FINAL
ENVIRONMENTAL IMPACT STATEMENT
For the Construction and Operation of an
Independent Spent Fuel Storage Installation To
Store the Three Mile Island Unit 2
Spent Fuel at the Idaho National Engineering and
Environmental Laboratory

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U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards

**FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE CONSTRUCTION AND OPERATION OF AN INDEPENDENT SPENT FUEL
STORAGE INSTALLATION TO STORE THE THREE MILE ISLAND UNIT 2 SPENT FUEL
AT THE IDAHO NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY**

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Abstract

This Final Environmental Impact Statement (FEIS) was prepared by the U.S. Nuclear Regulatory Commission (NRC) in accordance with the requirements of 10 CFR Part 51, that implement the National Environmental Policy Act (NEPA) of 1969 as amended. The FEIS contains an assessment of the potential environmental impacts of the construction and operation of an Independent Spent Fuel Storage Installation (ISFSI) for the Three Mile Island Unit 2 (TMI-2) fuel debris at the Idaho National Engineering and Environmental Laboratory (INEEL). The NRC proposes to issue a license to the U.S. Department of Energy-Idaho Operations Office (DOE-ID) which will authorize DOE-ID to store the TMI-2 fuel debris in an ISFSI. DOE-ID is proposing to design, construct, and operate at the Idaho Chemical Processing Plant (ICPP). The TMI-2 fuel debris would be removed from wet storage at the Test Area North (TAN) pool, transported to the ISFSI at the ICPP, and placed in storage modules on a concrete basemat.

As part of its overall spent nuclear fuel (SNF) management program, the U.S. Department of Energy (DOE) has prepared a final programmatic environmental impact statement (EIS) that provides an overview of the spent fuel management proposed for INEEL, including the construction and operation of the TMI-2 ISFSI (the DOE SNF EIS). In addition, DOE-ID has prepared an environmental assessment (EA) to describe the environmental impacts associated with the stabilization of the TAN storage pool and the construction/operation of the ISFSI at the ICPP. As provided in NRC's NEPA procedures outlined in 10 CFR Part 51, Appendix A to Subpart A, a FEIS of another Federal agency may be adopted in whole or in part in accordance with the procedures outlined in 40 CFR 1506.3 of the regulations of the Council on Environmental Quality (CEQ). Under 40 CFR 1506.3(b), if the actions covered by the original EIS and the proposed action are substantially the same, the agency adopting another agency's statement is not required to recirculate it except as a final statement.

The NRC has determined that its proposed action of issuing a license authorizing construction and operation of the ISFSI is substantially the same as actions considered in DOE's environmental documents referenced above and, therefore, has elected to adopt the DOE documents as the NRC FEIS. The NRC staff has independently reviewed the DOE SNF EIS and the DOE-ID EA to determine that it is current and that NRC NEPA procedures have been satisfied. The format used has been to excerpt from the DOE NEPA documents a description of the proposed action, an evaluation of alternative actions, a description of the affected environment, and an evaluation of the impacts of both construction and operation of the ISFSI. The NRC staff concludes that the facility can be constructed and operated with small and acceptable effects on the public and the existing environment at the INEEL.

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SUMMARY AND CONCLUSIONS

Introduction:

This Final Environmental Impact Statement (FEIS) was prepared by the Nuclear Regulatory Commission (NRC), Office of Nuclear Material Safety and Safeguards to assess the potential environmental impacts of licensing the construction and operation of an independent spent fuel storage installation (ISFSI) for the dry storage of the fuel debris from the Three Mile Island Unit 2 (TMI-2) reactor (the proposed action). The ISFSI is to be located at the Idaho Chemical Processing Plant (ICPP) on the Idaho National Engineering and Environmental Laboratory (INEEL).

As part of its overall spent nuclear fuel (SNF) management program, the U.S. Department of Energy (DOE) has prepared a final programmatic environmental impact statement (EIS) that provides an overview of the spent fuel management proposed for INEEL, including the construction and operation of the TMI-2 ISFSI (the DOE SNF EIS). In addition, the U.S. Department of Energy-Idaho Operations Office (DOE-ID) has prepared an environmental assessment (EA) to describe the environmental impacts associated with the stabilization of the TAN storage pool and the construction/operation of the ISFSI at the ICPP. As provided in NRC's NEPA procedures outlined in 10 CFR Part 51, Appendix A to Subpart A, a FEIS of another Federal agency may be adopted in whole or in part in accordance with the procedures outlined in 40 CFR 1506.3 of the regulations of the Council on Environmental Quality (CEQ). Under 40 CFR 1506.3(b), if the actions covered by the original EIS and the proposed action are substantially the same, the agency adopting another agency's statement is not required to recirculate it except as a final statement.

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Proposed Action:

NRC's proposed action is to issue a license authorizing DOE-ID to construct and operate a dry storage ISFSI at the ICPP. The proposed action considered in the DOE-ID environmental documents is to remove the TMI-2 core debris from the TAN storage pool in preparation for transport and dry storage. The TMI-2 canisters would be stored in a dry shielded container (DSC) and transported to ICPP for storage in an ISFSI. The ISFSI would be an above-ground storage system using horizontal storage modules (HSMs) that would be sited, constructed, and operated at ICPP. Established storage cask technologies would be used for dry storage on a concrete basemat constructed at the ICPP.

Need for the Proposed Action:

The DOE has proposed the action to meet the terms and conditions of the Settlement Agreement reached among the DOE, the State of Idaho, and the U.S. Department of the Navy. Under the terms of this agreement, the DOE has committed to constructing the ISFSI by December 31, 1998 and beginning to

move fuel into the facility by March 31, 1999. In addition to terms in the Settlement Agreement, vulnerabilities in spent nuclear fuel storage at the TAN storage pool include lack of redundant containment of pool water (i.e., stainless steel pool liner), no provisions for detecting subsurface leaks from the pool, and inadequate control of the air space over the pool.

No-Action Alternative:

The no-action alternative is denial of the license application for the facility and continued storage of TMI-2 core debris, commercial fuels, and hardware in the TAN pool. The TAN pool would remain operational. Regular surveillance, monitoring, and maintenance of the pool area and Hot Shop would continue. These activities may include: physical inspection; underwater video inspection to ensure no loss of structural, containment, or integrity; and routine analysis of pool water. The leak detection monitoring and corrosion inspection devices that have been installed to address some of the TAN pool vulnerabilities would remain operational. The TMI-2 canisters and storage racks would require periodic requalification for continued underwater storage.

Alternative Spent Nuclear Fuel Storage Methods

This FEIS also considers alternative SNF storage methods. These include:

- Constructing a new wet (underwater) storage pool. This option would not meet the terms of the Settlement Agreement that requires DOE-ID to move SNF out of wet storage by 2023. In addition, wet storage facilities incur high construction and maintenance costs.
- Refurbishing the TAN Pool by removing the TMI-2 core debris from the pool and placing it into temporary storage. The pool would be upgraded to meet current standards. Suitable temporary storage facilities for the fuels and core debris do not exist at the INEEL. Because the underwater design life of the TMI-2 core debris canisters is 30 years, the integrity of the canisters would have to be reevaluated periodically. Continued storage in the TAN Pool would require the Hot Shop to remain operational.
- Storing TMI-2 Fuel in Existing ICPP Storage Systems by transporting the TMI-2 core debris from TAN to ICPP, then transferring it to either underground dry vault storage or the Irradiated Fuel Storage Facility (IFSF). This alternative was eliminated from further evaluation because there is insufficient vault space and there are other INEEL fuels identified for storage in these vaults. In addition, the TMI canisters are too tall for the shuttle bin, which transfers canisters from the handling cave to the storage area.

Alternative Sites

Alternative sites for construction and operation of the ISFSI were also considered, including:

- Constructing an ISFSI at TAN for the TMI-2 core debris. This option does not reflect the decision to consolidate SNF storage at ICPP as decided in the Record of Decision for the DOE SNF EIS.
- Constructing an ISFSI at a point within the INEEL, but removed from above the Snake River Plain Aquifer. There are two locations on the INEEL, the Birch Creek Area, and the Lemhi

Range Area, that are not over the Snake River Plain Aquifer, but are still within the Eastern Snake River Basin or streamflow source area. The site in the Lemhi Range area is near a geologic fault that could be considered a potential seismic threat. The other site is located about 1.6 km (1 mile) from a capable geological fault, and is also located in a region of steeply sloping land, potential habitat for sensitive species, private land, and is visible from a public highway.

Environmental Impacts of Construction:

Construction of the ISFSI would involve pad excavation, grading (leveling), and preparing a suitable base for the ISFSI reinforced concrete foundation. Excavated soil would be stockpiled onsite to be used upon completion of construction to provide the final grades and drainage. The disturbed area is expected to be about 0.4 ha (1.0 acre). Several environmental protection measures would be taken to mitigate potential construction impacts, including controls for noise, exhaust emissions, and fugitive dust emissions.

Groundwater at ICPP would not be affected by construction activities resulting from the proposed action. The construction would be conducted in accordance with requirements for storage and use of chemicals and construction materials so as to prevent potential contamination of the groundwater. During construction, there would be increased water usage associated with dust suppression and general construction activities. This water would be supplied from the existing ICPP water system, and the short-term usage would not adversely impact the capability of the water system or wells.

ISFSI construction at ICPP would require an average of 20 construction workers on the site for approximately one year. This is within normal fluctuations of the INEEL workforce, and temporary increases in workers would have minimal impact on regional socioeconomics. The DOE operating contractor would be responsible for managing the ISFSI operations upon completion of construction activities.

Due to the siting of this ISFSI in an existing developed area and the distance from public access points, [greater than 3.2 kilometer (2 miles)] there would be no adverse consequences to aesthetic and scenic resources. Overall environmental impacts on land use by any of the alternatives would be small because the DOE would build the proposed facility in developed areas that it has already dedicated to industrial use and that previous activities have disturbed. Under all the alternatives, proposed activities would be consistent with the existing land use plans. None of the proposed activities would involve land outside the INEEL boundaries, and no effects on surrounding land uses or local land use plans should occur.

Environmental Impacts of Operation:

The routine operation of the proposed ISFSI would involve only passive dry storage of the TMI-2 core debris which is sealed in a DSC and placed in a storage cask (i.e., HSM). The HSMs would be vented, and high efficiency particulate air filters would be used to minimize potential particulate emissions. Minor gaseous and no liquid effluents or solid wastes are expected to be generated during normal operation, nor are hazardous/toxic chemicals in storage during operation. The contribution of external radiation is from neutron and gamma dose rates generated from spent fuel storage. Shipping casks and the method of transport from TAN to ICPP would comply with applicable NRC and Department of Transportation requirements. Based on the transportation requirements, there are no reasonably foreseeable accident scenarios that would cause a threat to the public or environment from a radiological release from the casks.

The estimated effective dose equivalent (EDE) to the maximally exposed individual (MEI) of the public from emissions from the fuel and debris to be stored in the ISFSI at the ICPP is less than 0.1 mrem/yr (1×10^{-6} Sv/yr) which is 1 percent [10 mrem/yr (1×10^{-4} Sv/yr)] of the National Emission Standards for Hazardous Air Pollutants (NESHAPs).

During normal, incident-free transport for the entire onsite SNF management program at the INEEL, the potential occupational radiation exposure is calculated to be 3.4 person-rem (0.034 person-Sv), with 0.0014 latent cancer fatalities during a 40-yr period. General population exposure would potentially be 0.088 person-rem (8.8×10^{-4} person-Sv), resulting in 0.000044 latent cancer fatalities. For the maximum reasonably foreseeable SNF transportation accident on the INEEL, the estimated radioactivity exposure in the suburban population would result in about a 0.01 to 0.2 percent increase in the number of fatal cancers that would be likely from normal incidence in the affected population. The increase in latent cancer fatalities in the rural population is estimated to be about a 0.09 to 1.7 percent increase over the normal incidence rates.

During storage, the basic design features of the ISFSI would prevent loss of containment, shielding, or criticality control from a design basis accident for an earthquake, tornado, flood, fire, toppling or dropping accidents.

Conclusion:

The TMI-2 ISFSI represents only a small part of overall SNF management Activities at INEEL. Analysis of the potential environmental impacts associated with the construction and operation of an ISFSI at the ICPP indicates that adverse impacts are small when considered in the context of the Settlement Agreement among the DOE, the State of Idaho, and the U.S. Department of the Navy, the current vulnerabilities of continued storage of the TMI-2 fuel debris in the TAN pool, the current environmental conditions at the INEEL, and the scope of the ongoing operations of the INEEL. The FEIS supports licensing for the ISFSI.

FOREWORD

The information in this report will be considered by the Nuclear Regulatory Commission staff in the review of the 10 CFR Part 72 license application submitted by the U.S. Department of Energy-Idaho Operations Office for the design, construction, and operation of an independent spent fuel storage facility for Three Mile Island Unit 2 fuel debris at the Idaho National Engineering and Environmental Laboratory. This report documents the potential environmental consequences of the proposed action.

ACRONYMS AND ABBREVIATIONS

AIRFA	American Indian Religious Freedom Act
ALARA	As Low As Reasonably Achievable
ANL-W	Argonne National Laboratory-West
ARA	Auxiliary Reactor Area
ARPA	Archaeological Resources Protection Act
BLM	Bureau of Land Management
CAA	Clean Air Act
CAM	Constant Air Monitor
CEQ	Council on Environmental Quality
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
dBA	Decibels, A-Weighted
DEQ	Division of Environmental Quality
DNL	Day-Night Sound Level
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy-Idaho Operations Office
DSC	Dry Shielded Canister
EA	Environmental Assessment
EBR-1	Experimental Breeder Reactor 1
EDE	Effective Dose Equivalent
EPA	U.S. Environmental Protection Agency
ER	Environmental Report
EIS	Environmental Impact Statement
ESRP	Eastern Snake River Plain
FEIS	Final Environmental Impact Statement
FDM	Fugitive Dust Model
HEPA	High Efficiency Particulate Air
HSM	Horizontal Storage Modules
ICPP	Idaho Chemical Processing Plant
ICRP	International Commission on Radiological Protection
IDAPA	Idaho Administrative Procedures Act
IDE	Idaho Department of Education
IDHW	Idaho Department of Health and Welfare
IDLE	Idaho Department of Law Enforcement
IDWR	Idaho Department of Water Resources
INEEL	Idaho National Engineering and Environmental Laboratory
IFSF	Irradiated Fuel Storage Facility
ISC-2	Industrial Source Complex-2
ISDE	Idaho State Department of Employment
ISFSI	Independent Spent Fuel Storage Installation
LITCO	Lockheed Idaho Technologies Company
LLW	Low-Level Radioactive Waste
LMITCO	Lockheed Martin Idaho Technologies Company
LOFT	Loss-of-Fluid Test
MEI	Maximally Exposed Individual

NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standard for Hazardous Air Pollutant
NHPA	National Historic Preservation Act
NMSS	Office of Nuclear Material Safety and Safeguards
NOAA	National Oceanic and Atmospheric Administration
NRF	Naval Reactors Facility
NRC	Nuclear Regulatory Commission
NUHOMS®	Nuclear Horizontal Modular Storage System
OSHA	Occupational Safety and Health Administration
PBF	Power Burst Facility
PSD	Prevention of Significant Deterioration
PTC	Permit to Construct
RAM	Remote Air Monitor
RESL	Radiological and Environmental Sciences Laboratory
RCRA	Radiologically Controlled Requirements Area
RWMC	Radioactive Waste Management Complex
SAIC	Science Applications International Corporation
SNF	Spent Nuclear Fuel
SRP	Snake River Plain
TAN	Test Area North
T&E	Threatened and Endangered
TLD	Thermoluminescent Dosimeter
TMI	Three Mile Island
TMI-2	Three Mile Island Unit 2
TRA	Test Reactor Area
USBC	U.S. Bureau of Census
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
UTM	Universal Transverse Mercator
WAG	Waste Area Group

UNITS OF MEASURE AND SI UNIT CONVERSIONS

Property	English Units	Metric/SI Units	Conversion Factor	
			English to SI/Metric	SI/Metric to English
Length	inch	centimeter	2.54	0.3937
	feet	meter	0.3048	3.2808
	mile	kilometer	1.6093	0.6214
Area	acre	hectare	0.4047	2.4710
	square mile	square kilometer	2.5898	0.3861
Volume	gallon	cubic meter	3.785e-03	264.2008
	cubic feet	cubic meter	0.0283	35.3146
Dose Equivalent	rem	sievert	0.01	100
Measure of Exposure	Roentgen	Coulomb/Kg (X-unit)	2.5766×10^{-4}	3881
Absorbed Dose	rad	Gray (Joule/Kg)	0.01	100
Activity	Curie	Becquerel	3.7×10^{10}	2.7027×10^{-11}

1.0 PURPOSE AND NEED

1.1 Introduction

This Final Environmental Impact Statement (FEIS) has been issued by the Nuclear Regulatory Commission (NRC), Office of Nuclear Material Safety and Safeguards (NMSS). This document has been prepared in accordance with NRC regulations at Title 10 Code of Federal Regulations (CFR), Part 51, which implement the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended. In accordance with 10 CFR 51.20(b)(9), the NRC must prepare an environmental impact statement (EIS) prior to the issuance of a Part 72 license for the proposed U.S. Department of Energy (DOE) Three Mile Island Unit 2 (TMI-2) Independent Spent Fuel Storage Installation (ISFSI) at the Idaho National Engineering and Environmental Laboratory (INEEL).

The principal objectives of the NEPA process are to build into agency decision making an appropriate and careful consideration of the environmental aspects of proposed actions and to make environmental information available to public officials and citizens before decisions are made and actions are taken. The process is intended to help public officials make decisions based on an understanding of environmental consequences and to take actions that will appropriately weigh environmental concerns.

The NEPA requires in Section 102(2)(C) that the Federal Government, as part of its continuing responsibility, prepare an EIS for Federal actions significantly affecting the quality of the human environment. The statement should include:

- the environmental impact of the proposed action;
- any adverse and unavoidable environmental effects should the proposal be implemented;
- alternatives to the proposed action;
- the relationship between the local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and
- any irreversible and irretrievable commitments of resources involved should the proposed action be implemented.

The NEPA also established the Council on Environmental Quality (CEQ) to assist Federal agencies in meeting their NEPA responsibilities, and the NRC takes account of CEQ regulations in preparing its environmental documents. CEQ regulations provide that an agency may adopt the FEIS of another agency provided that the FEIS being adopted meets the standards for an adequate statement [See 40 CFR 1506.3(a)]. If the proposed action and actions covered by the FEIS being adopted are substantially the same, the agency adopting another agency's statement is not required to recirculate it except as a final statement [See 40 CFR 1506.3(b)]. In 1983, the CEQ issued guidance designed to encourage agencies to make use of adoption procedures in appropriate cases to eliminate duplicative EISs and reduce delay (48 FR 34263). CEQ's guidance counsels that when an agency plans to adopt the FEIS of another agency it must independently review that FEIS to determine that it is current and that its own NEPA procedures have been satisfied. The guidance also makes clear that other environmental documents, such as environmental assessments (EAs), may also be adopted provided that the adopting agency independently evaluates the information contained therein and takes full responsibility for its scope and content.

1.2 Adoption of DOE's Environmental Impact Statement and Environmental Assessment

The Department of Energy has prepared two documents that consider the environmental impacts of actions that are substantially the same as the proposed action:

As part of its spent fuel management program, the DOE prepared the "Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement," DOE EIS-0203-F (DOE SNF EIS) which was issued in April 1995 after extensive public comment (U.S. Department of Energy, 1995a). The DOE SNF EIS provides an overview of the spent fuel management proposed for INEEL, of which the construction and operation of the TMI-2 ISFSI is only a small part. Although much of this document reflects the broader goals of the DOE spent fuel management plan and is not specific to the proposed licensing action, it also contains much of the same background environmental information that must be provided in the NRC FEIS. The Record of Decision for this FEIS makes a decision to consolidate spent fuels currently stored at various locations at the INEEL at ICPP but deferred decision on the particular project that involves relocating the TMI-2 fuel debris.

Subsequently, the DOE prepared an "Environmental Assessment: Test Area North Pool Stabilization Project," DOE/EA-1050 (DOE EA), which was issued in draft in May 1995 (U.S. Department of Energy-Idaho Operations Office, 1995) after a public comment period, and then modified and released for a second comment period, further revised, and reissued in May 1996 (U.S. Department of Energy-Idaho Operations Office, 1996a). This EA is tiered from the DOE SNF EIS. The proposed action analyzed in the DOE EA would remove the canisters of TMI-2 core debris and commercial fuels from the Test Area North (TAN) Pool and transfer them to the ICPP for interim dry storage in an ISFSI. Thus, the DOE EA evaluated environmental impacts associated with (a) constructing an ISFSI at ICPP; (b) removing the TMI-2 and commercial fuels from the pools and transporting them to ICPP for placement in the ISFSI; and (c) draining and stabilizing the TAN Pool. This EA also evaluated reasonable alternatives, including the no action alternative. In August 1997, after a public comment period, DOE issued an update (U.S. Department of Energy-Idaho Operations Office, 1997) of this EA (DOE/EA-1217) to include in the proposed action a "drying process" for the TMI-2 core debris canisters, and certain other SNF currently stored underwater in the TAN Pool.

The NRC staff has independently reviewed the DOE SNF EIS to determine that it is current and that the NRC NEPA procedures have been satisfied. The staff has also independently reviewed the DOE EA and its update to evaluate the material specific to the proposed licensing action and to determine whether it is sufficient, when taken together with the DOE SNF EIS, in scope and content to be used as the basis for the NRC FEIS. The staff finds that these documents include an environmental analysis of the same actions as the proposed action of the NRC FEIS, such that adoption of these documents as the NRC FEIS is appropriate.

The NRC has developed the FEIS by excerpting text, figures and tables from the DOE documents that are related to the proposed licensing action to construct an ISFSI at the ICPP. These sections have been identified in the text, and incorporated into the NRC FEIS. Where less than a complete section has been excerpted, ellipses (...) have been added to show the omission. Sections from the DOE documents have been renumbered to correspond to the outline of the NRC FEIS, and referencing has been changed to correspond to NRC format requirements. Additionally, minor editorial changes of conversion to SI units, punctuation, grammar, consistency, and references to sections from the DOE documents have been made

to the excerpted material to aid in readability. The excerpted text has also been modified throughout to incorporate the 1997 name change to INEEL. Where necessary, text has been added to clarify information (e.g., acronyms, references, etc.) contained in excerpts from the DOE documents. This additional text has been identified in square brackets. In accordance with 10 CFR Part 51, the applicant submitted, along with its license application, an Environmental Report (ER) on October 31, 1996 (U.S. Department of Energy-Idaho Operations Office, 1996b). This ER provides additional descriptive information for this EIS.

1.3 Background Information

An introduction for the proposed construction and operation of an ISFSI for the TMI-2 core debris is provided in Section 1., Introduction, of the U.S. Department of Energy-Idaho Operations Office (DOE-ID) EA (U.S. Department of Energy-Idaho Operations Office, 1997):

As did the 1996 EA [U.S. Department of Energy-Idaho Operations Office, 1996a], this update [U.S. Department of Energy-Idaho Operations Office, 1997] analyzes the environmental and health impacts of removing various radioactive materials from underwater storage, dewatering these materials, constructing a new interim dry storage facility, and transporting and placing the materials into the new facility. Also, as did the 1996 EA, this EA analyzes the removal, treatment, and disposal of water from the pool, and placement of the facility into a safe, standby condition. The entire action would take place within the boundaries of the INEEL. The materials are currently stored underwater in the TAN building 607 pool, the new interim dry storage facility would be constructed at the Idaho Chemical Processing Plant (ICPP) which is about 25 miles south of TAN, see Figure 1.3-1. The materials that would be removed from underwater storage and placed into dry storage include nuclear reactor core debris from the 1979 TMI Unit 2 reactor accident. ...

In May of 1995, the State of Idaho asked the District Court to continue the prior injunction against SNF transportation by the [DOE], claiming that the SNF EIS was defective. This litigation was settled between DOE, the Department of the Navy, and the State of Idaho. On October 17, 1995, the Federal District Court entered a Court Order that incorporated, as requirements, the terms and conditions of the parties' in a Settlement Agreement (U.S. Department of Energy, 1995c). Paragraph E7 of the Settlement Agreement states that "DOE shall complete construction of the Three Mile Island dry storage facility by December 31, 1998. DOE shall commence moving fuel into the facility by March 31, 1999, and shall complete moving fuel into the facility by June 1, 2001." Among the terms and conditions of the Settlement Agreement is the requirement to transfer all spent nuclear fuel out of wet storage, to request funds to replace wet storage, and to commence spent fuel loading into dry storage by July 1, 2003. The proposed action analyzed in this EA is consistent with, and preparatory to, meeting those terms and conditions.

A separate lawsuit challenging the adequacy of the DOE SNF EIS remains pending in the United States District Court for the District of Idaho, Snake River Alliance Education Fund v. DOE, No. CV95-0331-S-EJL.

Figure 1.3-1 Location of facilities within the Idaho National Engineering and Environmental Laboratory (U.S. Department of Energy-Idaho Operations Office, 1997)

Background information on the proposed licensing action is provided in Section 1.2, Background, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

The TAN-607 facility, which includes the TAN Pool and Hot Shop (Figure 1.3-2), was constructed in 1954. The TAN Pool was designed to store radioactive materials and is presently loaded to nearly 100% of useable capacity with the TMI core debris canisters, commercial fuels, and hardware (U.S. Department of Energy, 1993a). In August of 1993, the Secretary of Energy commissioned a comprehensive baseline study of the environmental, safety, and health vulnerabilities associated with the storage of SNF in the DOE complex. A multidisciplinary working group comprised of DOE employees and contractors evaluated the inventory and condition of DOE's reactor-irradiated nuclear material, which includes SNF and reactor-irradiated target material. The working group also evaluated the condition of facilities that store SNF and identified the vulnerabilities and problems associated with these facilities. Vulnerabilities identified at TAN include inadequate corrosion monitoring, lack of leak detection and leak trending of the pool water inventory, and a potential deficiency in the seismic design of the basin (U.S. Department of Energy, 1993a). DOE issued a Phase I Plan of Action to address SNF storage vulnerabilities in February 1994 (U.S. Department of Energy, 1994a), a Phase II Plan of Action in April 1994 (U.S. Department of Energy, 1994b), and a Phase III Plan of Action in October 1994 (U.S. Department of Energy, 1994c). The TAN Pool Stabilization Project addresses vulnerabilities identified in these plans.

The TAN Hot Shop is a large shielded high bay with overhead cranes, a large overhead manipulator, auxiliary wall mounted manipulators, and other equipment for remotely handling radioactive material. The Hot Shop is designed for the examination, testing, and monitoring of SNF, storage casks, and radioactive materials. The TAN Pool consists of the pool and a vestibule, an extension of the TAN Pool. A submerged passageway with an underwater rail system and transfer cart connects the vestibule to the main TAN Pool. The top of the passageway is 5 ft [1.5 m] underwater to protect the main pool area from potential radiation sources in the Hot Shop and to isolate the air exchange between the Hot Shop and TAN Pool. The Hot Shop also contains a silo, which is a shielded enclosure used for temporary storage of SNF assemblies and other radioactive materials.

The canisters containing the TMI core debris are stored in a fully flooded and vented condition in the TAN Pool. During defueling operations at the TMI-2 plant, the debris was placed in three types of cylindrical stainless-steel canisters: fuel, knockout, and filter (Figure 1.3-3). The fuel canisters are receptacles for large pieces of core debris, the knockout canisters were designed to contain smaller debris, and the filter canisters contain stainless-steel filters and fines that were collected in the filters during defueling operations. Neutron absorbing materials (boron carbide poison in the form of plates or rods) were designed into each type of canister to prevent criticality events. The canisters, placed in the TAN Pool between 1986 and 1990, are currently stored in a six-pack configuration in stainless-steel storage modules lined with poison plates.

The TMI core material contained in the canisters is not typical of normal commercial fuels with intact fuel assemblies or fuel rods. The TMI core material is an agglomerate of the various items that existed within the reactor vessel after the accident. Due to the unique (damaged) nature of the core material, it was placed in specially designed canisters

Figure 1.3-2 Diagram of the Test Area North hot shop and Test Area North pool area (U.S. Department of Energy-Idaho Operations Office, 1997)

Figure 1.3-3 Diagrams of the three types of Three Mile Island Unit 2 core debris canisters (U.S. Department of Energy-Idaho Operations Office, 1997)

for transport from the TMI reactor to Idaho for storage. The damaged condition of the fuel, gas generation potential, low heat load, and relatively low volatile fission product inventory differentiate the debris from normal SNF. Due to the debris' characteristics and degree of water removal, it may be stored in a vented configuration or in a storage system designed to accommodate the generation of combustible gases. Intact (non-damaged) commercial fuels also have low decay heat loads; however, because volatile fission products are contained in the fuel rod cladding, vented dry storage is not required.

In a wet storage condition, the TMI canisters must vent to release radiolytic generated hydrogen and oxygen. Venting is accomplished through a vent orifice located in the top of each canister. Orifices were sealed using protective caps for canister shipment from TMI in Pennsylvania to the INEEL. The canisters were received at TAN and placed in the TAN Pool, the protective caps removed, and the canisters flooded with demineralized water. To allow gases generated within the canisters to escape, the vent port on each canister was connected to a water filled vent tube that extends upwards and out of the pool water surface.

1.4 Need for the Proposed Action

The need for the proposed action is discussed in Section 1.1, Need for Agency Action, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

DOE has identified, and proposes to eliminate vulnerabilities associated with SNF storage facilities [*Spent Fuel Working Group Report on Inventory and Storage of the Department's Spent Nuclear Fuel and Other Reactor Nuclear Material and Their Environmental, Safety, and Health Vulnerabilities* (U.S. Department of Energy 1993a)]. Vulnerabilities that were originally identified for TAN are storage of SNF in an unlined pool, wet storage of commercial SNF in aluminum coffins, and seismic inadequacy of the pool.

Compliance with the terms and conditions of the Settlement Agreement as discussed in Section 1.0 [of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997)].

The TAN Pool does not meet SNF storage requirements delineated in DOE Order 420.1 "Facility Safety" (U.S. Department of Energy, 1995d). Principal deficiencies of the TAN Pool include lack of redundant containment of pool water (i.e., stainless steel pool liner), no provisions for detecting subsurface leaks from the pool, and inadequate control of the air space over the pool.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 No Action Alternative

A description of the No Action Alternative is provided in Section 2.2.1, No Action, of the U.S. Department of Energy (DOE) Environmental Assessment (EA) (U.S. Department of Energy-Idaho Operations Office, 1997):

The no action alternative is to continue storage of TMI [Three Mile Island] core debris in the TAN [Test Area North] Pool. The TAN Pool would remain operational. Regular surveillance, monitoring, and maintenance of the pool area and Hot Shop would continue. These activities may include: physical inspection; underwater video inspection to ensure no loss of structural containment or integrity; and routine analysis of pool water. The leak detection monitoring and corrosion inspection devices that have been installed to address some of the vulnerabilities discussed in Section 1.1 [of the U.S. Department of Energy-Idaho Operations Office (DOE-ID) EA (U.S. Department of Energy-Idaho Operations Office, 1997)] would remain operational. The TMI canisters and storage racks would require periodic requalification for continued underwater storage.

2.2 Proposed Action

A description of DOE's Proposed Action which includes NRC's Proposed Licensing Action is provided in Section 2.1, Proposed Action, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

The proposed action is to remove the TMI-2 core debris ... from the TAN Storage Pool ... in preparation for transport and storage. The TMI-2 canisters ... would be transported to the ICPP [Idaho Chemical Processing Plant] for storage in an ISFSI [Independent Spent Fuel Storage Installation]. The ISFSI would be an above-ground storage system that would be sited, constructed, and operated at ICPP. ... Any future proposals for the TAN Pool or the Hot Shop would undergo subsequent NEPA [National Environmental Policy Act] review.

An additional description of the details of the transfer of the TMI-2 fuel debris from TAN to the ICPP is provided in Section 1.3, Description of the TMI-2 Debris, of the DOE Environmental Report (ER) submitted as part of the License Application for the construction and operation of the ISFSI (U.S. Department of Energy-Idaho Operations Office (1996b):

Transfer of the TMI-2 debris from TAN to ICPP would require the TMI-2 canisters to be loaded into a NUHOMS® DSC [dry shielded canister]. The DSC would then be loaded into the transport cask. The transport cask would be placed on a special use trailer, inspected, and transported by truck to the TMI-2 ISFSI at ICPP. Transportation from TAN to ICPP would be conducted in accordance with a route specific license¹ that would be obtained from the Nuclear Regulatory Commission

¹While these shipments will most likely be made under the general licensing provisions of 10 CFR 71.12, a specific route approval would be required under 10 CFR 73.37.

nuclear fuel. Upon arrival of the transport cask at the ISFSI, the trailer would be positioned at the HSM for cask transfer. The transport cask lid and ram-port cover would be removed, whereby the ram would push the DSC into a vacant position in a HSM. The HSM storage door would then be installed, the DSC vent system connected, and the transport cask prepared for a return to TAN to repeat the operation. It is anticipated that twenty-nine trips would be required to transport all the TMI-2 canisters from TAN to ICPP.

