin containers with the remaining pins, washed, and loaded into an ISC for storage in the ISA. Additionally, several fuel assemblies are known gas leakers; these assemblies would be processed last to minimize the consequences of potential contamination release and resultant deposition in the sodium-removal equipment, which would make equipment maintenance more difficult.

### 3.1.1.7 Sodium-Bonded Materials

There are seven sodium-bonded metal fuel assemblies plus sodium-bonded (metal and carbide) pins which must be removed from the reactor and dispositioned to support FFTF shutdown. These types of materials formerly were considered test articles, and as such were often transported from the FFTF to the Idaho National Engineering Laboratory (INEL). Approximately 20 shipments per year from FFTF to INEL were made.

Presently, however, along with the bulk of the FFTF irradiated fuel, these sodium-bonded materials now fall within the definition of spent nuclear fuel. As stated earlier (Section 3.1.1.2), the disposition of all DOE spent nuclear fuel is being evaluated (DOE 1995). A Record of Decision is anticipated in June, 1995. Interim storage of the sodium-bonded materials, either onsite or at INEL, would be consistent with the potential alternatives proposed in DOE 1995. Therefore, in order to support the FFTF shutdown schedule, the sodium-bonded materials could be washed in the IEM Cell, and stored with the bulk of the

FFTF irradiated fuel in the ISA, or pending the outcome of the programmatic environmental impact statement for spent nuclear fuel (DOE 1995), transported to INEL (as in the past). The material could be managed either as full assemblies, or broken down into pin form. A brief discussion of each action is provided below. The associated impacts of both actions are addressed in Section 5.0 of this EA.

For interim storage of the sodium-bonded materials in the ISA, the washing and transfer of the materials to an ISC generally would be conducted in a similar fashion as with the bulk of the FFTF fuel (Section 3.1.1). The irradiated fuel assemblies would be transferred from IDS to the IEM Cell for residual sodium removal. The assemblies either may be broken down into pin form, the pins placed into new pin containers, and the pin containers transferred to ISCs, or transferred as intact assemblies to ISCs. The ISCs would be transported to the ISA.

Alternatively, DOE would consider future shipment of these materials to INEL for consolidation with the existing Experimental Breeder Reactor-II (EBR-II) metal fuel inventory (a similar action conducted in the past). Under this alternative, the fuel would be washed in the IEM Cell. The intact assemblies could be managed as is, or disassembled into pin form, loaded into new pin containers, and transported to INEL. Transportation from the Hanford Site to the INEL, at a distance of approximately 800 kilometers (500 miles), would be conducted (as in the past) using existing, licensed shipping casks (NRC and DOE) and existing procedures. Current cask transportation requirements for this material (in pin form), including license considerations and allowable inventories (radionuclide and sodium), would require (conservatively) approximately 70 shipments from the FFTF to the INEL. However, historical data have provided a basis for revision of the license, which could reduce the number of shipments to approximately 12. Appropriate documentation would be provided prior to initiation of actual transportation activities. Potential transportation impacts associated with this action are discussed in Section 5.0.

### 3.1.2 Sodium Drainage and Storage

The metallic sodium would be maintained in a molten state until the fuel assemblies were removed from their respective storage location (i.e., the FFTF reactor vessel, IDS, or the FSF), and the sodium was transferred to appropriate storage. Minor plant modifications, and construction of a new sodium storage facility closely coupled to the FFTF complex, would be necessary to support sodium drain operations. The sodium would be drained into tanks located in the sodium storage facility, to the maximum practical extent, by pressure transfer.

Conceptually, the sodium storage facility would be a concrete building approximately 28 meters (92 feet) long by 27 meters (90 feet) wide. This new facility would be designed and constructed adjacent to the FFTF complex for sodium offload to meet appropriate *Resource Conservation and Recovery Act of 1976* (RCRA) storage requirements, and would withstand a sodium fire. This facility would provide storage capacity for the FFTF's primary, secondary, IDS, and FSF sodium. The sodium storage tanks, originally procured for the Clinch River Breeder Reactor Project, would be installed in this facility. The tanks are currently stored at the Hanford Site's 300 Area. It is anticipated that three 302,000-liter (80,000-gallon) tanks and one 190,000-liter (52,000-gallon) tank would be required (with minor modifications) for storage of the sodium. The floor of the facility would be lined with a steel sump covered by a deck plate system containing nominal 2.5-centimeter (one-inch) holes spaced under the piping and appropriate openings under each tank to allow sodium entry. This design would restrict air flow back into the sump in order to suppress sodium burning in the unlikely event of a sodium leak and fire. The sump meets RCRA storage requirements to provide secondary containment with sufficient capacity to contain the total contents of the largest storage tank. The building would be approximately 10 meters (33 feet) tall to permit clearance above the tanks for piping runs. Two entry doors would be provided with locks to restrict access to the interior. Smoke-type fire detectors would be provided, as necessary. Other basic services such as minimal lighting, mechanical ventilation, high-efficiency filtering of tank vents, oxygen and radiation monitoring, leak detection, trace-heat power, 120-volt power outlets, and communications would be provided. Installation of a water-sprinkler fire suppression system is not anticipated, minimizing the potential for a sodium-water reaction and subsequent hydrogen and sodium hydroxide generation.

Chemically, NaK is more reactive than sodium, especially with air, and can become shock sensitive. Therefore, evaluations would continue to be conducted to determine the final disposition of the NaK systems. Current planning indicates that the NaK would be mixed into the bulk sodium by flushing the FFTF's NaK cooling systems with sodium. This would be accomplished by cross-connecting appropriate sodium and NaK piping. The total NaK inventory is a small fraction of 1 percent of the sodium volume, and sodium properties (e.g., freezing point) would not be measurably affected by the presence of this small quantity of NaK. The ongoing evaluations also would consider draining the NaK systems to suitable containers for storage in the sodium storage facility, pending final disposition.

A substantial inventory of slightly radioactive sodium is currently stored in the 200 Area of the Hanford Site. This material includes approximately 356,000 pounds (162,000 kilograms, 42,120 gallons) of Hallam Reactor sodium metal, which currently is stored in five tanks (each with a capacity of approximately 61,000 liters [16,000 gallons]), which arrived at Hanford in late 1967. One hundred fifty eight 55-gallon (208-liter) drums of Sodium Reactor Experiment (SRE) Reactor sodium metal (approximately 56,870 pounds or 25,850 kilograms [6,720 gallons]) were received at the Hanford Site in 1975, after being use by Atomics International as primary coolant in their SRE reactor. These materials are currently stored in appropriate facilities in the 200 West Area of the Hanford Site. The Hallam and the SRE sodium inventories may be transported in their current configuration to the new sodium storage facility, or repackaged, as necessary, for transportation and storage in the new facility. The disposition of this material may be included with the FFTF inventory.

### 3.1.3 Sodium Disposition

The inventory of the bulk metallic sodium (and NaK if present) would undergo appropriate excess evaluations to determine if alternative sponsors and/or uses were available. Current planning is that the sodium will be converted to sodium hydroxide for use at Hanford by the Tank Waste Remediation System (TWRS) Pretreatment Program. The conversion of the FFTF sodium represents approximately 950,000 kilograms (2.1 million pounds) of sodium hydroxide. Final TWRS Pretreatment Program definition is anticipated during Calendar Year 1998. In the event the 1998 evaluation determines the sodium use at TWRS is not viable, the sodium would be converted to an acceptable stable form for disposal as waste.

Because of the uncertainty in the final sodium regulatory designation, and the fact this is a new facility, the SSF would be designed and constructed to meet *Resource Conservation and Recovery Act of 1976* (RCRA) requirements, as implemented by the WAC 173-303, *Dangerous Waste Regulations*. This would eliminate modifying the facility to meet WAC 173-303 storage requirements following the 1998 evaluation should the sodium designation change to waste.

Detailed layout of the sodium reaction facility (SRF) would await the 1998 evaluation which will determine the final sodium form and disposition. However, current baseline planning is that the sodium reaction process being developed for implementation at INEL (used by the Argonne National Laboratory-West) would form the basis for the FFTF's SRF. The INEL facility is a four-room, L-shaped building and an enclosed, covered concrete pad on which process equipment is located. The building is supported on a reinforced concrete pad. The overall dimensions of the rooms (i.e., sodium melting and draining room, barrel holding room, caustic loading room and control room) sum to approximately 150 square meters (1,600 square feet) of floor space. The approximate overall dimensions of the enclosed area, including the rooms, is 344 square meters (3,700 square feet). The walls and roof of the sodium melting and draining room are concrete, while the three remaining rooms are constructed of galvanized steel siding and roof panels on a structural steel frame. Service doors are provided. The facility is designed to meet appropriate building and seismic codes for that area. Appropriate utilities (e.g., heating, ventilation and air conditioning; electrical; water/steam; nitrogen) are provided. The general location of the expected FFTF SRF is shown in Figure 4. Locating the SRF adjacent to the SSF would reduce construction and operation costs through the sharing of utility hookups and operational integration.

In the first stage of the baseline sodium conversion process, molten sodium metal and water would be injected into a reaction vessel that was partially filled with approximately 50 percent (by weight) sodium hydroxide at about 116 °C (240 °F). A vigorous reaction would produce more sodium hydroxide and hydrogen gas. The hydrogen would be swept out of the vessel by a nitrogen cover gas purge, and maintained at sufficiently low dilution to prevent flammability when mixed with air (a 4 percent mixture of hydrogen in air is flammable).

If necessary, in the second process stage, the sodium hydroxide solution would be converted to an acceptable stable form for disposal as waste. As the base case, the sodium hydroxide solution would be neutralized with dilute sulfuric acid and dehydrated to form solid sodium sulfate. The sodium sulfate base case considers that sodium sulfate is a stable, non-regulated material suitable for land disposal at the Hanford Site under applicable State of Washington regulations. The solid product would be dried, collected into containers, and transported to an appropriate disposal facility on the Hanford Site or held for future use as possible feedstock for other processes on the Hanford Site. The radionuclides present in the FFTF's sodium, except for tritium which would be exhausted through the vent system, are expected to be carried with the solid sodium sulfate. The sodium metal would be processed in 2 years assuming a plant efficiency of 70 percent. The safety and radiological release considerations for the process are discussed in Section 5.0. Approximately 8,200 drums of sodium sulfate (at approximately 208-liters, or 55-gallons, each) would be generated for disposal. The baseline case is expected to provide the bounding environmental impacts associated with disposition of the sodium.

### 3.1.4 Sodium Residuals

Following the drainage of the sodium and NaK systems, approximately 15,000 liters (4,000 gallons) of residual sodium would remain in the main portions of the FFTF's piping and equipment. Additional indeterminate quantities would remain in other portions of the plant systems, especially in complex, small-diameter piping systems. Included in the proposed action would be accommodation of these residuals to a stabilized condition such that long-term monitoring and surveillance of the FFTF could be conducted in a safe and environmentally sound manner. The current concept for accommodating residuals would be to maintain an inert gas atmosphere to prevent any chemical reactions during long-term surveillance and maintenance.

### 3.1.5 Auxiliary Systems Shutdown

General plant support for the FFTF during the first 4 years of the transition to shutdown would be comparable to that required for maintaining the plant in its current safe configuration because prior to draining the sodium, approximately 90 percent of the plant systems are required to support hot sodium circulation. As systems become no longer necessary to support plant deactivation activities, the need for general maintenance and plant support would be reduced.2

Many of these systems and utilities contain hazardous materials, such as glycol, oils, asbestos, and polychlorinated biphenyl (PCB). These materials would be reused, recycled, or disposed of. Excess chemicals (e.g., maintenance solvents) also would be recycled or disposed of, as appropriate.

Essentially all of the plant systems would be deactivated at final shutdown, placing the FFTF into a long-term surveillance and monitoring phase. Actual facility support would be limited to minimal maintenance, inert gas system positive pressure checks, and facility walkdowns. Similar monitoring would be required for the sodium storage facility until it is drained, and the sodium is processed through the SRF.

### 3.1.6 Resultant Waste Streams

The management of various waste streams, resulting from the FFTF's shutdown activities, is considered within the scope of this EA.

The shutdown of the FFTF would include the disposal of 22 radioactive instrument stalk assemblies that were used to instrument test fuel assemblies. These stalks extended from the top of the reactor core, up to the reactor head compartment, and provided the structure for the routing of instrumentation leads from the experiment to interfacing equipment for transfer of the instrumentation signals to control consoles and monitors. The radioactive portions of the stalks would be cut in the IEM Cell, washed in the Sodium Removal System, and appropriately packaged and transported to the Hanford Site's 200 Areas for disposal.

Fuel washing would result in primarily solid wastes in the form of depleted ion exchange resin. Conversion of the sodium to a stabilized form would result in both airborne emissions, as well as a substantial quantity of radioactive, nonhazardous solid waste (i.e., sodium carbonate). Hazardous materials associated with the auxiliary systems (e.g., glycols and oils) may represent a large quantity of materials that would be reused, recycled, or appropriately packaged and managed as regulated wastes.

The solid and liquid effluents from the shutdown activities that contain radioactive and/or hazardous materials would be appropriately packaged. Primary consideration would be given to transportation of the wastes to (and use of) existing Hanford Site treatment, storage, and/or disposal (TSD) facilities. Offsite TSD facilities also would be considered, as appropriate. All activities would be conducted in full compliance with applicable regulations, including RCRA, the *Clean Air Act of 1977*, and U.S. Department of Transportation (DOT) requirements, which would be in force at the time of the action.

## 3.2 Alternatives to the Proposed Action

### 3.2.1 No-Action Alternative

Under the No-Action Alternative, the FFTF would remain in a hot standby state, continuing under existing conditions. That is, ongoing monitoring and minimal maintenance for hot standby. No fuel would be moved. This alternative would result in continued expenditure of funding (approximately $35,000,000 per year) for maintaining systems in a safe and operable configuration (WHC 1994). This alternative would be inconsistent with the DOE's need to shutdown the FFTF.

### 3.2.2 Irradiated Fuel Storage

Storage would be on an interim basis pending the future fuels management to be discussed in the *Draft Environmental Impact Statement: Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs* (DOE 1995). Additional expense and potential transportation impacts would be incurred for dry storage of the irradiated fuel at another location on the Hanford Site (e.g., the 200 West Area's Hanford Central Waste Complex [HCWC]). Environmentally, this alternative would be comparable to the proposed action. It is noted that the fuel could continue to reside in FSF. This option would conflict with the need for the FFTF shutdown, and would incur additional costs due to the operation of the FSF and its support systems.

### 3.2.3 Unirradiated Fuel Storage

Alternative locations and configurations of the unirradiated fuel were considered. Storage in the FSF would require verification of appropriate safeguards and security requirements, and continuation of the expenditures associated with maintaining the 400 Area as a protected area (e.g., a security force continuously present onsite).

The downloading of the fuel assemblies to pellets at the PFP would entail additional exposure to workers, expense, and equipment and facility modifications. The proposed action (i.e., vault storage of the fuel assemblies at the PFP) does not preclude future disposition of the fuel.

### 3.2.4 Sodium Storage

New facilities in the 200 West Area's HCWC were considered for storage of the large quantity of reactor sodium. The large volumes and transportation requirements would require multiple transfers, additional costs, and unnecessary exposure to workers. Potential transportation accidents also could result in additional exposure to the public.

### 3.2.5 Sodium Disposition

The reaction facility at the INEL was considered as an alternate location for treatment of the sodium from the FFTF. The existing INEL facility would require modifications to convert the sodium to a final form acceptable for use as a product (i.e., TWRS), or to a stable form suitable for land disposal. Potential transportation impacts associated with the shipment of large quantities of radioactive sodium to INEL would be associated with this alternative. For perspective, the truck or rail transportation would require design and procurement of special containers for the transport of radioactive metallic sodium. Based on volume, approximately 50 shipments of radioactive sodium over public highways would be required. Additionally, after reaction, the resulting material (e.g., sodium hydroxide) would require shipment back to the Hanford Site for disposition. Finally, associated institutional issues, including interstate transport, public perceptions, and potential state government issues and expectations, also would require consideration in concert with applicable regulations.

### 3.2.6 Sodium Residuals

Alternative methods for accommodation of the sodium residuals will continue to be evaluated, including alternative cover gases and chemical reactants. These methods would not be expected to provide any additional environmental impacts, nor any new initiators or risks for accidents, and would be subject to appropriate safety and NEPA reviews.

# 4.0 Affected Environment

General information regarding the Hanford Site may be found in the *Hanford Site National Environmental Protection Agency (NEPA) Characterization* report (Cushing 1994). The Hanford Site is approximately 1,450 square kilometers (560 square miles) and located in the southeastern portion of the State of Washington. It is a semiarid region of rolling topography with some trees occurring along the Columbia River. Two topographical features dominate the landscape: Rattlesnake Mountain, a treeless 1,066-meter (3,500-foot) anticline located on the southwest boundary, and Gable Mountain, a small ridge 339 meters (1,112 feet) in height located on the central portion of the Hanford Site. The Columbia River flows through the northern part of the Hanford Site and forms part of the eastern boundary of the Hanford Site.

The FFTF is located in the 400 Area of the Hanford Site. The nearest natural watercourse is the Columbia River, about 7 kilometers (4.5 miles) away. The nearest population center is Richland, Washington, about 19 kilometers (12 miles) from the 400 Area. The 400 Area is more than 30 meters (100 feet) above the groundwater table, and about 165 meters (550 feet) above sea level. This location is more than 30 meters (100 feet) above the probable maximum flood and not located in a wetland.

The Hanford Site is characterized as having a mild climate with 15 to 17 centimeters (6 to 7 inches) of annual precipitation, and occasional high winds of up to 129 kilometers (80 miles) per hour. Tornadoes are extremely rare, and no destructive tornadoes have occurred in the region surrounding the Hanford Site. The probability of a tornado hitting any given facility on the Hanford Site is estimated at 10 chances in 1 million during any given year. The region is categorized as one of low to moderate seismicity.

The vegetation of the Hanford Site is a shrub-steppe community dominated by big sagebrush and rabbitbrush. The sagebrush, cheatgrass, and Sandberg's bluegrass community are perhaps the most common. Extensive site development around the 400 Area facilities has removed most of the native vegetative cover.

Pocket mice and jackrabbits are the primary small mammal species observed in the vicinity of the FFTF. Large mammals are deer and elk, although the elk are almost entirely on the Arid Lands Ecology Reserve located on Rattlesnake Mountain. Coyotes and raptors are the primary predators.

No species protected under the endangered species act, candidates for such protection, or species listed as threatened, endangered, candidate, sensitive, or monitor by the Washington State government were observed during a biological review (Appendix B).

The Hanford Site is known to be rich in cultural resources, and contains many well-preserved archaeological sites and structures from prehistoric and historic periods. The proposed activities would occur in the 400 Area, several miles from any natural water courses. No sensitive archeological resources in the area of the reactor complex have been identified (Appendix C). Additional information regarding the cultural resources on the Hanford Site may be found in the *Hanford Cultural Resources Laboratory Annual Report for 1992* (PNL 1993).