2.2.1 Construction and Operation of an Independent Spent Fuel Storage Installation

A description of the activities related to the construction and operation of the ISFSI is provided in Section 2.1.4, Independent Spent Fuel Storage Installation, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

The ISFSI would be a dry, above-ground SNF storage system which is based on an existing NRC topical license adapted to the unique features of the TMI debris (disrupted fuel in existing storage canisters). ... The ISFSI would be designed to (a) receive the transport cask, (b) transfer the debris ... from the transport cask into storage, (c) store the canisters ... (d) allow inspection and monitoring of key safety parameters during storage, and (e) provide for retrievability of the canisters ... to allow ready retrieval of SNF for further processing or disposal (10 CFR 72.122). A vacant storage position in the ISFSI or a transport cask would be maintained for overpacking or retrieval of canisters. Figure 2.2-1 depicts an artist rendition of an ISFSI.

The ISFSI would be located near CPP-666 (Figure 2.2-2) in an area that would accommodate access. Figure 2.2-3 depicts the plan view of the TMI-2 ISFSI submitted to the NRC for licensing. The ISFSI pad would require approximately one acre [0.4 hectare] and the design would incorporate shielding and design features for safe operation. It would be designed to accommodate combustible gas, specifically hydrogen and oxygen generated by radiolysis ... below explosive levels. Any gases generated in the canisters would pass through a HEPA [High Efficiency Particulate Air] filter prior to release to the atmosphere. Constant air monitors (CAMs), remote air monitors (RAMs), and passive air monitoring systems would be used, if required by the NRC safety analysis.

2.3 Alternative Spent Fuel Storage Methods

This section describes "... alternatives that were considered and dismissed from further consideration ..." in the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997).

2.3.1 Construct New Wet Storage Facilities

A description of the consideration and dismissal of constructing new wet storage as an alternative is provided in Section 2.2.2.2, Construct New Wet Storage, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

Figure 2.2-1 Artist rendering of an Independent Spent Fuel Storage Installation (U.S. Department of Energy-Idaho Operations Office, 1997)

Figure 2.2-2 Proposed Independent Spent Fuel Storage Installation location at the Idaho Chemical Processing Plant (U.S. Department of Energy-Idaho Operations Office, 1997)

Figure 2.2-3 Independent Spent Fuel Storage Installation construction site, Three Mile Island Unit 2 Independent Spent Fuel Storage Installation pad and storage modules at the Idaho Chemical Processing Plant (U.S. Department of Energy-Idaho Operations Office, 1997)

Construction of a new wet (underwater) storage pool would not meet the terms of the Settlement Agreement that requires the DOE-ID to move SNF out of wet storage by 2023. In addition, wet storage facilities incur high construction and maintenance costs.

2.3.2 Refurbish the Test Area North Pool

A description of the consideration and dismissal of refurbishing the TAN Pool as an alternative is provided in Section 2.2.2.1, Refurbish the TAN Pool, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

The TMI core debris ... would be removed from the pool and placed into temporary storage. The pool would be upgraded to meet current standards. Suitable temporary storage facilities for the fuels and core debris do not exist at the INEEL. Because the underwater design life of the TMI core debris canisters is 30 years, the integrity of the canisters would have to be reevaluated periodically. Continued storage in the TAN Pool would require the Hot Shop to remain operational.

2.3.3 Store Three Mile Island Unit 2 Fuel in Existing Idaho Chemical Processing Plant Storage Systems

A description of the consideration and dismissal of storing the TMI-2 fuel in the existing ICPP storage systems as an alternative is provided in Section 2.2.2.3, Store the TMI Canisters and Loss-of-Fluid Test (LOFT) and Commercial Fuels in Existing ICPP Storage Systems, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

This alternative would transport the TMI core debris ... from TAN to ICPP, then transfer them to either underground dry vault storage (CPP-749) or the Irradiated Fuel Storage facility (IFSF) located at CPP-603 (Figure 2.2-2). This alternative was eliminated from further evaluation because there is insufficient vault space and there are other INEEL fuels identified for storage in these vaults.

The IFSF is a shielded storage facility at ICPP and has 636 positions for canisters of SNF. There are currently 327 unused canister positions. The IFSF storage canisters are approximately 11-ft tall [3.35 m] and 18 inches [0.5 m] in diameter while the TMI canisters are approximately 12.5-ft [3.8 m] tall and would extend approximately 18 inches [0.5 m] above the IFSF vaults. There is not adequate space in the IFSF to transfer the TMI canisters into the IFSF canisters or for the necessary lifting and handling fixtures and tools. In addition, the TMI canisters are too tall for the shuttle bin, which transfers canisters from the handling cave to the storage area.

2.4 Alternative Sites

Alternative sites for construction and operation of the ISFSI were also considered and dismissed in the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997).

2.4.1 Construct an Independent Spent Fuel Storage Installation at Test Area North

A description of the consideration and dismissal of constructing and operating the TMI-2 ISFSI at TAN as an alternative is provided in Section 2.2.2.4, Construct an ISFSI at TAN, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

Construction of an ISFSI at TAN for the TMI and commercial fuel does not reflect the decision to consolidate SNF storage at ICPP as decided in the Record of Decision for the SNF EIS (U.S. Department of Energy, 1995b). This alternative was included in the May, 1995 version of this EA and was subsequently eliminated.

2.4.2 Construct an Independent Spent Fuel Storage Installation at a Point Removed from Above the Snake River Plain

A description of the consideration and dismissal of constructing and operating the TMI-2 ISFSI at a point removed from above the Snake River Plain (SRP) Aquifer as an alternative is provided in Section 2.2.2.5, Construct an ISFSI at a Point Removed from above the SRP Aquifer, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

Paragraph E8 of the Settlement Agreement among DOE, the Department of the Navy and the State of Idaho (U.S. Department of Energy, 1995c) requires that DOE shall, after consultation with the State of Idaho, determine the location of dry storage facilities within the INEEL, which shall, to the extent technically feasible, be at a point removed from above the Snake River Plain Aquifer, an EPA designated sole source aquifer. In accordance with this Agreement, a review was conducted to determine if there is such an alternative site on the INEEL for the proposed ISFSI.

Figure 2.4-1 shows the boundaries of the INEEL imposed over a map of the Eastern Snake River Basin and the Eastern Snake River Plain Aquifer. There are two locations on the INEEL, the Birch Creek Area, and the Lemhi Range Area, that are not over the Snake River Plain Aquifer, but are still within the Eastern Snake River Basin or streamflow source area. These sites were also dismissed as one is near a geologic fault that could be considered a potential seismic threat. The other site was dismissed due to the parcel's proximity [1.6 km] (1 mile) from a capable geological fault, steep slopes of the land, potential habitat for sensitive species, proximity to private land, and visibility from Highway 22.

All precipitation that falls in the Eastern Snake River Basin that does not evaporate or is not transpired is transported by rivers and streams or flows underground to the Snake River Plain Aquifer. The Birch Creek Area is located over an alluvial aquifer that provides recharge to the SRP Aquifer. The Lemhi Range Area encompasses the southern extension of the Lemhi Mountain Range which contains many intermittent stream channels that drain to the Snake River Plain Aquifer. Neither area would provide a construction site for the proposed ISFSI that is hydrologically isolated from the SRP Aquifer. Additionally, the development of either the Birch Creek or the Lemhi Range areas would require site preparation in undeveloped locations, access road construction and the extension of utility lines, all of which would cause environmental impacts. The negative environmental impacts and the cost of developing

Figure 2.4-1 Location of the Idaho National Engineering and Environmental Laboratory, Eastern Snake River Plain and the generalized flow direction of the Snake River Plain Aquifer (U.S. Department of Energy, 1995a)

separate infrastructure in either the Birch Creek or Lemhi Range area would be much greater than the construction of an ISFSI within the boundaries of an existing facility such as TAN or ICPP. For these reasons, the alternative of siting the proposed ISFSI off the aquifer was eliminated from further consideration.

3.0 AFFECTED ENVIRONMENT

3.1 Site Description

An overview of the site description of the affected environment at the Idaho National Engineering and Environmental Laboratory (INEEL) is provided in the Section 2.1.1, Site Location and Description, of the U.S. Department of Energy-Idaho Operations Office (DOE-ID) Environmental Report (ER) (U.S. Department of Energy-Idaho Operations Office, 1996a):

The ISFSI is to be located at the INEEL, one of nine multiprogram laboratories within the DOE complex. The INEEL area measures about 37.5 mi (60.3 km) north to south and about 34.8 mi (56.0 km) east to west. Figure 3.1-1 depicts the location of the INEEL in relation to Idaho and adjacent states, Figure 3.1-2 shows the location of the INEEL relative to surrounding cities. Most of the INEEL is located within Butte County, but portions are also within Bingham, Bonneville, Jefferson, and Clark counties. The ICPP [Idaho Chemical Processing Plant] is located totally within Butte County.

The INEEL has nine primary facility areas situated on an expanse of otherwise undeveloped, high-desert terrain. The ISFSI would be sited at the ICPP, a facility with the mission to receive and store spent nuclear fuels and radioactive wastes. Other INEEL facilities include Test Area North (TAN), Naval Reactors Facility (NRF), Test Reactor Area (TRA), Central Facilities Area (CFA), Power Burst Facility (PBF), Auxiliary Reactor Area (ARA), Argonne National Laboratory-West (ANL-W), and the Radioactive Waste Management Complex (RWMC). The INEEL is the current wet storage site for the TMI-2 core debris.

The geographic center of the ICPP is easting 43° 34' 13" latitude, northing 112° 55' 56" longitude. The Universal Transverse Mercator (UTM) coordinates of the proposed ISFSI location within ICPP are 213.665 mi (343.867 km) east by 2998.424 mi (4825.583 km) north, Zone 12.

The ISFSI site is located in a flat-lying area near the Big Lost River in the south central part of the INEEL. The area is underlain by about 30 to 60 ft (9–18 m) of Big Lost River alluvial silts, sands, and gravels, which lie on an alternating sequence of basalt lava flows and interbedded sediments extending to a depth of about 2,000 to 2,300 ft (600 to 700 m). Landforms in the vicinity of ISFSI consist of braided channels (some abandoned) of the Big Lost River to the west and north of the site, and irregular flow lobes of basalt lavas to the east of the site.

...

The INEEL site, controlled by the DOE, occupies about 890 square miles (2,300 km²). The ISFSI would occupy approximately [1 acre (0.4 ha)] within the ICPP complex such that a 100 meter radius includes current areas of the ICPP (Figure 3.1-3). As depicted in Figure 3.1-4, the shortest distance from the ICPP to the INEEL site boundary is to the south, a distance of 8.5 mi (13.7 km). The next closest INEEL boundary to ICPP is 8.6 mi (13.8 km) to the northwest. The INEEL is remote from major population centers, waterways, and interstate transportation routes. The INEEL has no permanent residents,

SAA0044

Figure 3.1-1 Location of the Idaho National Engineering and Environmental Laboratory in southeastern Idaho (U.S. Department of Energy-Idaho Operations Office, 1996b)

Figure 3.1-3 Three Mile Island Unit 2 Independent Spent Fuel Storage Installation location with 100 meter radius line (U.S. Department of Energy-Idaho Operations Office, 1996b)

Figure 3.1-4 Distance from the Idaho Chemical Processing Plant to the Idaho National Engineering and Environmental Laboratory boundary (U.S. Department of Energy-Idaho Operations Office, 1996b)

and ingress and egress of site personnel for performance of their duties and visiting personnel on official business are strictly controlled by the DOE. Visitor access to the INEEL is restricted, except for persons driving through the INEEL on one of four public highways and visitors to the Experimental Breeder Reactor-1 (EBR-1), National Historical Monument, which is open to the public during the summer months.

3.2 Geology, Soils, and Seismology

A description of the general geology of the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.6.1, General Geology, of the DOE Spent Nuclear Fuel (SNF) Environmental Impact Statement (EIS) (U.S. Department of Energy, 1995a):

The site is on the Eastern Snake River Plain (Figure 3.2-1). The Plain forms a broad northeast-trending, crescent-shaped trough with low relief composed primarily of surface basaltic lava flows formed 1.2 million to 2,100 years ago. The Plain features thin, discontinuous, and interbedded deposits of wind-blown loess and sand; water-borne alluvial fan, lacustrine, and floodplain alluvial sediments; and rhyolitic domes formed 1,200,000 to 300,000 years ago (Kuntz et al., 1990) (Figure 3.2-2). Mountains and valleys of the Basin and Range Province, which trend north to northwest and consist of folded and faulted rocks that are more than 70 million years old, bound the Plain on the north and south. The Yellowstone Plateau bounds the Plain on the northeast. The major episode of Basin and Range faulting began 20 to 30 million years ago and continues today, most recently associated with the October 28, 1983, Borah Peak earthquake [moment magnitude 6.9, magnitude 7.3 on the Richter scale with a resulting peak around acceleration of 0.022 to 0.078 at the INEEL (Jackson, 1985)], which occurred along the Lost River fault, approximately 100 kilometers (62 miles) from site facilities and the 1959 Hebgen Lake Earthquake, moment magnitude 7.5, approximately 150 kilometers (93 miles) from the INEEL (Figure 3.2-1).

The northeast-trending volcanic terrain of the Plain has a markedly different geologic history and tectonic pattern than the folded and faulted terrain of the northwest-trending Basin and Range. The Basin and Range faults have not been observed on or across the Plain. Four northwest-trending volcanic rift zones, attributed to basaltic eruptions that occurred 4 million to 2,100 years ago, lie across the Plain at the INEEL (Bowman, 1995; Hackett and Smith, 1992; Kuntz et al., 1990).

The seismic characteristics of the Eastern Snake River Plain and the adjacent Basin and Range Province are also different. Earthquakes and active faulting are associated with the Basin and Range tectonic activity. The Plain has historically experienced few and small earthquakes (King et al., 1987; Pelton et al., 1990; Woodward-Clyde Consultants, 1992; Jackson et al., 1993).

A description of the natural resources of the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.6.2, Natural Resources, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

In 1979 the INEEL drilled a geothermal exploration well to 3,159 meters (10,365 feet). Researchers measured a temperature of 142 °C (288 °F) but identified no commercial

Legend:

- Large Earthquake Epicenter
- Town
- - - Limits of Parabolic Zone of Seismicity
- Quaternary Normal Faults
- Holocene Movement
- Pleistocene Calderas
- Tertiary Calderas

Figure 3.2-1 Location of Idaho National Engineering and Environmental Laboratory in context of regional geologic features (U.S. Department of Energy, 1995a)

Figure 3.2-2 Lithologic logs of deep drill holes in the Idaho National Engineering and Environmental Laboratory area (U.S. Department of Energy, 1995a)

quantities of geothermal fluids (Idaho Department of Water Resources, 1980). Mineral resources include several quarries or pits inside the INEEL boundary that supply sand, gravel, pumice, silt, clay, and aggregate for road construction and maintenance, new facility construction and maintenance, waste burial activities, and ornamental landscaping cinders. During excavations, DOE might study the gravel pits to characterize the local surficial geology of the site. Outside the site boundary, mineral resources include sand, gravel, pumice, phosphate, and base and precious metals (Strowd et al., 1981; Mitchell et al., 1981). The geologic history of the Plain makes the potential for petroleum production at the INEEL very low.

A description of the general seismology of the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.6.3, Seismic Hazards, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

The distribution of earthquakes at and near the INEEL from 1884 to 1989 clearly shows that the Plain has a remarkably low rate of seismicity, whereas the surrounding Basin and Range has a fairly high rate (Figure 3.2-3, Woodward-Clyde Consultants, 1992). The mechanism for faulting and generation of earthquakes in the Basin and Range is attributed to northeast-southwest directed crustal extension.

Several investigators have suggested hypotheses for the low rate of seismic activity within the Plain compared to the activity in both the Centennial Tectonic Belt and the Intermountain Seismic Belt:

- Smith and Sbar (1974) and Brott et al. (1981) suggest that high crustal temperatures beneath the Plain and adjacent region inside the seismic parabola (Figure 3.2-1) result in ductile deformation (aseismic creep), in contrast to the brittle deformation (rock fracture) that occurs in the Basin and Range.
- Anders et al. (1989) suggest that the Plain and the adjacent region inside the seismic parabola (Figure 3.2-1) have increased integrated lithospheric strength. They propose that the presence of mid-crustal basic intrusive rock strengthens the crust so that it is too strong to fracture (see also Smith and Arabasz, 1991).
- Parsons and Thompson (1991) propose that magma dike injection suppresses normal faulting and associated seismicity by altering the local tectonic stress field. As dikes are injected in volcanic rift zones, they push apart the surrounding rocks and decrease differential stress, thereby preventing earthquakes from occurring.
- Anders and Sleep (1992) propose that the introduction of mantle-derived magma into the midcrust beneath the Plain has decreased faulting and earthquakes by lowering the rate of deformation.

The markedly different tectonic and seismic histories of the Plain and Basin and Range provinces reflect the dissimilar deformational processes acting in each region. Both regions are subjected to the same extensional stress field (Weaver et al., 1979; Zoback and Zoback, 1989; Pierce and Morgan, 1992; Jackson et al., 1993); however, crustal deformation occurs through dike injection in the Plain and through large-scale normal

Figure 3.2-3 Earthquakes with magnitudes greater than 2.5 from 1884 to 1989 (U.S. Department of Energy, 1995a)

faulting in the Basin and Range (Rodgers et al., 1990; Parsons and Thompson, 1991; Hackett and Smith, 1992).

Major seismic hazards include the effects from ground shaking and surface deformation (faulting, tilting). Other potential seismic hazards (e.g., avalanches, landslides, mudslides, soil settlement, and soil liquefaction) are not likely to occur at the INEEL because the local geologic conditions are not conducive to them. Based on the seismic history and the geologic conditions, earthquakes greater than moment magnitude 5.5 (and associated strong ground shaking and surface fault rupture) are not likely to occur in the Plain. However, moderate to strong ground shaking from earthquakes in the Basin and Range can affect the INEEL. Researchers use patterns of seismicity and locations of mapped faults to assess potential sources of future earthquakes and to estimate levels of ground motion at the site. The sources and maximum magnitudes of earthquakes that could produce the maximum levels of ground motions at all INEEL facilities include the following (Woodward-Clyde Consultants, 1990; Woodward-Clyde Consultants, 1992):

- A moment magnitude 7.0 earthquake at the southern end of the Lemhi fault along the Howe and Fallert Springs segments
- A moment magnitude 7.0 earthquake at the southern end of the Lost River fault along the Arco segment
- A moment magnitude 5.5 earthquake associated with dike injection in either the Arco or Lava Ridge-Hell's Half Acre Volcanic Rift Zone and the Axial Volcanic Zone
- A "random" moment magnitude 5.5 earthquake occurring in the Eastern River Plain. ...

3.3 Hydrology

3.3.1 Surface Water Resources

A description of the surface water resources in the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.8.1, Surface Water, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

Other than surface-water bodies formed from accumulated runoff during snowmelt or heavy precipitation and manmade infiltration and evaporation ponds, there is little surface water at the site. The following sections discuss regional drainage conditions, local runoff, floodplains, and surface-water quality. Figure 3.3-1 supports discussions in this section.

3.3.1.1 Regional Drainage

The INEEL is in the Pioneer Basin, a closed drainage basin that includes three main surface-water bodies—the Big and Little Lost Rivers and Birch Creek. These water bodies drain mountain watersheds directly west and north of the site. However, most of the

Figure 3.3-1 Selected facilities and predicted inundation map for probable maximum flood-induced overtopping of Mackay Dam at the Idaho National Engineering and Environmental Laboratory U.S. Department of Energy, 1995a)

surface-water flow is diverted for irrigation before it reaches site boundaries (Barracclough et al., 1981), resulting in little or no flow for several years inside the site boundaries (Pittman et al., 1988).

The Big Lost River drains approximately 3,755 square kilometers (1,450 square miles) of land before reaching the site. Approximately 48 kilometers (30 miles) upstream of Arco, Idaho, Mackay Dam controls and regulates the flow of the river, which continues southeast past the towns of Moore and Arco and onto the Eastern Snake River Plain. The river channel then crosses the Southwestern boundary of the site, where the INEEL Diversion Dam controls surface-water flow. During heavy runoff events, the dam diverts surface water to a series of natural depressions, designated as spreading areas. The Big Lost River continues northeasterly across the site to an area of natural infiltration basins (playas or sinks) near Test Area North. In dry years, surface water does not usually reach the western boundary of the site, and because the INEEL is located in a closed drainage basin, surface water never flows off the site.

Birch Creek drains an area of approximately 1,943 square kilometers (750 square miles). In the summer, upstream of the site, surface water from Birch Creek is diverted to provide irrigation and to produce hydropower. In the winter, water flow crosses the northwest corner of the site, entering a manmade channel 6.4 kilometers (4 miles) north of TAN, where it then infiltrates into channel gravels.

The Little Lost River drains an area of approximately 1,826 square kilometers (705 square miles). Streamflow is diverted for irrigation north of Howe, Idaho. Surface water from the Little Lost River has not reached the site in recent years; however, during high stream flow years, water will reach the site and infiltrate into the subsurface (EG&G, 1984).

3.3.1.2 Local Runoff

Surface water generated from local precipitation will flow into topographic depressions (lower elevations than the surrounding terrain) on the site. This surface water either evaporates or infiltrates into the ground, increasing subsurface saturation and enhancing subsurface migration (Wilhelmson et al., 1993).

Localized flooding can occur at the site when the ground is frozen and melting snow combines with heavy spring rains. Test Area North was flooded in 1969 (Koslow and Van Haaften, 1986). In 1969 extensive flooding caused by snowmelt occurred in the lower Birch Creek Valley (Koslow, 1984). Studies have shown that both the 25- and 100-year, 24-hour rainfall/snowmelt storm event could cause flooding within the Radioactive Waste Management Complex (Dames & Moore, 1992). The drainage system, including dikes and erosion prevention features designed to mitigate potential surface water flooding, are being upgraded.

3.3.1.3 Floodplains

Intermittent surface-water flow and the INEEL Diversion Dam (built in 1958 and enlarged in 1984) have effectively prevented flooding from the Big Lost River onto the

site. However, onsite flooding from the river could occur if high water in the Mackay Dam or the Big Lost River were coupled with a dam failure. Koslow and Van Haaften (1986) examined the consequences of structural failure of the Mackay Dam due to a seismic event, coupled with a probable maximum flood (the largest flood assumed possible in an area). This scenario predicts flood waters overtopping the INEEL Diversion Dam and spreading at the Idaho Chemical Processing Plant, Naval Reactor Facility, and the Test Area North Loss-of-Fluid Test Facility (Figure 3.3-1). In the event of a combined Mackay Dam failure and a 100-year flood (flood that occurs on an average of every 100 years), flooding along the Big Lost River would also occur, with low velocities and water depths on the INEEL (Koslow and Van Haaften, 1986). The area inundated under the Mackay Dam failure scenarios probably would use more than the 100- or 500-year floodplains for the Big Lost River at the INEEL. A 100-year floodplain study for the INEEL is in progress.

3.3.1.4 Surface Water Quality

Water quality in the Big and Little Lost Rivers and Birch Creek is similar and has not varied a great deal over the period of record. Measured physical, chemical, and radioactive parameters have not exceeded applicable drinking water quality standards. Chemical composition is determined primarily by the mineral composition of the rocks in the mountain ranges northwest of the site and by the chemical composition of irrigation water in contact with the surface water (Robertson et al., 1974; Bennett, 1990).

Site activities do not directly affect the quality of surface water outside the site because discharges from site facilities are to manmade seepage and evaporation basins or stormwater injection wells. Effluents are not discharged to natural surface waters. In addition, surface water does not flow directly off the site (Hoff et al., 1990). However, water from the Big Lost River, as well as seepage from evaporation basins and stormwater injection wells, does infiltrate the Snake River Plain (SRP) Aquifer (Robertson et al., 1974; Wood and Low, 1988; Bennett, 1990). These areas are inspected, monitored, and sampled as stipulated in the INEEL Stormwater Pollution Prevention Program (U.S. Department of Energy-Idaho Operations Office, 1993b).

3.3.2 Subsurface Water Resources

A description of the subsurface water resources in the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.8.2, Subsurface Water, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

Subsurface water at the site occurs in the Snake River Plain Aquifer and the vadose zone. This section describes regional and local hydrogeologic conditions, vadose zone hydrology, perched water, and subsurface-water quality. Generally, the term "groundwater" refers to usable quantities of water that enter freely into wells under confined and unconfined conditions within an aquifer (Driscoll, 1989).

3.3.2.1 Regional Hydrogeology

The INEEL overlies the Snake River Plain Aquifer, the largest aquifer in Idaho (Figure 3.3-2). This aquifer underlies the Eastern Snake River Plain and covers an area of approximately 24,900 square kilometers (9,611 square miles). Groundwater in the aquifer generally flows south and southwestward across the Snake River Plain. The estimated water storage in the aquifer is 2.5×10^{12} cubic meters (2 billion acre-feet, which is about the same as the volume of water contained in Lake Erie) (Robertson et al., 1974). A typical irrigation well can yield as much as 13.9×10^6 cubic meters (3.7×10^6 gallons) per year of water if pumped every day (Garabedian, 1989). The SRP Aquifer is among the most productive aquifers in the nation.

The drainage basin recharging the SRP Aquifer covers an area of approximately 90,643 square kilometers (35,000 square miles). The aquifer is recharged by infiltration of irrigation water, seepage from stream channels and canals, underflow from tributary stream valleys extending into the watershed, and direct infiltration from precipitation (Garabedian, 1989). Most recharge occurs in surface water-irrigated areas and along the northeastern margins of the plain. Groundwater discharges primarily from the aquifer through springs that flow into the Snake River and from pumping for irrigation. Major springs and seepages that flow from the aquifer are located near the American Falls Reservoir (southwest of Pocatello) and the Thousand Springs area between Milner Dam and King Hill (near Twin Falls).

3.3.2.2 Local Hydrogeology

The INEEL site covers 2,305 square kilometers (890 square miles) of the north-central portion of the SRP Aquifer. Depth to groundwater from the land surface at the site ranges from approximately 61 meters (200 feet) in the north to over 274 meters (900 feet) in the south (Pittman et al., 1988) (see Figure 3.3-3). Groundwater flow is generally toward the south-southwest, and the upper surface is primarily unconfined (not overlain by impermeable soil or bedrock). However, the aquifer behaves as if it were partially confined because of localized geologic conditions. The occurrence and movement of groundwater in the aquifer depends on the geologic setting and the recharge and discharge of water within that setting. Most of the aquifer consists primarily of numerous relatively thin, basaltic lava flows with interbedded sediments extending to depths of 1,067 meters (3,500 feet) below the land surface (Irving, 1993). Most of the groundwater migrates horizontally through fractured, basaltic interflow zones (broken and rubble zones) that occur at various depths. Water also migrates vertically along joints and the interfingering edges of interflow zones (Garabedian, 1986). Sedimentary interbeds restrict the vertical movement of groundwater. The variability in how the aquifer stores and transmits water increases the difficulty in aquifer investigations and modeling.

The rate at which water moves through the ground depends on the hydraulic gradient (change in elevation and pressure with distance in a given direction) of the aquifer, the effective porosity (percentage of void spaces), and hydraulic conductivity (capacity of a porous media to transport water) of the soil and bedrock. Because aquifer porosity and hydraulic conductivity decrease with depth, most of the water in the aquifer moves through the upper 61 to 152 meters (200 to 500 feet) of the basalts. Estimated flow rates

Figure 3.3-2 Location of the Idaho National Engineering and Environmental Laboratory, Eastern Snake River Plain and the generalized flow direction of the Snake River Plain Aquifer (U.S. Department of Energy, 1995a)

Figure 3.3-3 Hydrostratigraphy across the Idaho National Engineering and Environmental Laboratory and water table surface. Location of the Idaho National Engineering and Environmental Laboratory, Eastern Snake River Plain and the generalized flow direction of the Snake River Plain Aquifer (U.S. Department of Energy, 1995a)

within the aquifer range from 1.5 to 6.1 meters (5 to 20 feet) per day (Barraclough et al., 1981).

The aquifer's ability to transmit water (transmissivity), and its ability to store water (storativity) are important physical properties of the aquifer. In general, the hydraulic characteristics of the aquifer enable the easy transmission of water, particularly in the upper portions.

Recharge to the aquifer originates off the site from precipitation in the mountains to the west and north. Most of the inflow to the aquifer results from the underflow of groundwater along alluvial-filled valleys adjacent to the Eastern Snake River Plain and adjacent surface-water drainages (i.e., Big and Little Lost Rivers and Birch Creek). In addition, recharge at the site is related to the amount of precipitation, particularly snowfall, for a given year (Barraclough et al., 1981).

3.3.2.3 Vadose Zone Hydrology

The vadose (unsaturated) zone extends from the land surface down to the water table. Within the vadose zone, water and air occupy openings in the geologic materials. Subsurface water in the vadose zone is referred to as vadose water. At the site this complex zone consists of surface sediments (primarily clay and silt, with some sand and gravel) and many relatively thin basaltic lava flows, with some sedimentary interbeds. Thick surficial deposits occur in the northern part of the site, which thin to the south where basalt is exposed at the surface.

The vadose zone protects the groundwater by filtering many contaminants through adsorption, buffering dissolved chemical wastes, and slowing the transport of contaminated liquids to the aquifer. The vadose zone also protects the aquifer by storing large volumes of liquid or dissolved contaminants released to the environment through spills or migration from disposal pits or ponds, allowing natural decay processes to occur.

Travel times for water through the vadose zone are important for an understanding of contaminant movement. The flow rates in the vadose zone depend directly on the extent of fracturing, the percentage of sediments versus basalt, and the moisture content of vadose zone material. Flow increases under wetter conditions and slows under dryer conditions.

3.3.2.4 Perched Water

Locally, saturated conditions that exist above the water table are called perched water. Perched water occurs when water migrates vertically and laterally from the surface until it reaches an impermeable layer (Irving, 1993). As perched water spreads laterally, sometimes for hundreds of meters, it moves over the edges of the impermeable layer and continues downward. Several perched water bodies can form between the land surface and the water table.

In general, perched water bodies slow the downward migration of fluids that infiltrate into the vadose zone from the surface because the downward flow is not continuous. The occurrence of perched water at the site is related to the presence of disposal ponds or

other surface-water bodies, which studies have detected at the Idaho Chemical Processing Plant, Test Reactor Area, and Test Area North. For example, a 1986 field study at the Idaho Chemical Processing Plant showed that perched water occurs in three areas at possibly three depth zones, ranging from approximately 9 meters (30 feet) to 98 meters (322 feet) below the ground surface and extending laterally as much as 1,097 meters (3,600 feet). In general, the chemical concentrations, shape, and size of these bodies have fluctuated over time in response to the volume of water discharged to the infiltration ponds (Irving, 1993).

3.3.2.5 Subsurface Water Quality

Natural water chemistry and contaminants originating at the site affect subsurface water quality. The INEEL Groundwater Protection Management Program conducts monitoring programs. This program collects samples from surface water, perched water, and aquifer wells to identify contaminants and contaminant migration to and within the aquifer.

3.3.2.5.1 Natural Water Chemistry

Several factors determine the natural groundwater chemistry of the Snake River Plain Aquifer beneath the site. These factors include the weathering reactions that occur as water interacts with minerals in the aquifer and the chemical composition of (1) groundwater originating outside the site; (2) precipitation falling directly on the land surface; and (3) streams, rivers, and runoff infiltrating the aquifer (Wood and Low, 1986, 1988). The chemistry of the groundwater is different, depending on the source areas. For example, groundwater from the northwest contains calcium, magnesium, and bicarbonate leached from sedimentary rocks, and groundwater from the east contains sodium, fluorine, and silicate resulting from contact with volcanic rocks (Robertson et al., 1974).

Although the natural chemical composition of groundwater beneath the site does not exceed the Environmental Protection Agency drinking water standards for any component, the natural chemistry affects the mobility of contaminants introduced into the subsurface from INEEL activities. Many dissolved contaminants adsorb (or attach) to the surface of rocks and minerals in the subsurface, thereby retarding the movement of contaminants in the aquifer and inhibiting further migration of contamination. However, many naturally occurring chemicals compete with contaminants for adsorption sites on the rocks and minerals or react with contaminants to reduce their attraction to rock and mineral surfaces.

3.3.2.5.2 Groundwater Quality

Previous waste discharges to unlined ponds and deep wells have introduced radionuclides, nonradioactive metals, inorganic salts, and organic compounds to the subsurface. Table 3.3-1 summarizes the highest detected concentrations of contaminants observed in the aquifer between 1987 and 1992, concentrations near the site boundary, EPA [U.S. Environmental Protection Agency] maximum contaminant levels, and DOE Derived Concentration Guides. The following paragraphs discuss each category of contaminants and comparisons of observed concentrations to maximum contaminant levels.

Table 3.3-1. Highest Detected Contaminant Concentrations in Groundwater at the Idaho National Engineering and Environmental Laboratory (1987 to 1992)

	Highest detected recent concentration ^a (Year)	Recent boundary condition (year)	Current maximum contaminant level	Derived concentration guide
Radionuclides (picocuries per liter)				
Americium-241	0.91 ^b (1990)	< detection limit ^c (1988)	15 ^{d,e}	30 ^f
Cesium-137	2,050 ^b (1988)	< detection limit ^c (1986)	200 ^g	3,000 ^f
Cobalt-60	890 ^b (1987)	< detection limit ^c (1987)	100 ^g	10,000 ^f
Iodine-129	3.6 ^b (1987)	0.00083- background ^h (1992)	1 ^g	500 ^f
Plutonium-239	1.28 ^b (1990)	< detection limit ^c (1988)	15 ^{d,e}	40 ^f
Plutonium-239/240	1.08 ^b (1990)	< detection limit ^c (1988)	15 ^{d,e}	30 ^f
Strontium-90	640 ^b (1992)	< detection limit ^c (1988)	8 ^{g,o}	1,000 ^f
Tritium	48,000 ^b (1988)	background ⁱ (1988)	20,000 ^g	2,000,000 ^f
Nonradioactive metals (milligrams per liter)				
Cadmium	0.0073 ^b (1992)	background ^c (1988)	0.0005 ^d	not applicable
Chromium (total)	0.21 ^b (1988)	background ^c (1988)	0.1 ^d	not applicable
Lead	0.009 ^b (1987)	background ^c (1987)	0.015 ^{g,n}	not applicable
Mercury	0.0004 ^b (1987)	background ^c (1987)	0.002 ^d	not applicable
Inorganic salts (milligrams per liter)				
Chloride	200 ^b (1991)		250 ^d	not applicable
Nitrate	5.4 ^b (as NO ₃) (1988)	background ^j	10 (as N) ^d	not applicable
Sulfate	140 ^k (1985)	background ^j	250 ^d	not applicable
Organic compounds (milligrams per liter)				

Table 3.3-1. Highest Detected Contaminant Concentrations in Groundwater at the Idaho National Engineering and Environmental Laboratory (1987 to 1992) (cont'd)

	Highest detected recent concentration ^a (Year)	Recent boundary condition (year)	Current maximum contaminant level	Derived concentration guide
Carbon tetrachloride	0.0066 ^b (1993)	< detection limit ^d (1988)	0.005 ^d	not applicable
Chloroform	0.951 (1988)	< detection limit ^d (1988)	0.1 ^{d,m}	not applicable
1,1 dichloroethylene	0.009 ^b (1989)	< detection limit ^d (1989)	0.007 ^d	not applicable
Cis-1,2-dichloroethylene	3.9 ^b (1992)	< detection limit ^d (1988)	0.07 ^d	not applicable
Trans-1,2-dichloroethylene	2.6 ^b (1988)	< detection limit ^d (1988)	0.1 ^d	not applicable
Tetrachlorethylene	0.051 ^b (1992)	< detection limit ^d (1988)	0.005 ^d	not applicable
1,1,1-trichloroethane	0.012 ^b (1989)	< detection limit ^d (1988)	0.2 ^d	not applicable
Trichloroethylene	4.6 ^b (1992)	< detection limit ^d (1989)	0.005 ^d	not applicable
Vinyl chloride	0.027 ^l (1989)	< detection limit ^d (1989)	0.002 ^d	not applicable

^aConcentrations are generally for 1987 to 1992.

^bGolder Associates (1994).

^cOrr and Cecil (1991).

^dMaximum contaminant level values taken from U.S. Environmental Protection Agency (1993a).

^eMaximum contaminant levels have not been established for plutonium-238, plutonium-239, plutonium-240, and americium-241. However, these radionuclides have not been detected above the established limits for gross alpha particle activity (U.S. Environmental Protection Agency, 1993) or the proposed adjusted gross alpha activity maximum contaminant level for drinking water (Federal Register, 1991a). DCGs for radionuclides taken from DOE Order 5400.5, Radiation Protection of the Public and the Environment (U.S. Department of Energy, 1990b).

^fMaximum contaminant level values taken from (Code of Federal Regulations, 1991c).

^hMann (1994).

ⁱMann and Cecil (1990).

^jRobertson et al. (1974); Edwards et al. (1990).

^kPittman et al. (1988).

^lMann (1990) and Liszewski and Mann (1992).

^mValue is for total trihalomethanes, which is the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform), and trichloromethane (chloroform).

ⁿLead action level.

^oCalculated value based on total body or arms dose of 4 millirem per year.

Radionuclides

In general, radionuclide concentrations in the Snake River Plain Aquifer beneath the site have decreased since the mid-1980s because of changes in disposal practices, radioactive decay, adsorption of radionuclides to rocks and minerals, and dilution by natural surface water and groundwater entering the aquifer (Pittman et al., 1988; Orr and Cecil, 1991; Bargelt et al., 1992). Radionuclides released and observed in the soil and groundwater include tritium, strontium-90, iodine-129, cobalt-60, cesium-137, plutonium-238, plutonium-239/240, and americium-241 (Golder Associates, 1994). Most of these radionuclides have been observed at the Idaho Chemical Processing Plant [ICPP] and Test Reactor Area [TRA] facility areas. However, radionuclides have also been observed in the Test Area North [TAN] disposal well.

Concentrations of radionuclides in the aquifer have decreased over time. This decrease is attributed to reduced discharges, adsorption, radioactive decay, and improved waste management practices. As of 1992, concentrations of iodine-129, cobalt-60, tritium, strontium-90, and cesium-137 had exceeded the EPA maximum contaminant levels for radionuclides in drinking water in localized areas inside the INEEL boundary. Currently, there are no individual maximum contaminant levels for plutonium-238, plutonium-239, plutonium-240, and americium-241. However, these radionuclides have not been detected above the established limits for gross radioactivity or the proposed adjusted gross alpha activity maximum contaminant level for drinking water (Golder Associates, 1994; Mann et al., 1988; Orr and Cecil, 1991).

Extremely low concentrations of iodine-129 and tritium have migrated outside site boundaries. In 1992, iodine-129 concentrations were well below the maximum contaminant levels in two wells approximately 6 and 13 kilometers (4 and 8 miles) south of the site boundary (Mann, 1994). Tritium concentrations were much below maximum contaminant levels just south of the site boundary in 1985. By 1988 the tritium plume encompassed by the 500 picocuries [1.85×10^4 Bq/m³ per liter contour] was back inside the site boundary, and its size has continued to decrease (Pittman et al., 1988; Orr and Cecil, 1991; Orr et al., 1991). Cobalt-60, strontium-90, cesium-137, plutonium-238, plutonium-240/241, and americium-241 have not been detected outside the site boundaries.

Nonradioactive Metals

The INEEL has released sodium, chromium, lead, and mercury on the site and into the subsurface through unlined ponds and deep wells. Of these metals, the INEEL released sodium in the greatest quantity from waste treatment processes, however, sodium is not toxic and does not have an established maximum contaminant level. In 1988 chromium concentrations exceeding the maximum contaminant level were measured near the Test Reactor Area. Lead and mercury have occurred at concentrations below the maximum contaminant level near the Idaho Chemical Processing Plant (Orr and Cecil, 1991).

Inorganic Salts

Human activities at the site have released chloride, sulfate, and nitrate into the subsurface. Although chloride and sulfate releases have occurred, only nitrate has exceeded maximum contaminant levels (near the Idaho Chemical Processing Plant in 1981). Disposal of nitrates to the injection well and infiltration ponds at the Idaho Chemical Processing Plant account for the elevated nitrate levels in the central portion of the site. By 1988 the levels of nitrate decreased to below the maximum contaminant level. Irrigation in the Mud Lake area might be causing these contaminants to enter the northeastern portion of the site in concentrations comparable to those in nearby irrigated areas (Orr et al., 1991; Robertson et al., 1974; Edwards et al., 1990).

Organic Compounds

Concentrations of volatile organic compounds have been detected in the aquifer beneath the site. However, many of these compounds were detected at amounts below the detection limit (0.002 milligram per liter), or two parts per billion, which is the lowest concentration at which a specific analytical method can detect a contaminant. However, concentrations of the following compounds exceeding the maximum contaminant levels have occurred in and near the Test Area North disposal well: carbon tetrachloride, chloroform, 1,2-cis-dichloroethylene, 1,1-dichloroethylene, 1,2-trans-dichloroethylene, trichloroethylene, tetrachloroethylene, and vinyl chloride (Leenheer and Bagby, 1982; Mann and Knobel, 1987; Mann, 1990; Liszewski and Mann, 1992).

3.3.2.5.3 Perched Water Quality

Wastewater discharges from INEEL operations have infiltrated into the vadose zone and created most of the perched water beneath the site. Studies have detected elevated concentrations of the following contaminants in samples: tritium, cesium-137, cobalt-60, chromium, and sulfate concentrations in deep perched water near the Test Reactor Area, and strontium-90 in perched water near the Idaho Chemical Processing Plant and at Test Area North (Irving, 1993; Schafer-Perini, 1993). DOE has not yet measured potential concentrations of contaminants in all INEEL perched water bodies. In general, the chemical concentrations, shape, and size of these bodies have fluctuated over time in response to the volume of water discharged to the infiltration ponds.

3.3.3 Water Use and Rights

A description of the surface and subsurface water use in the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.8.3, Water Use and Rights, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

The INEEL does not withdraw or use surface water for site operations, nor does it discharge effluents to natural surface water. However, the three surface-water bodies at or near the site (Big and Little Lost Rivers and Birch Creek) have the following designated uses: agricultural water supply, cold-water biota, salmonid spawning, and primary and secondary contact recreation. In addition, waters in the Big Lost River and

Birch Creek have been designated for domestic water supply and as special resource waters.

Groundwater use on the Snake River Plain includes irrigation, food processing and aquaculture, and domestic, rural, public, and livestock supply. Water use for the upper Snake River drainage basin and the Snake River Plain Aquifer was 16.4 billion cubic meters (4.3 trillion gallons) per year in 1985, which was more than 50 percent of the water used in Idaho and approximately 7 percent of agricultural withdrawals in the nation. Most of the water withdrawn from the Eastern Snake River Plain [1.8 billion cubic meters (0.47 trillion gallons) per year] is for agriculture. The aquifer is the source of all water used at the INEEL. Site activities withdraw water at an average rate of 7.4 million cubic meters (1.9 billion gallons) per year (U.S. Department of Energy-Idaho Operations Office, 1993e). However, the baseline annual withdrawal rate dropped to 6.5 million cubic meters (1.7 billion gallons) in 1995. The average annual withdrawal is equal to approximately 0.4 percent of the water consumed from the Eastern Snake River Plain Aquifer, or 53 percent of the maximum annual yield of a typical irrigation well. Of the quantity of water pumped from the aquifer, a substantial portion is discharged to the surface or subsurface and eventually returned to it (U.S. Department of Energy-Idaho Operations Office, 1993d,e).

A sole-source aquifer, as designated by the Safe Drinking Water Act (Safe Drinking Water Act, 1974) is one that supplies 50 percent of the drinking water consumed in the area overlying the aquifer. Sole-source aquifer areas have no alternative source or combination of sources that could physically, legally, and economically supply all those who obtain their drinking water from the aquifer. Because groundwater supplies 100 percent of the drinking water consumed within the Eastern Snake River Plain (Gaia Northwest, 1988) and an alternative drinking water source or combination of sources is not available, the Environmental Protection Agency designated the Snake River Plain Aquifer a sole-source aquifer in 1991 (Federal Register, 1991b).

DOE holds a Federal Reserved Water Right for the INEEL, which permits a water pumping capacity of 2.3 cubic meters (80 cubic feet) per second and a maximum water consumption of 43 million cubic meters (11.4 billion gallons) per year for drinking, process water, and noncontact cooling. Because it is a Federal Water Right, the site's priority on water rights dates back to the establishment of the INEEL.

3.4 Meteorology and Climatology

3.4.1 Regional

Locations of regional meteorological monitoring stations are shown in Figure 3.4-1, adopted from Volume 2, Appendix F, Section F-3.4, Air Quality Impact Assessment Methodology.

A description of the regional meteorology and climatology of the affected environment at the INEEL is provided in Volume 2, Part A, Section 4.7.1, Climatology and Meteorology of the DOE SNF EIS (U.S. Department of Energy, 1995a):

Figure 3.4-1 Locations of meteorological monitoring stations at the Idaho National Engineering and Environmental Laboratory site and surrounding communities (U.S. Department of Energy, 1995a)

The Eastern Snake River Plain climate exhibits low relative humidity, wide daily temperature swings, and large variations in annual precipitation. Average seasonal temperatures measured onsite range from -7.3°C (Celsius) [$(18.8^{\circ}\text{F}$ (Fahrenheit))] in winter to 18.2°C (64.8°F) in summer, with an annual average temperature of about 5.6°C (42°F). Temperature extremes range from a summertime maximum of 39.4°C (103°F) to a wintertime minimum of -45°C (-49°F). Large year-to-year variations in average monthly and seasonal temperatures are common, as are large variations in temperature in different locations. Annual precipitation is light, averaging 22.1 centimeters (8.71 inches), with monthly extremes of zero to 12.8 centimeters (5 inches). The maximum 24-hour precipitation rate is 4.6 centimeters (1.8 inches). The greatest short-term precipitation rates are primarily attributable to thunderstorms, which occur approximately two or three days per month during the summer. The average annual snowfall is 70.1 centimeters (27.6 inches), with extremes of 151.6 centimeters (59.7 inches) and 17.3 centimeters (6.8 inches). Relative humidity ranges from an average minimum of 27 percent to a maximum of 79 percent on an annual basis.

The INEEL site is in the belt of prevailing westerlies; however, these winds are normally channeled by the mountain ranges bordering the Eastern Snake River Plain into a southwest wind. Most offsite locations experience the predominant southwest/northeast wind flow of the Eastern Snake River Plain, although subtle terrain features near some locations cause considerable variations from this flow regime. An illustration of annual wind flow is provided by the wind roses in Figure 3.4-2. These wind roses show the frequency of wind direction (in other words, the direction from which the wind blows) and speed at three meteorological monitoring sites on the INEEL site for the period 1989 to 1992. The highest hourly average near-ground wind speed measured onsite is 22.8 meters per second (51 miles per hour) from the west-southwest, with a maximum instantaneous gust of 34.9 meters per second (78 miles per hour) (Clawson et al., 1989). ... Visibility in the region is good because of the low moisture content of the air and minimal sources of visibility-reducing pollutants. At Craters of the Moon Wilderness Area [approximately 20 kilometers (12.4 miles) southwest of the INEEL site], the annual visual range is from 130 to 156 kilometers (81 to 97 miles) (Notar, 1993).

Air pollutant dispersion is a result of the processes of transport and diffusion of airborne contaminants in the atmosphere. Transport is the movement of a pollutant in the wind field, while diffusion refers to the process whereby a pollutant plume is diluted by turbulent eddies. Vertical diffusion of pollutants may be restricted or enhanced by the temperature gradient of the atmosphere (that is, the change in temperature with altitude). Lapse conditions, which tend to enhance vertical diffusion, occur slightly less than 50 percent of the time. Conversely, thermal stratification or inversion conditions, which inhibit vertical diffusion, occur slightly more than 50 percent of the time. The height to which the pollutants can freely diffuse is known as the mixing depth, while the layer of air from the ground up to the mixing depth is known as the mixed layer. Estimates of the monthly average depth of the mixed layer range from 120 meters (400 feet) in December to 900 meters (3,000 feet) in July. Nocturnal (nighttime) inversions form at approximately sunset and dissipate about one to two hours after sunrise. These inversions are often ground-based, meaning that the temperature increases with height from the ground (Clawson et al., 1989).

Figure 3.4-2 Annual average wind direction and speed at meteorological monitoring stations on the Idaho National Engineering and Environmental Laboratory site (U.S. Department of Energy, 1995a)

3.4.2 Local

A description of the local meteorology of the affected environment at the INEEL is provided in Section 2.3, Climatology and Meteorology, of the DOE-ID ER (U.S. Department of Energy-Idaho Operations Office, 1996a):

The U.S. Weather Bureau, subsequently the Environmental Sciences Service Administration, and presently the NOAA [National Oceanic and Atmospheric Administration], has maintained a meteorological observation program at the INEEL since 1949. The Environmental Research Laboratories (the NOAA facility at the INEEL) is a permanent installation and continues to update all meteorological data. Figure 3.4-3 shows the locations of the present INEEL stations.

The weather monitoring instruments at CFA are located about 3 miles (4.8 km) from ICPP and, with the exception of wind roses, the information collected is representative of conditions at ICPP. Tables 3.4-1 through 3.4-4 provide a summary of INEEL climatological records. Wind roses (Figures 3.4-4 and 3.4-5) have been provided from the NOAA Grid III (GRD 3) station to reflect the topographic influences on wind in the immediate area of ICPP. Tower measurements at GRD 3 have shown a 180 degree direction shear between levels 20 and 50 feet (6.10 and 15.24 meters) above the ground in the early morning hours. This is attributed to the fact that the slope of the terrain in this area is opposite the general slope of the terrain over the Eastern Snake River Plain. The general down slope drainage is, therefore, opposed by this local anomaly in the topography (Page 106 of Clawson et.al., 1989).

3.4.3 Severe Conditions

A description of the severe weather conditions in the affected environment at the INEEL is provided in Volume 2, Part A, Section 4.7.1, Climatology and Meteorology, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

... Other than thunderstorms, severe weather is uncommon. Five funnel clouds (tornadoes not touching the ground) and no tornadoes have been reported onsite from 1950 to 1988. ...

3.4.4 Air Quality and Atmospheric Dispersion

A description of the radiological air quality of the affected environment at the INEEL is provided in Volume 2, Part A, Section 4.7.3, Radiological Air Quality, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

3.4.4.1 Radiological Air Quality

The population of the Eastern Snake River Plain is exposed to environmental radiation from both natural and manmade sources. This section summarizes the sources and levels of radiation exposure in this geographical region, including sources of airborne radionuclide emissions from the INEEL site. Estimates of radioactivity levels and radiological doses from current INEEL site operations, including anticipated increases to

Figure 3.4-3 The airborne radioactivity monitoring network at the Idaho National Engineering and Environmental Laboratory (onsite and offsite) (U.S. Department of Energy-Idaho Operations Office, 1996b)

the baseline (increases from facilities expected to become operational by June 1, 1995), are provided and discussed.

3.4.4.1.1 Sources of Radioactivity

The major source of radiation exposure in the ESRP is natural background radiation. Sources of radioactivity related to INEEL site operations contribute a small amount of additional exposure.

Background radiation includes sources such as cosmic rays; radioactivity naturally present in soil, rocks, and the human body; and airborne radionuclides of natural origin (such as radon). Radioactivity still remaining in the environment as a result of atmospheric testing of nuclear weapons also contributes to the background radiation level, although in very small amounts. The natural background dose for residents of the ESRP is estimated at 351 millirem [3.51 mSv] per year, with more than half (about 200 millirem [2.00 mSv] per year) caused by the inhalation of radioactive particles formed by the decay of radon (Hoff et al., 1992, National Council on Radiation Protection and Measurements, 1987).

INEEL site operations can result in releasing radioactivity to air either directly (such as through stacks or vents) or indirectly (such as by resuspension of radioactivity on contaminated grounds). Concentrations of radionuclides in direct releases are monitored or estimated based on knowledge of the materials used and activities performed. Indirect releases are estimated using engineering calculations that relate surface contamination levels to expected airborne concentrations.

Emissions from INEEL site facilities include the noble gases (argon, krypton, and xenon) and iodine; particulate, fission products, such as ruthenium, strontium, and cesium; radionuclides formed by neutron activation, such as tritium (hydrogen-3), carbon-14, and cobalt-60; and heavy elements, such as uranium, thorium, and plutonium, and their decay products. Historically, the radionuclide with the highest emission rate is the noble gas krypton-85, which is released mainly by chemical reprocessing of spent nuclear fuel and processing of high-level waste at the ICPP¹. Activities at the ICPP also release relatively small amounts of iodine-129, an isotope of concern because of its long half-life (16 million years) and biological properties. (Iodine isotopes taken into the body tend to accumulate in the thyroid gland.) Reactor operations release mainly noble gas isotopes with short half-lives, including argon-41 and isotopes of xenon (mainly xenon-131m, -133, -135, and -138). Other activities at the INEEL site, including waste management operations, result in very low levels of airborne radionuclide emissions. Table 3.4-5 provides a summary of the principal types of airborne radioactivity emitted from existing INEEL site facilities, plus estimated emissions from projects expected at the time the analysis was performed to become operational before June 1, 1995. For all existing facilities except the ICPP, these estimates are based on emissions data for 1991.

¹Fuel reprocessing at the INEEL site ceased in April 1992, and baseline emission rates do not include contributions from reprocessing. Rather, reprocessing-related emissions are assessed in Section 5.7, Air Resources [of the DOE SNF EIS (U.S. Department of Energy, 1995a)] as potential impacts associated with possible future spent nuclear fuel management activities.

Table 3.4-1 Monthly and Annual Temperature Averages and Extremes Average^a

	MAXIMUM			AVERAGE			MINIMUM		
	High	Average	Low	High	Average	Low	High	Average	Low
January	37.9	27.6	19.5	25.1	15.8	6.5	13.1	3.8	8.8
February	45.9	34.0	25.6	34.2	21.6	9.9	22.4	9.1	6.5
March	51.5	42.9	33.6	37.5	30.7	19.1	24.6	8.4	4.5
April	64.7	55.3	46.1	45.9	41.3	35.4	32.0	27.2	22.5
May	76.1	66.3	59.9	58.3	51.3	46.7	40.7	36.2	33.3
June	85.3	76.1	69.9	67.5	59.9	56.2	49.7	43.7	40.4
July	91.2	87.0	82.5	71.8	68.2	66.1	53.1	49.3	46.5
August	90.2	84.8	75.4	70.2	65.9	60.3	53.4	47.1	43.2
September	81.2	73.4	64.1	61.1	55.5	48.6	45.2	37.4	31.9
October	67.7	60.5	53.7	49.2	43.5	38.2	32.1	26.5	21.2
November	50.7	42.5	37.8	36.4	29.9	24.5	24.3	17.3	10.3
December	37.1	31.2	22.3	26.8	19.6	10.2	17.6	7.5	-1.9
ANNUAL	59.5	59.0	53.8	44.3	41.8	39.1	29.9	28.1	24.0
^a Temperature in °F, based on National Weather Service archived Central Facilities Area data from April 1954 through December 1982 (NOAA)									

Table 3.4-2. Average, highest, and lowest total precipitation, Central Facilities Area

Month	Average^a cm (in.) of H₂O	Highest^a cm (in.) of H₂O	Lowest^a cm (in.) of H₂O	Normal cm (in.) of H₂O
January	1.75 (0.69)	6.50 (2.56)	0.00 (0.00)	1.85 (0.73)
February	1.63 (0.64)	6.10 (2.40)	0.03 (0.01)	1.96 (0.77)
March	1.52 (0.60)	3.66 (1.44)	0.18 (0.07)	1.57 (0.62)
April	1.85 (0.73)	6.35 (2.50)	0.00 (0.00)	1.30 (0.51)
May	3.05 (1.20)	11.23 (4.42)	0.18 (0.07)	2.79 (1.10)
June	3.00 (1.18)	9.88 (3.89)	0.05 (0.02)	2.77 (1.09)
July	1.35 (0.53)	5.82 (2.29)	0.00 (0.00)	0.66 (0.26)
August	1.45 (0.57)	8.31 (3.27)	0.00 (0.00)	1.22 (0.48)
September	1.60 (0.63)	8.94 (3.52)	0.00 (0.00)	0.89 (0.35)
October	1.32 (0.52)	4.24 (1.67)	0.00 (0.00)	1.68 (0.66)
November	1.73 (0.68)	4.42 (1.74)	0.00 (0.00)	1.04 (0.41)
December	1.91 (0.75)	8.71 (3.43)	0.05 (0.02)	1.50 (0.59)
ANNUAL	22.12 (8.71)	36.58 (14.40)	11.43 (4.50)	19.23 (7.57)
^a Data period of record spans January 1950 through December 1988. (Clawson et al., 1989)				

Table 3.4-3 Snowfall Amounts, Central Facilities Area^a

	Monthly			
	Average ^b (in.)	Maximum (in.)	Minimum (in.)	Maximum 24-hr Period ^c (in.)
January	7.7	18.1	1.4	8.5
February	5.3	15.0	0.1	7.5
March	3.5	10.2	0.8	8.6
April	2.4	11.9	0.0	6.7
May	1.1	8.3	0.0	4.7
June	0.0	Trace	0.0	Trace
July	0.0	0.0	0.0	0.0
August	0.0	0.0	0.0	0.0
September	0.1	1.0	0.0	1.0
October	0.7	7.2	0.0	4.5
November	3.0	12.3	0.0	6.5
December	6.4	22.3	Trace	7.0
SEASONAL	26.0	40.9	11.3	8.6
^a Based on CFA data from January 1950 through December 1982				
^b Average based on data measured during period from March 1954 through December 1982				
^c Based on data measured from January 1950 through September 1983				

Table 3.4-4 Hourly Average Windspeeds, Central Facilities Area^a

	Average Speed (mph)		Highest Hourly Average Speed (mph)			
	20-ft ^b Level	250-ft ^c Level	20-ft ^d Level		250-ft ^e Level	
			Speed	Direction	Speed	Direction
January	5.6	9.7	48	WSW	65	SW
February	6.9	11.3	36	SW	52	WSW
March	8.7	13.8	51	WSW	67	WSW
April	9.3	14.6	39	WSW	49	WSW-SW
May	9.3	14.3	41	SW	47	WSW-SW
June	8.9	14.2	36	SW	46	WSW-SW
July	8.0	13.5	35	WSW	47	WSW
August	7.7	13.1	40	WSW	54	SW
September	7.2	12.8	42	WSW	56	WSW
October	6.8	12.3	44	WSW	58	WSW
November	6.4	11.6	40	WSW	54	WSW
December	5.1	9.6	43	SW	56	SW
ANNUAL	7.5	12.6	51	WSW	67	WSW
^a Based on Central Facilities Area data ^b April 1950 through October 1964 ^c July 1951 through October 1964 ^d April 1950 through October 1983 ^e July 1951 through October 1983						

Grid III 10 meter 93-95
January 1 - December 31; Midnight - 11 PM

CALM WINDS 6.39%

NOTE: Frequencies
indicate direction
from which the
wind is blowing.

WIND SPEED (KNOTS)

Figure 3.4-4 Grid III 10-meter wind roses, January 1993 to December 1995 (U.S. Department of Energy-Idaho Operations Office, 1996b)

Grid III 64 meter 93-95
January 1 - December 31; Midnight - 11 PM

Figure 3.4-5 Grid III 64-meter wind rose, January 1993 to December 1995 (U.S. Department of Energy-Idaho Operations Office, 1996b)

Table 3.4-5. Summary of Airborne Radionuclide Emissions (in curies) From Facility Areas at the Idaho National Engineering and Environmental Laboratory Site^a

Facility	Tritium/carbon-14	Iodines	Noble gases	Mixed fission and activation products ^b	U/Th/TRU ^c
Argonne National Laboratory-West	$1.0 \times 10^{+2}$	(d)	$1.3 \times 10^{+4}$	8.1×10^{-4}	1.8×10^{-6}
Central Facilities Area	$2.6 \times 10^{+0}$	5.0×10^{-7}	—	1.9×10^{-5}	9.6×10^{-7}
Idaho Chemical Processing Plant	$4.3 \times 10^{+1}$	6.4×10^{-2}	$1.0 \times 10^{+4}$	3.6×10^{-2}	9.4×10^{-9}
Naval Reactors Facility	1.9×10^{-1}	6.3×10^{-6}	5.7×10^{-1}	5.6×10^{-5}	—
Power Burst Facility/Waste Experimental Reduction Facility	$4.9 \times 10^{+1}$	—	—	$1.3 \times 10^{+0}$	9.8×10^{-3}
Radioactive Waste Management Complex	—	—	—	2.6×10^{-5}	4.2×10^{-6}
Test Area North	1.2×10^{-1}	—	—	5.6×10^{-6}	5×10^{-5}
Test Reactor Area	$1.6 \times 10^{+2}$	1.6×10^{-2}	$3.3 \times 10^{+3}$	$3.0 \times 10^{+0}$	1.8×10^{-6}
INEEL Total	$2.1 \times 10^{+3}$	1.1×10^{-1}	$1.2 \times 10^{+5}$	$5.6 \times 10^{+0}$	1.0×10^{-2}
<p>^aWith the exception of the ICPP, emissions estimates are based on 1991 operations. ICPP emissions are based on 1993 emissions but are scaled upward to reflect operation of the New Waste Calcining Facility at maximum permitted levels. Anticipated projects in the baseline include the Waste Experimental Reduction Facility (compacting and sizing operations but not incineration), ANL-W, and Portable Water Treatment Unit, as described in Appendix F, Section F-3, Air Resources [of the DOE SNF EIS (U.S. Department of Energy, 1995a)].</p> <p>^bMixed fission and activation products that are primarily particulate in nature (for example, cobalt-60, strontium-90, and cesium-137).</p> <p>^cU/Th/TRU = Radioisotopes of uranium, thorium, or transuranic elements such as plutonium, americium, and neptunium.</p> <p>^dA dash (—) indicates that the emissions for this group are negligibly small or zero.</p>					

Emission rates for the ICPP are based on actual 1993 emissions data, scaled upward to reflect operation of the New Waste Calcining Facility (a high-level waste processing operation) at maximum permitted levels. Thus, the radiological emissions are representative of a baseline year that includes processing of high-level waste, but not spent nuclear fuel processing.

3.4.4.1.2 Existing Radiological Conditions

Monitoring and assessment activities are conducted to characterize existing radiological conditions at the INEEL site and surrounding environment. Results of these activities show that exposures resulting from airborne radionuclide emissions are well within applicable standards and are a small fraction of the dose from background sources. These results are discussed separately below for onsite and offsite environments.

3.4.4.1.2.1 Onsite Doses

An indication of onsite radiological conditions is obtained by comparing measured concentrations with those from INEEL site boundary communities and distant locations. Results from onsite and boundary community locations include contributions from background conditions and INEEL site emissions, while distant locations represent background conditions beyond the influence of INEEL site emissions. These data show that 1991 average airborne radioactivity and radiation exposure levels within and around the INEEL site were no different than those at distant stations. The average annual dose (as measured by thermoluminescent dosimeters during 1991) was 127 millirem [1.27 mSv] for distant locations and 125 millirem [1.25 mSv] for boundary community locations (Hoff et al., 1992).

Air dispersion models were applied to assess the radiation dose to workers at major INEEL site facility areas as a result of cumulative emissions from existing facilities and those expected to become operational before June 1, 1995 (Leonard, 1993, 1994). Results of this assessment indicate that the maximum dose at any onsite area is currently about 0.2 millirem [2×10^{-3} mSv] per year. This dose could increase to about 4 millirem [4×10^{-2} mSv] per year if the maximum projected operation of the Portable Water Treatment Unit at the Power Burst Facility Area is included; however, that operation is temporary (one to two years) and is not representative of a permanent increase in the baseline. If only permanent facility emissions are considered, the baseline worker dose could increase to 0.32 millirem [3.2×10^{-3} mSv] per year. The actual and projected doses are a very small fraction of the DOE-established occupational dose limit (5,000 millirem [50.0 mSv] per year) and are below the National Emissions Standard for Hazardous Air Pollutants (NESHAP) dose limit of 10 millirem [0.1 mSv] per year. The NESHAP limit, established under the Clean Air Act (CAA), applies to the highest exposed member of the public (not to workers) but is the most restrictive limit for airborne releases and serves as a useful comparison for these results.

3.4.4.1.2.2 Offsite Doses

The offsite population may receive a radiation dose as a result of radiological conditions directly attributable to INEEL site operations. The dose associated with baseline

radiological emissions (existing facilities and those expected at the time the analysis performed to become operational was before June 1, 1995) is assessed for a maximally exposed individual [MEI] within 80 kilometers (50 miles). The maximally exposed individual is a hypothetical person whose habits and proximity to the INEEL site are such that the person would receive the highest dose projected to result from sitewide radiological emissions. The dose calculated for the maximally exposed individual as a result of current and projected sitewide emissions is about 0.05 millirem [5×10^{-4} mSv], which is well below both the National Emissions Standard for Hazardous Air Pollutants dose limit (10 millirem [0.1 mSv] per year) and the dose received from background sources (351 millirem [3.51 mSv] per year). Figure 3.4-6 illustrates a comparison of these dose rates. As evident in this figure, 10-millirem [0.1-mSv] dose limit is a very small fraction of the background level and provides a high degree of protection.