# 5.0 Environmental Impacts

The following sections present information on those potential environmental impacts that may result from proposed FFTF shutdown, and surveillance and maintenance, activities. Although there are uncertainties and risks associated with even the most routine operations, the proposed action would not be expected to result in any additional radiological or hazardous material releases to the environment. Proposed activities would comply with current DOE orders, and state and federal regulations.

## 5.1 Proposed Actions: Impacts from Routine Operations

The potential for release of radioactive emissions during routine activities exists. However, the existing FFTF ventilation systems (providing filtration of airborne effluents) would continue to be operational to maintain emissions at or below those reported in 1993 (PNL 1994). Radioactive airborne emissions from the SRF are expected to be limited to tritium. The emissions would be in compliance with DOE and the State of Washington Department of Health (DOH) guidelines and regulations that are in force at the time of the proposed action. In the baseline case, the SRF would be used to convert metallic sodium to chemically-stable sodium hydroxide or sodium sulfate. The facility could be designed to process about 105 kilograms (230 pounds) of sodium per hour. The hydrogen produced by the process would be swept out of the reaction vessel using approximately 730 kilograms (1,600 pounds) of nitrogen per hour. At this processing rate, theoretically, the maximum tritium concentration in the effluent could be about $2.1 \times 10^{-5}$ microcuries per milliliter. At the point of public access, the guideline for public exposure to tritium would not be exceeded. This maximum discharge value would result in an onsite dose rate (i.e., approximately 100 meters or 300 yards) of approximately 0.16 millirem per year, substantially less than the DOE onsite limit of 100 millirem per year. The calculated dose rate at the site boundary from airborne emissions, $2.6 \times 10^{-4}$ millirem per year would be less than the DOE limit of 10 millirem per year for members of the public. These calculated values are considered very conservative, because further reduction in the discharge concentration would occur as much of the tritium would remain in the sodium hydroxide solution as tritiated water.

There would be some radiological exposure for the workers involved in the proposed activities. However, the anticipated exposure would not be expected to be substantially greater than current, routine FFTF activities. Since 1984, the average occupational external radiological exposure to workers in the FFTF has been approximately 6 millirem per year, which is substantially less than the maximum allowable exposure of 5,000 millirem per year. The cessation of reactor operations (April 1992) has resulted in the termination of various plant activities which, in the past, contributed to personnel exposure. It is expected that the potential personnel exposure associated with shutdown activities would be offset by the aforementioned terminated activities. Therefore, personnel exposures would continue to be well below DOE guidelines (5,000 millirem per year for onsite workers, and 100 millirem per year to the public), in keeping with the As Low As Reasonably Achievable (ALARA) principle. Additionally, appropriate procedures and administrative controls (e.g., personnel training and Radiation Work Permits) would be in place prior to any proposed activities. Also, radiation and hazardous chemical levels, and worker and public exposure levels, would continue to be monitored during the proposed actions.

Assuming 200 FFTF radiation workers are directly involved with the proposed activities (including construction and operation) and exposed to radiation at the average annual rate of 6 millirem per year (an annual total of 1.2 person-rem), based on a dose-to-risk conversion factor of $4.0 \times 10^{-4}$ (onsite) latent cancer fatality (LCF) per person-rem (56 FR 23363), $5 \times 10^{-4}$ LCFs per year would be expected to result from the proposed action. The activities include periodic inspections of the ISA, which would be conducted at intervals appropriate with DOE Orders and federal/state regulations in force at that time. It is most likely that no cancer fatalities would be induced by the proposed action during its duration. After the useful life of the facilities, stabilization, surveillance and maintenance activities would be expected to result in substantially zero onsite personnel exposure.

Additionally, it was reported that the estimated annual PFP personnel radiation exposure during fuel storage would be 3.325 person-rem (DOE 1992). This was based on estimated background radiation levels in the center of the storage vault of 0.069 rem per hour, with the equivalent of approximately 60 unirradiated FFTF fuel assemblies. Actual dose rates are less than 0.02 rem per hour. Therefore, the addition of fuel assemblies to the current inventory, including potential transportation impacts of either unirradiated or slightly irradiated fuel, is not expected to exceed the consequences previously analyzed for unirradiated FFTF fuel storage at the PFP (DOE 1992). Appropriate safety and procedure reviews would be conducted to assure proposed storage configurations would maintain personnel exposures to ALARA guidelines.

Also, no public exposure above that currently experienced from Hanford Site operations is anticipated as a result of these actions. That is, the potential dose to the hypothetical offsite maximally exposed individual (MEI) during Calendar Year (CY) 1993 from Hanford Site operations was 0.03 millirem (PNL 1994). The potential dose to the local population of 380,000 persons from 1993 operations was 0.4 person-rem. The 1993 average dose to the population was 0.001 millirem per person. The current DOE radiation limit for an individual member of the public is 100 millirem per year, and the national average dose from natural sources is 300 millirem per year. No adverse health effects would be expected to result from these low doses. Further, it is anticipated that routine operations would not provide additional exposure of toxic or noxious vapors to workers or members of the general public.

No environmental impacts from the transportation of materials would be anticipated as a result of the proposed action, should transportation be required (see Section 3.1.1.7). Previous similar transportation operations (i.e., approximately 20 experimental fuel shipments per year between FFTF and INEL) have resulted in no releases to the environment. Seven sodium-bonded fuel assemblies may eventually be transported, via truck trailer, to INEL using existing procedures, including appropriate packaging (i.e., licensed shipping casks with proper shielding and materials of construction). Transportation would be conducted using licensed casks under the prescribed shipping regulations (e.g., DOT) in force at the time. Approximately 70 shipments may be required to transport sodium-bonded fuel pins to INEL. The casks would be transported under highway route control procedures, which include specific routes, notifications to states and tribes, satellite tracking, and weather considerations. Any shipment would require less than 24 hours.

The potential transportation impacts associated with incident-free INEL fuel shipments were evaluated in the *Radiological Transportation Risk Assessment of the Shipment of Sodium-Bonded Fuel from the Fast Flux Test Facility to the Idaho National Engineering Laboratory* (WHC 1994b). Two shipment scenarios (i.e., 70 shipments at 18 pins per shipment and 12 shipments at 100 pins per shipment) were considered based on potential transportation strategies (see Section 3.1.1.7). For both scenarios, the impact to workers is calculated to be approximately 0.4 person-rem ($1.5 \times 10^{-4}$ LCFs). The impact to the public is approximately 11 person-rem ($5 \times 10^{-3}$ LCFs).

Hazardous materials (e.g., solvents, glycols, PCBs, asbestos) which may be removed or stabilized would be managed and reused, recycled, or disposed of in accordance with applicable federal and state regulations. Such materials include approximately 360,000 liters (94,000 gallons) of ethylene glycol, 32,000 liters (8,500 gallons) of PCB transformer oil, and 370,000 liters (99,000 gallons) of fuel oil. Approximately 8,200 drums of sodium sulfate (at approximately 208-liters, or 55-gallons, each) could be generated for disposal. The baseline case is expected to provide the bounding environmental impacts associated with disposition of the sodium. Radioactive material, radioactively-contaminated equipment, and radioactive mixed wastes would be appropriately packaged, stored, and disposed of at existing facilities on the Hanford Site. For example, the disposition of any spent resin would be based on its final radionuclide inventory. None of the materials would be anticipated to be generated in substantial quantities when compared to the annual amount routinely generated throughout the Hanford Site. For example, during CY 1992, 23,800 cubic meters (approximately 840,489 cubic feet) of low-level nonindustrial waste was received for disposal and/or storage in the 200 Areas (WHC 1993). This compares with a projection of approximately 30 cubic meters (1,000 cubic feet) of similar wastes for the proposed action.

Noise levels would be comparable to existing conditions in the 400 Area. The amount of equipment and materials to be used, such as steel and other metals for tankage and piping necessary for modifications, represent a minor long-term commitment of nonrenewable resources. Minor modifications to the existing 400 Area for access/lay down areas would be conducted in previously disturbed areas.

The proposed action is not expected to impact the flora and fauna, air quality, geology, hydrology and/or water quality, land use, or the population. Biological and Cultural Resources Reviews (Appendices B and C, respectively) support these expectations.

Although the FFTF has not yet been evaluated for eligibility for the National Register of Historic Places (Register), a cultural resources review has indicated that none of the proposed actions will affect any of the characteristics of the facility which would make it eligible for the Register (see Appendix C).

Current staffing levels at FFTF would be reduced in concert with the shutdown program activities. Personnel required for the shutdown activities would decrease from the current level of approximately 400 to approximately 10 full-time employees (WHC 1994a). This reduction represents approximately 2.5 percent of the current Hanford Site workforce (CY 1995). Social and economic impacts cannot be quantified at this time because of uncertainties associated with the future Hanford Site budgets.

## 5.2 Proposed Actions: Impacts from Accidents

No accidents associated with phenomenologically initiated events (e.g., earthquake, wind and tornado) were considered in this EA because the equipment associated with the proposed shutdown activities either is, or would be, designed to meet phenomenological criteria based on the safety classification of the equipment, system, or structure. The specific accident scenarios discussed below are believed to provide the bounding consequences for the proposed shutdown activities. A range of postulated accidents associated with FFTF operations have been addressed in the *Environmental Statement for the Fast Flux Test Facility* (AEC 1972), and reactor safety documentation. For this EA, specific accident consequences have been analyzed for proposed shutdown activities, and are discussed below.

Scenarios are related to fuel offload and sodium drain, storage, and reaction. These events include both high consequence and low probability and low consequence and high probability scenarios for the onsite (100 meters, 0.062 miles) worker and the MEI offsite (i.e., approximately 7 kilometers or 4.5 miles). For the following accident scenarios, the daytime population of the 400 Area is estimated to be no greater than 1,000 people, including visitors. The maximum offsite population is assumed to be in the worst sector (south-southeast, population approximately 80,000).

The risk to the directly involved worker (i.e., an individual in the immediate vicinity of an event) is highly dependent upon the worker's specific location, meteorological conditions, and nature of the accident. All of the aforementioned circumstances could either increase or minimize the severity of the consequences. Therefore, no quantification of risk to the directly involved worker is available. Further, although the consequences of the most serious postulated event (a sodium fire as discussed in Section 5.2.6) could be severe, the probability of such an occurrence is extremely low, and therefore the risk is small.

Also, the handling of materials such as fuel and alkali metals is similar to routine activities conducted at FFTF, and represent similar hazards and initiators associated with potential events for the proposed actions. Workers wear required protective clothing and follow administrative controls in accordance with a radiation work permit and hazardous materials permit. The DOE's constant review of appropriate procedures, and related information, reduce the potential for future unanticipated events and minimize the potential impacts.

Accidents associated with the offsite transportation of sodium-bonded metal fuel were evaluated in the *Radiological Transportation Risk Assessment of the Shipment of Sodium-Bonded Fuel from the Fast Flux Test Facility to the Idaho National Engineering Laboratory* (WHC 1994b). The calculated population risk was calculated to be approximately $3 \times 10^{-4}$ person-rem ($1.5 \times 10^{-7}$ LCFs). The cumulative accident risk for transportation by truck of all spent nuclear fuel (for the INEL centralization alternative, DOE 1995), was calculated to be 0.54 person-rem ($2.7 \times 10^{-4}$ LCFs).

### 5.2.1 FFTF Fuel Offload Supporting Shutdown

Accidents associated with irradiated fuel offload were analyzed. No accidents associated with loss of active cooling were considered, because of the extremely low decay heat (e.g., less than 250 watts) of the fuel inventory.

Further, as previously discussed in Section 2.0, a substantial reduction in the radioactive content (i.e., fission products and noble gases) of the fuel has occurred since cessation of reactor operations. Further radioactive decay will occur prior to initiation of fuel offload activities. Therefore, the following analyses are considered conservative.

#### 5.2.1.1 Event During Fuel Washing

An IEM Cell accident is postulated to involve a fuel assembly or pin container that retains a much larger than normal amount of residual metallic sodium (e.g., 2,000 grams, 4 pounds) and that the 93°C (200°F) rinse water is transferred to the wash vessel before the normal, controlled reaction with moist argon has occurred. This is a conservative assumption, since operating experience, and analysis of water samples taken following the process cycles, have shown that sodium quantities average in the range of 200 to 500 grams (0.4 to 0.9 pounds). During the water fill, a gas bubble is assumed to form around the mass of sodium, isolating it from contact with the water. When the system fill is complete, the system circulating pump is turned on which causes the water to collapse the gas bubble and allows water to flood the sodium in the fuel assembly, resulting in an immediate, vigorous sodium and water reaction. The system pressure will rise rapidly as a result of heating the water by the heat of chemical reaction, the heat of solution of sodium hydroxide in water, generation of hydrogen gas, and flashing of some of the water to steam. Pressure is vented to surge and drain tanks through a relief valve. Analysis of this event indicates that sufficient system volume exists to minimize the pressure pulse without exceeding the allowable design pressures of the sodium removal system. The system is filled with argon, therefore, no hydrogen or oxygen reaction would occur.

#### 5.2.1.2 Event During Cask Loading and Transfer

It was postulated that mechanical failure (e.g., break of a grapple on an overhead hoist) during a loaded ISC transfer initiated a cask drop. The cask is specifically designed to maintain structural integrity under defined accidental drop scenarios, including the aforementioned event. It was assumed that the drop caused a mechanical shock sufficient to open up pinhole leaks in five percent of the pins in seven assemblies. It was assumed that no particulate material was released, but 100 percent of the noble gas inventory in the affected pins would be released directly to the environment. This extremely unlikely accident (i.e., probabilities ranging from 1 x $10^{-4}$ to 1 x $10^{-6}$) resulted in a calculated population dose of 0.27 person-rem. Applying the offsite conversion rate of 5 x $10^{-4}$ LCFs per person-rem, 1.4 x $10^{-4}$ LCFs could result from this scenario. The offsite MEI (offsite at approximately 7 kilometers or 4.5 miles) would receive approximately 3.0 x $10^{-6}$ rem, which (times the conversion factor) would equate to 2.3 x $10^{-9}$ LCFs. The onsite worker (i.e., 100 meters, 0.062 miles) would receive an estimated 1.2 person-rem, which would convert to 4.7 x $10^{-4}$ LCFs (i.e., a dose-to-risk conversion factor of 4.0 x $10^{-4}$ LCFs per person-rem for the worker population [56 FR 23363]). Further, assuming the 1,000 onsite personnel (as stated in Section 5.2), the postulated onsite population consequences would be 0.5 LCFs.

#### 5.2.1.3 Interim Storage of Irradiated Fuel

Interim storage is a static activity. The ISC design specifications include considerations for thermal loading, radiation, drops, wind loading and seismic qualification. The specifications preclude the potential for a criticality. The materials of construction will be compatible with, or adequately resistant to, corrosive materials that may come in contact with the ISC throughout its life cycle. The design of the casks, administrative controls segregating casks from personnel, and the configuration of the facility (i.e., passive cooling, no superstructure, no cask stacking) contribute to an environmentally sound action. The ISA facility design would limit the radiation exposure at the ISA fence to no more than 0.05 millirem per hour (based on the ISC surface design limit of 2 millirem per hour). Surveillance of the stored irradiated fuel (e.g., personnel inspections, monitoring) would be conducted pursuant to applicable regulations and guidelines in force at that time.

#### 5.2.1.4 Transfer and Interim Storage of Unirradiated Fuel

The transfer and storage of unirradiated FFTF fuel was previously analyzed in the *Environmental Assessment: Storage of Fast Flux Test Facility Unirradiated Fuel in the Plutonium Finishing Plant Complex*, (DOE 1992). The transfer was from the 300 Area of the Hanford Site, which is a greater travel distance by approximately 10 kilometers (6.2 miles) than proposed from the FFTF to the PFP, but is part of the same route. The analysis indicated that no credible accident with significant consequence during transportation would occur. A postulated event during storage also was analyzed. A container drop resulted in a calculated offsite 70-year committed dose of 5.2 x $10^{-6}$ rem, which was an extremely conservative estimate based on release of plutonium oxide powder to the environment.

### 5.2.2 FFTF Sodium Drain and Storage Supporting Shutdown

In a reasonably foreseeable event scenario (probability greater than 1 x $10^{-2}$), approximately 9 kilograms (20 pounds) of radioactive sodium leaks from a mechanical joint during a transfer from the primary heat transport system to the sodium storage facility located adjacent to FFTF. The sodium is at low temperature (300 to 400°F) and at low pressure (25 pounds per square inch). Under these conditions, the sodium is assumed to burn. However, if a small fire were to occur, trained onsite personnel and emergency response equipment are available for immediate intervention to minimize potential environmental consequences both onsite and to the general public.

Conservatively, assuming the release fraction for a fire to be bounding in this case, the estimated onsite and offsite dose consequences would be 5.3 x $10^{-2}$ rem and 8.8 x $10^{-3}$ rem, respectively. These equate to calculated onsite and offsite population LCFs of approximately 2.1 x $10^{-2}$ and 0.36, respectively. The corresponding toxicological releases would be small.

### 5.2.3 Sodium Reaction Facility

Two reasonably foreseeable accidents in the SRF were identified. One was a potential sodium hydroxide spill. A maximum discharge of 50 percent sodium hydroxide solution would be approximately 3,780 liters (1,000 gallons) from a storage tank. This material would not burn and would be contained in catch pans within the facility. All radionuclides except tritium would be retained in the sodium hydroxide solution and would not be discharged to the environment. Any small amount of tritium that would be released would be much less than that discharged during plant operation.

A second postulated event was accumulation of hydrogen in the process equipment during reaction activities, such that flammable concentrations resulted in a brief hydrogen fire. Hydrogen gas is released during the reaction of sodium metal and water. The hydrogen typically would be vented from the process along with the nitrogen purge used to maintain mixing in the reaction vessel. For safety, the percentage of hydrogen is maintained below that which can burn in air (i.e., 4 percent by volume). Should the nitrogen gas supply fail, the reaction process would be automatically stopped. The fire itself is not expected to result in any environmental impacts; the loss of nitrogen flow might allow the measured concentration of tritium being exhausted to temporarily increase (i.e., amount of tritium per unit volume of sample). The annual average allowable limit for release of tritium (1 x $10^{-7}$ microcuries per milliliter per year) would not be exceeded.

For example, the following calculations conservatively assume that all the tritium (1.2 x $10^{-2}$ curies) contained in 105 kilograms (230 pounds) of sodium (that amount of sodium processed in an hour) is released as a result of the postulated hydrogen fire. If the 1.2 x $10^{-2}$ curies of tritium were released into, and mixed with, the air in the building (2.1 x $10^{9}$ milliliters or 74,000 cubic feet), the tritium concentration would be 5.7 x $10^{-6}$ microcuries per milliliter. This compares with the allowable worker limits (derived air concentrations) for tritium of 2 x $10^{-5}$ microcuries per milliliter. A facility worker would receive a dose of 0.7 millirem from a 1-hour exposure. If the entire 1.2 x $10^{-2}$ curies were released from the facility, the maximum dose to an onsite worker (assumed to be located 100 meters [300 feet] from the facility) would be less than 1.1 x $10^{-5}$ rem. Assuming an onsite population of 1,000 people, and that each received the maximum dose, the collective onsite population dose would be 1.1 x $10^{-2}$ person-rems. This equates to 4.4 x $10^{-6}$ LCFs for the onsite worker population. Release of the 1.2 x $10^{-2}$ curies would result in a dose of 1.2 x $10^{-8}$ rem to the maximum offsite individual. Assuming a maximum offsite population in the worst sector of 80,000 people, the collective dose to the offsite population would be 9.6 x $10^{-4}$ person-rem. This equates to 4.8 x $10^{-7}$ LCFs.