The collective dose to the surrounding population as a result of INEEL site emissions, assessed using 1990 U.S. Census Bureau data for the total population residing within a circular area with an 80-kilometer (50-mile) radius extending from each facility, is about 0.3 person-rem [3×10^{-3} person-Sievert]. The population dose is distributed over a population of about 120,000, resulting in an average individual dose of well below 0.001 millirem [1×10^{-5} mSv]. The population dose of 0.3 person-rem [3×10^{-3} person-Sievert] is very small when compared with the dose received by the same population from background sources (over 40,000 person-rem [400 person-Sievert]). For future years, the baseline population dose is projected to increase (even though baseline emission rates do not rise) by an amount corresponding to the growth of the surrounding population.

3.4.4.1.2.3 Summary of Radiological Conditions

Radioactivity and radiation levels resulting from INEEL site emissions are very low, well within applicable standards, and negligible when compared to doses received from natural background sources. This applies both to onsite conditions to which INEEL site workers or visitors may be exposed, and offsite locations where the general population resides. Health risks associated with maximum exposure levels in the onsite and offsite environments are described in Section 4.12, Health and Safety [of the DOE SNF EIS (U.S. Department of Energy, 1995a)].

A description of the nonradiological air quality of the affected environment at the INEEL is provided in Volume 2, Part A, Section 4.7.4, Nonradiological Conditions, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

3.4.4.2 Nonradiological Conditions

Persons in the Eastern Snake River Plain are exposed to sources of air pollutants, such as agricultural and industrial activities, residential woodburning, wind-blown dust, and automobile exhaust. Many of the activities at the INEEL also emit air pollutants. The types of pollutants that are assessed here include (a) the criteria pollutants regulated under the National and State Ambient Air Quality Standards and (b) other types of pollutants with potentially toxic properties called toxic (or hazardous) air pollutants. Criteria pollutants include nitrogen dioxide, sulfur dioxide, carbon monoxide, lead, ozone, and respirable particulate matter (particles less than 10 micrometers in diameter, which are

Figure 3.4-6 Comparison of radiation dose to the maximally exposed individual (due to current and projected radiological emissions at the Idaho National Engineering and Environmental Laboratory site) to the National Emission Standard for Hazardous Air Pollutants dose limit and the dose from background sources (U.S. Department of Energy, 1995a)

small enough to pass easily into the lower respiratory tract), for which National Ambient Air Quality Standards have been established. Total suspended particulate matter is also designated by the State of Idaho as a criteria pollutant. Volatile organic compounds are assessed as precursors leading to the development of ozone.² Toxic air pollutants include cancer-causing agents, such as arsenic, benzene, carbon tetrachloride, and formaldehyde, as well as materials with noncancer health hazards, such as fluorides, ammonia, and hydrochloric and sulfuric acids.

3.4.4.2.1 Sources of Air Emissions

The types of nonradiological emissions from INEEL facilities and activities are similar to those of other major industrial complexes the size of the INEEL. Combustion sources such as boilers and emergency generators emit both criteria and toxic air pollutants. Sources such as chemical processing operations, waste management activities (other than combustion), and research laboratories emit primarily toxic air pollutants. A total of 26 toxic air pollutants have been identified that are emitted from existing INEEL facilities in quantities exceeding the screening level established by the State of Idaho. The health hazard associated with toxic air pollutants emitted in lesser quantities is considered low enough by the State of Idaho not to require detailed assessment.) Waste management, construction, and related activities (such as excavation) also generate fugitive particulate matter.

Baseline emission rates for existing facilities have been characterized for two separate cases. The *actual emissions case* represents the collective emission rates of nonradiological pollutants experienced by INEEL facilities during 1991 for criteria pollutants and 1989 for toxic air pollutants. These are the most recent years for which complete data are available. In contrast to this actual case, emissions have also been estimated for a hypothetical maximum year. This is appropriate because many facilities that are governed by conditions imposed by operating permits (such as maximum hours of operation or emission rates) typically operate at levels well below those allowed by the permit. It is conceivable that emission rates of currently operated facilities could increase greatly and still remain within the bounds of permitted conditions. The *maximum emissions case* has, therefore, been characterized. This baseline case represents a scenario in which all permitted sources at the INEEL are assumed to operate in such a manner that they emit specific pollutants to the maximum extent allowed by operating permits or applicable regulations. The baseline also includes projected increases (that is, emissions from projects expected at the time the analysis was performed to become operational before June 1, 1995.) A summary of criteria and toxic air pollutant emission rates for the actual and maximum emissions cases, including projected increases, is provided in Table 3.4-6.

² Ozone is formed by reactions of oxides of nitrogen and oxygen in the presence of sunlight. Volatile organic hydrocarbons, sometimes called precursor organics, contribute to the formation of ozone. Oxides of nitrogen and volatile organic hydrocarbons are, therefore, regulated as precursors to ozone.

Table 3.4-6. Annual Average and Maximum Hourly Emission Rates of Nonradiological Air Pollutants for the Actual and Maximum Baseline Cases at the Idaho National Engineering and Environmental Laboratory

	Actual case		Maximum case		Projected increases ^a	
	Annual average (kilograms per year)	Maximum hourly (kilograms per hour)	Annual average (kilograms per year)	Maximum hourly (kilograms per hour)	Annual average (kilograms per year)	Maximum hourly (kilograms per hour)
Criteria Pollutants						
Carbon monoxide	300,000	150	2,200,000	250	1,300	27
Nitrogen dioxide	740,000	450	3,000,000	790	4,400	95
Sulfur dioxide	200,000	120	1,700,000	350	2,100	16
Particulate matter ^b	300,000	220	900,000	290	2,400	9.8
Lead	4.1	0.084	68	0.8	6.8	7.8×10^{-4}
Toxic Pollutants^c						
Acetaldehyde	31	0.39	180	0.68	0	0
Ammonia	1,600	3.4	6,500	3.4	0	0
Arsenic	4.2	9.0×10^{-4}	24	6.3×10^{-3}	0	0
Benzene	340	15	530	16	30	0.86
1,3-Butadiene	220	0.81	390	1.8	0	0
Carbon tetrachloride	28	0.083	28	0.083	4.5×10^{-5}	9.1×10^{-7}
Chloroform	1.9	5.5×10^{-3}	1.9	5.5×10^{-3}	0.045	4.5×10^{-6}
Chromium - trivalent	3.1	2.5×10^{-3}	38	0.013	0.0295	3.4×10^{-6}
Chromium - hexavalent	0.4	6.2×10^{-4}	26	7.2×10^{-3}	0.0016	1.8×10^{-7}
Cyclopentane	350	0.58	350	0.58	0	0
Dichloromethane	620	0.29	1,100	0.29	0.0091	4.1×10^{-5}
Formaldehyde	740	1.3	3,300	2.7	220	7.6
Hydrazine	8.3	9.5×10^{-4}	8.3	9.5×10^{-4}	0	0
Hydrochloric acid	1,500	0.34	1,500	0.34	0	0
Mercury	200	0.023	200	0.023	0	0
Naphthalene	16	2.2	16	2.2	0	0
Nickel	270	0.057	1,000	0.24	0.35	4.5×10^{-5}
Nitric acid	1,500	1.7	97,000	12	0	0
Phosphorus	56	0.024	210	0.072	0	0
Potassium hydroxide	990	0.24	2,100	0.24	0	0
Propionaldehyde	62	0.24	110	0.41	0	0
Styrene	4.7	0.74	4.7	0.74	0	0
Tetrachloroethylene	980	0.11	980	0.11	0	0
Toluene	580	56	580	56	0	0
Trichloroethylene	4.5	0.013	4.5	0.013	0.18	6.4×10^{-5}
Trimethylbenzene	87	12	87	12	0	0

^aIncreases include the Fuel Cycle Facility at Argonne National Laboratory-West; the INEEL Research Center expansion; and the Utility Systems Upgrade Project at the Idaho Chemical Processing Plant, as well as existing facilities that became operational after the baseline year.

^bAll particulate matter is assumed to consist of respirable particles less than 10 microns in diameter (that is, PM-10); includes PM-10 emissions from fugitive sources

^cToxics that are listed in State of Idaho regulations and are emitted in levels that exceed screening criteria.

3.4.4.2.2 Existing Conditions

For most of the pollutants included in this assessment (including all toxic air pollutants), insufficient monitoring data exist to allow a meaningful description of existing air quality. Rather, the characterization of existing nonradiological conditions relies on an extensive program of air dispersion modeling. The modeling program applied for this purpose utilized computer codes, methods, and assumptions that are considered acceptable by the EPA and the State of Idaho for regulatory compliance purposes. In general, the Industrial Source Complex-2 (ISC-2) model was used for assessment of criteria pollutants and selected toxic air pollutants; the Fugitive Dust Model (FDM) was used to assess impacts due to fugitive dust emissions; and the simpler SCREEN model was used to assess other toxic air contaminants. The SCREEN model incorporates methods and data that tend to overestimate impacts, and it is useful for identifying cases that require additional, more refined (ISC-2) assessment. The methodology applied in these assessments is described in detail in Appendix F, Section F-3, Air Resources, of Volume 2 of this EIS [the DOE SNF EIS (U.S. Department of Energy, 1995a)]. The remainder of this section describes the results of the air dispersion modeling effort in terms of air quality conditions associated with the actual and maximum baseline cases. In particular, assessment results are presented for concentrations of pollutants in air within and around the INEEL site.

3.4.4.2.2.1 Onsite Conditions

The existing conditions have been assessed for each facility area as a result of cumulative emissions from sources located within that area as well as other areas of the INEEL site. Except for public roads, criteria pollutant levels are not assessed for onsite locations because standards for these pollutants apply only to ambient air locations (that is, locations to which the general public has access). Toxic air pollutants, however, are assessed because of potential exposure of workers to these hazardous substances. Typically, the dominant contributors to pollutant levels at each of these areas are sources within that area. Onsite levels of specific toxics are compared to occupational exposure limits set for these substances by either the Occupational Safety and Health Administration (OSHA) or the American Conference of Government Industrial Hygienists. (The lower of the two limits is used.)

Results of the onsite assessment for both the actual and maximum emissions are presented in Table 3.4-7. For most of the toxics, the estimated onsite concentrations of toxic air pollutants are well below levels established for protection of workers. The maximum short-term benzene concentration (that is, the highest level predicted to occur over an eight-hour period) slightly exceeds the standard at the highest predicted location within the Central Facilities Area. These levels result principally from emissions associated with petroleum fuel storage, handling, and combustion. All other toxic pollutant levels at onsite locations are well within the most restrictive occupational exposure limits.

3.4.4.2.2.2 Offsite Conditions

Estimated maximum offsite pollutant concentrations were calculated for locations along the INEEL site boundary and for public roads within the site boundary. These are considered ambient air locations because the public has general access. Pollutant levels

Table 3.4-7. Highest Predicted Concentrations of Toxic Air Pollutants at Onsite Locations For the Maximum Baseline Case at the Idaho National Engineering and Environmental Laboratory Site, Including Anticipated Increases to the Baseline

Toxic air pollutant	Location of maximum concentration ^a	Maximum eight-hour concentration ($\mu\text{g}/\text{m}^3$)	Occupational exposure limit ^b ($\mu\text{g}/\text{m}^3$)	Percent of standard
Carcinogens				
Acetaldehyde	ANL-W	$1.1 \times 10^{+2}$	$1.8 \times 10^{+5}$	<1
Arsenic	CFA	2.8×10^{-1}	$1.0 \times 10^{+1}$	3
Benzene	CFA	$3.1 \times 10^{+3}$	$3.0 \times 10^{+3}$	103
Butadiene	TRA	$3.8 \times 10^{+3}$	$2.2 \times 10^{+4}$	17
Carbon tetrachloride	RWMC	$2.5 \times 10^{+2}$	$1.3 \times 10^{+4}$	2
Chloroform	RWMC	$1.7 \times 10^{+1}$	$9.9 \times 10^{+3}$	<1
Formaldehyde	ANL-W	$5.7 \times 10^{+1}$	$9.0 \times 10^{+2}$	6
Hexavalent chromium	ICPP/TAN	$2.4 \times 10^{+0}$	$5.0 \times 10^{+1}$	5
Hydrazine	TRA	1.8×10^{-3}	$1.0 \times 10^{+2}$	<1
Methylene chloride	CFA/ICPP	$3.2 \times 10^{+0}$	$1.7 \times 10^{+5}$	<1
Nickel	CFA	$4.1 \times 10^{+1}$	$1.0 \times 10^{+2}$	41
Perchloroethylene	CFA	$4.3 \times 10^{+2}$	$1.7 \times 10^{+5}$	<1
Trichloroethylene	RWMC	$4.0 \times 10^{+1}$	$2.7 \times 10^{+5}$	<1
Noncarcinogens				
Ammonia	ICPP	$9.7 \times 10^{+2}$	$1.7 \times 10^{+4}$	6
Cyclopentane	CFA	$1.1 \times 10^{+3}$	$1.7 \times 10^{+6}$	<1
Hydrochloric acid	CFA	$1.1 \times 10^{+2}$	$7.0 \times 10^{+3}$	2
Mercury	ICPP	$3.0 \times 10^{+0}$	$5.0 \times 10^{+1}$	6
Naphthalene	CFA	$2.3 \times 10^{+3}$	$5.0 \times 10^{+4}$	5
Nitric acid	ICPP	$7.7 \times 10^{+2}$	$5.0 \times 10^{+3}$	15
Phosphorus	TAN	$5.5 \times 10^{+1}$	$1.0 \times 10^{+2}$	55
Potassium hydroxide	ANL-W	$1.4 \times 10^{+1}$	$2.0 \times 10^{+3}$	<1
Styrene	PBF	$3.5 \times 10^{+2}$	$2.1 \times 10^{+5}$	<1
Toluene	CFA	$2.5 \times 10^{+4}$	$1.9 \times 10^{+5}$	13
Trimethylbenzene	CFA	$1.3 \times 10^{+4}$	$1.2 \times 10^{+5}$	11
Trivalent chromium	TAN	$6.3 \times 10^{+0}$	$5.0 \times 10^{+2}$	1
^a ANL-W = Argonne National Laboratory-West; PBF = Power Burst Facility; ICPP = Idaho Chemical Processing Plant; CFA = Central Facilities Area; TRA = Test Reactor Area; TAN = Test Area North; RWMC = Radioactive Waste Management Complex. ^b Occupational exposure limits are eight-hour, time-weighted averages established by the American Conference of Governmental Hygienists (ACGIH) or Occupational Safety and Health Administration (OSHA); the lower (most restrictive) of the two limits is used.				

were also calculated for Craters of the Moon Wilderness Area. The results for criteria pollutants are presented in Table 3.4-8 and indicate that all concentrations are well within the ambient air quality standards for both the actual and maximum emissions cases. For the maximum emissions baseline, the highest sulfur dioxide concentration (over a 3-hour period) at the site boundary is about 13 percent of the standard, while the highest 24-hour particulate matter level is about 33 percent of the standard. Levels of all other pollutants are below 12 percent of applicable standards. the highest offsite levels are estimated to occur at the boundary south and south-southwest of the Central Facilities Area. Somewhat higher results were obtained for public roads traversing the site, with 24-hour particulate matter at 53 percent of the standard and 3- and 24-hour sulfur dioxide at 45 and 37 percent of the standard, respectively. Values at the Craters of the Moon Wilderness Area were below 10 percent of applicable standards in all cases. It should be noted that actual emissions from INEEL site facilities are much lower than those assumed for the maximum scenario, so there is a wide margin of protection inherent in these results. Figure 3.4-7 illustrates the difference in actual and maximum emissions for criteria and toxic air pollutants.

Concentrations of criteria pollutants from certain sources are also compared to Prevention of Significant Deterioration (PSD) regulations, which have been established to ensure that air quality remains good in those areas where ambient air quality standards are not exceeded. (See Section F-3.3.1.2 [of the DOE SNF EIS (U.S. Department of Energy, 1995a)] for a description of these regulations.) These Prevention of Significant Deterioration increments are allowable increases over baseline conditions from sources that have become operational after certain baseline dates. Increments have been established by Federal and State regulations for sulfur dioxide, total suspended particulates, and nitrogen dioxide, and by Federal regulations for respirable particulate matter. Separate increments are established for pristine areas, such as national park or wilderness areas (termed Class I areas) and for the nation as a whole (Class II areas). Craters of the Moon Wilderness Area is the Class I area nearest the INEEL site. The amount of increment consumed by existing sources subject to Prevention of Significant Deterioration regulation has been assessed (Raudsep et al., 1995). These results are presented in Tables 3.4-9 and 3.4-10 for Class I and II areas, respectively, for all increment consuming sources projected as of May 1, 1994. The amount of increment consumed for Prevention of Significant Deterioration sources operating at maximum allowable emission rates is less than 10 percent of the allowable increment for all annual evaluations but somewhat higher for short-term assessments. The maximum increment consumed at Craters of the Moon is 53 percent of the 3-hour sulfur dioxide level and, in Class II areas, 43 percent of the 24-hour level for respirable particulate matter.

Concentrations of toxic air pollutants are compared to the ambient air standards recently promulgated for new sources by the State of Idaho Rules for Control of Air Pollution in Idaho (Idaho Department of Health and Welfare, 1994). These standards are increments that apply only to new or modified sources and not to existing emissions. Nevertheless, these increments are useful as reference levels for comparing current conditions with recommendations for ensuring public health protection in association with new sources of emissions. Thus, the discussion that follows refers to these increments as reference levels. Annual average concentrations of carcinogenic toxics are assessed for offsite locations (site boundary and Craters of the Moon Wilderness Area), while levels of

Table 3.4-8. Ambient Air Concentrations of Criteria Pollutants For the Maximum Baseline Scenario at the Idaho National Engineering and Environmental Laboratory Site, Including Anticipated Increases to the Baseline

	Averaging time	Baseline concentration ($\mu\text{g}/\text{m}^3$)			Applicable ^a ($\mu\text{g}/\text{m}^3$)	Approximate percent of standard		
		Site boundary	Public roads	Craters of the Moon		Site boundary	Public roads	Craters of the Moon
Carbon monoxide	One-hour	362	614	134	40,000	0.9	2	0.3
	Eight-hour	104	284	28	10,000	1	3	0.3
Nitrogen dioxide	Annual	1	4	0.2	100	1	4	0.2
Lead	Quarterly	0.0002	0.001	<0.0001	1.5	0.01	0.1	<0.01
Particulate matter ^b	24-hour	13	33	3	150	9	22	2
	Annual	1	3	0.1	50	1	6	0.2
Particulate matter ^c	24-hour	50	80 ^d	10	150	33	53	7
	Annual	2	5 ^d	1	50	4	10	2
Sulfur dioxide	Three-hour	168	579	60	1,300	13	45	5
	24-hour	43	135	10	365	12	37	3
	Annual	2	6	0.3	90	3	8	0.4
^a National Ambient Air Quality Standards; all standards are primary except for three-hour sulfur dioxide, which is secondary. ^b Particulate matter from stationary emission points. All particulate matter is assumed to consist of respirable particles less than 10 microns in diameter (that is, PM-10). The State of Idaho also has a standard for total suspended particulates, but the Federal standard for PM-10 is more restrictive. ^c Cumulative contributions from stationary point sources, fugitive emissions sources (such as vehicle travel on paved and unpaved roads), and landfills and concrete batch plant operations. ^d Does not include fugitive emissions caused by vehicular traffic.								

Annual Average Baseline Emission Rates

Hourly Baseline Emission Rates

Figure 3.4-7 Comparison of actual emission rates for criteria and toxic air pollutants at the Idaho National Engineering and Environmental Laboratory site with the rates assumed for the maximum emissions scenario (U.S. Department of Energy, 1995a)

noncarcinogenic toxics are assessed for locations along public roads as well as offsite locations.

Maximum offsite concentrations of carcinogenic toxics, which are summarized in Table 3.4-11, are observed to occur at the site boundary due south of the Central Facilities Area. All carcinogenic air pollutant levels are below the reference levels. Noncarcinogenic air pollutant levels are summarized in Table 3.4-12. For site boundary locations, these levels are all well below the reference levels (1 percent or less). Levels at some public road locations, which are closer to emissions sources, are higher than site boundary locations, but still well below the reference levels. All pollutant levels estimated for Craters of the Moon Wilderness Area are much less than 1 percent of the reference levels suitable for comparison.

Table 3.4-9. Prevention of Significant Deterioration [PSD] Increment Consumption at the Craters of the Moon Wilderness (Class I) Area by Existing Sources Subject to Prevention of Significant Deterioration Regulation^a

Pollutant	Averaging time	PSD increment ^b ($\mu\text{g}/\text{m}^3$)	Maximum predicted concentration ($\mu\text{g}/\text{m}^3$)	Percent of PSD increment consumed
Sulfur dioxide	3-hour	25	13	53
	24-hour	5	2	40
	Annual	2	0.08	4
Respirable particulates ^c	24-hour	8	0.94	12
	Annual	4	0.015	0.4
Total suspended particulates	24-hour	10	0.94	9.4
	Annual	5	0.015	0.3
Nitrogen dioxide	Annual	2.5	0.003	0.1

^aSource: Raudsep et al. (1995)

^bAll increments specified are state of Idaho standards except those for respirable particulates, which were recently promulgated by the U.S. Environmental Protection Agency.

^cData on particulate size are not available for most sources. For purposes of comparison to the respirable particulate increments, it is conservatively assumed that all particulates emitted are of respirable size (that is, 10 microns or less in diameter).

Table 3.4-10. Prevention of Significant Deterioration [PSD] Increment Consumption at Class II Areas at the Idaho National Engineering and Environmental Laboratory Site by Existing Sources Subject to Prevention of Significant Deterioration Regulation^a

Pollutant	Averaging time	PSD increment ^b ($\mu\text{g}/\text{m}^3$)	Maximum predicted concentration at the site boundary ($\mu\text{g}/\text{m}^3$)	Maximum predicted concentration at the site boundary ($\mu\text{g}/\text{m}^3$)	Amount of PSD increment consumed ^c	Percent of PSD increment consumed
Sulfur dioxide	3-hour	512	43	72	72	14
	24-hour	91	6.9	20	20	22
	Annual	20	0.49	1.8	1.8	9
Respirable particulates ^d	24-hour	30	3.7	13	13	43
	Annual	17	0.11	0.9	0.9	5.3
Total suspended particulates	24-hour	37	3.7	13	13	35
	Annual	19	0.11	0.9	0.9	4.7
Nitrogen dioxide	Annual	25	0.03	0.22	0.2	0.9
^a Source: Raudsep et al. (1995) ^b All increments specified are state of Idaho standards except those for respirable particulates, which were recently promulgated by the U.S. Environmental Protection Agency. ^c The highest value of either the site boundary or public road locations is used. ^d Data on particulate size are not available for most sources. For purposes of comparison to the respirable particulate increments, in is conservatively assumed that all particulates emitted are of respirable size (that is, 10 microns or less in diameter).						

3.4.4.2.3 Summary of Nonradiological Air Quality

The baseline conditions of nonradiological air quality on and around the INEEL site have been estimated for actual and maximum emissions scenarios. The air quality is good and within applicable guidelines. The area around the INEEL site is in attainment or unclassified for all National Ambient Air Quality Standards. Levels of criteria pollutants are well within the ambient air quality standards for both scenarios. For toxic emissions, all INEEL site boundary and public road levels are below reference levels appropriate for comparison. Within the INEEL site, a very localized and slight exceedance occurs for levels of benzene at the Central Facilities Area. All other toxic pollutant levels at onsite locations are well below applicable limits. Health risks associated with maximum potential exposure levels in the onsite and offsite environments are described in Section 4.12,

Table 3.4-11. Highest Predicted Concentrations of Carcinogenic Air Pollutants at Site Boundary Locations For the Maximum Baseline Case at the Idaho National Engineering and Environmental Laboratory Site, Including Anticipated Increases to the Baseline

Toxic air pollutant	Annual average concentration ($\mu\text{g}/\text{m}^3$)	Standard ^a ($\mu\text{g}/\text{m}^3$)	Percent of standard
Acetaldehyde	1.1×10^{-2}	4.5×10^{-1}	2
Arsenic	9.0×10^{-5}	2.3×10^{-4}	39
Benzene	2.9×10^{-2}	1.2×10^{-1}	24
Butadiene	1.0×10^{-3}	3.6×10^{-3}	28
Carbon tetrachloride	6.0×10^{-3}	6.7×10^{-2}	9
Chloroform	4.0×10^{-4}	4.3×10^{-2}	< 1
Formaldehyde	1.2×10^{-2}	7.7×10^{-2}	16
Hexavalent chromium	6.0×10^{-5}	8.3×10^{-5}	72
Hydrazine	1.0×10^{-6}	3.4×10^{-4}	< 1
Methylene chloride	6.0×10^{-3}	2.4×10^{-1}	3
Nickel	2.7×10^{-3}	4.2×10^{-3}	65
Perchloroethylene	1.1×10^{-1}	$2.1 \times 10^{+0}$	5
Trichloroethylene	9.7×10^{-4}	7.7×10^{-2}	1
^a Acceptable ambient concentrations for carcinogens (AACC) listed in Rules for the Control of Air Pollution in Idaho. Acceptable ambient concentrations for carcinogens are increments that apply only to new (not existing) sources and are used here only as reference levels.			

Health and Safety, of Volume 2 of this EIS [the DOE SNF EIS (U.S. Department of Energy, 1995a)].

3.5 Biotic Resources

3.5.1 Terrestrial

A description of the terrestrial biota (flora) of the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.9.1, Flora, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

Table 3.4-12. Highest Predicted Concentrations of Noncarcinogenic Toxic Air Pollutants at Site Boundaries and Public Road Locations at the Idaho National Engineering and Environmental Laboratory Site, Including Anticipated Increases to the Baseline

Toxic air pollutant	Location	Annual average concentration ($\mu\text{g}/\text{m}^3$)	Standard ^a ($\mu\text{g}/\text{m}^3$)	Percent of standard
Ammonia	Public road	$6.0 \times 10^{+0}$	$1.8 \times 10^{+2}$	3
	Site boundary	4.1×10^{-1}		<1
Cyclopentane	Public road	$2.7 \times 10^{+0}$	$1.7 \times 10^{+4}$	<1
	Site boundary	3.9×10^{-2}		<1
Hydrochloric acid	Public road	9.8×10^{-1}	$7.5 \times 10^{+0}$	13
	Site boundary	9.7×10^{-2}		1
Mercury	Public road	4.2×10^{-2}	$1.0 \times 10^{+0}$	4
	Site boundary	1.3×10^{-2}		1
Naphthalene	Public road	$1.8 \times 10^{+1}$	$5.0 \times 10^{+2}$	4
	Site boundary	1.9×10^{-3}		<1
Nitric acid	Public road	6.4×10^{-1}	$5.0 \times 10^{+1}$	1
	Site boundary	2.6×10^{-1}		<1
Phosphorus	Public road	3.0×10^{-1}	$1.0 \times 10^{+0}$	30
	Site boundary	8.9×10^{-3}		<1
Potassium hydroxide	Public road	2.0×10^{-1}	$2.0 \times 10^{+1}$	1
	Site boundary	2.0×10^{-1}		1
Propionaldehyde	Public road	3.0×10^{-1}	$4.3 \times 10^{+0}$	7
	Site boundary	6.4×10^{-3}		<1
Styrene	Public road	$1.3 \times 10^{+0}$	$1.0 \times 10^{+3}$	<1
	Site boundary	2.4×10^{-4}		<1
Toluene	Public road	$3.7 \times 10^{+2}$	$3.8 \times 10^{+3}$	10
	Site boundary	6.2×10^{-2}		<1
Trimethylbenzene	Public road	$1.0 \times 10^{+2}$	$1.2 \times 10^{+3}$	8
	Site boundary	1.0×10^{-2}		<1
Trivalent chromium	Public road	3.6×10^{-2}	$5.0 \times 10^{+0}$	<1
	Site boundary	2.2×10^{-3}		<1

^aAcceptable ambient concentrations (AAC) listed in Rules for the Control of Air Pollution in Idaho (Idaho Department of Health and Welfare, 1994). Acceptable ambient concentrations are increments that apply only to new (not existing) sources and are used here only as reference levels.

Vegetation on the INEEL site is primarily of the shrub-steppe type and is a small fraction of the 45,000 square kilometers (111.2 million acres) of this vegetation type in the Intermountain West. The 15 vegetation associations on the INEEL site range from primarily shadscale-steppe vegetation at lower altitudes through sagebrush- and grass-dominated communities to juniper woodlands along the foothills of the nearby mountains and buttes (Rope et al., 1993; Kramber et al., 1992; Anderson, 1991). These associations can be grouped into six basic types: juniper woodland, grassland, shrub-steppe (which consists of "sagebrush-steppe" and "salt desert shrubs"), lava, bareground-disturbed, and wetland vegetation. Shrub-steppe vegetation, which is dominated by big sagebrush (*Artemisia tridentata*), saltbush (*Atriplex* spp.), and rabbitbrush (*Chrysothamnus* spp.) covers more than 90 percent of the INEEL. Grasses include cheatgrass (*Bromus tectorum*), Indian ricegrass (*Oryzopsis hymenoides*), wheatgrasses, (*Agropyron* spp.), and squirreltail (*Sitanion hystrix*). Herbaceous plants include phlox (*Phlox* spp.), wild onion (*Allium* spp.), milkvetch (*Astragalus* spp.), Russian thistle (*Salsola kali*), and various mustards. Work being conducted by Idaho State University will provide additional information on INEEL plant communities and the status of sensitive plant species.

Facility and human-disturbed (grazing not included) areas cover only about 2 percent of the INEEL. Introduced annuals, including Russian thistle and cheatgrass, frequently dominate disturbed areas. These species usually are less desirable to wildlife as food and cover, and compete with more desirable perennial native species. These disturbed areas serve as a seed source, increasing the potential for the establishment of Russian thistle and cheatgrass in surrounding less-disturbed areas. Vegetation inside facility boundaries is generally disturbed or landscaped. Species richness on the INEEL is comparable to that of like-sized areas with similar terrain in other parts of the Intermountain West. Plant diversity is typically lower in disturbed and modified areas.

3.5.2 Wildlife

A description of the wildlife in the vicinity of the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.9.2, Fauna, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

The INEEL site supports animal communities characteristic of shrub-steppe vegetation and habitats. More than 270 vertebrate species occur, including 46 mammal, 204 bird, 10 reptile, 2 amphibian, and 9 fish species (Arthur et al., 1984; Reynolds et al., 1986). Common small-mammal genera include mice (*Reithrodontomys* spp. and *Peromyscus* spp.), chipmunks (*Tamias* spp.), jackrabbits (*Lepus* spp.), and cottontails (*Sylvilagus* spp.).

Songbirds and passerines commonly observed at the INEEL include the American robin (*Turdus migratorius*), horned lark (*Eremophila alpestris*), black-billed magpie (*Pica pica*), sage thrasher (*Oreoscoptes montanus*), Brewer's sparrow (*Spizella breweri*), sage sparrow (*S. belli*), and western meadowlark (*Sturnella neglecta*), while resident upland gamebirds include the sage grouse (*Centrocercus urophasianus*), chukar (*Alectoris chukar*), and grey partridge (*Perdix perdix*). Common migratory bird species, which use the INEEL for part of the year, include a variety of waterfowl [e.g., mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), and Canada goose (*Branta canadensis*)] and raptors [e.g.,

Swainson's hawk (*Buteo swainsoni*), rough-legged hawk (*B. lagopus*), and American kestrel (*Falco sparverius*).

The most abundant big-game species that occurs on the INEEL is the pronghorn, but mule deer (*Odocoileus hermonius*), moose (*Alces alces*), and elk (*Cervus elaphus*) are present in small numbers as transients. Other large mammals observed on the INEEL include the coyote (*Canis latrans*), which is common across the site, and the badger (*Taxidea taxus*) and bobcat (*Felis rufus*), both of which are present across the site but are much less abundant. ...

A number of researchers have studied effects of radiation exposure from contaminated areas at INEEL on small mammals and birds, and have concluded that subtle sublethal effects (e.g., reduced growth rates and life expectancies) can occur in individual animals as a result of radiation exposure. However, they can attribute no population or community-level impacts to such exposures (Halford and Markham, 1978, Evenson, 1981; Arthur et al., 1986; Millard et. al, 1990).

The monitoring of radionuclide levels outside the boundaries of the various INEEL facilities and off the INEEL site has detected radionuclide concentrations above background levels in individual plants and animals (Markham, 1974; Craig et al., 1979; Markham et al., 1982; Morris, 1993), but these limited data suggest that populations of exposed animals (e.g., mice and rabbits) as well as animals that feed on these exposed animals (e.g., eagles and hawks) are not at risk.

3.5.3 Aquatic

Only intermittent streams cross the INEEL in the vicinity of the ICPP. Wetlands are present at the site. A description of the aquatic fauna in the vicinity of the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.9.2, Fauna, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

... Fish, including kokanee salmon (*Oncorhynchus nerka*), rainbow trout (*Oncorhynchus mykiss*), and mountain whitefish (*Prosopium williamsoni*), occur on the INEEL only when the Big Lost River flows onto the site (as a result of heavy rain or snowfall in the mountains to the northwest); they are not full-time residents.

A description of the wetlands of the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.9.4, Wetlands, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

The U.S. Fish and Wildlife Service National Wetlands Inventory has identified more than 130 areas inside the boundaries of the INEEL that might possess some wetlands characteristics. Surveys conducted in the fall of 1992 indicate that these possible wetlands cover about 1.4 percent (33 square kilometers or 8,206 acres) of the INEEL site (Hampton et al., 1993). Approximately 70 percent of these possible wetlands areas occur near the Big Lost River and its spreading areas and playas, near the Birch Creek Playa, and in an area north of and in the general vicinity of Argonne National Laboratory-West. Limited riparian (riverbank) communities with mature trees along the Big Lost River (Reynolds, 1993) reflect the intermittent flow in the river (1986 and 1993 were the last two years with flow reported on the site). The remainder of the possible wetlands are

scattered throughout the INEEL site. In 1994, INEEL began evaluating these potential wetlands to determine if they meet the Corps of Engineers definition of jurisdictional wetlands (U.S. Army Corps of Engineers, 1987). Approximately 20 wetlands are near facilities and are mostly manmade (e.g., industrial waste and sewage treatment ponds, borrow pits, and gravel pits).

3.5.4 Threatened and Endangered Species

A description of the threatened and endangered species in the vicinity of the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.9.3, Threatened, Endangered, and Sensitive Species, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

State and Federal regulatory agency lists (Lobdell, 1992; 1995), the Idaho Department of Fish and Game Conservation Data Center list, and information from site surveys provided the information to identify Federal- and state-protected, candidate, and sensitive species that potentially occur on the INEEL. This information identified two Federal endangered (bald eagle, and peregrine falcon) and nine Federal Category 2 candidate (white-faced ibis, northern goshawk, ferruginous hawk, burrowing owl, long-eared myotis, small-footed myotis, pygmy rabbit, Townsend's western big-eared bat, and Idaho pointheaded grasshopper) species as animals that potentially occur on the INEEL site (Table 3.5-1). Five animal species listed by the state as Species of Special Concern occur on the site. No frequent observations of the Federal- or state-listed animal species have occurred near any of the facilities where proposed actions would occur. This analysis did not identify any Federal- or state-listed plant species as potentially occurring on the INEEL site. Eight plant species identified by other Federal agencies and the Idaho Native Plant Society as sensitive, rare, or unique occur on the site (Chowlewa and Henderson, 1984).

3.6 Socioeconomics and Local Community Characteristics and Services

A description of the socioeconomics of the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.3, Socioeconomics, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

This section presents a brief overview of current socioeconomic conditions within a region of influence where approximately 97 percent of the INEEL workforce lived in 1991 (DOE-ID, 1991). The INEEL region of influence is a seven-county area comprised of Bingham, Bonneville, Butte, Clark, Jefferson, Bannock, and Madison Counties. The region of influence also includes the Fort Hall Indian Reservation and Trust Lands (home of the Shoshone-Bannock Tribes) in Bannock, Bingham, Caribou, and Power Counties.

3.6.1 Employment

Historically, the regional economy has relied predominantly on natural resource use and extraction. Today, farming, ranching, and mining remain important components of the regional economy. Idaho Falls is the retail and service center for the region of influence, and Pocatello has evolved into an important processing and distribution center and site of higher education institutions.

Table 3.5-1. Threatened and Endangered Species, Special Species of Concern, and Sensitive Species That May be Found On the Idaho National Engineering and Environmental Laboratory

	Name	Status	
BIRDS	Northern goshawk (<i>Accipiter gentilis</i>)	C2, SSC, FS, BLM	<p>Comments</p> <p>The ferruginous hawk nests on and migrates through the INEEL. This species is found throughout the INEEL but is observed more frequently in juniper woodlands. The peregrine falcon has been observed rarely in winter, but has not been observed during other seasons. The last sighting was in 1993 (Morris, 1993). It is not known to nest on the INEEL and is not commonly observed near facilities (Reynolds, 1993). The bald eagle is a winter resident and is locally common in the far north end and on the western edge of the INEEL near Howe (Reynolds, 1993). It is not known to nest on the INEEL and is not commonly observed near facilities (Reynolds, 1993). The white-faced ibis, which uses aquatic and riparian habitats, is an uncommon migrant at the INEEL. The long-billed curlew is known to nest on the north end of the INEEL near agricultural lands. The northern goshawk is a casual migrant through the INEEL.</p>
	Burrowing owl (<i>Athene cunicularia</i>)	C2, BLM	
	Ferruginous hawk (<i>Buteo regalis</i>)	C2, SSC, BLM	
	Swainson's hawk (<i>Buteo swainsoni</i>)	BLM	
	Great egret (<i>Casmerodius albus</i>)	SSC	
	Merlin (<i>Falco columbarius</i>)	SSC, BLM	
	Peregrine falcon (<i>Falco peregrinus</i>)	E	
	Gyr Falcon (<i>Falco rusticolus</i>)	BLM	
	Common loon (<i>Gavia immer</i>)	SSC, FS	
	Bald eagle (<i>Haliaeetus leucocephalus</i>)	E	
	Long-billed curlew (<i>Nanienius americanus</i>)	SPS, BLM	
	American white pelican (<i>Pelecanus erythrorhynchos</i>)	SSC	
	White-faced ibis (<i>Plegadis chihi</i>)	C2	
MAMMALS	Merriam's shrew (<i>Sorex merriami</i>)	SPS	<p>The pygmy rabbit is common on the INEEL, but its distribution is patchy (Reynolds et al., 1986). Roosts and hibernation caves for Townsend's western big-eared bat occur on the INEEL. All are over 7 kilometers (3 miles) from facilities. Brood caves might exist on the site but have not been located.</p>
	Pygmy rabbit (<i>Brachylagus (Sylvilagus) idahoensis</i>)	C2, BLM, SSC	
	California myotis (<i>Myotis californicus</i>)	SSC	
	Fringed myotis (<i>Myotis thysanodes</i>)	SSC	
	Western pipistrelle (<i>Pipistrellus hesperus</i>)	SSC, BLM	
	Townsend's western big-eared bat (<i>Plecotus townsendii</i>)	C2, SSC, FS, BLM	
	Long-eared myotis (<i>Myotis evotis</i>)	C2	
	Small-footed myotis (<i>Myotis subulatus</i>)	CS	
PLANTS	Lemhi milkvetch (<i>Astragalus aquilonius</i>)	BLM, FS, INPS	<p>The eight plant species identified as sensitive, rare, or unique that are known to occur on the INEEL occur primarily at a distance from INEEL facilities and are uncommon on the INEEL because they require unique microhabitat conditions.</p>
	Painted milkvetch (<i>Astragalus ceramicus</i> var. <i>apus</i>)	3c, INPS-M	
	Winged-seed evening primrose (<i>Camissonia pierposperma</i>)	BLM, INPS-S	
	Nipple cactus (<i>Corypita tiita nrisouriensis</i>)	INPS-M	
	Spreading gilia (<i>Ipomopsis (Gilia) polycladon</i>)	BLM, INPS-2	
	King's bladderpod (<i>Lesquerella kingii</i> var. <i>cobrensis</i>)	INPS-M	
	Tree-like oxytheca (<i>Oxytheca dendroidea</i>)	INPS-S	
	Sepal-tooth dodder (<i>Cuscuta denticulata</i>)	INPS-1	
INSECTS	Idaho pointheaded grasshopper (<i>Acrolophitus pulchellus</i>)	C2, BLM	Occurs just north of the INEEL.
<p>*Key: C2 = Federal Category 2 species. BLM = Bureau of Land Management monitored. 3c = No longer considered for Federal listing. FS = U.S. Forest Service monitored. E = Federal and state endangered species. INEEL = Idaho National Engineering Laboratory INPS-S = Idaho Native Plant Society sensitive. INPS-1 = Idaho Native Plant Society State Priority 1. INPS-M = Idaho Native Plant. INPS-2 = Idaho Native Plant Society State Priority 2. SSC = State species of special concern. SPS = State protected species</p>			

3.6.1.1 Region

The labor force in the region of influence increased from 92,159 in 1980 to 104,654 in 1991, an average annual growth rate of approximately 1.2 percent. In 1991 the region of influence accounted for approximately 18 percent of the total state labor force of 504,000 (Idaho State Department of Employment, 1992). As listed in Table 3.6-1, the projected labor force in the region of influence will reach 108,667 by 1995.

Unemployment rates varied considerably among the counties of the region of influence in 1991, ranging from 2.6 percent in Clark County to 6.3 percent in Bannock and Bingham Counties. Since 1980 the average annual unemployment rate for the region has ranged from 5.3 percent in 1989 to 8.3 percent in 1983. In 1991 the average annual unemployment rate for the region of influence was 5.5 percent compared to the statewide average of 6.2 percent (Idaho State Department of Employment, 1992).

Employment in the region of influence increased from 86,261 in 1980 to 98,898 in 1991, an average annual growth rate of approximately 1.3 percent. As listed in Table 3.6-1, employment is projected to increase to 101,450 by 1995.

3.6.1.2 Idaho National Engineering and Environmental Laboratory

INEEL plays a substantial role in the regional economy. During Fiscal Year 1990, INEEL directly employed approximately 11,100 personnel, accounting for almost 12 percent of total regional employment. The estimated population directly supported by INEEL employment was approximately 38,000 persons, or 17 percent of the total regional population. The major employers at INEEL are DOE-ID, DOE-ID contractors, Argonne National Laboratory-West, and the Naval Reactors Facility (see Figure 3.6-1).

In 1992, the total direct INEEL employment was approximately 11,600 jobs (U.S. Department of Energy-Idaho Operations Office, 1994). Projections as of January 1995 indicate that the total number of jobs at INEEL will decrease to approximately 8,620 in Fiscal Year 1995 and to approximately 7,250 in Fiscal Year 2004 (Tellez, 1995). Projected decreases in INEEL employment are primarily related to contractor

Table 3.6-1. Projected Labor Force, Employment, and Population For the Idaho National Engineering and Environmental Laboratory Region of Influence, 1995-2004

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Labor Force	108,667	109,607	110,547	111,487	112,427	113,367	114,308	115,248	116,188	117,129
Employment	101,450	102,328	103,205	104,083	104,960	105,838	106,716	107,593	108,471	109,348
Population	247,990	251,518	255,096	258,726	262,406	266,140	268,667	271,219	273,795	276,395
Source: Idaho State Department of Employment (1986, 1991, 1992); Science Applications International Corporation (1994);

Figure 3.6-1 Historic and projected baseline employment at the Idaho National Engineering and Environmental Laboratory, 1990-2004 (U.S. Department of Energy, 1995a)

consolidation, which accounts for 64 percent of the projected losses between Fiscal Year 1994 and Fiscal Year 2004, and to reduced activities at the Naval Reactors Facility, which accounts for 33 percent of the projected job losses. Contract changes at DOE-ID resulted in the consolidation of several contracts under one contract. The consolidation eliminated redundant administrative activities previously performed by each individual contractor and offered early retirement or other options to impacted INEEL contractor employees.

3.6.2 Population and Housing

3.6.2.1 Population

From 1960 to 1990, population growth in the region of influence mirrored statewide growth. During this period, the region's population increased at an average annual rate of approximately 1.3 percent, while the growth rate for the State was 1.4 percent. Between 1980 and 1990, population growth in the region of influence approximately equaled that of the State with an average growth rate of 0.6 percent per year. The region of influence had a 1990 population of 219,713, which comprised 22 percent of the total State population of 1,006,749. Based on population and employment trends, the population in the region of influence will reach approximately 248,000 persons by 1995 (Table 3.6-1).

In 1990, the most populous counties were Bannock and Bonneville, which together contained over 60 percent of the seven-county total (Figure 3.6-2). Butte and Clark were the least populous of the counties in the region of influence. The largest cities in the region of influence are Pocatello and Idaho Falls, with 1990 populations of approximately 46,000 and 44,000, respectively. In 1990, the Fort Hall Indian Reservation and Trust Lands contained 5,113 residents, most of whom (52 percent) resided in Bingham County.

3.6.2.2 Housing

Bonneville and Bannock Counties (which respectively include the cities of Idaho Falls and Pocatello) provided 67 percent of the 73,230 year-round housing units in the region of influence in 1990 (see Table 3.6-2). Of this number, approximately 70 percent were single-family units, 17 percent were multifamily units, and 13 percent were mobile homes. Most of the multifamily units (75 percent) were in Bonneville and Bannock Counties. About 29 percent of the occupied housing units in the region were rental units and 71 percent were homeowner units (U.S. Bureau of the Census, 1992).

The median value of owner-occupied housing units ranged from \$37,300 in Clark County to \$68,700 in Madison County, and median monthly rents ranged from \$243 in Butte County to \$366 in Bonneville County. In 1990, there were 1,510 occupied housing units on the Fort Hall Indian Reservation and Trust Lands (USBC, 1992) and a vacancy rate of 14 percent.

Note: 1995 to 2004 represent population projection

Legend:

Figure 3.6-2 Historic and projected total population for the counties of the region of influence, 1940-2004 (U.S. Department of Energy, 1995a)

Table 3.6-2. Number of Housing Units, Vacancy Rates, Median House Value, and Median Monthly Rent by County and Region of Influence^a

County	Homeowner Housing Units			Rental Units		
	Number of units	Vacancy rates	Median Value (\$)	Number of units	Vacancy rates	Median monthly rent (\$)
Bannock	16,447	2.4	53,300	7,467	10.3	294
Bingham	9,010	2.0	50,700	2,955	9.2	284
Bonneville	17,707	1.9	63,700	7,375	6.2	366
Butte	780	4.6	41,400	302	16.2	243
Clark	177	1.7	37,300	114	9.6	281
Jefferson	4,000	2.0	54,300	992	4.1	314
Madison	3,522	1.3	68,700	2,392	2.8	299
Region of influence	51,674	2.1	—	21,556	4.6	—
^a Source: U.S. Bureau of the Census (1992).						

3.6.3 Community Services

This assessment considers the following selected community services in the region of influence: public schools, law enforcement, fire protection, hospital services, and solid waste disposal. Table 3.6-3 summarizes pertinent characteristics of these services for the region of influence.

Seventeen public school districts and three nonpublic schools provide educational services for about 58,000 children in the region of influence. Of these students, about 6,500 were dependents of INEEL-related employees. During the 1990-1991 academic year, most public school districts spent an average of \$3,000 to \$4,000 per student annually. Higher education in the region is provided by the University of Idaho, Idaho State University, Brigham Young University, Ricks College, and the Eastern Idaho Technical College.

Seven county sheriff's offices, 12 city police departments, and the Idaho State Police provide law enforcement services in the region. There was a total of 479 sworn officers and 100 other law enforcement personnel in 1991, more than 59 percent of whom served Bannock and Bonneville Counties.

Table 3.6-3. Summary of Public Services Available in the Region of Influence^a

	County						
Public Service	Bannock	Bingham	Bonneville	Butte	Clark	Jefferson	Madison
Schools							
Number of public school districts	2	5	3	1	1	3	2
Total enrollment	15,455	11,311	17,896	765	166	5,339	5,967
Number of INEEL-related students (excluding military)	485	1,532	4,040	301	5	134	47
Health Care Delivery							
Number of hospitals	3	2	1	1	0	0	1
Number of licensed beds	309	238	311	4	—	—	52
Law Enforcement							
Number of sworn law enforcement officers	151	65	143	4	2	18	43
Total personnel per 1000 population	2.5	2.0	2.2	1.3	6.3	1.6	1.9
Fire Protection							
Number of fire stations	9	7	6	2	1	4	1
Number of firefighters	166	96	121	15	7	63	24
Number of firefighting vehicles	37	25	24	3	1	11	6
Municipal Solid Waste Disposal							
Number of landfills meeting EPA ^b regulations	1 ^e	3 ^d	1 ^e	2	0 ^f	1	0 ^f
Expected lifespan in years	30	3-6	50	30	—	2	—
^a Source: Idaho Department of Education (1991); Idaho Department of Health and Welfare (1990); Idaho Department of Law Enforcement (1991); Kouris (1992a); and Kouris (1992b). ^b EPA = U.S. Environmental Protection Agency. ^c Fort Hall Mine Landfill is being redesigned to meet EPA standards. ^d Aberdeen Landfill may close due to noncompliance with EPA standards. ^e A new landfill is replacing Bonneville County Landfill. ^f Madison and Clark Counties are evaluating a regional landfill for use after 1993.							

Eighteen fire districts in the region of influence operate 30 fire stations staffed by 180 paid and approximately 300 volunteer firefighters. Bingham, Bonneville, Butte, Clark, and Jefferson Counties, which surround the INEEL, have developed emergency plans to be implemented in the event of a radiological or hazardous materials emergency. Each emergency plan identifies facilities with extremely hazardous substances and defines transportation routes for these substances. The emergency plans also include procedures for notification and response, listings of emergency equipment and facilities, evacuation routes, and training programs.

Eight hospitals serve the region of influence with more than 900 licensed beds and a capacity of nearly 128,000 patient-days per year. Occupancy rates range from 22.0 to 61.7 percent in the region (Idaho Department of Health and Welfare, 1990). County governments and the Blackfoot, Dubois, Idaho Falls, and Pocatello fire departments provide regional ambulance services. A private ambulance company serves residents in Butte County. Four quick-response units, two medical helicopters, and two clinics specializing in emergency medical services also serve the region of influence (Hardinger, 1990; U.S. West Directories, 1992).

Municipal solid waste generated in the region of influence is transported to county landfills. In 1992, twelve landfills served the region of influence. Four landfills (one each in Bannock, Clark, Jefferson, and Madison Counties) will close without replacement before reaching their planned capacity due to noncompliance with new EPA standards (Code of Federal Regulations, 1991a).

3.6.4 Public Finance

In Fiscal Year 1991, total county revenues for the region of influence amounted to approximately \$90 million (see Table 3.6-4). County governments receive most of their revenues from taxes and intergovernmental transfers. In 1991 the total assessed value of taxable property in the region of influence was about \$4.5 billion. In addition to property tax revenues, local governments (cities and counties) also receive revenue from sales tax disbursements and revenue-sharing programs. These two sources provide approximately 60 to 85 percent of the total revenues received by each county.

Although DOE as a Federal agency is exempt from paying state or local taxes, INEEL employees and contractors are not. In 1992, INEEL employees paid an estimated \$60 million in Federal withholding tax and \$24 million in state withholding tax.

In 1991 the major categories of county government expenditures were general government services, 27 percent; road maintenance, 18 percent; public safety, 16 percent; health and welfare programs, 16 percent; sanitation and public works, 9 percent; debt service, 3 percent; trust remittances, 2 percent; and other expenditures, 9 percent.

3.7 Environmental Justice

A description of Environmental Justice analysis performed by DOE for the environment affected by the overall SNF management plan at the INEEL is provided in Volume 2, Part A, Section 5.20, Environmental Justice, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

Table 3.6-4. Total Revenues and Expenditures by County, Fiscal Year 1991^a

County	Total revenues (\$)	Total expenditures (\$)
Bannock	16,232,274	14,216,708
Bingham	11,434,200	10,708,011
Bonneville ^b	50,186,650	51,850,100
Butte	1,417,684	1,397,012
Clark	1,236,849	1,086,379
Jefferson	4,408,236	4,566,074
Madison	5,249,432	5,662,080
Seven-county region	90,165,325	89,486,364
^a Sources: Ghan (1992); Bingham County (circa 1992); McFadden (circa 1992); Swager & Swager (1992a); Swager & Swager (1992b); Draney, Searle, and Associates (1992); Schwendiman & Sutton (1992). ^b Bonneville County's financial statements and total revenue data include special accounts for schools, cities, cemeteries, fire districts, ambulance districts, and other special accounts not found in other county budgets. The majority of intergovernmental revenue is used to fund these accounts.		

In February 1994, Executive Order 12898, titled *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (FR, 1994), was released to Federal agencies. This order directs Federal agencies to incorporate environmental justice as part of their missions. As such, Federal agencies are specifically directed to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their program, policies, and activities on minority populations and low-income populations. ...

This section provides an assessment of the area surrounding the INEEL with respect to proposed environmental restoration and waste management programs under all alternatives considered in this volume. In addition, this assessment includes consideration of the management of spent nuclear fuel under all alternatives evaluated in Volume 1 of this EIS [the DOE SNF EIS], which are integrated into the alternatives of Volume 2 [of the DOE SNF EIS] as appropriate. This assessment includes potential adverse impacts resulting from both onsite activities and associated transportation of materials. Based on this assessment, it is concluded that none of the alternatives considered under the proposed action results in disproportionately high and adverse effects on minority

populations or low-income communities surrounding the INEEL or associated offsite transportation routes.

3.7.1 Community Characteristics

Demographic information obtained from the U.S. Bureau of Census [USBC] was used to identify minority populations and low-income communities in the zone of potential impact surrounding the INEEL. This zone is within a circle that has an 80-kilometer (50-mile) radius. This 80-kilometer (50-mile) radius was selected because it was judged to encompass all of the impacts that may occur. This radius is also based on air impact modeling and socioeconomic impact analysis used in this EIS. Transportation impacts are assessed within 800 meters (0.5 miles) of transportation routes for incident-free transportation because impacts beyond this distance are negligible. For transportation accidents, an 80-kilometer (50-mile) radius was used. Demographic maps were prepared using 1990 census data available from the U.S. Bureau of the Census (U.S. Bureau of the Census, 1992). Figures 3.7-1 and 3.7-2 illustrate census tract distributions for both minority populations and low-income populations respectively for areas surrounding the INEEL. These maps were generated from an analysis of 1990 United States Bureau of Census Tiger Line files, which contain political boundaries and geographical features, and Summary Tape Files 3A (as processed by the U.S. Environmental Protection Agency), which contain demographic information. Data were resolved to the census tract group level. Census tracts are designated areas designed to encompass roughly 4,000 people per tract, but in reality generally range from 2,500 to 8,000 people.

An 80-kilometer (50-mile) radius circle appears on each map defining a zone of potential impact. As discussed above, this zone of potential impact relates to the analysis performed in the [DOE SNF] EIS. Because of the diversity of locations of current and potential onsite environmental restoration and waste management activities, the circle has been centered on a conservative location to identify the maximum number of minority populations and low-income populations. The center is located in the southeast corner of the INEEL, at the location of the Argonne National Laboratory-West.

Minority populations and low-income populations are defined as follows:

Minority population: A group of people and/or community experiencing common conditions of exposure or impact that consists of persons of the United States classified by the U.S. Bureau of the Census as Negro/Black/African-American, Hispanic, Asian and Pacific Islander, American Indian, Eskimo, Aleut, and other nonwhite persons, based on self-classification by the people according to the race with which they most closely identify. For the purposes of analysis, minority populations are defined as those census tracts within the zone of impact for which the percent minority population exceeds the average of all census tracts within the zone of impact or where the percent minority population exceeds 50 percent for any given census tract. In the case of migrant or dispersed populations, a minority population consists of a group that is greater than 50 percent minority.

Low-income population: A group of people and/or community experiencing common conditions of exposure or impact, in which 25 percent or more of the population is

Figure 3.7-1 Minority population distribution within 50 miles (80 kilometers) of the Idaho National Engineering and Environmental Laboratory (U.S. Department of Energy, 1995a)

Figure 3.7-2 Low-income population distribution within 50 miles (80 kilometers) of the Idaho National Engineering and Environmental Laboratory (U.S. Department of Energy, 1995a)

characterized as living in poverty (Federal Register, 1993). The U.S. Bureau of the Census characterizes persons in poverty as those whose income is less than a "statistical poverty threshold." The threshold for the 1990 census was a 1989 income of \$12,674 for a family of four. This threshold is a weighted average based on family size and the age of the persons in the family. Table 3.7-1 presents the U.S. Census poverty thresholds (U.S. Bureau of Census, 1992) used in this analysis.

3.7.1.1 Distribution of Minority Populations and Low-income Populations Near the Idaho National Engineering and Environmental Laboratory

According to the data, approximately 172,366 people reside within the 80-kilometer (50-mile) radius of the INEEL. Of that total population, 7 percent, or approximately 11,722, are classified as minority individuals. The area surrounding the INEEL has a relatively small percentage of minorities compared to comparable DOE sites (see Appendix L to Volume 1 of this [DOE SNF] EIS). The minority composition is primarily Hispanic, Native American, and Asian. The Fort Hall Indian Reservation of the Shoshone-Bannock Tribes lies largely within 80 kilometers (50 miles) of the INEEL. The spatial distribution of the minority population residing in 37 census tracts within 80 kilometers (50 miles) of the INEEL is shown in Figure 3.7-1. Census tracts that were bisected by the 80-kilometer (50-mile) radius circumference line were included in the analysis if 50 percent of the tract fell within the 80-kilometer (50-mile) radius. As indicated in the legend, census tracts have been shaded according to the percentage of minority individuals within the area. Because of the variations in the populations of census tracts, the geographical size of any particular census tract area is not necessarily proportional to the numerical population within that tract. Because of the sparse population surrounding the site, census tracts are relatively large in geographical area. The minority population surrounding the INEEL resides largely to the southeast of the site.

Of the total population, 14 percent, or approximately 23,416 individuals, fall within the definition of low-income for purposes of this analysis. Figure 3.7-2 shows the spatial distribution of low-income individuals within 80 kilometers (50 miles) of the INEEL. Census tracts containing low-income populations lie largely southeast of the site.

3.8 Demography

A description of the population demographics of the affected environment at the INEEL is provided in Section 2.1.2, Population Distribution, of the DOE-ID ER (U.S. Department of Energy-Idaho Operations Office, 1996b)³:

³ Populations in this section are discussed from three viewpoints: (1) "region of influence" as identified in Appendix F, Section F-1, Socioeconomics of the [DOE SNF EIS] (U.S. Department of Energy, 1995a) was determined to be a seven-county area comprised of Bingham, Bonneville, Butte, Clark, Jefferson, Bannock, and Madison counties, where over 97 percent of the INEEL employees reside. The region of influence includes the Fort Hall Indian Reservation and Trust Lands (home of the Shoshone-Bannock Tribes), located in Bannock, Bingham, Caribou, and Power counties; (2) a 50-mile circle [80 kilometer] centered at the Argonne National Laboratory-West for the purposes of identifying whether disproportionately high and adverse impacts might exist to minority or low-income populations; (3) a 50-mile circle [80 kilometer] centered at the ICPP to show population densities from the proposed site.

Table 3.7-1. Poverty Thresholds in 1989 By Size of Family and Number of Related Children Under 18 Years

	Weighted average threshold (\$)	None (\$)	One (\$)	Two (\$)	Three (\$)	Four (\$)	Five (\$)	Six (\$)	Seven (\$)	Eight or more (\$)
One person (unrelated individual)	6,310									
Under 65 years	6,451	6,451								
65 years and over	5,947	5,947								
Two persons	8,076									
Household under 65 years	8,343	8,303	8,547							
Household 65 years and over	7,501	7,495	8,515							
Three persons	9,885	9,699	9,981	9,990						
Four persons	12,674	12,790	12,999	12,575	12,619					
Five persons	14,990	15,424	15,648	15,169	14,796	14,572				
Six persons	16,921	17,740	17,811	17,444	17,092	16,569	16,259			
Seven persons	19,162	20,412	20,540	20,101	19,794	19,224	18,558	17,828		
Eight persons	21,328	22,830	23,031	22,617	22,253	21,738	21,084	20,403	20,230	
Nine or more persons	25,480	27,463	27,596	27,229	26,921	26,415	25,719	25,089	24,933	23,973

From 1960 to 1990, population growth in the region of influence mirrored State-wide growth. During this period, the region's population increased at an average annual rate of approximately 1.3 percent, while the growth rate for the State was 1.4 percent. Between 1980 and 1990, population growth in the region of influence approximately equaled that of the State, with an average growth rate of 0.6 percent per year. The region of influence had a 1990 population of 219,713, which comprised 22 percent of the State's total population of 1,006,749. The most populous counties were Bannock and Bonneville, which together contained over 60 percent of the seven county total. Butte and Clark were the least populous of the counties in the region of influence.

The population within a 50-mile (80-kilometer) circle centered at ANL-W (on the INEEL site) has been characterized for the purposes of identifying whether any disproportionately

high and adverse impacts might exist to minority or low-income populations. The population within this circle surrounding the INEEL site is shown to be 7 percent minority and 14 percent low-income, based on USBC information and the definitions and approach presented in Section 8.1 on Environmental Justice [of the DOE-ID ER].

Population in the region of influence is projected to reach 276,395 persons by 2004 based on population and employment trends. Over the period 1990 to 2004, the average annual growth rate is projected to be 1.6 percent compared to a projected State-wide annual growth rate of 1.7 percent.

Figures 3.8-1, 3.8-2, 3.8-3, and 3.8-4 show population densities, based on the 1990 Census, for the years 1990 through 2020 at 10-year intervals for the 50 mile (80 km) radius around ICPP. Also shown are the relative locations of the major towns. The nearest populated area to the INEEL is Atomic City, population about 30, located approximately 1 mile (1.6 km) from the southern INEEL boundary and about 11 miles (19 km) from the ICPP.

3.8.1 Population Within 10 Miles [16 Kilometers]

There are no permanent residents or cities or towns within a 10-mile (16-km) circle centered at the ICPP (Figure 3.8-1). However, several INEEL facilities, such as the CFA, TRA, and the RWMC are within 10 miles of the ICPP. Also, the Experimental Breeder Reactor 1 (EBR-1), a National Historic Landmark, is located southwest and within 10 miles of the ICPP. Institutional control would continue to restrict access to INEEL lands for the next 100 years (U.S. Department of Energy-Idaho Operations Office, 1996c), thus population within 10 miles (16 km) of the ICPP is unlikely to change through 2035.

3.8.2 Population Within 10 and 50 Miles [16 and 80 Kilometers]

The population between 10 and 50 miles [16 and 80 km] of the ICPP is about 118,644 (Figure 3.8-1). The two largest cities within the region of influence are Pocatello and Idaho Falls, with 1990 populations of approximately 46,000 and 44,000, respectively. In 1990, the Fort Hall Indian Reservation and Trust Lands contained 5,113 residents. The age distribution within the region of influence, over a seven county area is shown in Table 3.8-1. Expected population growth through 2020 is depicted in Figures 3.8-2, 3.8-3, and 3.8-4.

3.8.2.1 Transient Population

Year round variations in populations are caused by the daily influx of the workforce. About 4,110 workers are employed within 10 miles (16 km) of the ICPP (Table 3.8-2). U.S. Highways 20 and 26 pass through the site and are within 10 miles (16 km) of ICPP. Traffic on these highways, other than the daily site traffic, is related to travel between cities surrounding the site and the many recreational opportunities in the area. ... The projected INEEL workforce for the year 2004 is 7,250 (U.S. Department of Energy, 1995a).

Figure 3.8-2 Population distribution for 2000 within 50 miles (80 kilometers) of the Idaho Chemical Processing Plant (U.S. Department of Energy-Idaho Operations Office, 1996b)

Figure 3.8-3 Population distribution for 2010 within 50 miles (80 kilometers) of the Idaho Chemical Processing Plant (U.S. Department of Energy-Idaho Operations Office, 1996b)

Figure 3.8-4 Population distribution for 2020 within 50 miles (80 kilometers) of the Idaho Chemical Processing Plant (U.S. Department of Energy-Idaho Operations Office, 1996b)

Table 3.8-1. County Population By Age Distribution

County	Percentage by Age Group		
	0-14	15-64	> 64
Bannock	28	62	10
Bingham	33	57	10
Bonneville	30	61	9
Butte	29	58	13
Clark	27	61	12
Jefferson	34	56	10
Madison	27	67	6
Average	30	60	10

Table 3.8-2. Idaho National Engineering and Environmental Laboratory Workforce at Facilities on the Idaho National Engineering and Environmental Laboratory

Facility	INEEL Workforce
CFA	854
ICPP	1,157
PBF	116
NRF	1,022
TAN	335
TRA	430
WMF (RWMC)	196
Total	4,110
Source: Lockheed Idaho Technologies Company Monthly Headcount Report - March 1996	

3.9 Land Use

A description of the current and anticipated land use of the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.2, Land Use, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

The INEEL site encompasses 570,914 acres (2,310.4 square kilometers) in Butte, Bingham, Jefferson, Bonneville, and Clark Counties, Idaho. This section describes existing land uses at the INEEL and in the surrounding region, and land use plans and policies applicable to the surrounding area.

3.9.1 Existing and Planned Land Uses at the Idaho National Engineering and Environmental Laboratory

Categories of land use at the INEEL include facility operations, grazing, general open space, and infrastructure such as roads. Facility operations include industrial and support operations associated with energy research and waste management activities (DOE also conducts such activities at its Idaho Falls facilities). In addition, DOE uses INEEL land for recreation and environmental research associated with the designation of the INEEL as a National Environmental Research Park.