Such a brief release would provide minimal risk to workers and the general public. Therefore, in both scenarios, the low probability and minimal effects associated with the postulated events make the risks small.

### 5.2.4 Residual Sodium Accommodation and Auxiliary Systems Shutdown

No substantial accident consequences were identified associated with accommodation of sodium residuals or system layups, as described in Section 3.1.4. Any events, with associated initiators and risks, would be expected to be similar to typical industrial settings, and no greater than routine FFTF operations.

### 5.2.5 Reasonably Foreseeable Nonradiological Accident Scenario(s)

The environmental effects of accidents related to nonradiological materials are limited to those associated with most routine industrial activity. Personnel injuries, such as back strains or minor abrasions, would receive appropriate medical treatment. Administrative controls, proper training and specification of detailed procedures used in handling the materials would be in place, all of which would minimize the potential of any effects of such an accident.

An example of the environmental effects of accidents related to nonradiological materials would be a postulated spill of ethylene glycol (i.e., antifreeze) in the FFTF itself. As with typical industrial activities, ethylene glycol is used routinely in chilled water systems. The existing FFTF chilled water system, which is operational, was designed to preclude such a spill. Impervious sumps or alternative control measures are used to ensure containment of the ethylene glycol should a pump seal fail or a pipe leak occur. Any spill would be isolated, and trained personnel would take the necessary steps to contain the spill and effect cleanup. Proper training and specification of detailed procedures used in handling the materials are in place, which also would minimize any effects of such an accident.

Additionally, due to the large volumes of nitrogen used at FFTF, many isolated areas of oxygen-deficient atmospheres are routinely present. The potential for accidents associated with such an environment are minimized by proper monitoring equipment and alarms. Also, personnel training and appropriate administrative controls (e.g., placards, barricades) further enhance personnel safety.

### 5.2.6 Maximum Reasonably Foreseeable Accident

The Maximum Reasonably Foreseeable Accident is postulated to be a large leak (due to growth of a metal defect in one storage tank) in the sodium storage facility. The tank is initially filled with approximately 265,000 liters (70,000 gallons) of molten sodium at about 177°C (350°F) with a static head of approximately 6 meters (20 feet). The entire inventory of the tank is assumed to discharge onto the steel floor of the secondary containment (an area of approximately 770 square meters (8,200 square feet) and to burn, releasing a sodium hydroxide aerosol plume. Although hydrogen generation would occur in the scenario, the environmental impacts of an ignition or explosion would be expected to be bounded by a continuous burn of the sodium. Finally, even though the facility structure is assumed to remain intact, the sodium hydroxide aerosol release fraction is assumed to be 35 percent.

This scenario is extremely conservative. The calculated frequency of tank leaks is approximately $1 \times 10^{-5}$ per year, based primarily on commercial light water reactor data. However, this is for small leaks initiated by growth of manufacturing defects; the frequency of large leaks would be much lower. Furthermore, this leakage frequency is conservatively based on applications which typically experienced much more severe duty (i.e., higher pressures and temperatures, and substantial thermal transient usage). In a more realistic accident scenario, the sodium would leak from a small crack at a relatively slow rate, and the covered sump system (described in Section 3.1.2) would self-extinguish the burning sodium. No credit was taken in the analysis for this safety feature. The scenario described above was selected to bound the consequences of a sodium spill and fire, even though the scenario is considered incredible. Simultaneous failure of more than one tank was considered incredible, and was not analyzed.

For this scenario, it is assumed that the onsite receptor is exposed to only the first 10 minutes of the plume. This is based on the obvious nature of the plume, which is a visible, very irritating, white cloud. The calculated onsite dose consequence is $2.5 \times 10^{-4}$ rem. The offsite receptor is assumed to be exposed for the duration of the fire. The additional exposure time results in a calculated offsite dose consequence of $3.9 \times 10^{-4}$ rem.

The daytime population of the 400 Area is estimated to be no greater than 1,000 people, including visitors. Only a fraction of the population would be exposed as a result of this postulated event. Even so, using 1,000 people as the exposed onsite population, no more than approximately $1 \times 10^{-4}$ LCFs (i.e., essentially zero) would occur. The maximum offsite population dose in the worst sector (south-southeast, population approximately 80,000) would be approximately 31 person-rem, equating to $1.6 \times 10^{-2}$ LCFs. Therefore, no latent fatalities due to radiation from this incredible accident would be expected.

Of greater impact are the toxicological consequences of the sodium hydroxide plume from the postulated fire associated with the Maximum Reasonably Foreseeable Accident. The calculated onsite (100 meters [330 feet]) sodium hydroxide concentration is approximately 166 milligrams per cubic meter. The sodium hydroxide concentration at the site boundary (approximately 7 kilometers [5 miles]) was calculated to be approximately 0.05 milligrams per cubic meter.

The resultant calculated toxicological consequences may be compared to draft Hanford-specific Emergency Response Planning Guidelines (ERPG) for sodium hydroxide developed by the Hanford Environmental Health Foundation and applied in accordance with toxicological risk acceptance guidelines in WHC-CM-4-46, *Nonreactor Facility Safety Analysis Manual* (WHC 1988). These guidelines, which are based on lesser consequences being acceptable for higher frequency events, provide the basis for evaluating potential risk to onsite workers and the offsite population.

Emergency Response Planning Guidelines 1 (ERPG-1) is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing other than mild transient adverse health effects (e.g., headaches, dizziness, nausea) or perceiving a clearly defined objectionable odor. Similarly, ERPG-2 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action. Finally, ERPG-3 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.

Typically, calculated onsite consequences are limited to a range from ERPG-2 to ERPG-3, dependent upon event frequency (1 per year and $1 \times 10^{-6}$ per year, respectively). The criteria for sodium hydroxide as discussed in WHC 1988, are 40 milligrams per cubic meter (ERPG-2), and 100 milligrams per cubic meter (ERPG-3). The aforementioned calculated onsite consequences of 166 milligrams per cubic meter fall above the ERPG-2 to ERPG-3 range. However, personnel working near sodium facilities would be well aware of the hazards and response procedures, and would evacuate and remain clear of any white plume of smoke coming from a sodium facility. Based on the extremely low probability of occurrence, even if the consequences of such an event are as severe as calculated for the onsite worker, the extremely low probability of occurrence and administrative training and controls make the risks of a sodium fire from the proposed action small.

Similarly, the offsite consequences are limited from ERPG-1 (corresponding to an event frequency of 1 per year) to ERPG-2 (corresponding to an event frequency of $1 \times 10^{-6}$ per year) (WHC 1988). These guidelines correspond to 2 milligrams of sodium hydroxide per cubic meter and 40 milligrams of sodium hydroxide per cubic meter, respectively. The calculated offsite toxicological consequences of approximately 0.05 milligrams sodium hydroxide per cubic meter fall well below the applicable guidelines. The aforementioned training, procedures, and controls, coupled with local municipal emergency preparedness (e.g., telecommunications, law enforcement response) would minimize risks to the public.

## 5.3 Alternative Actions

### 5.3.1 Environmental Impacts: No-Action Alternative

As stated earlier, the handling of irradiated and unirradiated fuel and operation of sodium systems are considered routine FFTF evolutions. Therefore, maintaining the plant in its current configuration would not be expected to result in potential environmental impacts greater than those currently experienced at the Hanford Site. Liquid and gaseous effluents, which may contain radioactive and hazardous constituents, are continually monitored at the Hanford Site (PNL 1994). The specific constituents monitored are selected based on applicability. The potential dose to the hypothetical offsite MEI in 1993 from Hanford operations was 0.03 millirem (PNL 1994). The potential dose to the local population of 380,000 persons from 1993 operations was 0.4 person-rem. The 1993 average dose to the population was 0.001 millirem. Additionally, air samples were collected for volatile organic compounds and PCBs. All measured air concentrations of these organic compounds were well below applicable maximum allowable concentration standards for air contaminants. Further, chemical water quality constituents measured in Columbia River water during 1992 were generally similar upstream and downstream and in compliance with applicable standards (PNL 1994). It is anticipated, therefore, that the No-Action Alternative would have no greater environmental impacts than those presently experienced at the Hanford Site (PNL 1994).

### 5.3.2 Other Alternatives

The potential impacts from alternatives were discussed in Sections 3.2.2 to 3.2.6.

## 5.4 Proposed Actions: Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires that Federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs and activities on minority and low-income populations. DOE is in the process of developing official guidance on the implementation of the Executive Order. The analysis in this EA (Sections 5.1 and 5.2) indicates that there would be minimal impacts to both the offsite population and potential workforce during the shutdown of the FFTF, under both routine and accident conditions, with the exception of social and economic impacts which are unknown (see Section 5.1). It is not expected that there would be any disproportionate impacts to any minority or low-income portion of the community.

## 5.5 Proposed Actions: Cumulative Impacts

The proposed actions would contribute minimal risks in addition to those associated with routine Hanford Site operations. The proposed actions also would minimize the potential for, and consequences of, inadvertent releases of radioactive and hazardous materials from FFTF. The proposed actions would result in both near-term and long-term decrease in exposure, due to cessation of FFTF operations.

As stated in Section 5.1, hazardous materials (e.g., solvents, glycols, PCBs, asbestos) which may be removed or stabilized would be managed and reused, recycled, or disposed of in accordance with applicable federal and state regulations. Such materials include approximately 360,000 liters

(94,000 gallons) of ethylene glycol, 32,000 liters (8,500 gallons) of PCB transformer oil, and 370,000 liters (99,000 gallons) of fuel oil. Approximately 8,200 drums of sodium sulfate (at approximately 208-liters, or 55-gallons, each) could be generated for disposal. None of the materials would be anticipated to be generated in substantial quantities when compared to the annual amount routinely generated throughout the Hanford Site.

Also, as stated in Section 5.1, the reduction in FFTF personnel represents approximately 2.5 percent of the CY 1995 Hanford Site workforce. Social and economic impacts cannot be quantified at this time because of uncertainties associated with the future Hanford Site budgets. However, as stated in Section 5.4, the analysis in this EA indicates that there would be minimal impacts to both the offsite population and potential workforce during the shutdown of the FFTF, under both routine and accident conditions. It is not expected that there would be any disproportionate impacts to any minority or low-income portion of the community.

# 6.0 Permits and Regulatory Requirements

Any generated radioactive solid waste would be subject to the requirements of DOE Order 5820.2A, *Radioactive Waste Management*. Disposal of solid, low-level mixed waste would be subject to DOE Order 5820.2A and the additional requirements of RCRA, and WAC 173-303.

The storage of irradiated fuel would meet applicable requirements of DOE Order 6430.1A, *General Design Criteria*, DOE Order 5480.11, *Radiation Protection for Occupational Workers*, (DOE 1988) and DOE Order 5820.2A, *Radioactive Waste Management*. The ISC would be designed to meet the intent of 10 CFR 72 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste." However, the casks would not be formally licensed, as at this time there is no anticipated need to transport the casks over public highways.

All activities would be conducted in accordance with all applicable Federal Clean Air Act requirements (e.g., *Clean Air Act of 1977*, as amended), and State requirements (e.g., *Washington Clean Air Act* [Chapter 70.94, Revised Code of Washington]). No measurable additional radioactive airborne emissions are anticipated from FFTF or the ISA as a result of the proposed action. The FFTF is registered with the State of Washington Department of Health, pursuant to WAC 246-247, "Radiation Protection - Air Emissions." This regulation establishes the same standards as the "National Emission Standards for Hazardous Air Pollutants" (40 CFR 61) (0.01 rem, maximum individual effective dose equivalent), and additional requirements such as source registration. Best Available Radionuclide Control Technology is required for new or modified sources by WAC 402-80, "Monitoring and Enforcement of Air Quality and Emission Standards for Radionuclides," and WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides." Appropriate notifications would be provided. Fugitive emissions (especially dust) from modifications in the FFTF, and construction and operational activities associated with the ISA and the new sodium facilities would be controlled in accordance with normal practices, as per Benton County Clean Air Authority, Regulation 1, and in accordance with the requirements in WAC 173-400, "General Regulations for Air Pollution Sources." Existing ventilation filtration controls would minimize airborne releases from the FFTF to the environment. Examples of such controls include wetting ground surfaces, and enclosing construction areas with plastic covering.

The sodium storage and sodium reaction facilities would be subject to applicable permit requirements for the treatment, storage and disposal of hazardous waste under RCRA and WAC 173-303. The facilities also would be subject to applicable air permitting requirements in effect at that time (e.g., WAC 173-401, "Operating Permit Regulation"), which may include a Notice of Construction for that facility, and/or any operating permit limitations.

A small quantity of waste solvents may be handled as a liquid hazardous waste. Present plans do not involve storing this waste onsite for more than 90 days. All applicable requirements pertaining to generators of hazardous waste (i.e., RCRA, WAC 173-303) would be met. Radioactive waste flush solutions would be appropriately stored and disposed of in the existing 200 Area's tank farms.

Fuel transportation, including to the HCWC and/or INEL, would be in accordance with applicable regulations and orders, *including Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes*, DOE Order 5480.3 (DOE 1985), and DOE-RL Order 5480.1A (DOE-RL 1988). In addition, applicable requirements promulgated by DOT and NRC would be followed, including 10 CFR 71 and 49 CFR 171 through 178. The PCBs would be managed appropriately under the *Toxic Substances Control Act of 1976*.

# 7.0 Agencies Consulted

The States of Washington and Oregon, the Yakama Indian Nation, the Confederated Tribes of the Umatilla Reservation, the Wanapum, the Nez Perce Tribe, and associated stakeholders have been notified regarding the proposed action. The State of Washington, the Yakama Indian Nation, the Confederated Tribes of the Umatilla Reservation, the Wanapum, and the Nez Perce Tribe were provided copies of the draft EA for preapproval review.

Comments from the Yakama Indian Nation regarding the draft EA were received by DOE, and were considered in preparing the final EA. The comments and responses are provided in Appendix D.

## 8.0 References

10 CFR 71, 1993, "Packaging & Transportation of Radioactive Material," *Code of Federal Regulations*, as amended.

10 CFR 72, 1993, "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High-Level Waste," *Code of Federal Regulations*, as amended.

40 CFR 61, 1993, "National Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations*, as amended.

49 CFR 171, 1993, "General Information, Regulations, and Definitions," *Code of Federal Regulations*, as amended.

49 CFR 172, 1993, "Hazardous Materials Tables and Hazardous Materials Communications Regulations," *Code of Federal Regulations*, as amended.

49 CFR 173, 1993, "Shippers - General Requirements for Shipments and Packagings," *Code of Federal Regulations*, as amended.

49 CFR 177, 1993, "Carriage by Public Highway," *Code of Federal Regulations*, as amended.

49 CFR 178, 1993, "Shipping Container Specification," *Code of Federal Regulations*, as amended.

50 CFR 17, 1992, "Endangered and Threatened Wildlife and Plants," *Code of Federal Regulations*, as amended.

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PNL, 1994, *Hanford Site Environmental Report for Calendar Year 1993*, PNL-9823, Pacific Northwest Laboratory, Richland, Washington.

*Resource Conservation and Recovery Act of 1976*, 42 USC 6901 et seq.

*Toxic Substances Control Act of 1976*, 15 USC 2601, et seq.

WAC 173-303, 1990, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

WAC 173-400, 1994, "General Regulations for Air Pollution Sources," *Washington Administrative Code.*

WAC 173-401, 1994, "Operating Permit Regulation," *Washington Administrative Code.*

WAC 173-480, 1993, "Ambient Air Quality Standards and Emission Limits for Radionuclides," *Washington Administrative Code*, as amended.

WAC 246-247, 1993, "Radiation Protection-Air Emissions," *Washington Administrative Code*, as amended.

WAC 402-80, 1993, "Monitoring and Enforcement of Air Quality and Emission Standards for Radionuclides," *Washington Administrative Code*, as amended.

*Washington Clean Air Act*, 1991, "Chapter 70.94, Revised Code of Washington".

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WHC, 1994a, *Fast Flux Test Facility Shutdown Program Plan*, WHC-SD-FF-SSP-004, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994b, *Radiological Transportation Risk Assessment of the Shipment of Sodium-Bonded Fuel from the Fast Flux Test Facility to the Idaho National Engineering Laboratory*, WHC-SD-TP-RPT-013, Westinghouse Hanford Company, Richland, Washington.

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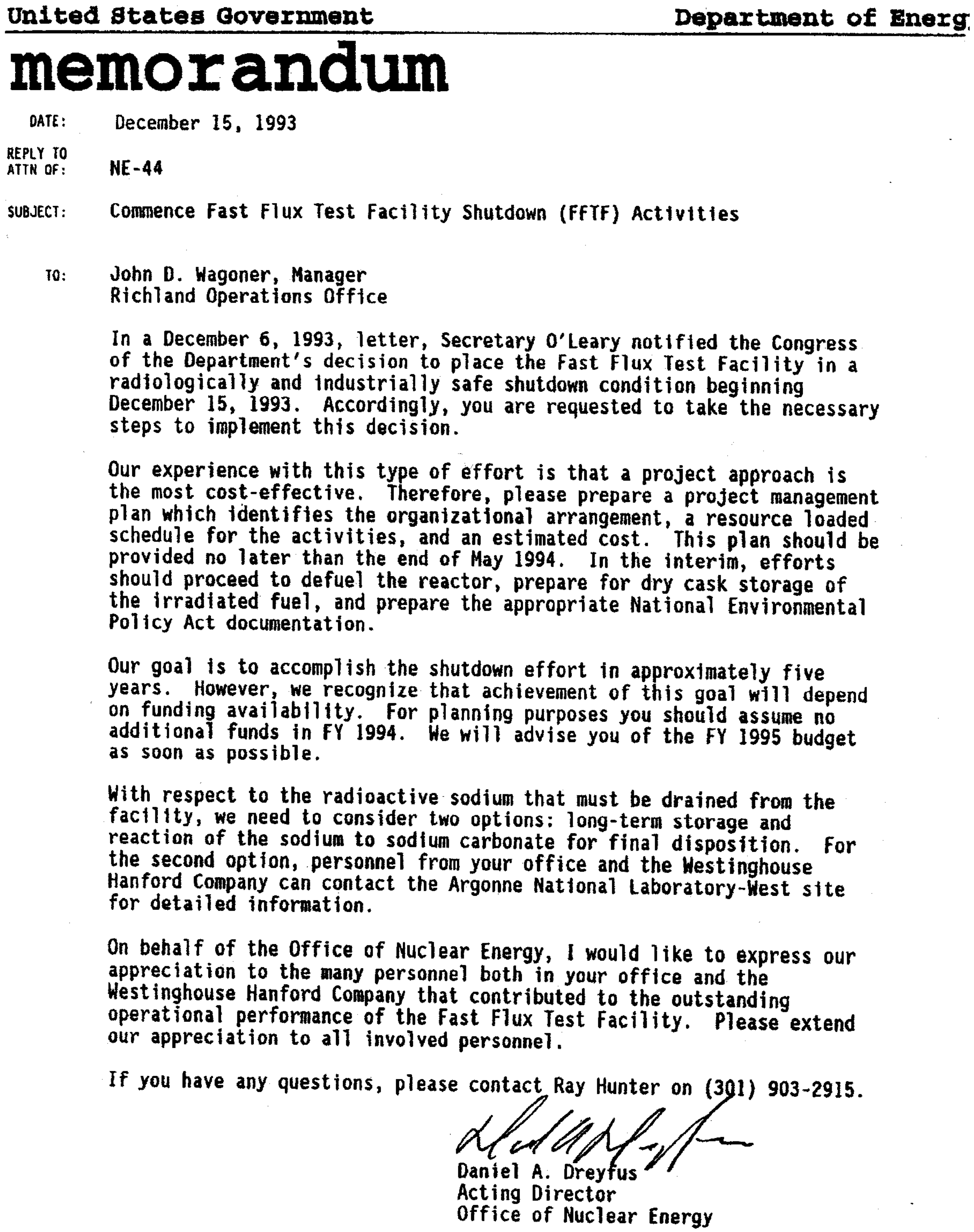
# Appendix A

## Shutdown Notification



**United States Government** **Department of Energ**

# memorandum

DATE: December 15, 1993

REPLY TO ATTN OF: NE-44

SUBJECT: Commence Fast Flux Test Facility Shutdown (FFTF) Activities

TO: John D. Wagoner, Manager
Richland Operations Office

In a December 6, 1993, letter, Secretary O'Leary notified the Congress of the Department's decision to place the Fast Flux Test Facility in a radiologically and industrially safe shutdown condition beginning December 15, 1993. Accordingly, you are requested to take the necessary steps to implement this decision.

Our experience with this type of effort is that a project approach is the most cost-effective. Therefore, please prepare a project management plan which identifies the organizational arrangement, a resource loaded schedule for the activities, and an estimated cost. This plan should be provided no later than the end of May 1994. In the interim, efforts should proceed to defuel the reactor, prepare for dry cask storage of the irradiated fuel, and prepare the appropriate National Environmental Policy Act documentation.

Our goal is to accomplish the shutdown effort in approximately five years. However, we recognize that achievement of this goal will depend on funding availability. For planning purposes you should assume no additional funds in FY 1994. We will advise you of the FY 1995 budget as soon as possible.

With respect to the radioactive sodium that must be drained from the facility, we need to consider two options: long-term storage and reaction of the sodium to sodium carbonate for final disposition. For the second option, personnel from your office and the Westinghouse Hanford Company can contact the Argonne National Laboratory-West site for detailed information.

On behalf of the Office of Nuclear Energy, I would like to express our appreciation to the many personnel both in your office and the Westinghouse Hanford Company that contributed to the outstanding operational performance of the Fast Flux Test Facility. Please extend our appreciation to all involved personnel.

If you have any questions, please contact Ray Hunter on (301) 903-2915.

Daniel A. Dreyfus
Acting Director
Office of Nuclear Energy

# Appendix B

## Biological Review
## (#94-WHC-140, #94-WHC-154)

Battelle
Pacific Northwest Laboratories
Battelle Boulevard
P.O. Box 999
Richland, Washington 99352
Telephone (509) 376-5345

May 23, 1994

Ms. Debbie Nielsen N2-53
Westinghouse Hanford Company
Facility Operations
Richland, WA 99352

Dear Ms. Nielsen

BIOLOGICAL REVIEW OF THE F027-IEM CELL ENHANCEMENTS/INTERIM STORAGE AREA ,THE SODIUM STORAGE FACILITY AND THE SODIUM REACTION FACILITY (FFTF SHUTDOWN PROJECT) #94-WHC-140 AND #94-WHC-154.

This report summarizes the results of the biological review for the above-referenced projects. The Interim Storage Area entails installing a fence around an existing 90 foot by 120 foot concrete pad. The fence dimensions will be 190 foot by 220 foot, with a depth of six inches. The Sodium Storage Facility entails the construction of 107 foot by 163 foot by 28 foot tall metal sided building. The Sodium Reaction Facility entails the construction of a 57 foot by 65 foot by 25 foot tall metal sided building. All projects are located inside the fenced area at FFTF. A biological survey of the sites proposed for the installation of these facilities was conducted on May 20,1994 by G. L. Fortner, R. Zufelt, and C. Mackinnon.. The pedestrian survey focused on plant and animal species protected under the Endangered Species Act, candidates for such protection, and plant and animal species listed as threatened, endangered, candidate, sensitive, or monitor by the State of Washington.

The proposed projects are located in an area that is highly disturbed by previous construction. Substrate at this site consists primarily of pavement and packed gravel which is herbicided annually. There is no vegetation on the subject area. Western Kingbird (*Tyrannus verticalis*), Western Meadowlark (*Sturnella neglecta*), European Starling (*Sturnus vulgaris*), American Kestrel (*Falco sparverius*), and Barn Swallow (*Hirundo rustica*) were observed in the vicinity of the proposed project. However, it is unlikely that the proposed projects would negatively impact any of the above mentioned species.

No species protected under the endangered species act, candidates for such protection, or species listed as threatened, endangered, candidate, sensitive, or monitor by the Washington State government were observed during this survey. Consequently, no adverse impacts to such species would occur from the proposed action.

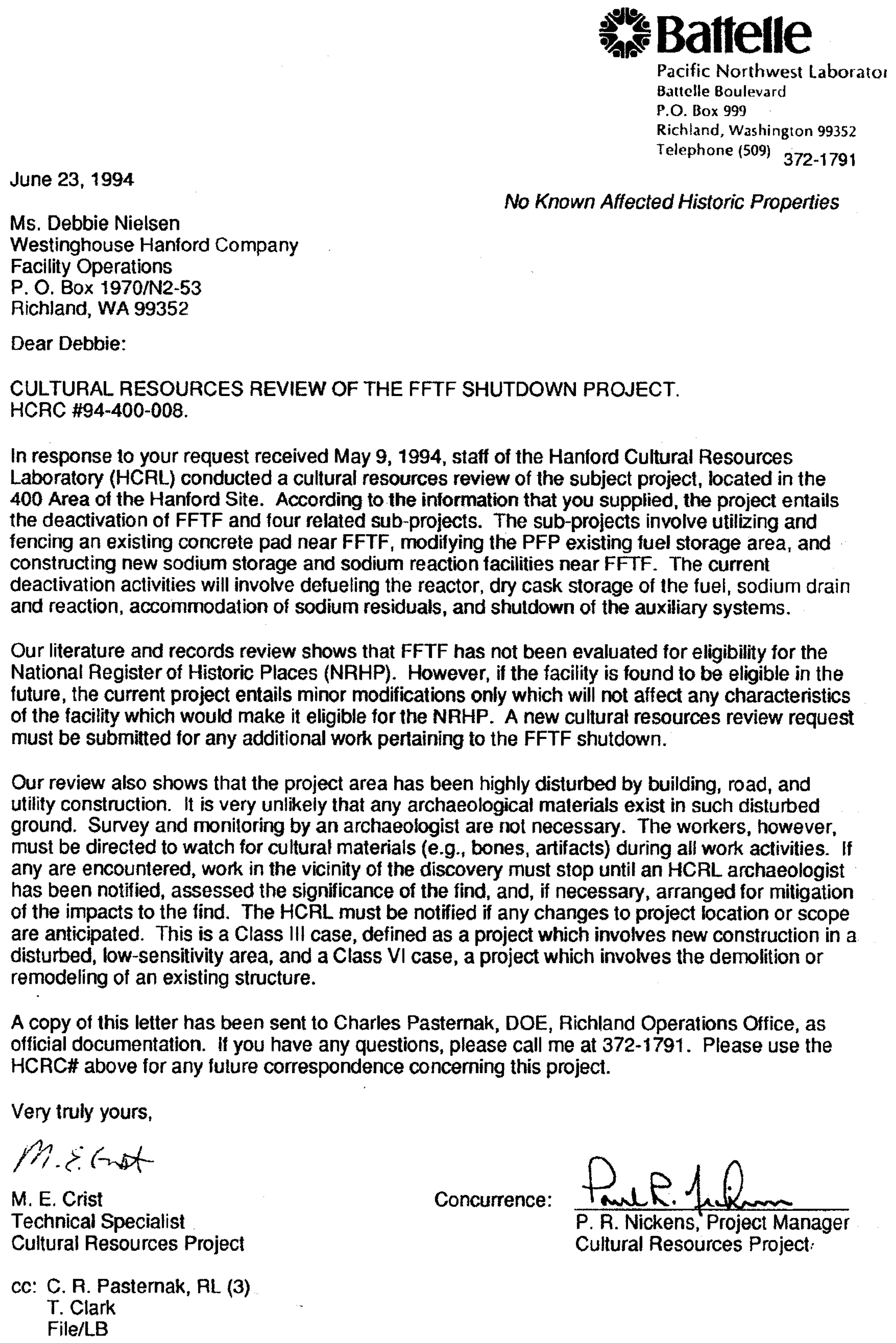
Sincerely,

C. A. Brandt, Ph.D.
Project Manager
Ecological Compliance Assessment

cc: RH Engelmann
PF Dunigan
RD Hildebrand
File
LB

# Appendix C

## Cultural Resources Review
## (HCRC #94-400-008)



Battelle
Pacific Northwest Laborato
Battelle Boulevard
P.O. Box 999
Richland, Washington 99352
Telephone (509) 372-1791

June 23, 1994

*No Known Affected Historic Properties*

Ms. Debbie Nielsen
Westinghouse Hanford Company
Facility Operations
P. O. Box 1970/N2-53
Richland, WA 99352

Dear Debbie:

CULTURAL RESOURCES REVIEW OF THE FFTF SHUTDOWN PROJECT.
HCRC #94-400-008.

In response to your request received May 9, 1994, staff of the Hanford Cultural Resources Laboratory (HCRL) conducted a cultural resources review of the subject project, located in the 400 Area of the Hanford Site. According to the information that you supplied, the project entails the deactivation of FFTF and four related sub-projects. The sub-projects involve utilizing and fencing an existing concrete pad near FFTF, modifying the PFP existing fuel storage area, and constructing new sodium storage and sodium reaction facilities near FFTF. The current deactivation activities will involve defueling the reactor, dry cask storage of the fuel, sodium drain and reaction, accommodation of sodium residuals, and shutdown of the auxiliary systems.

Our literature and records review shows that FFTF has not been evaluated for eligibility for the National Register of Historic Places (NRHP). However, if the facility is found to be eligible in the future, the current project entails minor modifications only which will not affect any characteristics of the facility which would make it eligible for the NRHP. A new cultural resources review request must be submitted for any additional work pertaining to the FFTF shutdown.

Our review also shows that the project area has been highly disturbed by building, road, and utility construction. It is very unlikely that any archaeological materials exist in such disturbed ground. Survey and monitoring by an archaeologist are not necessary. The workers, however, must be directed to watch for cultural materials (e.g., bones, artifacts) during all work activities. If any are encountered, work in the vicinity of the discovery must stop until an HCRL archaeologist has been notified, assessed the significance of the find, and, if necessary, arranged for mitigation of the impacts to the find. The HCRL must be notified if any changes to project location or scope are anticipated. This is a Class III case, defined as a project which involves new construction in a disturbed, low-sensitivity area, and a Class VI case, a project which involves the demolition or remodeling of an existing structure.

A copy of this letter has been sent to Charles Pasternak, DOE, Richland Operations Office, as official documentation. If you have any questions, please call me at 372-1791. Please use the HCRC# above for any future correspondence concerning this project.

Very truly yours,

M. E. Crist
Technical Specialist
Cultural Resources Project

Concurrence:
P. R. Nickens, Project Manager
Cultural Resources Project

cc: C. R. Pasternak, RL (3)
T. Clark
File/LB

# Appendix D

# Yakama Indian Nation Comments

# and

# DOE Responses*

*The attachments to the DOE response letter should be paginated pages 1-27 rather than pages 3-29. No pages of the attachments are missing.

SENT BY:RICHLAND OFFICE ; [illegible] ; [illegible] ; YAKIMA INDIAN NATION [illegible]

Bob Cook.

Confederated Tribes and Bands
of the Yakama Indian Nation

Established by the
Treaty of June 9, 1855

FILE COPY

March 7, 1995

Mr. John Wagoner, Manager
Richland Field Office
Department of Energy
P.O. Box 550 A7-50
Richland, WA 99352

Dear Mr. Wagoner:

Subject: HANFORD FAST FLUX TEST FACILITY SHUTDOWN; DRAFT ENVIRONMENTAL ASSESSMENT; DOE/EA-0993D; COMMENTS ON--

Based on the results of a prior cost/benefit analysis of the FFTF (not provided as part of the FFTF environmental assessment document), DOE determined that a shutdown of the FFTF is warranted. This action was directed in a DOE memorandum from D. Dreyfus, Acting Director of the Office of Nuclear Energy to DOE/RL J. Wagoner of December 15, 1993. The subject environmental assessment document outlines the sequence of activities necessary to complete the shutdown and handle and/or dispose of the radioactive and hazardous materials and wastes. This document is intended to compliance with the National Environmental Policy Act (NEPA) procedures.

DOE/RL noted a variety of radioactive and hazardous materials exist at the FFTF which will require reuse, storage, or remediation, abatement and/or disposal prior to the shutdown of the facility. Some of the materials include:

- Radioactive Materials:
  - fuels consisting of mixed oxides of plutonium and uranium located in reactor cores and several storage areas
  - liquid metallic sodium (estimated 296,000 gallons), or sodium sulfate solid
  - 600 gallons of sodium-potassium eutectic alloy
  - reactor components including reflectors, control rods, pins etc.
  - liquid waste water from washing (185,000 gallons reduced to 7,600 gallons by ion exchange)
  - 8.5 cu meters of spent ion-exchange resin
  - 600 gallons of sodium-potassium eutectic alloy
  - 30 cubic meters of low-level non-industrial waste

1

- Hazardous Materials (to be treated or disposed):
  - 94,000 gallons of ethylene glycol
  - 8,500 gallons of PCB transformer oil
  - 99,000 gallons of fuel oil
  - solvents (amount not specified)
  - asbestos

Comments:

Given the significant quantities of radioactive and hazardous materials which will require treatment and/or disposal at this site, the Yakama Nation considers that it is imperative that the DOE design a program for the FFTF shutdown that strongly emphasizes the following:

*1) Minimization of additional waste generated in the process of stabilizing the current waste.*

*2) Consolidation and centralization of high-level radioactive waste and/or spent fuel in one specific area.*

*3) Reuse or recycling of materials to avoid categorization as waste.*

*4) Integration with other programs at the Hanford complex with use of other waste streams, for example, tritiated water, to accomplish special shutdown actions.*

*5) Minimization of multiple iterations of handling and packaging of wastes with provisions for long-term interim surface storage integrated with other Hanford needs.*

*6) Cost effectiveness.*

*7) Minimization of potential exposure to acceptable levels for Yakama Nation members utilizing the Site in the future, considering disposal actions, remediation or long-term interim storage of wastes.*

*8) Inclusion of restoration actions associated with facilities and other actions requiring ultimate restoration of the site. For example the restoration of actions taken to create new pipelines for handling waste materials.*

The Attachment A to this letter describes the above recommendations in more detail. In addition, specific, detailed comments on the FFTF Environmental Assessment listed by page are also included in the attachment to this letter. We consider that even in advance of the subject environmental assessment that there will be significant impacts associated with the anticipated shutdown activities, including cumulative impacts associated with other Hanford waste management and environmental remediation actions.

We consider that it is advisable to proceed with an environmental impact statement to assure consideration of alternatives that minimize overall impacts, and we advise DOE to proceed in this way consistent with NEPA rules. We note that the shutdown appears to be the beginning stages of decontamination and decommissioning (D&D). In any case, alternatives for shutdown actions that consider immediate D&D should be considered to effect minimization of impacts and avoid piecemeal D&D actions.

Sincerely,

Russell Jim

Russell Jim, Manager
Environmental Restoration/Waste Management Program
Yakama Indian Nation

Attachment A: Detailed comments on draft FFTF EA.

cc: K. Clarke, DOE/RL
L. McClain, DOE/RL
M. Riveland, WA Ecol.
C. Clarke, U.S. EPA Reg. 10
T. Grumbly, DOE/EM
T. O'Toole, DOE/EH
Washington Gov. M. Lowry
U. S. Senator P. Murray
DNFSB
D. Sherwood, EPA, Richland

## ATTACHMENT A: DETAILED COMMENTS ON FFTF EA

**1. Minimization of additional waste generated in the process of stabilizing the current waste--**

During the shutdown process at the FFTF, significant quantities of new low-level and hazardous waste will be generated. This waste will include equipment used to retrieve, transfer, and store the waste, and decontamination equipment. The Yakama Nation considers that the total quantity of waste should be minimized wherever possible and existing contaminated materials should be used if possible, instead of creating additional waste materials and the need for increased landfill capacity or waste treatment, for example, incineration. For example, the FFTF Environmental Assessment discusses use of water for washing irradiated fuel. Low-level radioactive (tritiated) waste water is available for use. Such use will avoid contaminating pristine water with tritiated wastes during the washing process and the need for management of an additional tritiated waste stream.

**2. Consolidation and centralization of high level waste in one specific area--**

The Environmental Assessment discusses the creation of an interim storage area (ISA) in the 400 Area for the high level radioactive wastes/materials generated in the shutdown of the FFTF. The Yakama Nation recommends consolidation of high-level radioactive wastes in one general area on the Hanford reservation to minimize exposure and long-term monitoring efforts. We have recommended such actions in the past in various letters concerning management of tank wastes, N-Reactor spent fuel, denatured plutonium, etc. If the DOE has a permanent plan for consolidation of high level waste at the Hanford Reservation, discussion of the overall plan in the context of a permanent solution for the FFTF waste would be relevant in this document. Piecemeal consideration of impacts associated with the subject actions is not acceptable. Given the fact that the ISA has been designed as a temporary containment, discussion of the potential future options would force the consideration of whether this interim action is a prudent short-term action.

**3. Reuse or recycling of materials to avoid categorization as waste--**

The document addresses the treatment and interim storage (or disposal) of the radioactive wastes/materials and the liquid sodium. However, it provides inadequate information regarding the reuse or disposition of the other hazardous wastes. Accordingly, the environmental impacts of remedial alternatives for the other hazardous wastes are not discussed. The context of the EA which make trivial the environmental impact of the hazardous waste concerns is an oversight in this document and should be corrected. In particular long-term impacts (beyond the time when institutional controls can be relied upon) on future generations living at the site.