Much of the INEEL is open space that DOE has not designated for specific uses. Some of this open space serves as a buffer zone between INEEL facilities and other land uses. Facilities and operations use about 2 percent of the total INEEL site area (11,400 acres or 46 square kilometers). Public access to most facility areas is restricted. Approximately 6 percent of the INEEL, or 32,985 acres (133.5 square kilometers), is devoted to public roads and utility rights-of-way that cross the site. Recreational uses include public tours of general facility areas and the Experimental Breeder Reactor-1 (a National Historic Landmark), and controlled hunting, which is generally restricted to 0.5 mile (0.8 kilometer) inside the INEEL boundary.

Cattle and sheep grazing occupies between 300,000 and 350,000 acres (1,200 and 1,400 square kilometers). The U.S. Sheep Experiment Station uses a 900-acre (3.6-square-kilometer) portion of this land, at the junction of Idaho State Highways 28 and 33, for a winter feed lot for approximately 6,500 sheep. Grazing is not allowed within 2 miles (3.2 kilometers) of any nuclear facility and, to avoid the possibility of milk contamination by long-lived radionuclides, dairy cattle are not permitted on the site. The Department of the Interior's Bureau of Land Management grants and administers rights-of-way and grazing permits. Figure 3.9-1 shows selected land uses at the INEEL and in the surrounding region.

The INEEL site is within the Medicine Lodge Resource Area (approximately 140,415 acres or 568.3 square kilometers in the eastern and southern portions of the INEEL site) and the Big Butte Resource Area (430,499 acres or 1,742 square kilometers in the central and western portions); the Bureau of Land Management administers both of these areas. Under Resource Management Plans, the Bureau manages portions of these Resource Areas for grazing and wildlife habitat. No mineral exploration or development is allowed on INEEL land.

Legend:

- ANL-W Argonne National Laboratory-West
- ARA Auxiliary Reactor Area
- CFA Central Facilities Area
- EBR-I Experimental Breeder Reactor - I
- ICCP Idaho Chemical Processing Plant
- NRF Naval Reactors Facility
- PBF Power Burst Facility
- RWMC Radioactive Waste Management Complex
- TAN Test Area North
- TRA Test Reactor Area
- WERF Waste Experimental Reduction Facility

- Under grazing permits
- BLM or private land
- State land

PJ20-3

Figure 3.9-1 Selected land uses at the Idaho National Engineering and Environmental Laboratory and in the surrounding region (U.S. Department of Energy, 1995a)

DOE land use plans and policies applicable to the INEEL include the INEEL *Institutional Plan Fiscal Year 1994 - 1999* (U.S. Department of Energy-Idaho Operations Office, 1993c) and the *INEEL Technical Site Information Report* (U.S. Department of Energy-Idaho Operations Office, 1993a). The *Institutional Plan* provides a general overview of INEEL facilities, outlines strategic program directions and major construction projects, and identifies specific technical programs and capital equipment needs. The *Technical Site Information Report* presents a 20-year master plan for development activities at the site. Under the scope of these planning documents, energy research and waste management activities would continue in existing facility areas and, in some instances, expand into currently undeveloped site areas. These documents also describe environmental restoration, waste management, and spent nuclear fuel activities. Projected land use scenarios for the next 25 to 50 years include the outgrowth of current functional areas and the possible development of waterfowl production ponds in existing grazing areas.

No onsite land use restrictions due to Native American treaty rights would exist for any of the alternatives described in this [DOE SNF] EIS. The INEEL does not lie within any of the land boundaries established by the Fort Bridger Treaty, and the entire INEEL site is land occupied by the U.S. Department of Energy. Therefore, the provisions in the Fort Bridger Treaty that allows the Shoshone-Bannock Indians to hunt on unoccupied lands of the United States do not apply to the INEEL site.

3.9.2 Existing and Planned Land Use in Surrounding Areas

The Federal government, the State of Idaho, and private parties own the lands surrounding the INEEL site. Land uses on Federally owned land consist of grazing, wildlife management, range land, mineral and energy production, and recreational uses. State-owned lands are used for grazing, wildlife management, and recreational purposes. Privately owned lands are used primarily for grazing, crop production, and range land.

Small communities and towns near the INEEL boundaries include Mud Lake to the east; Arco, Butte City, and Howe to the west; and Atomic City to the south. The larger communities of Idaho Falls, Rexburg, Blackfoot, and Pocatello and Chubbuck are to the east and southeast of the INEEL site. The Fort Hall Indian Reservation is to the southeast of the INEEL. Recreation and tourist attractions in the region around the INEEL include the Craters of the Moon National Monument, Hell's Half Acre Wilderness Study Area, Black Canyon Wilderness Study Area, Camas National Wildlife Refuge, Market Lake State Wildlife Management Area, North Lake State Wildlife Management Area, Yellowstone National Park, Grand Teton National Park, Jackson Hole Recreation Complex, Targhee and Challis National Forests, and the Snake River.

Lands surrounding the INEEL site are subject to Federal and state planning laws and regulations. Federal rules and regulations that require public involvement in their implementation govern planning for and use of Federal lands and their resources. Land use planning in the State of Idaho is derived from the Local Planning Act of 1975 (State of Idaho Code, 1975). Because the State currently has no land use planning agency, the Idaho legislature requires each county to adopt its own land use planning and zoning guidelines. County plans that are applicable to lands bordering the INEEL site include the Clark County Planning and Zoning Ordinance and Interim Land Use Plan (Clark County, 1994), Bonneville County Comprehensive Plan (Bonneville County, 1976),

Bingham County Zoning Ordinance and Planning Handbook (Bingham County, 1986), Jefferson County Comprehensive Plan (Jefferson County, 1988), and Butte County Comprehensive Plan (Butte County, 1992). Land use planning for INEEL facilities within the Idaho Falls city limits is subject to Idaho Falls planning and zoning restrictions (City of Idaho Falls, 1989; 1992).

All county plans and policies accept development adjacent to previously developed areas to minimize the need to extend infrastructure improvements and to avoid urban sprawl. Because the INEEL is remote from most developed areas, INEEL lands and adjacent areas are not likely to experience residential and commercial development; no new development is planned near the INEEL site. However, DOE expects recreational and agricultural uses to increase in the surrounding area in response to greater demand for recreational areas and the conversion of range land to crop land.

Additional information on the aesthetic and scenic resources of the affected environment at the INEEL is provided in Volume 1, Appendix B, Section 4.5, Aesthetic and Scenic Resources, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

3.9.3 Visual Character of the Idaho National Engineering and Environmental Laboratory Site

The Bitterroot, Lemhi, and Lost River mountain ranges border the INEEL site on the north and west. Persons can see volcanic buttes near the southern boundary of the ML from most locations on the site and from the Fort Hall Reservation. Most of the INEEL site consists of open undeveloped land, covered predominantly by large sagebrush and grasslands (see Section 4.9 [of the DOE SNF EIS]). Pasture and irrigated farmland border much of the INEEL site (see Section 4.2 [of the DOE SNF EIS (U.S. Department of Energy, 1995a)]).

Although the INEEL has a master plan, it has not established specific visual resource standards. The nine facility areas on the INEEL site are generally of low density, look like commercial or industrial complexes, and are spread across the site. Structures in the facility areas range in height from 10 feet to approximately 100 feet (3 to 30 meters). About 90 miles (145 kilometers) of paved public highway run through the INEEL site (see Section 4.11 [of the DOE SNF EIS]). Although many INEEL facilities are visible from these highways, most facilities are located more than 0.5 mile (0.8 kilometer) from public roads.

3.9.4 Scenic Areas

The Craters of the Moon National Monument is about 15 miles (24 kilometers) southwest of the INEEL site's western boundary. The Monument is located in a designated Wilderness Area, which must maintain Class I (very high) air quality standards or minimal degradation, as defined by the CAA (Clean Air Act, 1990; Code of Federal Regulations, 1990; Code of Federal Regulations, 1991b). Under Section 169a of the CAA, air quality includes visibility and scenic view considerations.

Lands adjacent to the INEEL under Bureau of Land Management jurisdiction are Visual Resource Management Class II areas (Bureau of Land Management, 1984; Bureau of Land Management, 1986), which urge preservation and retention of the existing character

of the landscape. Lands inside the INEEL boundaries are Class III and IV areas, the most lenient classes in terms of modification. The Bureau of Land Management is considering the Black Canyon Wilderness Study Area, which is adjacent to the INEEL, for a Wilderness Area designation (Bureau of Land Management, 1986); if approved, this would result in an upgrade from Visual Resource Management Class II to a Class I.

Features of the natural landscape have special significance to the Shoshone-Bannock tribes. The visual environment of the INEEL site is within the visual range of Fort Hall Reservation.

3.10 Noise and Traffic

A description of the noise of the environment affected by the SNF management plan at the INEEL is provided in Volume 1, Appendix B, Section 4.10, Noise, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

3.10.1 Noise

The major noise sources at the INEEL occur primarily in developed operational areas. These sources include facilities; equipment and machines (e.g., cooling towers, transformers, engines, pumps, boilers, steam vents, paging systems, construction equipment, and materials-handling equipment); aircraft; and bus, car, truck, and railroad traffic. At the INEEL boundary, which is more than 3 kilometers (2 miles) from any facility, noise from most sources is barely distinguishable from background noise levels. Some disturbance of wildlife activities could occur at the INEEL as a result of noise from operational and construction activities. The State of Idaho and the counties in which the INEEL is located have not established any regulations that specify acceptable community noise levels, with the exception of prohibitions on nuisance noise.

Existing INEEL-related noises of public significance are from the transportation of people and materials to and from the site and in-town facilities via buses, trucks, private vehicles, helicopters, and freight trains. During the normal workweek, most of the 4,000 to 5,000 employees who work on the site (as opposed to those working in Idaho Falls) travel daily by buses from surrounding communities (see Section 4.3 [of the DOE SNF EIS (U.S. Department of Energy, 1995a)]). In addition, 300 to 500 private vehicles travel to the INEEL site from surrounding communities each day (see Section 4.11 [of the DOE SNF EIS]). Noise measurements along U.S. Highway 20 about 15 meters (50 feet) from the roadway indicate that the sound level from traffic ranges from 64 to 86 decibels, A-weighted (dBA) (Abbott et al., 1990), and that the primary source is buses (71 to 81 dBA). While few people reside within 15 meters (50 feet) of the roadway, the results indicate that INEEL traffic noise might be objectionable to members of the public residing near principal highways or busy bus routes. The acoustic environment along the INEEL site boundary in rural areas and at nearby areas away from traffic noise is typical of a rural location, with the day-night sound level (DNL) in the range of 35 to 50 dBA (U.S. Environmental Protection Agency, 1974).

Public exposure to aircraft noise is due in part to INEEL-related activities. Air cargo and business travel of INEEL personnel via commercial air transport is a significant fraction of all such travel in and out of regional airports. Onsite INEEL security patrol and

surveillance flights do not adversely affect individuals off the site because of the INEEL's remoteness. For INEEL helicopter flights that originate or terminate in Idaho Falls, members of the public are exposed to the unique noises produced by these aircraft. Because the number of flights per day is limited and most flights occur during nonsleeping hours, public exposure to aircraft nuisance noise is not great.

Normally only one train per day serves the INEEL, via the Scoville spur. Noise sources related to rail transport include those from diesel engines, wheel-track contact, and whistle warnings at rail crossings. Even with only one or two exposures to these sources per day, individuals residing near the railroad tracks might find the noises mildly objectionable.

3.10.2 Traffic and Transportation

An analysis of traffic through the environment affected by the SNF management plan at the INEEL is provided in Volume 1, Appendix B, Section 4.11, Traffic and Transportation, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

Roads are the primary access to and from the INEEL site. Commercial shipments are transported via truck and plane, some bulk materials are transported via rail, and waste is transported by road and rail. This section discusses the existing traffic volumes, transportation routes, transportation accidents, and waste and materials transportation, including baseline radiological exposures from waste and materials transportation. This section summarizes the information in Lehto (1993).

3.10.2.1 Roadways

3.10.2.1.1 Infrastructure Regional and Site Systems

Figure 3.10-1 shows the existing regional highway system. Two interstate highways serve the regional area. Interstate 15 (I-15), a north-south route that connects several cities along the Snake River, is approximately 40 kilometers (25 miles) east of the INEEL site. I-86 intersects I-15 approximately 64 kilometers (40 miles) south of the INEEL site, and provides a primary linkage from I-15 to points west. I-15 and US 91 are the primary access routes to the Shoshone-Bannock reservation. US 20 and US 26 are the main access routes to the southern portion of the INEEL site. Idaho State Routes 22, 28, and 33 pass through the northern portion of the INEEL; State Route 33 provides access to the northern INEEL site facilities. Table 3.10-1 lists the baseline (1991) traffic for several of these access routes. The level of service of these segments is currently designated "free flow," which is defined as "operation of vehicles is virtually unaffected by the presence of other vehicles."

The INEEL has developed an onsite road system of approximately 140 kilometers (87 miles) of paved surface, including about 29 kilometers (18 miles) of service roads that are closed to the public. Most of the roads are adequate for the current level of normal transportation activity and could handle some increased traffic volume. DOE plans to reconstruct several deteriorating INEEL roads built in the 1950s that have been and will continue to be used to transport heavier-than-normal loads.

Figure 3.10-1 Transportation routes in the vicinity of the Idaho National Engineering and Environmental Laboratory (U.S. Department of Energy, 1995a)

3.10.2.1.2 Infrastructure Idaho Falls

Approximately 4,000 DOE and contractor personnel administer and support INEEL work at offices in Idaho Falls. DOE shuttle vans provide hourly transport between in-town facilities. One of the busiest intersections is Science Center Drive and Fremont Avenue, which serves Willow Creek Building, Engineering Research Office Building, INEEL Electronic Technology Center, and DOE Office Buildings. This intersection is congested during peak weekday hours, but it is designed for the current traffic.

Table 3.10-1. Baseline Traffic For Selected Highway Segments^a

Route	Average daily traffic	Peak hourly traffic ^b
U.S. Highway 20-Idaho Falls to INEEL	2,290	344
U.S. Highway 20/26-INEEL to Arco	1,500	225
U.S. Highway 26-Blackfoot to INEEL	1,190	179
State Route 33 west from Mud Lake	530	80
Interstate 15-Blackfoot to Idaho Falls	9,180	1,380
^a Source: Lehto (1993).		
^b Estimated as 15 percent of average daily traffic.		

Table 3.10-2. Baseline Annual Vehicle Miles Traveled For Idaho National Engineering and Environmental Laboratory Related Traffic^a

Mode of travel and transportation	Vehicle miles traveled ^b
DOE buses	6,068,200
Other DOE vehicles	9,183,100
Commercial trucks	56,000
Personal vehicles on highways to INEEL	7,500,000
TOTAL	22,807,300
^a Source: Lehto (1993).	
^b To convert from miles to kilometers, multiply by 1.61.	

3.10.2.1.3 Transit Modes

Four major modes of transit use the regional highways, community streets, and INEEL site roads to transport people and commodities: DOE buses and shuttle vans, DOE motor pool vehicles, commercial trucks, and personal vehicles. Table 3.10-2 summarizes the baseline miles for INEEL-related traffic.

3.10.2.2 Railroads

Figure 3.10-1 shows the Union Pacific Railroad lines in southeastern Idaho. Idaho Falls receives railroad freight service from Butte, Montana, to the north, and from Pocatello and Salt Lake City to the south. The Union Pacific Railroad's Blackfoot-to-Arco branch, which crosses the southern portion of the INEEL, provides rail service to the site for the shipment of spent nuclear fuel and other waste, bulk commodities, and radioactive materials. This branch connects with a DOE-owned spur line at Scoville Siding, then links with developed INEEL areas. Table 3.10-3 lists rail shipments for Fiscal Years 1988 through 1992.

3.10.2.3 Airports and Air Traffic

Commercial airlines provide Idaho Falls with jet aircraft passenger and cargo service, as well as commuter service to both the Idaho Falls and Pocatello airports. In addition, local charter service is available in Idaho Falls, and private aircraft use the major airport and many other fields in the area. Total landings at the Idaho Falls airport for 1991 and 1992 were 5,367 and 5,598, respectively. The Idaho Falls and Pocatello airports collectively record nearly 7,500 landings annually.

Non-DOE air traffic over the INEEL site is limited to altitudes greater than 305 meters (1,000 feet) over buildings and populated areas, and non-DOE aircraft are not permitted to use the site. The primary air traffic at the INEEL site is DOE helicopters, which are used for security and emergency purposes. These helicopters have specific operations stations and duties.

3.10.2.4 Accidents

From 1987 through 1992, the average motor vehicle accident rate was 0.94 accident per million kilometers (1.5 accidents per million miles) for INEEL vehicles, which compares with an accident rate of 1.5 accidents per million kilometers (2.4 accidents per million miles) for all DOE complex vehicles and 8 accidents per million kilometers (12.8 accidents per million miles) nationwide for all motor vehicles (Lehto, 1993). There are no recorded rail or air accidents associated with the INEEL and, to date, no fatal air traffic accidents have involved flights through either the Idaho Falls or Pocatello airports.

Table 3.10-3. Loaded Rail Shipments To and From the Idaho National Engineering and Environmental Laboratory (1988-1992)^a

Fiscal Year	Inbound	Outbound
1988	63	44
1989	43	19
1990	34	3
1991	18	0
1992	23	0

^aSources: DOE Shipment Mobility/Accountability Collection System database; Attachment A to Appendix D of Volume 1 of this [DOE SNF] EIS (U.S. Department of Energy, 1995a).

3.10.2.5 Transportation of Waste, Materials, and Spent Nuclear Fuel

Hazardous, radioactive, industrial commercial, and recyclable wastes are transported on the INEEL site. Federal and State regulations and requirements govern the transportation of hazardous and radioactive materials (Lehto, 1993). Hazardous materials include commercial chemical products and hazardous wastes that are nonradioactive; they are regulated and controlled based on their chemical toxicity. Onsite spent nuclear fuel comes from Argonne National Laboratory-West, the Naval Reactors Facility, and the Advanced Test Reactor; it is transported by truck to various onsite storage and research and development facilities.

This assessment used six years of data (1987 through 1992) to establish a baseline of radiological doses from incident-free, onsite total nonnaval spent nuclear fuel transportation at the INEEL. Table 3.10-4 lists the results in terms of cumulative doses (1995-2035) and health effects. These doses do not include onsite naval shipments, which are assessed in Attachment A to Appendix D of Volume 1 of this [DOE SNF] EIS. The baseline includes no offsite shipments, which are addressed in Appendixes D and I [of the DOE SNF EIS].

3.11 Cultural and Archaeological Resources

A description of the cultural and archaeological resources of the affected environment at the INEEL is provided in Volume 1, Appendix B, Cultural and Archaeological Resources, Section 4.4, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

This section discusses cultural resources at the INEEL, including prehistoric and historic archeological sites and historic sites and structures, and traditional resources that are of

cultural or religious importance to local Native Americans. It also discusses paleontological localities on the INEEL site.

3.11.1 Archeological Sites and Historic Structures

As summarized in the INEEL Draft Management Plan for Cultural Resources (Miller, 1992), the INEEL contains a rich and varied inventory of cultural resources. This includes fossil localities that provide an important paleontological context for the region and the many prehistoric archeological sites that are preserved within it. These latter sites, including campsites, lithic workshops, cairns, and hunting blinds, among others, are also an important part of the INEEL inventory because they provide information about the activities of aboriginal hunting and gathering groups who inhabited the area for approximately 12,000 years. In addition, archeological sites, pictographs, caves, and many other features of the INEEL landscape are also important to contemporary Native American groups for historic, religious, and traditional reasons. Historic sites, including the abandoned town of Powell/Pioneer, a northern spur of the Oregon Trail known as Goodale's Cutoff, many small homesteads, irrigation canals, sheep and cattle camps, and stage and wagon trails, document the use of the area during the late 1800s and early 1900s. Finally, the many scientific and technical facilities inside the INEEL boundaries have preserved important information on the historic development of nuclear science in America.

To date, more than 100 cultural resource surveys have been conducted over approximately 4 percent of the area on the INEEL site. These surveys, most of which have occurred near major facility areas, have identified 1,506 archeological resources, including 688 prehistoric sites, 38 historic sites, 753 prehistoric isolates, and 27 historic isolates (Miller, 1992; Gilbert and Ringe, 1993). These numbers do not include architectural properties associated with the creation and operation of the INEEL. Until

Table 3.10-4. Cumulative Doses and Cancer Fatalities From Incident-free Onsite Shipments of Nonnaval Spent Nuclear Fuel at the Idaho National Engineering and Environmental Laboratory For 1995 Through 2035^{a,b}

	Estimated collective dose (person-rem)	Estimated cancer fatalities
Occupational	3.4	0.0014
General population	0.087	0.000044
^a Source: Maheras (1993).		
^b Onsite naval shipment doses are addressed in Attachment A to Appendix D of Volume 1 of this [DOE SNF] EIS.		

formal significance evaluations (archeological testing and historic records searches) have been completed, all cultural sites in this inventory are considered to be potentially eligible for nomination to the National Register of Historic Places. However, all the isolates have been categorized as unlikely to meet eligibility requirements (Yohe, 1993).

Due to the relatively high density of prehistoric sites on the INEEL and the need to consider these resources during Federal undertakings, DOE has sponsored a preliminary study, which resulted in the development of a predictive model, to identify areas where densities of sites are highest and where the potential impacts to significant archeological resources, as well as costs of compliance, would increase correspondingly (Ringe, 1993). This information provides guidance for INEEL project managers in the selection of appropriate areas for new construction. However, it does not take the place of inventories that are required by the National Historic Preservation Act before ground-disturbing projects can start (National Historic Preservation Act, 1966 as amended),

The predictive model, constructed using a multivariate statistical technique on environmental variables associated with areas with and without sites, indicates that prehistoric cultural resources appear to be concentrated in association with certain definable physical features of the land. In this context, very high densities of resources are likely to occur along the Big Lost River and Birch Creek, atop buttes, and within craters and caves. The Lemhi Mountains, the Lake Terretton basin, and a 1.75-mile- (2,800-meter-) wide zone along the edge of local lava fields probably contain a fairly high density of sites. Within the extensive flows of basaltic lava and along the low foothills of the Lemhi Mountains, site density is classified as moderate, and the lowest density of prehistoric resources probably occurs in the floodplain of the Big Lost River and the alluvial fans emerging from the Birch Creek Valley, in the sinks, and in the recent Cerro Grande lava flow. However, a classification of low or medium density does not eliminate the possibility that significant resources exist in those areas. Although the predictive model has not been tested, it is useful as a planning guide for defining areas most likely to contain archeological resources based on past surveys.

Although there has been no systematic inventory of historically significant facilities associated with the creation and operation of the INEEL, a preliminary study indicated that all INEEL facilities will require evaluation (Braun et al., 1993). The EBR-1 is a National Historic Landmark listed in the National Register of Historic Places. To date, however, few of the other properties have been formally evaluated for eligibility to the National Register. Memoranda of Agreement between DOE, the Idaho State Historic Preservation Office, and the National Advisory Council on Historic Preservation establish that certain structures at Test Area North (U.S. Department of Energy, 1993b) and Auxiliary Reactor Area (U.S. Department of Energy, 1993a) are eligible for nomination, and outline specific techniques for preserving the historic value of the areas in conformance with the requirements of the Historic American Building Survey and the Historic American Engineering Record. Other facilities on the INEEL site are likely to require similar efforts if DOE schedules them for major modification, demolition, or abandonment.

3.11.2 Native American Cultural Resources

Because Native American people believe the land is sacred, the entire INEEL reserve is culturally important to them. Cultural resources, to the Shoshone-Bannock peoples, include all forms of traditional lifeways and usage of all natural resources. This includes not only prehistoric archeological sites, which are important in a religious or cultural heritage context, but also features of the natural landscape, air, plant, water, or animal resources that might have special significance. These resources may be affected by changes in the visual environment (construction, ground disturbance, or introduction of a foreign element into the setting), dust particles, or by contamination. Geographically, the INEEL is included within a large territory once inhabited by and still of importance to the Shoshone-Bannock Tribes. Plant resources used by the Shoshone-Bannock Tribes that are located on or near the INEEL site are listed in Table 3.11-1. Areas significant to the tribes would include the buttes, wetlands, sinks, grasslands, juniper woodlands, Birch Creek, and the Big Lost River.

Five Federal laws prompt consultation between Federal agencies and Indian Tribes; the NEPA (National Environmental Policy Act, 1969), the National Historic Preservation Act (National Historic Preservation Act, 1966 as amended), the American Indian Religious Freedom Act (American Indian Religious Freedom Act, 1978), the Archeological Resources Protection Act (Archaeological Resources Protection Act, 1979), and the Native American Graves Protection and Repatriation Act (Native American Graves Protection and Repatriation Act, 1990). In accordance with these directives and in consideration of its Native American Policy (U.S. Department of Energy, 1990a and U.S. Department of Energy, 1992a), DOE is developing procedures at the INEEL for consultation and coordination with the Shoshone-Bannock Tribes of the Fort Hall Reservation. DOE has committed to additional interaction and exchange of information with the Shoshone-Bannock Tribes, and has outlined this relationship in a formal Working Agreement with these tribes (U.S. Department of Energy, 1992c). In addition, the Cultural Resources Management Plan for the INEEL (Miller, 1992) and the curation agreement for permanent storage of archaeological materials will be completed by June 1996. the Cultural Resources Management Plan will define procedures for involving the tribes during the planning stages of project development and the curation agreement will provide for the repatriation of burial goods in accordance with NAGPRA.

3.11.3 Paleontological Resources

There are 31 known fossil localities at the INEEL site. Available information suggests that the region has relatively abundant and varied paleontological resources. Preliminary analyses suggest that these materials are most likely to occur in association with archeological sites; in areas of basalt flows; in deposits of the Big Lost River, Little Lost River, and Birch Creek; in deposits of Lake Terreton and playas; in some wind and sand deposits; and in sedimentary interbeds or lava tubes within local lava flows (Miller, 1992).

Table 3.11-1. Plants Used By the Shoshone-Bannock Tribes That Are Located On or Near the Idaho National Engineering and Environmental Laboratory

Plant Family	Type of Use	Location	Abundance
Desert Parsley	medicine, food	scattered over site	common
Milkweed	food, tools	roadsides	scattered, uncommon
Sagebrush	medicine, tools	throughout the site	common, abundant
Balsamroot	food, medicine	around buttes	common but scattered
Thistle	food	scattered throughout site	common but scattered
Gumweed	medicine	disturbed areas	common
Sunflower	medicine, food	roadside	common
Dandelion	food, medicine	throughout site	common
Beggar's Ticks	food	disturbed areas throughout site	common, abundant
Tansymustard	food, medicine	disturbed areas	common
Cactus	food	throughout the site	common, abundant
Honeysuckle	food, tools	Big Southern Butte	common on butte
Goosefoot	food	throughout site	common, abundant
Russian Thistle	food	disturbed areas throughout site	common, abundant
Dogwood	food, medicine, tools	Webb Springs, Birch Creek	common where found
Juniper	medicine, food, tools	throughout site	common to abundant
Gooseberry	food	scattered throughout site	common
<i>Mentha arvensis</i>	medicine	Big Lost River	uncommon
Wild onion	food, medicine, dye	throughout site	common
<i>Calochortus spp.</i>	food	buttes	common
Fireweed	food	throughout site	common
Pine	food, tools, medicine	Big Southern Butte	common on butte
Douglas Fir	medicine	Big Southern Butte	common on butte
Plantain	medicine, food	throughout site	uncommon
Wildrye	food, tools	throughout site	common, abundant
Indian Ricegrass	food	throughout site	common, abundant
Bluegrass	food, medicine	throughout site	common, abundant
Serviceberry	food, tools, medicine	buttes	common where found
Chokeberry	food, medicine, tools, fuel	buttes	common where found
Wood's Rose	food, smoking, medicine, ritual	Big Lost River, Big Southern Butte	common, abundant
Red Raspberry	food, medicine	Big Southern Butte	uncommon
Willow	medicine	throughout site in moist areas	common
Coyote Tobacco	smoking, medicine	Big Lost River, Webb Springs	uncommon
Cattail	food, tools	sinks, outflow from facilities	uncommon
Source: Andersen et al. (1995).			

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Proposed Action

Impacts of the construction and operation of the Three Mile Island Unit 2 (TMI-2) Independent Spent Fuel Storage Installation (ISFSI) at the Idaho National Engineering and Environmental Laboratory (INEEL) were summarized briefly in Section 4, Environmental Impacts, of the U.S. Department of Energy (DOE) environmental assessment (EA) (U.S. Department of Energy-Idaho Operations Office, 1997). Additional information of the impacts is provided in Appendix B, Section 2.1, Summary of Considerations for the Preferred Storage Method and Location, of the 1996 U.S. Department of Energy-Idaho Operations Office (DOE-ID) EA (U.S. Department of Energy-Idaho Operations Office, 1996a).

A table summary (Table 4.1-1) of the proposed action is provided in Volume 2, Part B, Appendix C, Section C-2.1, Test Area North Pool Fuel Transfer, of the DOE SNF EIS (U.S. Department of Energy, 1995a).

4.1.1 Site Preparation and Construction Description

A description of the site preparation and construction of the ISFSI is provided in Section 4.1.1, Construction Impacts, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

Impacts associated with construction of the proposed ISFSI at the ICPP would be confined to approximately one acre of previously disturbed, undeveloped area. If contaminated soil is encountered during construction, the soil would be handled in accordance with INEEL procedures. Radiological Control Technicians would be on duty to monitor excavation activities. Gravel used for fill material would be obtained from existing INEEL borrow pits.

A description of the site preparation and construction of the ISFSI is provided in Section 4.1, Site Preparation and Construction, of the DOE-ID Environmental Report (ER) (U.S. Department of Energy-Idaho Operations Office, 1996b):

... Site preparation for ISFSI construction would begin with the pad excavation, grading (leveling), and preparing a suitable base for the ISFSI reinforced concrete foundation. Excavated soil would be stockpiled on-site to be used upon completion of construction to provide the final grades and drainage.

Improvements to the Big Lost River bridge or adjacent bypass road may be required to support the weight of the transport vehicle. Improvements to the bridge could include additional bridge supports or monitors. Improvements to the bypass could include installation of properly sized culverts (or bridging) and road improvements. ...

Table 4.1-1. Project Data Sheet For the Tan Area North Pool Fuel Transfer (Including Construction and Operation of an Independent Spent Fuel Storage Installation at the Idaho Chemical Processing Plant)

	Description/function:	TAN Pool Fuel Transfer	
Generic Information	Waste Area Group (WAG)	1 & 3	
	EIS Alternative (A,B,C or D)	A,B,D	
	SNF or Waste stream:	SNF	
	Action type:	New	
	Structure Type:	Storage Facility	
	Size (m2) Other features: (Pits, ponds, power/water/sewer lines)	380 (30 × 12) Storage Pad 18m × 91m × 30cm Existing Pool (7 × 21 × 7 m deep) Road/Power Lines	
Construction Information	Location:	Inside/outside of fence Inside/outside of bldg.	
		Inside ICPP Outside CPP-749 South or East	
	Cost(\$): PreConst.	\$4.12 Mil.	
	Cost(\$): Const.	\$16.48 Mil.	
	Schedule Start/End: PreConst.	1993-1994	
	Schedule Start/End: Const.	1995-1996	
	No. of workers (new/exist)	8 (Existing)	
	Heavy Equip. Equip. used:	Trucks	
	Trips:	1 to CFA, 13 to RWMC	
	Acres Disturbed: New	0	
	Previous	0.8	
	Revegetated	0	
Construction Information	Air Emissions:	(None/Ref.)	
		See Belanger et al. (1995)	
	Effluents:	Type:	
	Quantity: (liters)	None	
	Solid wastes:	Type:	
	Quantity: (m ³)	LLW	Ind.
		485	8.5
	Haz./Toxic Chemicals:	Storage/inventory	
		None	
	Cultural resource effects	None identified	
	Pits/ponding created: (m2)	None	
	Water usage: (liters)	Minimal	
Operational Information	Energy requirements:	Electrical: (MWH/yr)	
		0	
		Fossil Fuel: (liters)	
		12,800 liters diesel	
	Nightlights used: Y/N	No	
	Generators: Night (Y/N)	No	
	Day (Y/N)	No	
	Cost(\$): Operation:	\$1.7 Mil/yr for first four years	
	Schedule Start/End:	1997-2000	
	No. of workers: (new/exist)	No new	
	Heavy Equip. Equip. used:	Trucks	
	Trips:	66 TAN to ICPP and back	
Operational Information	Air Emissions:	(None/Ref.)	
		See Appendix F, Section 3	
	Effluents:	Type:	
	Quantity: (liters/yr)	None	
	Solid wastes:	Type:	
	Quantity: (m ³ /yr)	None	
	Haz./Toxic Chemicals:	Storage/inventory	
		None	
	Pits/ponding used: Y/N (m ²)	No	
	Water usage: (liters/yr)	Minimal	
	Energy requirements:	Electrical: (MWH/yr)	
		<0.1	
		Fossil Fuel: (liters/yr)	
		0	
	Nightlights used: Y/N	Yes	
	Generators: Night (Y/N)	No	
	Day (Y/N)	No	

Additional description of the site preparation and construction of the ISFSI is provided in Section 4.5.6, Site Clearing, of the DOE-ID ER (U.S. Department of Energy-Idaho Operations Office, 1996b):

The ISFSI site and bridge/bypass have been extensively disturbed from previous development activities. The ISFSI site will have soil removed to a depth of approximately 6 to 24 inches (15-61 cm) to prepare for ISFSI construction. Vegetation in the bridge/bypass construction area would be removed to facilitate construction, as necessary. ...

Additional information on site preparation and construction is provided in Section 4.5.7, Excavation and Soil Disposition, of the DOE-ID ER (U.S. Department of Energy-Idaho Operations Office, 1996b).

... Temporary drainage from the construction site after construction would be designed to use the existing ICPP drainage patterns and minimize disturbance of existing land. Following construction, the TMI-2 [Three Mile Island Unit 2] ISFSI construction site would be graded using the stockpiled soil (as necessary) so as to drain potential site runoff away from the ISFSI to the existing ICPP drainage system.

4.1.1.1 Air Quality

The impacts of construction of the ISFSI on the air quality at the INEEL are summarized in Section 4.1.1, Construction Impacts, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

Excavation and leveling activities associated with construction would generate temporary local particulate atmospheric pollution in the form of dust and vehicular emissions. Dust suspension would be controlled with water sprays or other soil fixatives as necessary.

Additional information on the impacts of construction activities related to SNF management on the air quality at the INEEL from 1995-2005 are summarized in Appendix B, Section 2.1, Summary of Considerations for the Preferred Storage Method and Location, of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a):

Potential short-term impacts to nonradiological air quality would include fugitive dust and exhaust emissions from support equipment during construction that would be temporary and localized. These short-term impacts would be reduced by following standard construction practices to minimize dust generation through the use of watering and dust surfactants. Long-term impacts would be evaluated as part of a permit to construct (PTC) evaluation. This evaluation would identify the applicable requirements of the Clean Air Act and ensure that any required permits and approvals would be obtained prior to construction.

4.1.1.2 Water Resources

The impacts of construction of the ISFSI on the water resources at the INEEL are summarized in Section 4.1.1, Construction Impacts, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

Groundwater at ICPP would not be affected by construction activities resulting from the proposed action. The construction would be conducted in accordance with requirements for storage and use of chemicals and construction materials so as to prevent potential contamination of the groundwater.

Additional information on the impacts of construction of the ISFSI on the water resources at the INEEL are summarized in Appendix B, Section 2.1, Summary of Considerations for the Preferred Storage Method and Location, of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a):

During construction, there would be increased water use associated with dust suppression and general construction activities. This water would be supplied from the existing ICPP water system and the short-term usage would not adversely impact the capability of the water system or wells. ...

4.1.1.3 Socioeconomic and Community Support Services

Information on the impacts of construction of the ISFSI on the socioeconomic and community support services at the INEEL are summarized in Section 4.1.2.4, Impacts on Socioeconomic Factors and Biological and Cultural Resources, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

... ISFSI construction at ICPP would require an average of 20 construction workers on the site for approximately 1 year. Temporary increases in workers would have minimal impact on regional socioeconomics. The DOE operating contractor would be responsible for managing the ISFSI operations upon completion of construction activities.

Additional information on the impacts of construction of the ISFSI on the socioeconomic and community support services at the INEEL are summarized in Appendix B, Section 2.1, Summary of Considerations for the Preferred Storage Method and Location, of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a):

Construction of this dry storage ISFSI at the ICPP would cause a short-term increase in the temporary construction force at the INEEL. This increase would be within the normal workforce fluctuations. Construction and operation of this ISFSI would not cause any long-term changes in employment, population, housing, or community services. ...

4.1.1.4 Recreation and Natural Resources

Information on the impacts of construction of the ISFSI on the recreation and natural resources in the affected environment at the INEEL is summarized in Appendix B, Section 2.1, Summary of Considerations for the Preferred Storage Method and Location, of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a):

Due to the siting of this ISFSI in an existing developed area and the distance from public access points (greater than 2 miles), there would be no adverse consequences to aesthetic and scenic resources [Volume 1, Appendix B, Section 5.5, Aesthetic and Scenic Resources, of the DOE SNF EIS (U.S. Department of Energy, 1995a)]. Although the construction would produce fugitive dust that could temporarily affect visibility, standard construction practice to minimize both erosion and dust generation would be followed.

Information on the impacts of construction of the ISFSI on cultural resources in the affected environment at the INEEL is summarized in Section 4.1.1, Construction Impacts, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

Archaeological resources are not expected to be encountered during construction. However, the INEEL Cultural Resource Management Office would be consulted to assess the significance of artifacts should any be detected during construction. The INEEL Cultural Resource Management Office would consult with the State Historic Preservation Officer (SHPO) and the Shoshone-Bannock Tribe, as necessary, to ensure appropriate follow-on actions. The National Historic Preservation Act (NHPA) of 1966 [See Section 5.0 of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997)] requires agencies to consider the impact of activities on properties listed or eligible for listing in the National Register of Historic Places (36 CFR 800). The TAN Pool and Hot Shop are potentially eligible for this listing. There would be minimal impacts to the INEEL's ecology because all construction impacts would be contained within the fenced boundaries of ICPP.

Information on the impacts of construction of the ISFSI on cultural resources in the affected environment at the INEEL is summarized in Appendix B, Section 2.1, Summary of Considerations for the Preferred Storage Method and Location, of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a):

The site is located within the fenced area at ICPP and has been extensively disturbed from previous activities. All areas within the ICPP facility perimeter have been surveyed for historical and archeological resources and, based on a cultural resource review for this project, would not be impacted (Section 4.1.1 of [the 1995 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1995)] and Volume 1, Appendix B, Section 5.4 and 5.16.3 of [the DOE SNF EIS (U.S. Department of Energy, 1995a)]). If excavation activities expose any unusual materials (e.g., bones, fossils, obsidian flakes, darkly stained soil horizons) construction activities would cease immediately, resuming only after professional cultural or paleontological resource specialists are consulted and any necessary mitigative action completed.

Information on the impacts of construction of the ISFSI on geologic resources in the affected environment at the INEEL is summarized in Appendix B, Section 2.1, Summary of Considerations for the Preferred Storage Method and Location, of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a):

Impacts to geologic resources would be associated with the excavation into soil and subsurface at the site, soil mounding and banking, and the extraction of aggregate from site gravel pits for base and fill material. Based on the limited area of excavation and volume of fill material required for the project, there would be no adverse impact to the geological resources. A secondary impact to geological resources from construction activities would be the potential for increased soil erosion. The project would minimize any potential soil erosion by the use of a stormwater pollution prevention plan to control stormwater runoff, and slope stability, and provide for site revegetation so as to cause no adverse impact to geological resources (Section 4.1.1 [of the 1995 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1995)] and Volume 1, Appendix B, Section 5.6 [of the DOE SNF EIS (U.S. Department of Energy, 1995a)]).

4.1.1.5 Land Use

Information on the impacts of construction of the ISFSI on land use in the affected environment at the INEEL is summarized in Section 4.1.1, Construction Impacts, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

Impacts associated with construction of the proposed ISFSI at ICPP would be confined to approximately one acre of previously disturbed, undeveloped area. ...

Information on the impacts of construction of the ISFSI on land use in the affected environment at the INEEL is summarized in Appendix B, Section 2.1, Summary of Considerations for the Preferred Storage Method and Location, of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a):

There would be minimal adverse impact to land use as a result of this action (Volume 1, Appendix B, Section 5.2 of [the DOE SNF EIS (U.S. Department of Energy, 1995a)]). The proposed site for the dry storage of the TMI core debris ...is less than 1 acre [0.4 ha] within the existing fenced area at the ICPP. This area is already dedicated to industrial use and has been previously disturbed by ICPP activities. The use of this land for spent nuclear fuel and debris storage is compatible with adjacent land uses which include the fuel receipt and storage areas (to the west and south) and the technical and operations support uses (to the east and north). ...

Construction of the ISFSI is proposed as a turn-key construction project where the contractor is responsible for design, construction, testing, and readiness review of the ISFSI prior to turnover to DOE-ID. A turn-key project requires that the contractor has control of the construction area with minimal access restrictions. This enables construction to proceed in an expedient manner with the contractor having control (with associated responsibility and liability) of activities at the construction site. At ICPP, this requirement may be met by selecting a site that has direct access to the

external fence, can be fenced from the remainder of the facility, and does not interfere or conflict with the internal transportation system including emergency ingress or egress routes. The selected site meets these criteria.

4.1.1.6 Noise and Aesthetics

Information on the effect of the alternatives for SNF management at INEEL from 1995-2035 (including construction of the ISFSI) on noise in the affected environment at the INEEL is given in Volume 1, Appendix B, Section 5.10, Noise, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

As discussed in Section 3.10.1, noises generated on the INEEL do not travel off the site at levels that affect the general population. Therefore, INEEL noise impacts for each alternative would be limited to those resulting from the transportation of personnel and materials to and from the site that would affect nearby communities, and from on-site sources that could affect wildlife near those sources.

Transportation noises would be a function of the size of the workforce (e.g., an increased workforce would result in increased employee traffic and corresponding increases in deliveries by truck and rail; a decreased workforce would result in decreased employee traffic and corresponding decreases in deliveries). This analysis of traffic noise considered railroad noise and noise from major roadways that provide access to the INEEL. DOE does not expect the number of freight trains per day in the region and through the site to change as a result of any of the alternatives. Rail shipments of spent nuclear fuel, regardless of the alternative, would be a small fraction of the rail traffic on the Blackfoot-to-Arco Branch of the Union Pacific System line that crosses the INEEL. The vehicles that transport employees and personnel on roads would be the principal source of community noise impacts near the INEEL.

This analysis used the day-night average sound level to assess community noise, as suggested by the EPA (U.S. Environmental Protection Agency, 1974, 1982) and the Federal Interagency Committee on Noise (Federal Interagency Committee on Noise, 1992). The analysis based its estimate of the change in day-night average sound level from the baseline noise level for each alternative on projected changes in employment and traffic levels. The analysis also considers the combination of construction and operation employment. The baseline noise level is comparable to that for the No-Action alternative. Section 3.10.1 discusses levels representative of the No-Action alternative. The traffic noise analysis considered U.S. Highway 20, which employees use to access the INEEL from Idaho Falls. Changes in noise level below 3 decibels probably would not result in a change in community reaction (Federal Interagency Committee on Noise, 1992).

4.1.1.7 Environmental Justice

An assessment of the impacts on environmental justice for the proposed SNF management alternatives at INEEL from 1995-2005 (including construction of an ISFSI at the ICPP) is provided in Volume 2, Part A, Section 5.20.5, Conclusion, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

The overall review indicated that the potential impacts calculated for each discipline under each of the proposed INEEL environmental restoration and waste management alternatives, including spent nuclear fuel management, are small and do not constitute a reasonably foreseeable adverse impact to the surrounding population. Therefore, the impacts also do not constitute a disproportionately high and adverse impact on any particular segment of the population, minorities or low-income communities included; thus, they do not present an environmental justice concern.

In addition, the DOE is confident that continued consultation between the tribes and the Federal government will enhance the knowledge and expertise of both and promote both informed decision making and effective mitigation of potential impacts from INEEL operations.

4.1.2 Operation

The routine operation of the proposed ISFSI involves only dry storage of the TMI-2 core debris that are sealed in a container; there will be minor gaseous and no liquid effluents generated with normal operation.

4.1.2.1 Air Quality

A brief summary of the impacts to air quality resulting from the operation of an ISFSI at the ICPP is provided in Appendix B, Section 2.1, Summary of Considerations for the Preferred Storage Method and Location, of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a):

There would be no adverse impacts to air quality as the project would comply with the Clean Air Act which contains requirements to prevent the deterioration of air quality from radiological and nonradiological emissions (Section 4.1.2.1 and 4.1.4 of [the 1995 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1995)]; Volume 1, Appendix B, Section 5.7 and 5.16.4 of [the DOE SNF EIS] (U.S. Department of Energy, 1995a)). ...

There would be no adverse impacts due to radiological emissions from the fuel debris and commercial fuel during storage at the ICPP. On an INEEL-wide basis, there would be no increase in emissions, only a change in the location of emissions from the current location at TAN to ICPP. The modeled effective dose equivalent (EDE) of emissions from the fuel and debris is below the National Emission Standards for Hazardous Air Pollutants (NESHAPs) standard of 1 % of the 10 mrem/yr [0.1 mSv/yr] standard (.1 mrem/yr [1×10^{-3} mSv/yr]) and NESHAPs approval is not required (Zohner, 1995).

Potential emissions and the effective dose equivalent (EDE) to the maximally exposed individual (MEI) is analyzed in Section 4.1.2.1, Impacts to Air Quality, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

Potential radionuclide emissions from the proposed action were calculated in an analysis of the canister dewatering and drying at TAN and dry storage at ICPP (See Table 4.1-2). The CAP-88 [Clear Air Act Assessment Package] computer code

(Environmental Protection Agency, 1990), an EPA approved method of modeling radionuclide emissions, was used to calculate Effective Dose Equivalent (EDE) to the Maximally Exposed Individual (MEI) from the activities. The EDE includes the 50-year Committed EDE from internal exposure through the ingestion and inhalation pathways and the external EDE from ground deposition and air immersion. The calculated EDE to the MEI is listed in Table 4.1-3. The EDE is a conservative estimate as the MEI location, for purposes of this calculation, is identified as a person living at the INEEL boundary. Potential emissions resulting from the activities would be evaluated as identified in Section 5.0 [of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997)] and monitored as required. The estimated

Table 4.1-2. Potential Radionuclide Inventory and Releases (Staley, 1996, 1997).

Nuclide	Ci in fuel ^a	Current TAN pool storage release (Ci/yr)	Dewatering and Drying Release (Ci/yr)	ICPP storage Release (Ci/yr)
H-3	7.80E+02	7.80E+01	7.80E+01	7.80E+01
Co-60	1.13E+04	3.89E-06	6.78E-12	6.63E-06
Kr-85	1.52E+04	1.52E+03	1.52E+03	1.52E+03
Sr-90	2.43E+05	8.36E-05	1.46E-10	1.43E-04
Y-90	2.43E+05	8.36E-05	1.46E-10	1.43E-04
I-129	1.14E-01	1.14E-02	1.14E-02	1.14E-02
Cs-134	2.34E+02	1.03E-07	1.40E-13	1.37E-07
Cs-137	2.85E+05	1.10E-04	1.71E-10	1.67E-04
Ba-137m	2.70E+05	1.05E-04	1.62E-10	1.58E-04
Eu-154	2.29E+03	7.87E-07	1.37E-12	1.4E-06
Pu-238	9.48E+02	3.26E-07	5.69E-13	5.56E-07
Pu-239	9.34E+03	3.21E-06	5.60E-12	5.48E-06
Pu-240	2.86E+03	9.83E-07	1.72E-12	1.68E-06
Pu-241	1.03E+05	3.54E-05	6.18E-11	6.04E-05
Am-241	4.67E+03	1.61E-06	2.80E-12	2.74E-06
^a Radionuclide inventory of 1984 TMI debris is decayed to 1997.				

Table 4.1-3. Effective Dose Equivalent to Maximally Exposed Individual Due to Potential Airborne Releases - Existing Storage and Proposed Action (Christensen, 1997; Staley, 1996, 1997).

Activity	EDE to MEI ^a
Existing TAN Storage Pool	3.2E-03 mrem/yr
Proposed Dewatering and Drying Activity	5.3E-03 mrem/yr
Transport and Cask Receiving	0.0 mrem/yr ^b
Proposed ICPP ISFSI Dry Storage	2.7E-03 mrem/yr
^a All doses modeled with CAP-88 computer code using releases from Table 4.1-4. Five-year average (1987-91) meteorological data from TAN and Grid 3 met towers used for TAN and ICPP, respectively. MEIs located at: 1) 12,100 meters NNE of TAN for TAN releases; and 2) 13,800 meters SW of ICPP for ICPP releases. ^b Canisters sealed during this time.	

doses to the MEI from the proposed action and the no action alternative (continued storage) are well below the NESHAP limit of 10 mrem/yr [0.1 mSv/yr].

The DOE has used computer models to calculate the off-site doses due to airborne radionuclide emissions. The modeling methodologies and a description of the receptors and meteorological information used in the modeling is given in the DOE SNF EIS (U.S. Department of Energy, 1995a).

Modeling methodologies used to calculate off-site doses due to airborne radionuclide emissions is described in Volume 2, Part B, Appendix F, Section F-3.4.2.1, Model Selection and Application, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

... CAP-88 (Clean Air Act Assessment Package), is routinely used at the INEEL for the specific purpose of evaluating compliance with National Emission Standards for Hazardous Air Pollutants standard 40 CFR 61. As prescribed by that standard, CAP-88 is used to calculate the highest off-site dose to any member of the public resulting from annual airborne radionuclide emissions from cumulative INEEL site operations. The result must be below 10 millirem [0.1 millisieverts] to demonstrate compliance with the standard.

Additional information on meteorological data used in atmospheric transport modeling is given in Volume 2, Part B, Appendix F, Section F-3.4.2.3, Meteorological Data, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

The atmospheric transport modeling performed as part of these radiological assessments was based on actual meteorological conditions measured at eight different

locations at the INEEL site. In particular, the data files prepared for these assessments were derived from observations at INEEL site weather stations over the period 1987 through 1991, which was assumed to be representative of conditions during the years covered by the Environmental Impact Statement (1995 through 2005).

A definition of the MEI is given in Volume 2, Part B, Appendix F, Section F-3.4.2.4, Receptor Location, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

The off-site individual whose assumed location and habits are likely to result in the highest dose is referred to as the maximally exposed individual (MEI). The location of the maximally exposed individual was identified on the basis of the source-receptor distance and direction combination that yielded the highest predicted off-site dose.

Modeling was also performed to assess nonradiological pollutants. Additional information on meteorological data used in atmospheric transport modeling is given in Volume 2, Part B, Appendix F, Section F-3.4.3.1.3, Meteorological Data, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

Meteorological data collected by the National Oceanic and Atmospheric Administration meteorological monitoring towers located at Grid 3 Tower, north of Central Facilities Area), Test Area North, and Argonne National Laboratory-West were used in the assessment of source impacts. Conditions at these three locations are representative of the three major wind flow regimes at the INEEL site (Clawson et al., 1989). Sources at Test Area North and Argonne National Laboratory-West were modeled with meteorological data from those respective locations. All other sources were modeled using data from the Grid 3 Station. The locations of these and other meteorological monitoring stations on and around the INEEL are shown in Figure 3.4.1. The meteorological data used contained hourly observations of wind speed, direction, temperature, and stability class for the years 1991 and 1992. Data required for the calculation of mixing height are currently being collected at the INEEL but are not available for these periods. Therefore, default mixing heights were used. For short-term assessments, a value of 150 meters (500 feet), which represents the lowest value measured at the INEEL site, was used. For annual average evaluations, 800 meters (2,600 feet) was used. This value has been calculated by the National Oceanic and Atmospheric Administration and is recommended for use in dispersion modeling assessments (Sagendorf, 1991). Each case was assessed separately using data from these years, and the highest of the predicted concentrations was selected.

4.1.2.2 Water Resources

As discussed in Appendix B, Section 2.1, Summary of Considerations for the Preferred Storage Method and Location, of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a):

... When constructed, the ISFSI would not be connected to the water system. Therefore, no long-term impact on water usage is anticipated as a result of the operation of this ISFSI. ...

Volume 2, Part B, Appendix C, Section C-2.1, Test Area North Pool Fuel Transfer, of the DOE SNF EIS (U.S. Department of Energy, 1995a) indicates that there are no liquid effluents or solid wastes produced during operation of the ISFSI, nor are hazardous/toxic chemicals in storage during operation (see Table 4.1-1).

The potential impacts of flooding of the ISFSI during operation are evaluated in Appendix B, Section 2.1, Summary of Considerations for the Preferred Storage Method and Location, of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a):

100 and 300 Year Floodplains and Wetlands: There are no wetlands or 100 year floodplains located within the ICPP (Ferguson et al., 1994) that would be impacted by the project (Volume 1, Appendix B, Section 5.9 of [the DOE SNF EIS (U.S. Department of Energy, 1995a)]). The combination of local climate, relief, and geology provides the INEEL with good natural flood-regulating characteristics. The Big Lost River is the only drainage to the INEEL that provides any real flood threat to the ICPP. A flood diversion system near RWMC, constructed in 1958 and enlarged in 1984, protects INEEL facilities such as ICPP from floods by diverting the floodwater to a basin that provides floodwater storage and infiltration. Based on an evaluation of the balance of storage and infiltration, the flood diversion system has the capability to accommodate the flood crest from the postulated 300-year flood (Section 1.4.5.2.4 of Lockheed Idaho Technologies Company, 1995). The diversion system, therefore, is considered to provide adequate flood protection to the ICPP (Section 1.4.5.2.6 of Lockheed Idaho Technologies Company, 1995) and the proposed ISFSI site. There are no siting limitations at the ICPP based on the 300 year floodplain; thus, the ISFSI is not anticipated to be affected.

Maximum Probable Flood (MPF): The impact to the ICPP of a maximum probable flood (MPF) was analyzed to provide a conservative flooding condition. The MPF is considered conservative as the last flood of the magnitude of an MPF occurred about 12,000 years ago during a wet climate cycle. The MPF scenario has flows estimated at 991.2 m³/s (35,000 cfs) with a water velocity that would range from 0.18 to 0.91 meters per second (0.6 to 3.0 feet per second) on the INEEL. This flood would result in shallow, slow-moving, flood water within the ICPP-controlled area up to an elevation of 1498.7 m (4916.6 ft). Based on elevations at ICPP, facilities that are in the northern half of the ICPP area would have approximately one to two feet [0.3 to 0.6 meter] of water while the southern end of ICPP would be above the MPF floodplain (Figure 1.4-57 of Lockheed Idaho Technologies Company, 1995).

The MPF velocities and water depth would have minimal impact on an ISFSI due to its design to withstand flooding. All INEEL facilities are designed to meet the INEEL architectural and engineering standards that establish design criteria to protect new facilities from adverse impacts associated with a MPF. Methods of flood protection (including MPF protection) include adding fill material to elevate structures; placing the contents above the flood elevation; designing the structure and the contents to protect against structural failure, to keep water out, or to reduce the effects of water entry. These methods would be employed in the design of the ISFSI. It is noted that an updated floodplain map of the Big Lost River floodplain is being prepared that will map the 100 and 500 year floodplains. Pending completion of the updated floodplain

map (expected to be available in 1997), it is assumed that the area encompassed by the MPF is greater than that for the 100 year and 500 year floods. As discussed previously, any potential impact to the ISFSI from a MPF would be mitigated as part of the design.

4.1.2.3 Socioeconomic and Community Support Services

The DOE will operate and maintain the site after the SNF is transferred to storage modules (HSMs), and placed on the basemat. Volume 2, Part B, Appendix C, Section C-2.1, Test Area North Pool Fuel Transfer, of the DOE SNF EIS (U.S. Department of Energy, 1995a) indicates that no new workers will be required during operation of the ISFSI (see Table 4.1-1). For this reason, the impact of operating the ISFSI on socioeconomic and community support services is expected to be negligible.

4.1.2.4 Recreation and Natural Resources

Most of the potential impacts on recreation and natural resources will occur during construction of the facility (see section 4.1.1.4). The potential impacts of ISFSI operation on air and water resources are addressed separately (sections 4.1.2.1 for air resources and 4.1.2.2 for water resources). Because the ISFSI is a passive facility, the impacts on recreation and natural resources will be substantially the same as those for construction of the facility.

4.1.2.5 Land Use

Most of the potential impacts on land use will occur during construction of the facility (see section 4.1.1.5). Because the ISFSI is a passive facility, the impacts on land use will be substantially the same as those for construction of the facility.

4.1.2.6 Noise and Aesthetics

Most of the potential impacts on noise will occur during construction of the facility (see section 4.1.1.6). Because the ISFSI is a passive facility, the potential impacts on noise will be substantially the same as or less than those for construction of the facility.

Information on the effect of the alternatives for spent nuclear fuel management at INEEL (including operation of the ISFSI) on the aesthetics in the affected environment at the INEEL is given in Volume 1, Appendix B, Section 5.5, Aesthetic and Scenic Resources, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

... Facility operations under each alternative would not produce emissions to the atmosphere that would impact visibility.

4.1.2.7 Transportation and Storage

A brief summary of the impact of transportation during operation of the ISFSI is provided in Appendix B, Section 2.1, Summary of Considerations for the Preferred Storage Method and Location, in the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a):

Shipping casks and the method of transport from TAN to ICPP will comply with applicable NRC [Nuclear Regulatory Commission] and Department of Transportation requirements. Based on the transportation requirements, there are no reasonably foreseeable accident scenarios that would cause a threat to the public or environment from a radiological release from the casks. ...

A description of the radiation exposure limits that will be used during transportation of the TMI-2 core debris from TAN to the ISFSI at ICPP is given in Section 4.1.2.2, Exposure to Radiation, in the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

The transportation from TAN to ICPP would be conducted so as to minimize radiation exposure. Specific criteria to limit radiation exposure during transport (10 CFR 71.47) include:

- 200 mrem [2 mSv] per hour on the accessible external surface of the canister
- 200 mrem [2 mSv] per hour at any point on the outer surface of the vehicle
- 10 mrem [0.1 mSv] per hour at any point 2 meters [6.56 feet] from the vertical planes represented by the outer lateral surfaces of the vehicle.
- 2 mrem [2×10^{-2} mSv] per hour in any normally occupied part of the vehicle.

4.1.2.7.1 Incident-Free Transportation

An assessment of baseline radiological doses from incident-free on-site transportation of SNF from 1995–2035 is provided in Volume 1, Appendix B, Section 4.11.5, Transportation of Waste, Materials, and Spent Nuclear Fuel, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

... This assessment used six years of data (1987 through 1992) to establish a baseline of radiological doses from incident-free, on-site total nonnaval spent nuclear fuel transportation at the INEEL. Table 4.1-4 lists the results in terms of cumulative doses (1995-2035) and health effects. ...

The methodology used to assess radiological exposure from normal, incident-free SNF transportation from 1995–2005 is outlined in Volume 2, Part A, Section 5.11.1.1, Methodology for Incident-Free Transportation, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

Radiological impacts were determined for two groups of people during normal incident-free transportation: (1) crewmen and (2) general population. For truck shipments, the crewmen were the drivers of the shipment. ... The general population

Table 4.1-4. Cumulative Doses and Cancer Fatalities From Incident-free Onsite Shipments of Nonnaval Spent Nuclear Fuel at the Idaho National Engineering and Environmental Laboratory for 1995 Through 2035^{a,b}

	Estimated collective dose (person-rem)	Estimated cancer fatalities
Occupational	3.4	0.0014
General population	0.087	0.000044
^a Source: Maheras (1993).		
^b Onsite naval shipment doses are addressed in Attachment A to Appendix D of Volume 1 of this [DOE SNF] EIS (U.S. Department of Energy, 1995a).		

was persons within 2,625 feet (800 meters) of the transport link (off-link), persons sharing the transport link (on-link), and persons at stops. Off-link doses, on-link doses, and doses at stops were evaluated for off-site shipments. Because the general population does not reside on the INEEL and the INEEL facilities are located far from major roads, no off-link doses or doses at stops were calculated for on-site shipments. However, on-link doses were determined for on-site shipments because the general population does have access to the majority of the roads on the INEEL. Radiological impacts were calculated using the RADTRAN 4 (Neuhauser and Kanipe, 1992) and RISKIND (Yuan et al., 1993) computer codes.

Additional information on the methodology used to assess radiological exposure from 1995–2035 due to normal, incident-free transportation of SNF is outlined in Volume 1, Appendix B, Section, 5.11.2.1, Incident-Free Transportation, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

The magnitude of the incident-free dose depends mainly on the Transport Index of the shipment and the on-link vehicle densities. The Transport Index is defined as the dose rate at 1 meter (3.28 feet) from the surface of a radioactive package; it is measured in millirem per hour. Spent nuclear fuel was assigned a dose rate of 14 millirem [0.14 mSv] per hour at 1 meter [3.28 ft] from the shipping container. This dose rate yielded a dose rate of 10 millirem [0.1 mSv] per hour at 2 meters (6.56 feet) from the edge of the transport vehicle, which is the regulatory limit for an exclusive use vehicle (see Madsen et al., 1986).

Radiological doses were converted to cancer fatalities using risk conversion factors of 5.0×10^{-4} fatal cancer per person-rem for members of the public and 4.0×10^{-4} fatal cancers per person-rem for workers. These risk conversion factors are from Publication 60 of the International Commission on Radiological Protection (International Commission on Radiological Protection, 1991).

Because the on-site transportation of spent nuclear fuel at the INEEL is considered rural, no incident-free nonradiological risk (from exhaust emissions and dust resuspension) was calculated.

The estimated impact of normal, incident-free on-site transportation of SNF from 1995–2035 is outlined in Volume 1, Appendix B, Section 5.11.4, Incident-Free Impacts, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

The occupational and general population collective doses from on-site spent nuclear fuel shipments and the resulting incidence of latent cancer fatalities were calculated. The results are the same regardless of alternative. Occupational radiation exposure would potentially be 3.4 person-rem [3.4×10^{-2} person-Sievert], resulting in 0.0014 latent cancer fatalities. General population exposure would potentially be 0.088 person-rem [8.8×10^{-4} person-Sievert], resulting in 0.000044 latent cancer fatalities.

In addition to collective radiation exposure, the maximally exposed individual doses due to INEEL on-site SNF shipments were calculated for a driver (occupational exposure), a person following a single shipment, and a person standing beside the road as a single shipment passes by (general member of the public). The calculated dose to a driver would be 1.7 rem [1.7×10^{-2} Sv], assuming that person drove all shipments over 40 years. The calculated maximally exposed individual dose to a person following a single shipment covering the longest distance from Test Area North to the Idaho Chemical Processing Plant would be 0.015 millirem [1.5×10^{-4} mSv], and to a person exposed to passing shipment at a distance of 1 meter (3.28 feet), the dose would be 0.0014 millirem [1.4×10^{-5} mSv] (Maheras, 1995).

4.1.2.7.2 Transportation Accidents

A summary of the impact of transportation impacts is given in Section 4.1.3.2, Transportation Accidents, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

The SNF EIS (U.S. Department of Energy, 1995a) analyzed transportation accidents associated with on-site SNF shipment. The SNF EIS analysis provides a “bounding” estimate of the annual probability of fatal cancers occurring in the local population due to a transportation accident. However, potential accident impacts associated with transportation of the TMI debris and commercial fuels would be lower than the SNF EIS bounding scenario. This is due to the nature of the material (See Section 1.2 [of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997)]) and the rigorous mitigative measures for SNF transport (U.S. Department of Energy-Idaho Operations Office, 1995).

The methodology used to assess radiological exposure from 1995–2005 due to transportation accidents is outlined in Volume 2, Part A, Section 5.11.1.2, Methodology for On-site Transportation Accident Analysis, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

The on-site transportation accident analysis considers the impacts of accidents during the transportation of spent nuclear fuel and radioactive waste by truck, which is the primary mode of transport on-site. This analysis addresses ordinary shipments within

the boundaries of the INEEL that originate at one INEEL facility and terminate at another INEEL facility. The on-site portions of off-site shipments that originate or terminate at the INEEL are included in the off-site transportation accident analysis.

... A maximum reasonably foreseeable assessment was performed for potential spent nuclear fuel and radioactive waste transportation accidents. Impacts are assessed for areas within a 50-mile (80-kilometer) radius. Because of the extensive land area occupied by the INEEL and, the distances between facilities, the potential impacts to surrounding communities from an on-site transportation accident are highly dependent on where the accident occurs.

Because it is not possible to predict where on the INEEL an accident might occur and the specific public areas that might be affected, the accident analysis assesses impacts in terms of generic rural and suburban population areas. The generic rural population area has an average population density of six persons per square kilometer and is typical of most areas within 30 miles (48 kilometers) of the geographical center of the INEEL site. The generic suburban population area has an average population density of 7.19 persons per hectare and bounds the most densely populated areas within 50 miles (80 kilometers) of the INEEL.

The consequences of the maximum reasonably foreseeable on-site transportation accident were calculated using the RISKIND computer code (Yuan et al., 1993). Consequences were assessed under both neutral and stable atmospheric conditions. Neutral conditions are typical of average conditions that result in good dispersion and dilution of atmospheric contaminants. Stable atmospheric conditions occur less than 5 percent of the time and result in low dispersion and dilution of atmospheric contaminants. Calculated radiation doses were used to estimate the potential for fatal cancers in the exposed populations using risk factors developed by the International Commission on Radiological Protection (International Commission on Radiological Protection, 1991).