Two options were discussed for treatment of the liquid sodium, i.e., reacting sodium to create either sodium hydroxide or sodium sulfate. A third alternative was mentioned by Mr. Daniel Dreyfus in his letter to Mr. John Wagoner (Appendix A) which was reaction of the sodium to sodium carbonate. It is not clear from the Environmental Assessment whether the latter alternative was considered. Moreover, the document made the assumption that the sodium hydroxide alternative was the chosen option, rather than outlining a logical process used in arriving at such a decision. We consider that the sodium carbonate option is a viable option and that it should be considered.

We note that a sodium carbonate waste form is an option being considered in the TWRS EIS for treatment of the high-level radioactive wastes at Hanford. We refer you HW-65806 RD for information on the desirability of this waste form. We suggest the use of carbonic acid in tritiated water solution as a reactant.

We request that systems engineering be applied to the waste management at FFTF to assure integration with other activities at Hanford. The coordination of the production of common final waste forms with common waste packages and subsequent storage schemes is indicated and necessary to effect economy in the actions at Hanford. The following comments address this issue further.

**4. Integration with other programs at the Hanford complex**

This Environmental Assessment document primarily outlines the process by which the nuclear fuel and liquid sodium from the FFTF will be transferred and temporarily stored. With coordinated long-range planning with other programs in operation at Hanford, it may be more cost-effective and resource protective to wait for several years to develop a plan to fully decommission the FFTF. This interim action has the appearance of a short-term politically correct solution that is poorly integrated with other programs and, therefore, costs more and requires logistically more effort in the long-term. The expediency associated with the current EA should be justified in the EA itself.

**5. Minimization of multiple iterations of handling and packaging of wastes--**

Much of the effort described in the FFTF EA document is an interim action, particularly regarding the repackaging of the irradiated fuel into interim storage casks (ISC). There is no discussion regarding the feasibility of final actions for this material or whether the plan outlined in this interim action precludes other available options in the future. Nor is there discussion about the anticipated duration of this temporary storage situation and the long-range plan for additional handling of this material.

We consider that storage casks and facilities for radioactive materials should be designed for a 500 year life and flexible long-term disposition rather than a temporary situation with no definitive plan for accomplishing a permanent solution. Specifically, the 50-year design life of the core component container and the decision to forgo the licensing process for the ISCs is short-sighted. Even if the licensing process is not pursued, package integrity which would be consistent with licensing should be considered in the EA.

**6. Cost-effectiveness--**

The document was difficult to evaluate because the authors did not discuss in detail the costs and benefits of alternative actions. The cost to maintain the FFTF in a status quo situation was mentioned, but not a detailed analysis of the short-term or long-term costs for each of the alternatives. It was not stated whether such a detailed document exists. However, that type of analysis is a critical adjunct to this document. Without it, recommendations resulting from the evaluation conducted in this document are not meaningful. Comment 4 above addresses the cost associated with expediency assumed in the preparation of this EA.

**7. Minimization of potential exposure to the native population--**

The document did not adequately address or evaluate potential radiological exposures from operation of the ISA. The ISA is proposed as a high-level radioactive waste storage facility and high potential dose rates associated with ISC handling and ISA maintenance warrant further analysis of radiation exposure. Normally such impacts warrant an EIS.

Insufficient data were provided to verify that the calculated dose rate for the ISA fence line, and potential impacts related to air emissions from vents on each ISC are not addressed in the environmental impact analysis. Yakama Nation requests more information to check these calculations and requests that exposures from cask vents be addressed. In addition, no scenario or general estimate was provided of Latent Cancer Fatalities for worker or public exposure for normal operation of the ISA.

In general, the Environmental Assessment document could be more "user friendly" with a summary of the wastes addressed including detailed chemical and physical characteristics, volumes, proposed actions, and contingencies. In addition, The EA should reference details on alternative options and costs; the draft document is not a feasibility study, but a summary of the feasibility study efforts that have occurred prior to this draft EA.

Finally, please reduce the number of acronyms to only those necessary; in many paragraphs, the frequency of acronyms obfuscated the meaning and made the review difficult.

**Attachment: Environmental Assessment Comments listed by section and page**

The attached page comments follow the format and content of the Environmental Assessment Review, Shutdown of the Fast Flux Test Facility, Hanford Site document.

**Purpose and Need for Agency Action (Section 1)**

**p.1-1:** The document makes reference to " achieving desired cost saving" as an objective of the project.

Comment: The concept of cost savings through plant shut-down should be developed more thoroughly and related to environmental restoration issues. How are the cost savings going to be realized? Presumably it will be through waste stream reduction, recycling and consolidation.

**Background (Section 2)**

**p.2-1:** The document makes generic reference to mixed oxides of plutonium and uranium, sodium coolant, a sodium-potassium eutectic alloy and mixed plutonium-uranium oxides.

Comment: A table listing the location and quantity of all irradiated fuels, solutions and waste streams specifying their activity and chemistry should be included as part of the environmental assessment. An inventory of irradiated, non-fuel components should also be provided for tracking purposes. Similarly, non-irradiated chemicals and wastes including solvents referenced in later sections of the document should also be included in the summation of the inventory.

**Alternatives Including the Proposed Action (Section 3)**

**3.1 Proposed Action**

*3.1.1 Reactor Fuel*

**p.3-1:** The document indicates that fuel from the reactor core will be replaced with irradiated non-fuel core components.

Comment: It is not clear if placement of these components in the reactor is intended to be an interim or final solution. The Yakama Nation does not consider that such a solution is consistent with the concept of centralizing irradiated waste streams at Hanford or permanent decommissioning of a nuclear reactor.

<u>p.3-1:</u> The document indicates that each irradiated fuel assembly would be limited "administratively" to a maximum decay heat value of 250 watts for fuel off-load handling.

<u>Comment:</u> Please define "administratively".

<u>p.3-1:</u> The document indicates that 11 fueled components with low to moderate radioactivity levels are proposed to be intermixed with 5 or 6 highly radioactive fueled components in a single cask.

<u>Comment:</u> This intermixing of low and moderate activity components with high activity components is contrary to the concept of segregation by radioactivity level. Intermixing of these components may result in an increase of the quantity of materials which must be handled as high level components. Yakama Nation recommends segregating these components.

<u>p.3-2:</u> The document indicates that a core component container (CCC) with a 50-year design life will be the primary confinement boundary for 6 or 7 fuel assemblies or pin containers.

<u>Comment:</u> Yakama Nation recommends using a CCC with a 500-year design life to minimize the need for future repacking or handling of the materials.

<u>p.3-3:</u> The document indicates that the Interim Storage Cask (ISC) would be modeled after an approved NRC design but that the cask would not be formally licensed (and therefore will not be publicly transportable). The design will consist of a passive ventilated concrete and steel shielded cask and a carbon steel secondary containment boundary.

<u>Comment:</u> Yakama Nation recommends using a ISC with a 500-year design life to minimize the need for future repacking or handling of the materials within the cask which would be necessary if a shorter design life was specified. In addition, a multi-purpose design which allows for transportation over public highways and long term storage is recommended.

The purpose of the passive ventilation ports on the cask and types of expected emissions should be specified. Appropriate air emission controls such as HEPA filters should be included in the design as appropriate.

<u>p.3-3:</u> The document indicates that the sodium removal process for sodium-wetted fuels will involve reaction with a moist argon atmosphere followed by several water rinses. Wash water will be recycled using an ion-exchange resin.

<u>Comment:</u> Yakama Nation recommends using existing tritiated water for the washing of the fuels. This will avoid generation of a new waste stream. According to the document, expected tritium effluent releases into Interim Examination and Maintenance Area will be filtered by FFTF ventilation. If tritiated water is used, effluent release levels may require additional monitoring and/or treatment.

<u>p.3-4:</u> The document indicates that the Interim Storage Area (ISA) will be located in the immediate area of the FFTF on an existing concrete pad. Casks from Hanford Site Area 300 may also be transported and stored at the ISA.

<u>Comment:</u> Yakama Nation recommends centralizing all high level wastes at the Hanford site to minimize the possibility of exposure to high level wastes across many storage locations within the Hanford complex. The need for construction of an ISA at the FFTF should be evaluated in the context of overall Hanford site high level waste storage practices. In addition, the details of the design and maintenance of the ISA are not provided, specifically if and where radiation monitoring is going to be performed and if any filtration of ISC vents will be performed.

<u>p.3-5:</u> The document indicates that seven sodium-bonded fuel assemblies which must be treated as spent nuclear fuel will be washed and stored in ISCs in the ISA. These materials may later be transported to INEL, as in the past, pending the outcome on a programmatic site-wide environmental impact statement for spent fuel.

<u>Comment:</u> As described in an earlier comment, the ISC should be a licensed design for multi-purpose use and a 500 year design life. This will allow any casks containing sodium-bonded fuel assemblies to be transported to INEL without repacking or double-handling, if this alternative is elected in the future.

*3.1.2 Sodium Drainage and Storage & 3.1.3 Sodium Disposition*

<u>p.3-6 and 3-7:</u> The document indicates that metallic sodium would be maintained in its molten state until a sodium storage facility (SSF) is constructed in the FFTF. Once the SSF is constructed, the molten sodium would be drained from the FFTF and stored until appropriate excess evaluations were performed. A substantial inventory of slightly radioactive sodium currently in 200 Area might be transported and stored in the SSF. The document also indicates that construction and operation of a Sodium Reaction Facility (SRF) to convert the bulk metallic sodium to sodium hydroxide or sodium sulfate is the current concept for final disposition of the material.

Comment: The activity and quantity of the metallic sodium inventory should be specified. In addition, Yakama Nation recommends fast-tracking the excess evaluation proposed for disposition of the sodium and coordinating decisions for construction of the SSF and a proposed SRF with FFTF shut-down activities. The Environmental Assessment indicates (page ES-3) the FFTF facility will be operated according to normal maintenance practices for 4 years until 1999. During this transition phase 90% of the hot sodium inventory will be required to remain in place to support operations. Programmatic decisions affecting the final disposition of the sodium are anticipated to be made by 1998. Given these time frames, it is not clear that the SSF would need to be constructed at all since the bulk metallic solution could be retained within the FFTF. An early decision on the disposition of the sodium could also impact planning and configuration of the SRF, and might minimize the need to construct multiple sodium processing stages. In addition, Yakama Nation recommends evaluating conversion of the metallic sodium to sodium carbonate form when designing the SRF.

### 3.1.4 *Sodium Residuals*

p.3-8: The document indicates that sodium residuals (over 4,000 gallons) will be left in-place in the FFTF's piping accommodated only by an inert atmosphere.

Comment: It is not clear if leaving these residuals in-place as described above is intended to be an interim or final solution. The Yakama Nation does not consider that such a solution is consistent with the concept of permanent decommissioning of a nuclear facility. All residuals should be removed and contained appropriately prior to disassembly of the FFTF.

### 3.1.5 *Auxiliary System Shutdown*

p.3-9: The document indicates that various hazardous materials are stored and/or used throughout the facility and that the ultimate plant deactivation and shut-down would consist of long-term surveillance and monitoring.

Comment: A table listing the location, quantity and proposed disposition of all hazardous materials should be included as part of the environmental assessment. Also, long-term surveillance and monitoring of the shut-down facility implies an interim rather than a final solution. The Yakama Nation does not consider that such a solution is consistent with the concept of permanent decommissioning of a nuclear facility. How long is the facility expected to be maintained in this condition? What is the long term plan for the facility, demolition?

### *3.1.6 Resultant Waste Streams*

**p.3-9:** The document indicates that radioactive instrument stalk assemblies will be washed and transported to 200 Areas for disposal, solid and liquid effluent will be treated and transported to Hanford TSDs, and all applicable regulations will be followed including the Clean Air Act of 1977.

Comment: The Yakama Nation recommends waste stream reduction, recycling and consolidation when managing waste generated as part of the shut-down of the FFTF. Metals should in particular be recycled as unrestricted metal are as slightly contaminated waste pack raw material. FFTF waste management should be integrated with a site-wide analysis of waste and process streams at the Hanford complex. Creating detailed hazardous/radioactive materials inventories (if not already available), as recommended earlier, will assist DOE in this process. Yakama Nation also recommends centralization of high level wastes. Specific design goals (waste minimization, volume reduction and recycling) for FFTF should be specified in the EA with evaluation of alternatives with respect to the goals.

The references to applicable regulations should specifically name the Clean Air Act Amendments of 1990 and the Washington Clean Air Act (Chapter 70.94 RCA and Washington Administrative Code 173-460).

### 3.2 Alternative to Proposed Actions (p. 3-11)

Comment: As described above in comments regarding the SSF, it is not clear if this facility needs to be constructed, since 90% of the bulk metallic solution will be in-use at the FFTF until 1999. The programmatic decision on the disposition of the metallic sodium is expected in 1998. The Yakama Nation recommends a benefit/cost analysis be accomplished to determine the feasibility of using FFTF existing system plumbing as a storage mechanism and/or conveying the metallic solution directly to a treatment or disposal facility rather than constructing a separate on-site storage facility.

## Affected Environment (Section 4)

**p.4-2:** deleted

## Environmental Impacts (Section 5)

### 5.1 Proposed Actions: Impacts from Routine Operations

**p.5-1:** The document indicates tritium airborne emissions are expected from the proposed SRF facility. The expected emission is calculated as 0.16 millirem/year compared to the 100 millirem/year on-site limit of DOE.

Comment: The federal standard for airborne emissions (e.g. tritium in this case) from a nuclear facility is 10 millirems. 100 millirems is the total off-site dose allowed to the public from nuclear facility. These criteria should be properly reflected in the EA.

### 5.2 Proposed Actions: Impacts from Accidents

Comment: The various accident scenarios do not address potential equipment or process failures and resulting releases due to earthquakes. Such an event should be considered and if excluded, justifications should be provided.

p.5-6: The document indicates that the ISC surface design limit for radiation is 2 millirem/hour, and the fence line concentration at the edge of the ISA is 0.1 millirem/hour.

Comment: Insufficient data were provided to verify that the calculated dose rate for the ISA fence line would be 0.1 millirem per hour based on a ISC surface design limit of 2 millirem/hour. Potential impacts related to air emissions from vents on each ISC are not addressed in the environmental impact analysis. The Yakama Nation requests more information to check these calculations and requests that exposures from releases from cask vents be addressed. In addition, no scenario or general estimate was provided of Latent Cancer Fatalities (LCFs) for worker or public exposure for normal operation of the ISA. The high potential dose rates associated with ISC handling and ISA maintenance warrant further analysis of radiation exposure.

### Permits and Regulatory Requirements (Section 6)

p.6-1: The document indicates that the ISC would be modeled after an approved NRC design following the intent of 10 CFR 70 but that the cask would not be formally licensed

Comment: Yakama Nation recommends using a ISC with a 500-year design life and suitable for disposal in a deep repository to minimize the need for future repacking or handling of the materials within the cask which may be necessary if a shorter design life were specified. In addition, a multi-purpose design which allows for transportation without fuel handling is recommended. Accordingly, the Yakama Nation recommends that the ISC be designed to meet license requirements.

**<u>Agencies Consulted (Section 7)</u>**

**<u>D.7-1:</u>** The document indicates that Yakama Indian Nation was consulted and/or was notified regarding the proposed action.

<u>Comment:</u> Please note that comments on the proposed action from the Yakama Indian Nation have been solicited by DOE, but the Yakama Nation has not been formally consulted by the DOE.

**Department of Energy**
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

APR 28 1995

95-FFTF-030

Mr. Russell Jim, Manager
Environmental Restoration/Waste Management Program
Yakama Indian Nation
Post Office Box 151
Toppenish, Washington 98948

Dear Mr. Jim:

RESPONSE TO THE YAKAMA INDIAN NATION COMMENTS ON THE JANUARY 1995, DRAFT NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) ENVIRONMENTAL ASSESSMENT (EA) OF THE FAST FLUX TEST FACILITY (FFTF) SHUTDOWN, HANFORD SITE, RICHLAND, WASHINGTON, (DOE/EA-0993D)

Thank you for reviewing the subject NEPA EA document. Your comments contained in your March 7, 1995, letter addressed to John D. Wagoner, Manager of the U.S. Department of Energy Richland Operations Office (RL), and followup comments and questions provided by Mr. F. R. Cook of your staff in our March 16, 1995, meeting and our March 30, 1995, telephone conversation were helpful in identifying areas of the EA which required additional information or clarification. For clarity, each of your March 7th letter comments is repeated in Attachment A, followed with our responses. Likewise, each of Mr. Cook's March 30th telephone questions are provided in Attachment B, followed with our responses.

Copies of the final EA will be provided to your office when it is completed. If you need further information about this EA, please contact Mr. D. H. Chapin, the RL 400 Area NEPA Document Manager on (509) 376-2171, or myself on (509) 376-6667.

Sincerely,

Paul F. X. Dunigan, Jr.

Paul F. X. Dunigan, Jr.
NEPA Compliance Officer

Attachments (2)

cc w/attachs:
F. R. Cook, Yakama Indian Nation

## ATTACHMENT A

The following responses address comments 1 through 8 provided in the March 7, 1995 letter from Mr. Russell Jim to Mr. John Wagoner, and to the specific, detailed comments provided in the attachment to the letter.

1. Minimization of additional waste generated in the process of stabilizing the current waste--

   During the shutdown process at the FFTF, significant quantities of new low-level and hazardous waste will be generated. This waste will include equipment used to retrieve, transfer, and store the waste, and decontamination equipment. The Yakama Nation considers that the total quantity of waste should be minimized wherever possible and existing contaminated materials should be used if possible, instead of creating additional waste materials and the need for increased landfill capacity or waste treatment, for example, incineration. For example, the FFTF Environmental Assessment discusses use of water for washing irradiated fuel. Low-level radioactive (tritiated) waste water is available for use. Such use will avoid contaminating pristine water with tritiated wastes during the washing process and the need for management of an additional tritiated waste stream.

   <u>Response</u>: We agree that waste minimization is an essential element of the FFTF transition project. One of the key objectives of the FFTF transition project is to identify and implement as many waste minimization and cost reduction initiatives as possible. The FFTF transition phase addressed by the Shutdown EA will not result in the generation of significant quantities of waste. Table 1 will be added to the EA identifying the materials present within the FFTF complex and the proposed disposition of each material. As indicated in the table, the majority of the plant fluids will be recycled, reused or returned to the original vendor. This will result in substantial cost savings from not having to dispose of these materials as waste.

   The comment discusses irradiated fuel washing and suggests using tritiated water for the washing process. The FFTF washing system is currently configured to receive demineralized water with a purity level of <20 microsiemens per centimeter from a noncontaminated demineralized water system. After the initial fill of the wash system with 500 gallons of demineralized water, it is not anticipated that refill of the system will be required (minor quantities of make-up water may be required). The ion exchange system will clean this 500 gallons of water following each wash cycle so that the processed water can be reused for the next washing evolution. This will reduce the volume of radioactive liquid waste that would have been generated from approximately 185,000 gallons to less than 1,000 gallons. Section 3.1.1.3 of the EA conservatively states that as much as 2,000 gallons may be generated. The savings in radioactive liquid waste disposal costs alone are expected to be greater than $2 million. It would not be cost effective to modify the wash system to allow the receipt and addition of tritiated

## Table 1. FFTF MATERIALS INVENTORY

| MATERIAL | INVENTORY[1] | PROPOSED DISPOSITION |
|---|---|---|
| Primary Sodium | 140,000 gallons (530,000 liters) with the following radioactivity level as of 1993:<br>Na-22 $5.2 \times 10^{-7}$ curies/gram<br>Cs-137 $1.0 \times 10^{-10}$ curies/gram<br>Total alpha (Pu-239) $1.2 \times 10^{-12}$ curies/gram<br>Tritium $1.6 \times 10^{-7}$ curies/gram | Tank Waste Remediation System (TWRS) High Level Waste Tank Sludge Pretreatment Program |
| Fuel Storage Facility | 31,000 gallons (117,000 liters) with a radioactivity level conservatively assumed to be the same as the primary sodium (actual level will be substantially less, but no sample data is available). | TWRS High Level Waste Tank Sludge Pretreatment Program |
| Interim Decay Storage Vessel | 23,000 gallons (87,000 liters) with a radioactivity level conservatively assumed to be the same as the primary sodium (actual level will be substantially less, but no sample data is available). | TWRS High Level Waste Tank Sludge Pretreatment Program |
| Secondary Sodium | 66,000 gallons 250,000 liters) with the following radioactivity level as of 1993:<br>Tritium $5.5 \times 10^{-8}$ curies/gram | TWRS High Level Waste Tank Sludge Pretreatment Program |
| Sodium-Potassium Alloy (NaK) | 600 gallons (2300 liters) | Intermix with the sodium for TWRS High Level Waste Tank Sludge Pretreatment Program |
| Sodium Reactor Experiment (SRE) Sodium | 6,720 gallons (56,870 pounds) currently stored in 158 55-gallon drums in the 200 Area of the Hanford Site. As of January 1989, the nuclide content was:<br>Na-22 $3.53 \times 10^{-11}$ curies/gram<br>Cs-137 $1.29 \times 10^{-9}$ curies/gram<br>Ba-137m $1.22 \times 10^{-9}$ curies/gram | This sodium may be converted to sodium hydroxide at the FFTF Sodium Reaction Facility for use by the TWRS Program |
| Hallam Reactor Sodium | 42,120 gallons (356,000 pounds) currently stored in five tanks in the 200 Area of the Hanford Site. As of July 1975, the nuclide content was:<br>Mn-54 $3 \times 10^{-12}$ curies/gram<br>Co-60 $8 \times 10^{-14}$ curies/gram<br>Zn-65 $2.7 \times 10^{-12}$ curies/gram<br>Ru-106 $1 \times 10^{-12}$ curies/gram<br>Cs-134 $8 \times 10^{-14}$ curies/gram<br>Cs-137 $1.2 \times 10^{-12}$ curies/gram<br>Ba-137m $1.2 \times 10^{-12}$ curies/gram | This sodium may be converted to sodium hydroxide at the FFTF Sodium Reaction Facility for use by the TWRS Program |

| MATERIAL | INVENTORY(1) | PROPOSED DISPOSITION |
|---|---|---|
| Highly Radioactive Fuel<br>>100 rem/hour at 1 meter unshielded | 329 components<br>Included in this inventory is the following special fuel components: | 322 components stored in ISCs at the ISA |
| | 2 delayed neutron monitor fuel | Encapsulate failed pin(s) in IEM Cell |
| | Sodium-Bonded Fuel (7 irradiated/1 unirradiated. The latter is not included in the above inventory) | Consolidate with Idaho National Engineering Laboratory sodium-bonded fuel, or store in ISCs at the ISA |
| Moderately Radioactive Fuel<br>>15≤100 rem/hour at 1 meter unshielded | 4 components | Intermix one each with 5 or 6 highly radioactive components in an ISC and store at the ISA |
| Slightly Radioactive Fuel<br>≤15 rem/hour at 1 meter unshielded | 7 components | Interim storage in an ISC at the Plutonium Finishing Plant |
| Unirradiated Fuel | 32 components | Interim storage in ISCs at the Plutonium Finishing Plant |
| Open Test Assembly Instrument Stalks | 22 stalks (e.g., upper hardware removed during disassembly of special test assemblies) | Leave in place or remove, wash, appropriately package and dispose |
| Ethylene Glycol | 94,000 gallons (356,000 liters) | Filter for reuse at the Hanford Site |
| Polychlorinated Biphenyl Electrical Transformer Oil | 8,500 gallons (32,000 liters) | Disposed of as hazardous waste |
| Cooling Tower Chemicals | Quantity dependent on chemicals remaining at the time of shutdown of the cooling towers | Return to vendor |
| Freon R-12 and R-22 | 29,000 pounds | Return to vendor or reuse at Hanford Site |
| Sulfuric Acid | 1,500 gallons (5700 liters) | Recycle |
| Depleted Ion Exchange Resin | 300 cubic feet (8.5 cubic meters) | Disposal at Hanford as low level radioactive solid waste |
| Fuel Oil | 99,000 gallons (375,000 liters) | Reuse at Hanford Site |
| Mobiltherm Oil | 2,000 gallons (7600 liters) | Return to vendor |

(1)Volumes are approximate

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water for the small quantity of water that will be used. In addition to piping modifications to the system, the water would have to be sampled and possibly treated, to achieve the required water purity to ensure that the fuel assemblies are adequately cleaned for the storage period. Cleanliness of the assembly will be essential to ensure that the fuel cladding integrity is maintained. A further concern would be contamination of the currently uncontaminated water supply system.

2. Consolidation and centralization of high level waste in one specific area--

The Environmental Assessment discusses the creation of an interim storage area (ISA) in the 400 Area for the high level radioactive wastes/materials generated in the shutdown of the FFTF. The Yakama Nation recommends consolidation of high-level radioactive wastes in one general area on the Hanford reservation to minimize exposure and long-term monitoring efforts. We have recommended such actions in the past in various letters concerning management of tank wastes, N-Reactor spent fuel, denatured plutonium, etc. If the DOE has a permanent plan for consolidation of high level waste at the Hanford Reservation, discussion of the overall plan in the context of a permanent solution for the FFTF waste would be relevant in this document. Piecemeal consideration of impacts associated with the subject actions is not acceptable. Given the fact that the ISA has been designed as a temporary containment, discussion of the potential future options would force the consideration of whether this interim action is a prudent short-term action.

Response: The FFTF has never managed or produced any high level radioactive wastes/materials. The majority of the FFTF fuel inventory is high activity material, but should not be confused with high level waste. The ISA will consist of a fenced outdoor existing storage pad located in the northeast corner of the FFTF complex. The inventory of irradiated FFTF fuel will be stored at the area on an interim basis pending the final disposition to be selected by the *Environmental Impact Statement: Department of Energy Programmatic Spent Nuclear Fuel management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs*. Above ground, dry cask storage is consistent with commercial practice and is currently used both nationally (e.g., by Virginia Power at the Surrey and North Anna plants), and internationally (e.g., nuclear power plants in Canada and Europe). A decision on whether the FFTF fuel will be consolidated with other Hanford Site fuel has not been made at this time. However, the Interim Storage Cask was designed to accommodate onsite transfers and a subsequent decision to transfer the fuel to a future centralized area on the Hanford Site could readily be achieved.

3. Reuse or recycling of materials to avoid categorization as waste--

The document addresses the treatment and interim storage (or disposal) of the radioactive wastes/materials and the liquid sodium. However, it provides inadequate information regarding the reuse or disposition of the other hazardous wastes. Accordingly, the environmental impacts of remedial alternatives for the other hazardous wastes are not discussed. The context of the EA which make trivial the environmental impact of the hazardous waste concerns is an oversight in this document and should be corrected. In particular long-term impacts (beyond the time when institutional controls can be relied upon) on future generations living at the site.

Two options were discussed for treatment of the liquid sodium. i.e., reacting sodium to create either sodium hydroxide or sodium sulfate. A third alternative was mentioned by Mr. Daniel Dreyfus in his letter to Mr. John Wagoner (Appendix A) which was reaction of the sodium to sodium carbonate. It is not clear from the Environmental Assessment whether the latter alternative was considered. Moreover, the document made the assumption that the sodium hydroxide alternative was the chosen option, rather than outlining a logical process used in arriving at such a decision. We consider that the sodium carbonate is a viable option and that it should be considered.

We note that a sodium carbonate waste form is an option being considered in the TWRS EIS for treatment of the high-level radioactive wastes at Hanford. We refer you to HW-65806 RD for information on the desirability of this waste form. We suggest the use of carbonic acid in tritiated water solution as a reactant.

We request that systems engineering be applied to the waste management at FFTF to assure integration with other activities at Hanford. The coordination of the production of common final waste forms with common waste packages and subsequent storage schemes is indicated and necessary to effect economy in the actions at Hanford. The following comments address this issue further.

Response: As discussed in the Comment 1 response, large quantities of waste are not expected to be generated by the transition process. At the completion of the transition phase, the FFTF will be in a stable and safe configuration for a long term surveillance and maintenance phase prior to the final disposition phase (see Comment 4 discussion). The scope of the final disposition phase activities is beyond the scope of this Shutdown EA which addresses only the transition and surveillance and maintenance phase activities. The potential long-term impacts on future generations living near the Hanford Site when the decommissioning of FFTF is complete, will be addressed by the NEPA evaluations of the future alternatives that will be developed for the final disposition of the FFTF and the Hanford Site.

One of the most outstanding waste minimization and chemical recycling activities that has been identified for the Transition Project is the proposed conversion of the drained FFTF sodium to sodium hydroxide for use in the Hanford Site Tank Waste Remediation System's (TWRS) high level waste tank sludge pretreatment process. The use of the sodium for this application is now included in the TWRS and FFTF Program technical baselines. The TWRS Program currently estimates that 21,000 metric tons of sodium hydroxide will be required. The sodium hydroxide produced from the FFTF sodium represents approximately 8 percent of this need. Use of this low level radioactive sodium hydroxide versus clean sodium hydroxide is a sound waste minimization practice and is expected to result in substantial cost savings of at least $10 million by eliminating the need to convert the sodium to a stable form (i.e., sodium sulfate) for waste disposal. We believe this initiative exemplifies the positive impact of using a site-wide systems engineering approach to ensure proactive integration and coordination between Hanford Site Programs.

In the unlikely event the sodium is not used by the TWRS Program, it is proposed to convert the sodium to a stable, non-regulated form that is suitable for land disposal on the Hanford Site. In this event, the preferred material is expected to be sodium sulfate. Mr. Daniel Dreyfus referred to sodium carbonate because this is the process used by the Idaho National Engineering Laboratory (INEL). In our base planning documents, the FFTF sodium reaction facility is modeled after the INEL facility; however, in the State of Washington, sodium carbonate is listed as a toxic substance and would require management in accordance with the dangerous waste regulations contained in Chapter 173-303 of the Washington Administrative Code (WAC). This would substantially increase the cost for management and disposal of the material. As a result, our proposed reaction process would be modified to produce sodium sulfate which is a stable, non-regulated material suitable for land disposal at the Hanford Site.

This planned disposition of the sodium for beneficial use at Hanford is a key element of the tentative Tri-Party Agreement on facility transition negotiations between the U.S. Department of Energy (DOE), Washington State Department of Ecology, and the U.S. Environmental Protection Agency. A tentative agreement between the three parties was signed on January 13, 1995. The agreement includes a draft change package for the FFTF that establishes enforceable milestones for the key activities required to transition the plant to a safe, stable and environmentally sound condition suitable for a long-term surveillance and maintenance phase prior to final decommissioning. The draft agreement will undergo a public review and comment period prior to final approval, which is expected in June 1995.

The text in Section 3.1 of the EA will be modified to clarify that conversion of the sodium to sodium sulfate would only be pursued if use of the material as product by the TWRS does not occur.

4. **Integration with other programs at the Hanford complex**

**This Environmental Assessment document primarily outlines the process by which the nuclear fuel and liquid sodium from the FFTF will be transferred and temporarily stored. With coordinated long-range planning with other programs in operation at Hanford, it may be more cost-effective and resource protective to wait for several years to develop a plan to fully decommission the FFTF. This interim action has the appearance of a short-term politically correct solution that is**

**poorly integrated with other programs and, therefore, costs more and requires logistically more effort in the long-term. The expediency associated with the current EA should be justified in the EA itself.**

Response: The decommissioning process for the FFTF, and other major transition facilities on the Hanford Site, will be accomplished in three phases: Phase I (Facility Transition), Phase II (Surveillance and Maintenance), and Phase III (Disposition). The FFTF transition phase started with termination of operations and includes those activities required to place the plant in a safe, stable and environmentally secure end-point condition with reduced risk to plant workers, the public, and the environment. The major transition activities consist of dry cask storage of the fuel, drain and storage of the sodium, and drain and/or deactivation of the plant systems.

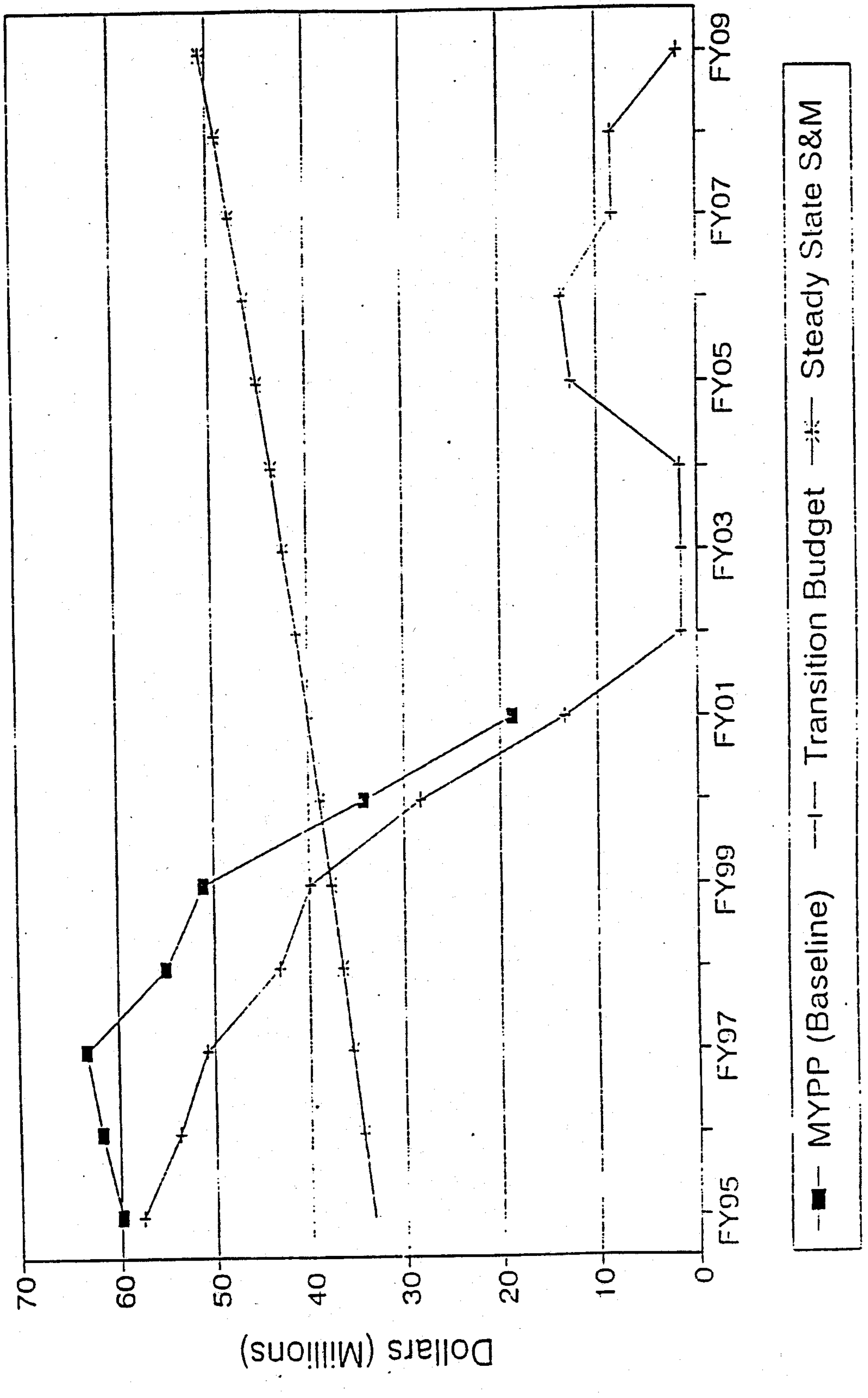
Present planning is that FFTF will be unoccupied and locked, with the exception of maintaining a minimal amount of lighting, fire protection equipment, and ventilation to support periodic routine surveillance. In addition, an inert gas supply will maintain a static nitrogen blanket on the drained sodium systems. The cost for surveillance and maintenance of the plant when this state is achieved is expected to be approximately $1-2 million per year. The goal is to achieve this low cost surveillance and maintenance state as quickly and as efficiently as possible so funds could then be redirected for other high priority environmental restoration activities at the Hanford Site.

At the completion of the Phase I transition activities, the FFTF complex will be turned over to the Hanford Site Environmental Restoration Contractor under the guidance of the DOE Office of Environmental Restoration (EM-40) for an extended surveillance and maintenance phase (Phase II) prior to the disposition phase (Phase III). During the surveillance and maintenance phase, the plant will be routinely monitored until decommissioning is completed. The DOE is currently developing a long-term facility decommissioning plan covering all key Hanford transition facilities. This decommissioning plan will facilitate integration and prioritization of the decommissioning activities with other Hanford cleanup efforts.

As previously mentioned, additional NEPA documentation will be required to address the final disposition phase and proposed end state for the FFTF and the Hanford Site. Section 3.1 of the EA will be expanded to clarify the three phased decommissioning approach and that the scope of this EA addresses Phases I and II of the decommissioning process.

Until the sodium is removed from the plant, approximately 90 percent of the plant systems are required to support hot sodium circulation. The minimum level of funding necessary to maintain the FFTF in a safe and stable condition prior to the sodium drain is estimated to be $35 million per year. Deferral of the transition phase would result in extending this high mortgage cost for the facility indefinitely. The attached cost profile (see Figure 1) shows the continued cost of maintaining FFTF in a minimum safe condition without conducting the

# Figure 1
# FFTF Expense Cases



planned transition activities. This figure provides the current FFTF Multi-Year Program Plan cost profile, and also depicts the additional cost savings that will result from ongoing productivity improvement initiatives and cost reduction efforts (i.e., acceleration of the Sodium Storage Facility). The figure graphically indicates that deferring the FFTF transition is not cost effective. Additional factors which explain the role and importance of the transition of FFTF are as follow:

- Utilizing the highly trained, experienced cadre of staff currently employed at the FFTF is essential to a safe and successful transition of this unique facility. Extending the deactivation by dropping to the minimum safe funding level, would require decreasing the current staff by approximately 40%.
- The subsequent cost of hiring and training new staff for the complex plant evolutions necessary to achieve the deactivated condition would be high, and likely result in an additional delay of at least two years. The level of expertise would clearly not be the same with new staff.
- Many critical activities (i.e., modifications, procurements, construction projects, resolution of technical issues, etc.) are in progress. Stopping momentum on these activities now, and trying to "revive" them later would contribute to higher total cost.

5. Minimization of multiple iterations of handling and packaging of wastes--

Much of the effort described in the FFTF EA document is an interim action, particularly regarding the repackaging of the irradiated fuel into interim storage casks (ISC). There is no discussion regarding the feasibility of final actions for this material or whether the plan outlined in this interim action precludes other available options in the future. Nor is there discussion about the anticipated duration of this temporary storage situation and the long-range plan for additional handling of this material.

We consider that storage casks and facilities for radioactive materials should be designed for a 500 year life and flexible long-term disposition rather than a temporary situation no definitive plan for accomplishing a permanent solution. Specifically, the 50-year design life of the core component container and the decision to forgo the licensing process for the ISCs is short-sighted. Even if the licensing process is not pursued, package integrity which would be consistent with licensing should be considered in the EA.

Response: As discussed in the Comment 2 response, storage of the fuel would be on an interim basis pending the final disposition to be selected by the DOE's Programmatic Environmental Impact Statement. Until the fuel is removed from the plant, the two sodium-filled fuel storage vessels cannot be drained. Drain of these vessels and shutdown

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of the Interim Examination and Maintenance (IEM) Cell (fuel washing location), fuel handling equipment and support systems are critical path elements of the transition activities and a delay would result in a significant cost impact, estimated to be in the order of $20 - 25 million annually. Placing the fuel in interim storage at the FFTF will not preclude future implementation decisions and will allow the plant to complete transition to a safe and low cost surveillance state.

The FFTF dry storage system minimum design life requirement was based on providing interim storage for the spent fuel until final disposition and complying with the federal regulations for commercial fuel storage casks which are licensed by the Nuclear Regulatory Commission (NRC). Specific storage cask design requirements are identified in 10 CFR Part 72 - "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-level Radioactive Waste." Specifically, Subpart L - Approval of Spent Fuel Storage Casks, paragraph 72.236(g) states that, "The cask must be designed to store the spent fuel safely for a minimum of 20 years and permit maintenance as required."

Since the ISC design is modeled after the NRC-licensed Ventilated Storage Cask VSC™ design, a comparison of the ISC design life to the VSC's™ licensing evaluation is most meaningful. In the NRC prepared Safety Evaluation Report for the licensing of the VSC™ issued under Docket No. 72-1007, Section 2.13 states that, "although the VSC™ is designed to a <u>design life of 50 years</u>, the NRC only evaluates the design on the bases of 20 years." Since the intent of the ISC design requirements is to meet, or exceed, licensable dry cask storage design practice, the FFTF dry storage system complies. Imposing a 500 year design life to the system would be cost prohibitive, if even achievable for a concrete cask design. In addition, since the FFTF dry storage concept seals the fuel assemblies inside the Core Component Container (CCC) and then further seals the CCC inside the ISC, it exceeds commercial fuel storage practice which relies on the fuel cladding as a boundary. The 50 year design life of the storage system is anticipated to be well within the time frame for final disposition currently being addressed by DOE's Programmatic Environmental Impact Statement.

Provisions have been incorporated into the ISC design to accommodate the possibility of future on-site fuel transfers; however, this unit is a storage cask not a licensed transportation cask. Fuel transportation casks are typically large, involve complex loading and transfer operations, and are very expensive. Design, procurement, and licensing of the 50 to 60 ISCs required for storage of the FFTF fuel to meet requirements for off-site shipping would be cost prohibitive and inconsistent with industry practice. As discussed above, the dry system is being designed to more stringent requirements than required by the NRC.

As requested by Mr. Bob Cook in the March 16, 1995 meeting, the ISC procurement specification and cost comparison information received during the competitive bid process for the ISC was provided to the Yakama Indian Nation on March 21, 1995. Figure 2 provides the competitive bid comparisons that were used to evaluate and select the ISC design. As depicted in the figure, the ductile iron (cast iron) or stainless steel casks are at least double the cost of the steel lined/concrete shielded unit. Further, the ductile cast iron casks had projected delivery schedules of 7.5 to 10 years, which would significantly extend the transition schedule. As discussed above, the cost of extending the schedule until the fuel is removed from the plant is estimated at $20 - 25 million per year. The high cost of the ductile cast iron metal casks coupled with the impact of a multi-year extension to the transition schedule clearly indicates that the steel lined/concrete cask design selected is the most cost effective approach and meets all identified criteria.

Section 3.1 of the EA will be revised to clarify that the ISCs have provisions incorporated into the design to accommodate future on-site transfer.

6. **Cost-effectiveness--**

**The document was difficult to evaluate because the authors did not discuss in detail the costs and benefits of alternative actions. The cost to maintain the FFTF in a status quo was mentioned, but not a detailed analysis of the short-term or long-term costs for each of the alternatives. It was not stated whether such a detailed document exists. However, that type of analysis is a critical adjunct to this document. Without it, recommendations resulting from the evaluation conducted in this document are not meaningful. Comment 4 above addresses the cost associated with expediency assumed in the preparation of this EA.**

Response: A detailed, quantitative cost analysis for the alternatives was not provided. While cost is a consideration for any action, the predominant purpose of an EA is to address environmental impacts. Typically, environmental impacts from the proposed action are addressed in a quantitative fashion, with a qualitative discussion provided for the environmental impacts associated with reasonable alternatives. Cost estimates for various aspects of the proposed action are provided in the *Fast Flux Test Facility Transition Project Plan* (WHC-SD-FF-SSP-004, Rev. 1, dated November 1994) which was previously provided to your staff.

The Comment 4 response contains a discussion on the cost benefits of completing the Phase I transition activities. The aforementioned FFTF Transition Project Plan provides additional details regarding the overall transition logic, costs and necessary activities. Qualitative and/or quantitative evaluations of each of the alternatives discussed in

FIGURE 2
COMPETITIVE BID COMPARISONS FOR INTERIM STORAGE CASK DESIGN AND FABRICATION (50 YEAR DESIGN LIFE)

| | [redacted] | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| | Offeror's Name | - W - | - X - | - Y - | - Z - |
| Item | Description | TOTAL | TOTAL | TOTAL | TOTAL |
| | CASK TYPE | St/Steel Liner Steel & Concrete Shielding | Ductile Iron | Ductile Iron | Stainless Steel Composite |
| 1 | DESIGN, ANALYZE, AND FABRICATE ONE INTERIM STORAGE CASK | 2,018,000.00 | 1,877,700.00 | 1,908,400.00 | 1,999,950.00 |
| 2 | FABRICATE NINE INTERIM STORAGE CASKS | 1,557,000.00 | 4,423,300.00 | 3,346,500.00 | 6,120,000.00 |
| 3 | ESTIMATED COST PER CASK LESS DESIGN FROM 2 ABOVE | 173,000.00 | 491,478.00 | 371,834.00 | 680,000.00 |
| 4 | ESTIMATED COST FOR FABRICATING 54 CASKS | 9,342,000.00 | 26,539,812.00 | 20,079,036.00 | 36,720,000.00 |
| 5 | TOTAL CASK COST = 1 + 4 (UNBURDENED DOLLARS) | 11,360,000.00 | 28,417,512.00 | 21,987,436.00 | 38,719,950.00 |
| | | | | | |
| | TOTAL 55 CASK PURCHASE COST = 1 + 5<br>FY'1995 BURDENING RATES<br>MPR = 7%<br>GA/CSP = 17% | 14,221,584.00 | 35,575,883.00 | 27,526,071.00 | 48,473,505.00 |
| | | | | | |
| | BEST DELIVERY SCHEDULE FOR THE FIRST 10 CASKS | 96 WEEKS<br>1.85 YEARS | 143 WEEKS<br>2.75 YEARS | 175 WEEKS<br>3.4 YEARS | 138 WEEKS<br>2.7 YEARS |
| | | | | | |
| | ESTIMATED DELIVERY SCHEDULE FOR 55 CASKS BASED ON PROPOSED SCHEDULES<br>NOTE: DID NOT INCLUDE THE ONE YEAR TAKEN FOR DESIGN | 3.0 YEARS | 7.6 YEARS | 10.0 YEARS | 6.8 YEARS |

Section 3.2, "Alternatives to the Proposed Action", were conducted which concluded that the proposed actions, aside from being environmentally sound, were the most cost-effective with minimal programmatic and institutional risks.

7. Minimization of potential exposure to the native population--

The document did not adequately address or evaluate potential radiological exposures from operation of the ISA. The ISA is proposed as a high-level radioactive waste storage facility and high potential dose rates associated with ISC handling and ISA maintenance warrant further analysis of radiation exposure. Normally such impacts warrant an EIS.

Insufficient data was provided to verify that the calculated dose rate for the ISA fence line, and potential impacts related to air emissions from vents on each ISC are not addressed in the environmental impact analysis. Yakama Nation requests more information to check these calculations and requests that exposures from cask vents be addressed. In addition, no scenario or general estimate was provided of Latent Cancer Fatalities for worker or public exposure for normal operation of the ISA.

Response: There are no high dose rates associated with the ISC storage at the ISA. The ISC is designed to a maximum surface dose of 2 millirem per hour and the design limit for radiation exposure at the ISA fence boundary is 0.05 millirem per hour. Surveillance of the ISA will typically occur from outside of the fenced boundary to ensure the area is undisturbed, locked, and clear of debris (i.e., tumbleweeds). Entry inside the fence will be required on a periodic basis to verify the inventory (as indicated by tamper indicating devices). The following clarifications will be made in the EA:

- Section 3.1 will be modified to state that the ISC is designed to provide shielding to limit the surface design dose to 2 millirem per hour.
- Section 3.1 will be modified to state that the ISA design would limit the radiation exposure at the ISA fence to 0.05 millirem per hour.
- Section 5.2 will be modified to correct the ISA dose limit of 0.05 millirem per hour at the fenced boundary. A sentence will be added indicating the expected surveillance frequencies.

The ISC dry storage system seals the fuel assemblies inside the Core Component Container and then further seals the Core Component Container inside the ISC. This exceeds commercial fuel storage practice which relies on the fuel cladding as a primary confinement boundary. There is no vent path from these sealed boundaries. The vent that is referred to in the text, is a vent in the external concrete radiation shield. This vent is provided to help remove the decay heat generated by the fuel from the concrete, thus resulting in lower fuel temperatures as well as concrete temperatures compared to other cask designs. Section 3.1 will be modified to clarify the cask description.

The potential Latent Cancer Fatalities for worker and public exposure due to normal operation of the ISA are addressed in Section 5.1. This activity was considered in the analysis of exposures to the FFTF worker as a result of all the proposed activities. As stated in the text, no exposures to the public above that currently experienced from Hanford Site operations is anticipated as a result of the transition activities.

8. Inclusion of restoration actions associated with facilities and other actions requiring ultimate restoration of the site. For example the restoration of actions taken to create new pipelines for handling waste materials.

<u>Response</u>: As discussed in the Comment 4 response, at the completion of the Phase I transition activities, the FFTF will be turned over to the Hanford Site Environmental Restoration Contractor under the guidance of the DOE Office of Environmental Restoration (EM-40) for an extended surveillance and maintenance phase (Phase II) prior to the disposition phase (Phase III). During the surveillance and maintenance phase, the plant will be routinely monitored until Phase III is completed. When the sodium disposition is complete, the SSF and SRF would be transitioned to a safe and stable deactivated state similar to the FFTF complex and turned over to the Environmental Restoration Contractor for surveillance and maintenance prior to final disposition. The DOE is currently developing a long-term facility decommissioning plan covering disposition of all key Hanford transition facilities. This decommissioning plan will facilitate integration and prioritization of the decommissioning activities with other Hanford cleanup efforts.

Future NEPA documentation will be required to address the final disposition phase, associated restoration activities, and the proposed end state for the FFTF, SSF, SRF, and the Hanford Site.

In general, the Environmental Assessment document could be more "user friendly" with a summary of the wastes addressed including detailed chemical and physical characteristics, volumes, proposed actions, and contingencies. In addition, the EA should reference details on alternative options and costs; the draft document is not a feasibility study, but a summary of the feasibility study efforts that have occurred prior to this draft EA.

<u>Response</u>: As indicated in the Comment 1 response, Table 1 will be included in the EA identifying the materials present within the FFTF complex that will be removed and stored, reused, recycled, or disposed of.

Finally, please reduce the number of acronyms to only those necessary; in many paragraphs, the frequency of acronyms obfuscated the meaning and made the review difficult.

Response: The EA will be reviewed to determine if some of the acronyms that are not frequently used can be eliminated. However, it becomes cumbersome to eliminate the use of all acronyms in a technical document such as this EA.

Attachment: Environmental Assessment Comments listed by section and page

The attached page comments follow the format and content of the Environmental Assessment Review, Shutdown of the Fast Flux Test Facility, Hanford Site document.

Purpose and Need for Agency Action (Section 1)

P. 1-1: The document makes reference to "achieving desired cost saving" as an objective of the project.

Comment: The concept of cost savings through plant shutdown should be developed more thoroughly and related to environmental restoration issues. How are the cost savings going to be realized? Presumably it will be through waste stream reduction, recycling and consolidation.

Response: As indicated in the response to Comment 4, the major cost savings will be achieved by reducing the high mortgage of FFTF from the current $35 million per year to approximately $1-2 million per year when the transition activities are complete.

Background (Section 2)

P. 2-1: The document makes generic reference to mixed oxides of plutonium and uranium, sodium coolant, a sodium-potassium eutectic alloy and mixed plutonium-uranium oxides.

Comment: A table listing the location and quantity of all irradiated fuels, solutions and waste streams specifying their activity and chemistry should be included as part of the environmental assessment. An inventory of irradiated, non-fuel components should also be provided for tracking purposes. Similarly, non-irradiated chemicals and wastes including solvents referenced in later sections of the document should also be included in the summation of the inventory.

Response: As indicated in the response to Comment 1, Table 1 will be provided listing the materials present within the FFTF complex that will be removed and stored, reused, recycled, or disposed of. The non-irradiated chemicals and wastes, including solvents, that are referred to in the EA are small quantities of maintenance shop and housekeeping materials that are used during routine operation and maintenance.

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## Alternatives Including the Proposed Action (Section 3)

### 3.1 Proposed Action

### *3.1.1 Reactor Fuel*

P. 3-1: The document indicates that fuel from the reactor core will be replaced with irradiated non-fuel core components.

Comment: It is not clear if placement of these components in the reactor is intended to be an interim or final solution. The Yakama Nation does not consider that such a solution is consistent with the concept of centralizing irradiated waste streams at Hanford or permanent decommissioning of a nuclear reactor.

Response: As each fuel component is removed from the reactor vessel, it must be replaced with a non-fueled component in order to maintain the upright geometry of the core necessary for the in-vessel handling machines to remotely grapple remaining core components. Initial shutdown planning called for inserting simulated core components that were used during the pre-critical checkout of the reactor system during this defueling evolution. Use of the irradiated non-fuel core components (e.g., reflectors, control rods, etc.) that would have been excessed to perform this needed function is an innovative and significant waste minimization approach that we have implemented. The simulated core assemblies that would have been inserted are non-contaminated and would have become contaminated with the radioactive sodium coolant. When defueling is complete, most of the non-fuel core components will be consolidated in the reactor vessel. This use of non-fuel irradiated hardware results in waste minimization and circumvents the associated washing (removal of sodium from) and disposal costs for this hardware, culminating in a cost avoidance of approximately $38 million. The final disposition of the reactor vessel and its internals has not been determined at this time. As mentioned earlier, the decontamination and decommissioning alternatives would be addressed by separate NEPA documentation.

P. 3-1: The document indicates that each irradiated fuel assembly would be limited "administratively" to a maximum decay heat value of 250 watts for fuel off-load handling.

Comment: Please define "administratively".

Response: The majority of the irradiated fuel components have decayed to a decay heat value of less than 250 watts. The design limit for the maximum decay heat load allowed in the fuel handling equipment and fuel storage is less than 1,500 watts. Decay heat values will be determined for each assembly, and each batch load of fuel will be limited "administratively", i.e., selected based on its decay heat value to ensure this limit is met. Rigid inventory controls are in place to ensure the current storage location of each assembly is known and documented.

**<u>P. 3-1:</u> The document indicates that 11 fueled components with low to moderate radioactivity levels are proposed to be intermixed with 5 or 6 highly radioactive fueled components in a single cask.**

**<u>Comment:</u> This intermixing of low and moderate activity components with high activity components is contrary to the concept of segregation by radioactivity level. Intermixing of these components may result in an increase of the quantity of materials which must be handled as high level components. Yakama Nation recommends segregating these components.**

<u>Response</u>: The planned storage option for the low radioactivity material is to store these materials in an ISC within the Hanford Site's Plutonium Finishing Plant (PFP) protected area. The four remaining moderate-radioactivity components would each be intermixed with higher radioactive fueled components in ISCs at the Interim Storage Area. As discussed in Section 3.1 of the EA. due to low- to moderate-radioactivity levels, these eleven fueled components require additional safeguards and security measures as there is insufficient radioactivity levels for the assemblies to be self-protecting. The segregation and/or intermixing of these components as discussed above is dictated by security considerations and provides the most cost effective management of these materials.

**<u>P. 3-2:</u> The document indicates that a core component container (CCC) with a 50-year design life will be the primary confinement boundary for 6 or 7 fuel assemblies or pin containers.**

**<u>Comment:</u> Yakama Nation recommends using a CCC with a 500-year design life to minimize the need for future repacking or handling of the materials.**

**<u>P. 3-3:</u> The document indicates that the Interim Storage Cask (ISC) would be modelled after an approved NRC design but that the cask would not be formally licensed (and therefore will not be publicly transportable). The design will consist of a passive ventilated concrete and steel shielded cask and a carbon steel secondary containment boundary.**

**<u>Comment:</u> Yakama Nation recommends using an ISC with a 500-year design life to minimize the need for future repacking or handling of the materials within the cask which would be necessary if a shorter design life was specified. In addition, a multi-purpose design which allows for transportation over public highways and long term storage is recommended.**

**The purpose of the passive ventilation ports on the cask and types of expected emissions should be specified. Appropriate air emission controls such as HEPA filters should be included in the design as appropriate.**

<u>Response</u>: Responses to Comments 5 and 7 address the design life of the dry storage system and anticipated radiation exposures as a result of the ISC storage at the ISA, respectively.

P. 3-3: The document indicates that the sodium removal process for sodium-wetted fuels will involve reaction with a moist argon atmosphere followed by several water rinses. Wash water will be recycled using an ion-exchange resin.

Comment: Yakama Nation recommends using existing tritiated water for the washing of the fuels. This will avoid generation of a new waste stream. According to the document, expected tritium effluent releases into Interim Examination and Maintenance Area will be filtered by FFTF ventilation. If tritiated water is used, effluent release levels may require additional monitoring and/or treatment.

Response: The response to Comment 1 explains why the use of tritiated water is not a cost effective option to consider.

P. 3-4: The document indicates that the Interim Storage Area (ISA) will be located in the immediate area of the FFTF on an existing concrete pad. Casks from the Hanford Site 300 Area may also be transported and stored at the ISA.

Comment: Yakama Nation recommends centralizing all high level wastes at the Hanford site to minimize the possibility of exposure to high level wastes across many storage locations within the Hanford complex. The need for construction of an ISA at the FFTF should be evaluated in the context of overall Hanford site high level waste storage practices. In addition, the details of the design and maintenance of the ISA are not provided, specifically if and where radiation monitoring is going to be performed and if any filtration of ISC vents will be performed.

Response: The FFTF has never managed or produced high level wastes. The fuel is high activity material, but not categorized as high level waste. Section 3.1 of the EA provides a description of the enhancements that will be provided to the existing concrete pad to provide the ISA. These include a fence, lights, and concrete crash barriers located near the road access areas. As indicated in the response to Comment 7, there will not be high radiation levels from the ISA (e.g., 0.05 millirem/hour at the fence). No installed radiation monitoring is required. As also indicated in the response to Comment 7, the ISC vents are merely a vent of the external concrete shield. The fuel is contained within a primary and secondary containment sealed boundary.

Section 5.1 of the EA will be expanded to provide a brief discussion of the expected surveillance for the ISA.

P. 3-5: The document indicates that seven sodium-bonded fuel assemblies which must be treated as spent nuclear fuel will be washed and stored in ISCs in the ISA. These materials may later be transported to INEL, as in the past, pending the outcome on a programmatic site-wide environmental impact statement for spent fuel.

**<u>Comment:</u> As described in an earlier comment, the ISC should be a licensed design for multi-purpose use and a 500 year design life. This will allow any casks containing sodium-bonded fuel assemblies to be transported to INEL without repacking or double-handling, if this alternative is elected in the future.**

<u>Response</u>: The preferred option for management of these seven sodium-bonded fuel assemblies is to transfer them to INEL for consolidation with their sodium-bonded fuel. The transfer of this fuel would be in existing licensed transportation casks (e.g., T-3), not an ISC. Similar transfers were routinely conducted during the operational years of FFTF. Alternatively, the fuel could be placed into ISCs and stored at the ISA. The text of Section 3.1 will be modified to clarify that existing casks would be used for the transfers to INEL.

*3.1.2 Sodium Drainage and Storage & 3.1.3 Sodium Disposition*

**<u>P. 3-6 and 3-7:</u> The document indicates that metallic sodium would be maintained in its molten state until a sodium storage facility (SSF) is constructed in the FFTF. Once the SSF is constructed, the molten sodium would be drained from the FFTF and stored until appropriate excess evaluations were performed. A substantial inventory of slightly radioactive sodium currently in 200 Area might be transported and stored in the SSF. The document also indicates that construction and operation of a Sodium Reaction Facility (SRF) to convert the bulk metallic sodium to sodium hydroxide or sodium sulfate is the current concept for final disposition of the material.**

**<u>Comment:</u> The activity and quantity of the metallic sodium inventory should be specified. In addition, Yakama Nation recommends fast-tracking the excess evaluation proposed for disposition of the sodium and coordinating decisions for construction of the SSF and a proposed SRF with FFTF shutdown activities. The Environmental Assessment indicates (page ES-3) the FFTF facility will be operated according to normal maintenance practices for 4 years until 1999. During this transition phase 90% of the hot sodium inventory will be required to remain in place to support operations. Programmatic decisions affecting the final disposition of the sodium are anticipated to be made by 1998. Given these time frames, it is not clear that the SSF would need to be constructed at all since the bulk metallic solution could be retained within the FFTF. An early decision on the disposition of the sodium could also impact planning and configuration of the SRF, and might minimize the need to construct multiple sodium processing stages. In addition, Yakama Nation recommends evaluating conversion of the metallic sodium to sodium carbonate form when designing the SRF.**

<u>Response</u>: The response to Comment 3 discusses the planned beneficial use of the sodium converted to sodium hydroxide for the Tank Waste Remediation System high level waste tank sludge pretreatment program. Until the sodium is drained from the plant, approximately 90% of the plant systems are required in order to maintain the facility in a safe and regulatory compliant state. Leaving the sodium in the plant systems until the TWRS Program is ready to receive the sodium hydroxide (Calendar Year 2008) would be cost prohibitive. As mentioned previously in the Comment 4 response, the cost to maintain the

plant in a safe configuration with molten sodium circulating is $35 million per year. The payback for the proposed design and construction of the Sodium Storage Facility, estimated at approximately $10.4 million, will quickly be achieved. Efforts are focussed on trying to accelerate the storage facility to the maximum possible extent within budgetary and regulatory constraints in order to achieve earlier cost reductions.

The quantity and activity of the sodium will be added to the EA in Table 1 which was provided in the Comment 1 response.

### *3.1.4 Sodium Residuals*

**P. 3-8: The document indicates that sodium residuals (over 4,000 gallons) will be left in place in the FFTF's piping accommodated only by an inert atmosphere.**

**Comment: It is not clear if leaving these residuals in place as described above is intended to be an interim or final solution. The Yakama Nation does not consider that such a solution is consistent with the concept of permanent decommissioning of a nuclear facility. All residuals should be removed and contained appropriately prior to disassembly of the FFTF.**

Response: As discussed in the response to Comment 4, the transition phase activities will remove hazardous materials to the maximum practical extent and deactivate the plant systems. Removal of the residuals would require major dismantlement of the sodium piping to ensure that open flow paths exist and to allow cleaning operations to be conducted in a safe manner. Plant dismantling would be addressed by the proposed disposition phase activities and associated NEPA documentation. It is planned to maintain an inert gas blanket over the frozen residuals to minimize any chemical reactions during the long-term surveillance and maintenance period. This will provide the greatest flexibility for later disposition activities.

### *3.1.5 Auxiliary System Shutdown*

P. 3-9: The document indicates that various hazardous materials are stored and/or used throughout the facility and that the ultimate plant deactivation and shutdown would consist of long-term surveillance and monitoring.

Comment: A table listing the location, quantity and proposed disposition of all hazardous materials should be included as part of the environmental assessment. Also, long term surveillance and monitoring of the shutdown facility implies an interim rather than a final solution. The Yakama Nation does not consider that such a solution is consistent with the concept of permanent decommissioning of a nuclear facility. How long is the facility expected to be maintained in this condition? What is the long term plan for the facility, demolition?

Response: Table 1 will be added to the EA as discussed in the Comment 1 response. The surveillance and maintenance phase could extend several decades before the decision is made to complete the decommissioning. The decision on when to commence the disposition phase would be determined on a Hanford site-wide priority basis.

### *3.1.6 Resultant Waste Streams*

P. 3-9: The document indicates that radioactive instrument stalk assemblies will be washed and transported to 200 Areas for disposal, solid and liquid effluent will be treated and transported to Hanford TSDs, and all applicable regulations will be followed including the Clean Air Act of 1977.

Comment: The Yakama Nation recommends waste stream reduction, recycling and consolidation when managing waste generated as part of the shutdown of the FFTF. Metals should in particular be recycled as unrestricted metal are as slightly contaminated waste pack raw material. FFTF waste management should be integrated with a site-wide analysis of waste and process streams at the Hanford complex. Creating detailed hazardous/radioactive materials inventories (if not already available), as recommended earlier, will assist DOE in this process. Yakama Nation also recommends centralization of high level wastes. Specific design goals (waste minimization, volume reduction and recycling) for FFTF should be specified in the EA with evaluation of alternatives with respect to the goals.

Response: We agree that waste minimization is an essential element of the FFTF transition project. As indicated in the Comment 1 response, Table 1 will be provided listing the planned reuse, recycle, or disposal. The 22 radioactive instrument stalk assemblies may be washed and disposed of as discussed in Section 3.1. Alternatively, these components may be retained in a shielded cell within the FFTF until the final disposition phase. If washing and disposition is pursued during the transition phase, the disposal option discussed in Section 3.1 provides the bounding consequences (i.e., waste generation). These components were irradiated and would not be candidates for metal recycling.

The references to applicable regulations should specifically name the Clean Air Act Amendments of 1990 and the Washington Clean Air Act (Chapter 70.94 RCA and Washington Administrative Code 173-460).

Response: Section 6.0 was revised to include the applicable clean air regulations.

### 3.2 Alternative to Proposed Actions (p. 3-11)

Comment: As described above in comments regarding the SSF, it is not clear if this facility needs to be constructed, since 90% of the bulk metallic solution will be in use at the FFTF until 1999. The programmatic decision on the disposition of the metallic sodium is expected in 1998. The Yakama Nation recommends a benefit/cost analysis be accomplished to determine the feasibility of using FFTF existing system plumbing as a storage mechanism

**and/or conveying the metallic sodium directly to a treatment of disposal facility rather than constructing a separate on-site storage facility.**

Response: As discussed in the response to Comment 4, availability of the Sodium Storage Facility is an essential element to allow off-load of the sodium and deactivation of the associated plant systems. A detailed review of the design and construction schedule for the SSF indicated that a six month acceleration could be achieved, contingent upon availability of appropriate funding, and would culminate in a substantial savings to the Project of approximately $3 million for every month the project is completed early. The SSF is expected to be operational by April 1997. As discussed in the response to the comment on Section 3.1, maintaining the sodium within the plant systems is not practical from a cost or technical standpoint.

Affected Environment (Section 4)

**P. 4-2: Deleted.**

Response: It is not clear what is intended by this comment. Was a page missing from your document?

Environmental Impacts (Section 5)

5.1 Proposed Actions: Impacts from Routine Operations

**P. 5-1: The document indicates tritium airborne emissions are expected from the proposed SRF facility. The expected emission is calculated as 0.16 millirem/year to the 100 millirem/year on-site limit of DOE.**

**Comment: The federal standard for airborne emissions (e.g., tritium in this case) from a nuclear facility is 10 millirems. 100 millirems is the total off-site dose allowed to the public from a nuclear facility. These criteria should be properly reflected in the EA.**

Response: Section 5.1 of the EA will be modified to clarify that the calculated dose rate at the site boundary from airborne emissions, $2.6 \times 10^{-4}$ millirem per year, would be less than the DOE limit of 10 millirem per year for members of the public. The 100 millirem per year limit applies to onsite personnel from all exposure pathways and the 10 millirem per year applies to offsite public exposure from the airborne pathway (the only potential offsite exposure pathway from the SRF). The maximum exposure from the SRF is far below both onsite and offsite limits.

5.2 Proposed Actions: Impacts from Accidents

**Comment: The various accident scenarios do not address potential equipment or process failures and resulting releases due to earthquakes. Such an event should be considered and if excluded, justifications should be provided.**

Response: Section 5.2 of the EA will be revised to reflect why no accidents associated with phenomenologically initiated events (e.g., earthquake, wind and tornado) were considered. The equipment associated with the fuel and sodium off-load activities either is, or will be, designed to meet design basis phenomenological criteria based on the safety classification of the equipment, system, or structure. The existing FFTF complex, including the sodium systems and fuel handling/washing equipment were designed to accommodate natural phenomenological criteria for a reactor facility. New equipment and processes associated with the FFTF deactivation (e.g., the Sodium Storage Facility, Interim Storage Casks, and the Interim Storage Area) are also being designed to meet appropriate phenomenological criteria. Therefore, no releases would occur as a result of these initiators. The Sodium Reaction Facility is in a pre-conceptual phase, and it will be designed to either meet similar criteria or demonstrate that any resulting releases are well within acceptable limits. The accident scenarios selected for analysis in the EA are believed to provide the bounding consequences for the FFTF shutdown activities.

**<u>P. 5-6:</u> The document indicates that the ISC surface design limit for radiation is 2 millirem/hour, and the fence line concentration at the edge of the ISA is 0.1 millirem/hour.**

**<u>Comment:</u> Insufficient data was provided to verify that the calculated dose rate for the ISA fence line would be 0.1 millirem/hour based on an ISC surface design limit of 2 millirem/hour. Potential impacts related to air emissions from vents on each ISC are not addressed in the environmental impact analysis. The Yakama Nation requests more information to check these calculations and requests that exposures from releases from cask vents be addressed. In addition, no scenario or general estimate was provided of Latent Cancer Fatalities (LCFs) for worker or public exposure for normal operation of the ISA. The high potential dose rates associated with ISC handling and ISA maintenance warrant further analysis of radiation exposure.**

<u>Response</u>: This comment was addressed in the response to Comment 7.

<u>Permits and Regulatory Requirements (Section 6)</u>

**<u>P. 6-1:</u> The document indicates that the ISC would be modeled after an approved NRC design following the intent of 10 CFR 70 but that the cask would not be formally licensed.**

**<u>Comment:</u> Yakama Nation recommends using an ISC with a 500-year design life and suitable for disposal in a deep repository to minimize the need for future repacking or handling of the materials within the cask which may be necessary if a shorter design life were specified. In addition, a multi-purpose design which allows for transportation without fuel handling is recommended. Accordingly, the Yakama Nation recommends that the ISC be designed to meet license requirements.**

<u>Response</u>: This comment was addressed in the response to Comment 5.

<u>Agencies Consulted (Section 7)</u>

**<u>P. 7-1:</u> The document indicates that Yakama Indian Nation was consulted and/or was notified regarding the proposed action.**

**Comment:** **Please note that comments on the proposed action from the Yakama Indian Nation have been solicited by DOE, but the Yakama Nation has not been formally consulted by the DOE.**

Response: As stated in Section 7.0 of the EA, stakeholders were notified regarding this EA. The text will be revised to indicate that the draft EA was provided for preapproval review, and that comments were received from the Yakama Indian Nation. The comments and responses will be provided as an appendix in the final EA.

## ATTACHMENT B

The following additional comments and questions were received from Mr. F. R. Cook per telephone conversation with Mr. D. H. Chapin on March 30, 1995.

1. What is the status of procurements of the ISCs, in light that the ISC bid packages were produced in 1993 and that no final decision has been made on the EA? Will new ISC bid packages have to be obtained?

Response: In August 1993, a determination was made that the cask design, testing, and fabrication fit within a Typical Class of Action available for Categorical Exclusion (CX) in Subpart D of the U.S. DOE NEPA Implementing Procedures. Subsequently, a contract was awarded in September 1993 for design, testing and fabrication of ten ISCs. It should be noted that the casks were required for either continued operation or shutdown and the actual contract placement occurred prior to the shutdown decision. The CX stated that appropriate NEPA documentation would be prepared and approved prior to the actual use of the casks for irradiated fuel. Use of the ISC for interim storage of the FFTF fuel is evaluated in the FFTF Shutdown EA (DOE/EA-0993D). Additional casks will be required to complete the spent fuel offload and a competitive fabrication-only contract, based on the verified and tested design from the current procurement, is expected to be placed by September 1995.

2. As discussed on our March 16th meeting with Mr. Cook, he re-emphasized that it is still the "desirable objective" of the Nation that a "500-year" design life for the ISCs be used (rather than RL's proposed 50-year design life) "EVEN IF MORE MONEY HAS TO BE SPENT."

Response: This comment has been addressed on page 12 of Attachment A.

3. The proposed bids for ductile iron ISCs seemed high. Were these really competitive bids?

Response: The bid information that was provided to the Yakama Indian Nation on March 21, 1995 summarized competitive bids that were received for design and fabrication of the first ten ISCs prior to placement of the contract (see Appendix A, Figure 2).

4. Why does the fuel assembly handling issue appear artificially limited by a 75-ton crane capacity? Why can't an equipment handling situation be utilized (such as the commercial establishment uses) so that storage of 7 fuel assemblies could be increased by a factor of 4 to 28?

Response: The existing FFTF remote fuel handling system consists of a number of one-of-a-kind complex fuel handling equipment, interfaces and operations. The system is constrained by size limitations at multiple locations throughout the plant. Selection of a larger cask would have had a significant impact on these interfaces.

5. Were any "trade" studies referenced/utilized in the conceptualization studies given to the vendors for their use in their ISC bid packages? From an

"economy-of-scale" standpoint, the commercial industry went through the same issues when designing the ISC size and storage capacity.

Response: Vendors were given the ISC specification/bid package, a copy of which was provided to the Yakama Indian Nation on March 21, 1995. This package did not contain trade studies or conceptualization studies. However, there were a number of vault storage system concepts that were investigated earlier which culminated in selection of above-ground dry storage casks based on programmatic considerations.

6. Issue is taken that it would take 10 years to deliver ductile iron ISCs. This is not a realistic delivery schedule.

Response: As indicated in Figure 2 of Appendix A, the delivery schedules were extrapolated based on the cost and schedule input provided by the vendors for design and fabrication of the first 10 casks. While they may not be accurate, they are certainly representative.

7. What is the assumed accident scenario for the shielding integrity of the ISCs proposed in the specs?

Response: The ISC was designed to maintain its integrity during a one foot drop. A severe drop of eight feet was also imposed on the design to allow for on-site transfers. Under this severe drop scenario, the concrete may degrade but the primary steel confinement boundary would remain intact with no release of material.

8. Have drops been assumed to be applied at the end of the design life of the ISCs?

Response: The answer is yes; for example, corrosion degradation of the steel confinement barrier was addressed as a design parameter.

9. Optimal accident scenario conditions, temperature criteria, and maximum internal pressure needs to be established to sustain fire hazards produced by residual sodium in the system potentially coming into contact with air (oxygen) rather than a nitrogen-helium environment.

Response: There is no residual sodium on the fuel in the ISCs, therefore there is no internal fire hazard. A Fire Hazards Analysis was completed for the Interim Storage Area which concluded there are no external fire hazards that would compromise the integrity of the casks.

10. What are the impacts of chloride and pesticide applications coming into contact with the concrete pad, i.e., salts from deicing, etc.? Will impacts on the pad potentially resulting from ambient conditions be considered?

Response: There are no plans to apply chlorides or pesticide applications to either the casks or the concrete pad. Even if pad degradation did occur, the pad does not perform any required safety function. Related to the ISC, chemical use restrictions will be in place and documented in the maintenance procedure per American Concrete Institute (ACI) - 515.1R guidelines.

**11. Why isn't high level waste and spent fuel storage associated with the FFTF shutdown being integrated into a site-wide situation?**

Response: The FFTF fuel, as well as other Hanford fuel, is being managed in a site-wide integrated approach. Interim storage of the inventory of irradiated FFTF fuel at the ISA will not preclude the final disposition to be selected by the *Environmental Impact Statement: Department of Energy Programmatic Spent Nuclear Fuel management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs*. A decision on whether the FFTF fuel will be consolidated with other Hanford Site fuel has not been made at this time. However, the ISC was designed to accommodate onsite transfers and a subsequent decision to transfer the fuel to a future centralized area on the Hanford Site could readily be achieved.

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