The maximum reasonably foreseeable on-site transportation accidents for the SNF management plan at the INEEL are extremely unlikely events, with estimated probabilities of occurrence ranging from 1×10^{-7} to 3.9×10^{-5} per year.

The impact of the maximum reasonably foreseeable on-site transportation accident for the SNF management plan at the INEEL from 1995–2035 is outlined in Volume 1, Appendix B, Section 5.11.4, Incident-Free Impacts, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

An on-site spent nuclear fuel transportation accident involving the inadvertent shipment of a short-cooled fuel element from the Advanced Test Reactor to the Idaho Chemical Processing Plant was considered to be the maximum reasonably foreseeable accident. The melted spent nuclear fuel has potential to relocate into a critical configuration. However, the probability of a criticality accident is much less than 1×10^{-7} per year and would be considered to be not reasonably foreseeable. Table 4.1–5 lists the calculated maximally exposed individual dose and collective dose to general population in the maximally impacted sector and corresponding risk of fatal cancers. The dose to the maximally exposed individual is considered an occupational exposure.

Table 4.1-5. Impacts From Maximum Reasonably Foreseeable Spent Nuclear Fuel Transportation Accident on Idaho National Engineering and Environmental Laboratory^a (Using Generic Rural and Suburban Population Densities)

Population density category ^b	Meteorology ^c	Accident frequency ^d (events/yr)	Dose to MEF ^e (rem)	Offsite population dose (person-rem)	Risk of fatal cancer per year ^f
Rural	Neutral	1.0×10^{-6}	$7.6 \times 10^{+1}$	$1.5 \times 10^{+3}$	7.5×10^{-7} (7.5×10^{-1})
Rural	Stable	1.0×10^{-7}	$2.5 \times 10^{+2}$	$1.2 \times 10^{+4}$	6.0×10^{-7} ($6.0 \times 10^{+0}$)
Suburban	Neutral	1.0×10^{-6}	$7.6 \times 10^{+1}$	$2.1 \times 10^{+4}$	1.1×10^{-5} ($1.1 \times 10^{+1}$)
Suburban	Stable	1.0×10^{-7}	$2.5 \times 10^{+2}$	$1.7 \times 10^{+5}$	8.5×10^{-6} ($8.5 \times 10^{+1}$)

^aSource: Enyeart (1994).

^bResults are for generic rural and suburban population densities. The generic rural population density has an average population of 6 persons per square kilometer; the generic suburban population density has an average population of 719 persons per square kilometer. For comparison, the sector with the highest population density within 80 kilometers (50 miles) is due east of the Idaho Chemical Processing Plant and Test Reactor Area at the INEEL with an average population density of 53 persons/km².

^cNeutral meteorology is characterized by Stability Class F, 1 meter-per-second wind speed, and occurring approximately 50 percent of the time. Stable meteorology is characterized by Stability Class F, 1 meter-per-second wind speed, and occurring approximately 5 percent of the time.

^dAccident frequency includes both the event frequency and the frequency of the meteorology. The frequency of stable meteorology is approximately one-tenth the frequency of neutral meteorology.

^eMaximally exposed individual located at the point of maximum exposure to the airborne release approximately 160 to 390 meters (525 to 1,280 feet) downwind, depending on meteorology. For onsite accidents the maximally exposed individual is assumed to be an INEEL worker.

^fFatal cancer risk = dose time accident frequency times (ICRP 60 risk factor for fatal cancers). The ICRP 60 risk factor is 5.0×10^{-4} fatal cancer per rem for public, 4.0×10^{-4} fatal cancer per rem for workers. For doses of 20 rem or more, the ICRP 60 conversion factor is doubled. Numbers in parenthesis indicate the total number of fatal cancers in the population if the accident occurs. The maximally exposed individual dose is considered an occupational exposure.

As listed in Table 4.1-5, the total number of fatal cancers expected in the suburban population affected by the transportation for neutral and stable meteorological conditions would be 11 and 85, respectively. For the neutral case, this would represent a 0.01-percent increase from the number of fatal cancers that would be likely from normal incidence in the affected population. For the stable case, this would represent a 0.20-percent increase from the number of fatal cancers that would be likely from normal incidence in the affected population.

The total number of fatal cancers expected in the rural population affected by the transportation for neutral and stable meteorological conditions would be 0.75 and 6.0, respectively. For the neutral case, this would represent a 0.09-percent increase from the number of fatal cancers that would be likely from normal incidences in the affected population. For the stable case, this would represent a 1.7-percent increase from the number of fatal cancers that would be likely from normal incidence in the affected population.

The estimated maximum nonradiological occupational and general population traffic fatalities over 40 years due to any of the spent nuclear fuel management alternatives would be 7.1×10^{-4} and 2.5×10^{-3} , respectively. These estimated fatalities were based on fatality risk factors for spent fuel shipments (Cashwell et al., 1986).

An analysis of the mitigative and preventive measures taken to reduce the potential impact of transportation accidents from 1995–2035 is given in Volume 1, Appendix B, Section 5.11.6, On-site Mitigative and Preventative Measures, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

All on-site shipments would be in compliance with DOE-ID Directive 5480.3, "Hazardous Materials Packaging and Transportation Safety Requirements." These requirements provide assurance that, under normal conditions, the INEEL would meet as-low-as-reasonably-achievable conditions, reasonably foreseeable accident situations (those with a probability of occurrence greater than 1×10^{-7} per year) would not result in a loss of shielding or containment or a criticality, and an unintentional release of radioactive material would generate a timely response.

DOE would approve the type packages used for on-site shipments or would obtain a Nuclear Regulatory Commission or DOE certificate of compliance. If the Type B on-site package did not have Nuclear Regulatory Commission or DOE certification, the user of the package would have to establish how administrative controls and site-mitigating circumstances would ensure that the package would maintain containment and shielding integrity. The administrative and emergency response considerations would provide sufficient control so that accidents would not result in loss of containment or shielding, in criticality, or in an uncontrolled release of radioactive material that would create a hazard to the health and safety of the public or workers. In the event of an accident, each DOE site has an established emergency management program. This program incorporates activities associated with emergency planning, preparedness, and response. Participating government agencies with plans that are interrelated with the INEEL Emergency Plan for Action include the State of Idaho, Bingham County, Bonneville County, Butte County, Clark County, Jefferson County,

the Bureau of Indian Affairs, and Fort Hall Indian Reservation. When an emergency condition exists at a facility, the Emergency Action Director is responsible for recognition, classification, notification, and protective action recommendations. At INEEL emergency preparedness resources include fire protection, radiological and hazardous chemical material response, emergency control center, the INEEL Warning Communication Center, the INEEL Site Emergency Operational Center, and medical facilities.

4.1.2.7.3 Storage Accidents

A description of the potential accidents during storage is provided in Section 4.1.3.3 of the DOE-ID EA (U.S. Department of Energy - Idaho Operations Office, 1997):

An ISFSI is designed to mitigate the effects of design basis accidents ... that could occur during storage. Design basis accidents account for human-caused events and the most severe natural phenomena reported for the site and surrounding area. Postulated accidents analyzed for an ISFSI include tornado winds and tornado general missiles, design basis earthquake, design basis flood, accidental cask drop, lightening effects, fire, explosions, and other incidents.

Special ISFSI design features include using nonflammable materials, providing a horizontal storage module with walls and a roof of structural steel and reinforced concrete (approximately 2.5 feet [0.76 meter] thick) to house a dry-shielded steel canister, and a passive ventilation system. Considering, the specific design requirements, for each accident condition, the design of the ISFSI would prevent loss of containment, shielding, or criticality control (LITCO 1995b, DOE 1996c).

4.1.2.8 Environmental Justice

An assessment of the impacts on environmental justice for the proposed SNF management alternatives at the INEEL from 1995–2005 (including the operation of the ISFSI at the ICPP) is provided in Volume 2, Part A, Section 5.20, Environmental Justice, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

4.1.2.8.1 Environmental Justice Assessment

This assessment of potential environmental justice impacts addresses waste management and environmental restoration programs at the INEEL for the near term (1995 to 2005). In addition, this assessment includes the management of spent nuclear fuel at the INEEL under all alternatives considered in Volume 1 of this [DOE SNF] EIS which are integrated into the alternatives of Volume 2 [of the DOE SNF EIS] as appropriate. This environmental justice analysis was based on a qualitative assessment of proposed projects and impacts reported in Section 5 of Volume 2 of the [DOE SNF] EIS (U.S. Department of Energy, 1995a) to determine if there were identifiable disproportionately high and adverse human health or environmental impacts on minority populations or low-income populations surrounding the INEEL.

The following definitions were used for this assessment:

Disproportionately high and adverse human health effects: Adverse health effects are measured in risks and rates that could result in latent cancer fatalities, as well as other fatal or nonfatal adverse impacts to human health. Disproportionately high and adverse human health effects occur when the risk or rate for a minority population or low-income population from exposure to an environmental hazard significantly exceeds the risk or rate to the general population and, where available, to another appropriate comparison group.

Disproportionately high and adverse environmental impacts: An adverse environmental impact is a deleterious environmental impact determined to be unacceptable or above generally-accepted norms. A disproportionately high impact refers to an impact (or risk of an impact) in a low-income or minority community that significantly exceeds that on the larger community. In assessing cultural and aesthetic environmental impacts, account shall be taken of impacts that uniquely affect geographically dislocated or dispersed low-income or minority populations.

In this assessment, DOE reviewed the proposed projects, facilities, and transportation associated with the proposed alternatives in Volume 2 of this [DOE SNF] EIS. This review included potential impacts arising under each of the major disciplines evaluated for the alternatives, including land use, socioeconomics, water resources, air resources, ecology, health and safety, facility operations, cultural resources, and transportation, which are the sciences pertinent to the identification of environmental impacts in the [DOE SNF] EIS. Regarding health effects, both normal facility operations and accident conditions were examined, with accident scenarios evaluated in terms of the risk to the public. Likewise, the examination of transportation included both normal and potential accident conditions for both truck and rail transportation of materials. Special exposure pathways were evaluated with respect to subsistence consumption of fish, game, or native plants.

As discussed in the following subsections, the potential radiological impacts due to both facility operations and reasonably foreseeable accident conditions are small. In addition, potential impacts as well as the potential number of fatalities due to both radiological and nonradiological exposures to truck or rail transportation is also small. Likewise, the probability of adverse impacts due to subsistence consumption of fish, game, or native plants is low.

4.1.2.8.1.1 Facility Operations

As indicated in Section 5.7 of Volume 2 [of the DOE SNF EIS (U.S. Department of Energy, 1995a)], for the maximally exposed member of the public living off-site, the likelihood of contracting a fatal cancer from normal operations ranges between about 1 occurrence in 240,000 to 1 occurrence in 1,000,000. This equates to less than one latent cancer fatality to the general public under any of the alternatives being considered over the 10-year period from 1995 to 2005.

Impacts from high consequence, low probability accident scenarios (Section 5.14 of Volume 2 [of the DOE SNF EIS]) would be adverse should they occur; however, the

impacts to specific population locations would be subject to meteorological conditions on the day of the accident. Whether or not such impacts would have disproportionately high and adverse effects with respect to any particular segment of the population, minority and low-income populations included, would be subject to natural motive forces including random meteorological factors. Prevailing winds for the INEEL are primarily from the southwest, although winds at the Test Area North are frequently from the north and west-northeast. Local rivers and streams drain the mountain watersheds north and west of the INEEL, but most surface water is diverted for irrigation before it reaches the site boundaries. Groundwater in the underlying Snake River Plain Aquifer generally flows to the south and southwest. As explained in the EIS, the risk to the public is defined as the potential consequence multiplied by the probability of occurrence. This risk represents the expected impact to members of the public. Based on this risk, no latent cancer fatalities are expected from reasonably foreseeable facility accidents.

Because the impacts due to facility operations and reasonably foreseeable accidents present no significant risk and do not constitute a reasonably foreseeable adverse impact to the surrounding population, no disproportionately high and adverse impacts would be expected for any particular segment of the surrounding population, minority and low-income populations included.

4.1.2.8.1.2 Transportation

Transportation corridors associated with Volume 2 of the [DOE SNF] EIS can be classified as roughly 80 percent rural, 17 percent suburban, and 3 percent urban. More specific details are available in Table 5.11-1 in Volume 2 to the [DOE SNF] EIS. As evaluated in Section 5.11 of Volume 2 [of the DOE SNF EIS (U.S. Department of Energy, 1995a)], for incident-free transportation, the total number of potential fatalities would be the sum of the health effects because of exposure to radiation and vehicular emissions. Over the 10-year period between 1995 and 2005, the estimated number of total potential fatalities because of waste shipments would range from 0.10 to 1.4 if shipments were made by truck, to from 0.02 to 0.3 if made by rail. Over the 40-year period between 1995 and 2035, estimated potential fatalities because of spent nuclear fuel shipments made by truck would range between 0.1 to 1.7 and between 0.1 to 0.26 if made by rail.

When and where an accident occurred, if one in fact occurred, would be completely random with respect to the immediate and surrounding population, as well as the motive forces that could propagate the impacts during the timeframe of occurrence. Although adverse impacts could occur in the unlikely event of a high consequence accident, any potential disproportionality with respect to any population, minority and low-income populations included, is subject to the randomness of the combination of factors that can produce such impacts.

Over the 10-year period, the estimated cumulative risk of latent cancer fatalities from radiological accidents would range from 1 in 1,300 to 1 in 340 if waste shipments were made by truck. During this period of time, from 0.3 to 3.4 fatalities would occur from traffic accidents. By contrast, if waste shipments were made by rail, the

cumulative risk of latent cancer fatalities would range from 1 in 17,000 to 1 in 2,900, while traffic accidents unrelated to waste shipment cargo would range between 0.003 to 0.04 fatalities. The risk from the maximum nonradiological chemical release accident involving a nitric acid shipment (discussed in Section 5.11.2.5 [of the DOE SNF EIS (U.S. Department of Energy, 1995a)]) is also small. The cumulative risk of latent cancer fatalities between the years 1995 and 2035 because of shipments of spent nuclear fuel by truck would range from 1 in 240,000 to 1 in 200, with an associated risk of traffic accident fatalities from 0.05 to 1.4. The corresponding risk if all spent nuclear fuel shipments were made by rail would range from 1 in 240,000 to 1 in 700 for latent cancer fatalities, with a risk for traffic fatalities ranging from 0.05 to 1.2.

Because the impacts due to transportation of waste materials or spent nuclear fuel by either truck or rail under either incident-free or reasonably foreseeable adverse accidents present no significant risk and do not constitute a reasonably foreseeable impact to the surrounding population, no disproportionately high and adverse impact would be expected for any particular segment of the surrounding population, minority and low-income populations included.

4.1.2.8.1.3 Perspective

To place the impacts in perspective with respect to risks encountered in everyday life, in 1990 there were approximately 510,000 cancer deaths in the United States population, of which about 64,000 were among the nonwhite population. This equates to roughly 1,132 cancer fatalities (of which 142 would affect minority populations) in an area comparable to that included in the 80-kilometer (50-mile) radius around the INEEL. Additionally, in 1992 there were about 40,000 traffic fatalities in the United States, of which about 7,400 were among the nonwhite population. This equates to roughly 89 traffic fatalities (of which 16 would affect minority populations) in an area comparable to that included in the 80-kilometer (50-mile) radius around the INEEL. The risk of latent cancer fatalities and the expectation of vehicular fatalities because of the activities proposed in this [DOE SNF] EIS would not appreciably increase this total, even if all impacts were associated with minority and low-income populations.

4.1.2.8.1.4 Subsistence Consumption of Fish, Wildlife, or Native Plants

The calculations in this [DOE SNF] EIS estimate dose and risk from ingestion of radionuclides based on site-specific agricultural data, and they assume a typical dietary pattern. Subsistence consumption of fish, wildlife, and native plant species is not explicitly addressed in this analysis. However, the calculations in this [DOE SNF] EIS include several conservative assumptions (see Appendix F of Volume 2 [of the DOE SNF EIS (U.S. Department of Energy, 1995a)]) that bound the potential for ingestion of radionuclides through these special exposure pathways. In particular, these calculations assume that a very high proportion of the diet is based on locally grown produce and locally grazed livestock, both of which are produced at locations representing the highest calculated concentrations of radioactivity. Nevertheless, there may be some differences between the uptakes of grazed livestock and free-ranging game. No human populations in the immediate vicinity of the INEEL are known to subsist entirely on locally harvested fish or wildlife.

Fishing and hunting are usually not allowed on the INEEL. One exception is depredation hunts, which were negotiated between the Idaho Department of Fish and Game and DOE (Hoff et al., 1993) and allow hunter access to one-half mile inside the northern INEEL boundaries. In addition to limited on-site hunting, several game species, including elk and pronghorn antelope, that contribute to the diets of local populations live on and migrate through the INEEL. This potential exposure pathway is small, as few animals that migrate from the INEEL contain elevated levels of contaminants. Data from game species, sheep that have grazed on the INEEL, and locally grown foodstuffs and native plants around the INEEL are routinely sampled for radionuclides. Concentrations of radioactivity generally have been small, and they are seldom elevated above those observed at locations distant from the INEEL where the principal likely source of nonnatural radionuclides is very small amounts of residual global fallout from past nuclear weapons tests. Data from monitoring programs are reported annually in INEEL Site Environmental Report (ER) (Hoff et al., 1993).

If transportation associated with environmental restoration and waste management activities at the INEEL (including spent nuclear fuel management) were to increase wildlife losses because of vehicle collisions with game, there might be a disproportionate impact to minority or low-income communities that rely primarily on hunted game. However, the maximum potential increases in shipments of spent nuclear fuel would be small additions to current rail and highway traffic, so the overall impact to wildlife would be small. Potential mitigation measures for any resulting adverse impact to low-income or minority populations include distributing the deceased animals to hunters in the vicinity known to partially subsist on game, controlling subsequent hunts, or relocating game if necessary.

4.1.2.8.1.5 Other Considerations

In addition to the above, reviews of other technical disciplines pursuant to the methodology in Section 3.7.3 did not indicate any significant adverse impacts because of land use, socioeconomics, water and air resources, ecology, cultural resources, or cumulative impacts. Therefore, no disproportionately high and adverse impacts were identified for any segment of the population. Of particular interest are the following:

4.1.2.8.1.5.1 Socioeconomics

Depending upon the various alternatives evaluated, the total labor force involved in INEEL environmental activities, including spent nuclear fuel management, could decrease by up to 500 jobs or increase by more than 900 jobs over the 10-year period between 1995 and 2005. Affirmative action programs would distribute such effects proportionately among workers, whereas coordination of planning activities with local communities would be intended to avoid placing undue burdens on local community resources. DOE may also provide support to local agencies if necessary to mitigate localized impacts.

4.1.2.8.1.5.2 Land Use, Ecology, and Cultural Resources

None of the alternatives would have a significant adverse impact on land use, ecology, and cultural resources because of the limited amount of previously undisturbed land that would be needed for use on-site (no off-site lands are involved) and mitigative programs already in place. These programs include working closely under agreements with the State of Idaho Historical Preservation Officer and the Shoshone-Bannock Tribal government regarding preservation of historic and cultural resources. Similarly, DOE is aware of sensitive ecological resources and avoids wetlands and endangered plant or animal specie habitats. Disturbance of certain ecological resources (which are not federally listed as threatened or endangered) is possible but not likely. The reasonably foreseen environmental impacts, if any, to land use, ecological resources, or cultural resources are expected to be small under any of the alternatives.

4.1.2.8.1.5.3 Cumulative Impacts

Based on the analysis of the impacts for each of the disciplines analyzed in this EIS, along with the impact of other past, present, and reasonably foresee-able future activities at the INEEL, no reasonably foreseeable cumulative adverse impacts are expected to the surrounding populations, minority populations and low-income populations included.

4.1.2.8.1.5.4 Impacts Because of Perception

Potential adverse impacts may result from the public's perception of risk associated with nuclear industry activities in general and DOE's activities in particular. For example, a waste management or spent nuclear fuel management facility has the potential to increase awareness of the nuclear industry, leading to concerns of potential adverse effects to the conduct of local commerce, such as tourism and agriculture. From both a National EPA and an environmental justice perspective, both the character and the substance of these potential impacts are not discernable. Therefore, it is not possible to identify any quantifiably adverse or disproportionately high distribution of any impacts of such perceived risk.

To better understand and help mitigate unfounded perceptions, DOE is working to enhance the general population's understanding of the potential impacts of INEEL programs in general and the various alternatives considered in this [DOE SNF] EIS in particular, with emphasis on minority populations, low-income groups, and Tribal governments.

4.1.2.8.2 Discussion of Related Issues Raised by the Shoshone-Bannock Tribes on the Fort Hall Indian Reservation in Public Comment and Consultations

The EIS Project Office has reviewed the comments on the EIS received from the Shoshone-Bannock Tribes on the Fort Hall Indian Reservation, which lies largely within 80 kilometers (50 miles) of the INEEL. To fully understand, evaluate, and consider these comments, consultations have taken place among tribal officials and appropriate INEEL officials. In addition to addressing specific comments on the EIS,

these ongoing consultations are designed to promote a mutual understanding of INEEL-related issues important to the tribes, both within and beyond the scope of INEEL environmental restoration and waste management programs and spent nuclear fuel management activities addressed in this [DOE SNF] EIS. As discussed earlier, no disproportionately high and adverse impacts have been identified to the Shoshone-Bannock Tribes or any other segment of the population as a whole.

To date, these consultations have resulted in an increased awareness of tribal values as they relate to nature, ties to the land, and religious beliefs. For the tribes, traditional resources include not only Native American archaeological sites, which are important in the context of religious and cultural heritage, but also features of the natural landscape, air, plant, water or animal resources that have special significance. Potential impacts to such resources on the INEEL, once inhabited by the Shoshone-Bannock Tribes, are of concern to the tribes. These potential impacts may result from disturbing the land or changing the environmental setting of sacred or traditional use areas. They may also result from pollution, noise, and contamination. Actions that have a deleterious effect on the land, air, water, or view are considered by the Shoshone-Bannock Tribes to be adverse to their traditional way of life. Potential mitigation measures include involving tribal representatives in discussions during the project planning stages to avoid sensitive areas, locating new facilities in areas with similar visual settings, avoiding Native American archaeological sites and traditional use and sacred areas, monitoring gathering areas and game animals for operational effects, and restoring native vegetation to areas of ground disturbance per revegetation guidelines (Anderson and Shumer, 1989). If avoidance is not feasible, data recovery at archaeological sites (such as archiving artifacts) and restoration of alternative hunting or gathering areas may be substituted after consultation with the tribes.

Based on these consultations, a number of changes have been made to the [DOE SNF] EIS to better characterize the Fort Hall Indian Reservation and its socioeconomic activities and setting. In addition, the DOE and Navy are working with the tribes to enhance their understanding of the potential impacts of the various alternatives considered in this [DOE SNF] EIS as they specifically relate to the Fort Hall Indian Reservation. These include potential exposures and impacts to the reservation from postulated facility and transportation accidents, as well as the impact from normal operations. One of the results of consultations between the DOE-ID and the Shoshone-Bannock Tribes is the preparation of a management agreement between the DOE-ID, the Federal Advisory Council on Historic Preservation, the State of Idaho, and the Tribes with respect to cultural resources at the INEEL.

4.1.2.8.3 Conclusion

The overall review indicated that the potential impacts calculated for each discipline under each of the proposed INEEL environmental restoration and waste management alternatives, including spent nuclear fuel management, are small and do not constitute a reasonably foreseeable adverse impact to the surrounding population. Therefore, the impacts also do not constitute a disproportionately high and adverse impact on any particular segment of the population, minorities or low-income communities included; thus, they do not present an environmental justice concern.

In addition, the DOE is confident that continued consultation between the tribes and the Federal government will enhance the knowledge and expertise of both and promote both informed decisionmaking and effective mitigation of potential impacts from INEEL operations.

It is important to note that the construction and operation of the TMI-2 ISFSI is only a small part of the SNF management activities discussed in the DOE SNF EIS (U.S. Department of Energy, 1995a). For this reason, it is likely that the socioeconomic and environmental justice impact of the construction and operation of the ISFSI will be small relative to the total impact discussed above.

4.1.2.9 Cumulative Environmental Impacts

The cumulative environmental impacts of construction and operation of the ISFSI are analyzed in Section 4.1.4, Cumulative Impacts, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

The radiological releases from current and future INEEL operations (U.S. Department of Energy, 1995a) to the worker, MEI, and the population within 50 miles [80 kilometer] of the INEEL are identified in Table 4.1-6. The incremental and cumulative 10 year dose (from 1995-2005) includes emissions associated with the TAN Pool Stabilization Project. Based on exposure for the cumulative 10 year dose, the risk to an INEEL worker at the location of highest dose from airborne radionuclide emissions would cause an estimated increased lifetime chance of developing fatal cancer of less than 1 in 500,000. The cumulative occupational radiation dose received by the entire INEEL workforce (about 10,000 workers) over the 10 years would result in less than 1 fatal cancer. For comparison, the natural lifetime incidence of fatal cancers in the same population from all other causes would be about 2,000 (U.S. Department of Energy, 1995a). Radiological dose impacts to the MEI were conservatively summed to derive cumulative impacts, although the location of the MEI may be different for each source. This conservatism serves to establish the upper-bounding dose. Despite this conservatism, the dose to the MEI is low (Table 4.1-6) and would result in a fatal cancer risk for the MEI of less than 1 occurrence in 300,000. The cumulative 10 year dose from all INEEL activities including this action from 1995 through 2005 would result in an increase of less than one fatal cancer in the population within fifty miles of the INEEL (U.S. Department of Energy, 1995a). The natural lifetime incidence of fatal cancers in the same population from all other causes would be about 24,000 out of a population of 120,000. Radiological releases resulting from the proposed action, present INEEL operations, and the future actions would not be expected to cause adverse health effects to workers, the MEI, or the general public.

Increases in nonradiological atmospheric pollutants would consist of temporary localized releases associated with construction of the storage system and vehicular emissions during transportation. These emissions would not measurably add to time-averaged ambient air concentrations of pollutants at the INEEL (U.S. Department of Energy, 1995a).

Cumulative impacts associated with waste generation would be minimal. The INEEL Landfill Complex, RWMC [Radioactive Waste Management Complex], and WERF [Waste Experimental Reduction Facility] have sufficient capacity to accept the wastes

Table 4.1-6. Radiological Air Emission Baseline and Ten-year Dose (U.S. Department of Energy, 1995a)

	INEEL Baseline Annual Dose	Annual Incremental Dose ^{a,b}	Cumulative Ten- year Dose ^{a,b}
Site worker (maximally exposed worker ^c)	.32 mrem	.14 mrem	4.6 mrem
Offsite individual (MEI)	.05 mrem	.58 mrem	6.3 mrem
Population within 50 miles ^d	.30 mrem	2.60 mrem	29.0 mrem
Natural Background	350 mrem		3,500 mrem
^a Includes the Pool Stabilization Project. ^b Based on implementation of projects in the SNF EIS (U.S. Department of Energy, 1995a) from 1995 to 2005. ^c The maximally exposed worker is located at the Test Reactor Area. ^d Cumulative radiation dose (person-rem) to the population within 50 miles of site facilities from INEEL operations from 1995 to 2005.			

generated by the proposed action in addition to other INEEL activities (U.S. Department of Energy, 1995a). It is anticipated there would be no increase in the amount of hazardous or mixed wastes generated on the INEEL that would result from the proposed action.

The work force for this project would be drawn from existing INEEL employees or commercial vendors contracted to design and construct the system. Changes in INEEL employment resulting from the proposed action would be within normal fluctuations in INEEL employment.

The proposed action would not contribute to cumulative impacts to biological resources. Activities associated with the proposed action would occur within the boundaries of existing facilities at the INEEL.

4.1.2.10 Adverse Environmental Impacts that Cannot be Avoided

Information on the adverse environmental impacts on the affected environment that cannot be avoided for this proposed action is given and discussed in Sections 4.1.1 and 4.1.2 of this EIS. NRC staff agrees that the proposed action would have an inconsequential effect on the environment.

4.1.2.11 Relationship Between Short-Term Uses and Long-Term Productivity

As discussed in Section 4.1.1.5 of this EIS, the proposed action includes the short-term use of about 0.4 ha (one acre) of previously disturbed, undeveloped land. The site will be decontaminated and decommissioned at the end of the facility use. Therefore, impacts from the proposed action will not lead to any long-term degradation of air, water, or land, nor will it present a danger to human health.

4.1.2.12 Irreversible and Irretrievable Commitment

The irreversible and irretrievable commitment of resources for the proposed action have been discussed in Section 4.1.4, Cumulative Impacts, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

The construction and operation of an ISFSI would consume irretrievable amounts of electrical energy, fuel, and miscellaneous chemicals and indefinitely commit concrete, metals, plastic, lumber, sand, and gravel and a fraction of the water used in construction (U.S. Department of Energy, 1995a). ... Scarce or strategic material would not be used for the construction of the ISFSI.

4.1.3 Decontamination and Decommissioning

When the proposed TMI-2 ISFSI ceases operation, the DOE will be required to submit an updated decontamination and decommissioning plan for NRC review and approval. NRC will require that the site be cleaned up to applicable standards at that time. A description of the current conceptual decontamination and decommissioning plan for the ISFSI is provided in the DOE-ID license application for the proposed action (U.S. Department of Energy-Idaho Operations Office, 1996b).

4.2 Impact Associated With the No Action Alternative

The impact associated with the no action alternative is analyzed in Section 4.2, Impacts Associated with the No Action Alternative, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997):

Annual airborne radionuclide emissions from the entire TAN facility are estimated to be 0.12 Ci [4,440 MBq] (U.S. Department of Energy, 1995a). Emissions from the TAN Pool and TAN-607 facility would not change as a result of the no action alternative.

There is no evidence of deterioration of concrete in the TAN Pool. Data from the leak detection system indicates that there is no evidence of any water leakage. A seismic evaluation of the TAN Pool vestibule (Lacey, 1994) determined the vestibule would prove adequate for a design basis ... earthquake. The analysis found that the vestibule would withstand an earthquake having a peak spectral acceleration of about 0.43g with no damage or leaks. For comparison, a maximum horizontal ground surface acceleration of 0.24g at the INEEL is estimated to result from an earthquake that could occur once every 2,000 years (U.S. Department of Energy, 1995a). While no seismic evaluations of the pool have been performed, the pool is similar in construction to the vestibule. Therefore, it may be inferred that a design basis earthquake will not result in cracking or leaking of the TAN Pool.

An event causing the water in the pool to drain, all mitigation responses to be ineffective (emergency water replacement systems unable to maintain water above the TMI canisters), and radiation sources in the pool to be exposed was analyzed (Rohrig, 1991). Resultant radiation levels at 6.6 ft [2.0 m] above the empty pool ranged from 1.5 to 7 rad/hr [1.5×10^{-2} to 7×10^{-2} Gray/hr] at the pool edge and 13 to 45 mrad/hr [1.3×10^{-4} to 4.5×10^{-4} Gray/hr] at 82 ft [25 m] away from the edge of the pool. Radiation entering the Hot Shop from the pool was not a concern as there are administrative and evacuation measures that require workers to leave the Hot Shop if an incident occurs.

Although the TAN Pool, in its current condition, poses minimal threat to human health and the environment, the no action alternative would not ensure compliance with the Settlement Agreement (U.S. Department of Energy, 1995c). The TAN Pool ventilation system is not adequate and there is no secondary containment system for the TAN Pool water. Continued use of the pool storage could require extensive modifications to meet environmental and safety requirements. Additionally, storage of the TMI core debris in the TAN Pool would require continuing maintenance of the Hot Shop and pool until the ultimate storage location or disposition of the TMI core debris is determined.

Additional consideration is given in the DOE SNF EIS (U.S. Department of Energy, 1995a) to no action alternatives for spent fuel management (e.g., Alternative A in Volume 2 and Alternative 1 in Volume 1). In all cases, however, the construction of an ISFSI at the ICPP is considered as part of the no action alternative (U.S. Department of Energy, 1995a) for these large-scale SNF management alternatives.

4.3 Cost Benefit Analysis

The DOE has conducted a cost benefit analysis of the different alternatives considered for its SNF management plan. Construction and operation of the TMI-2 ISFSI constitutes a small part of the overall SNF management activities discussed in the DOE SNF EIS (U.S. Department of Energy, 1995a). It is included as part of Alternatives A, B, and D in the 10-year plan for INEEL, and all alternatives considered in the 40-year national SNF management plan.

4.3.1 Costs of constructing and operating the Independent Spent Fuel Storage Installation at the Idaho Chemical Processing Plant

As described in Volume 2, Part B, Appendix C, Section C-2.1, Test Area North Pool Fuel Transfer, of the DOE SNF EIS (U.S. Department of Energy, 1995a), costs (including construction and operation of the ISFSI), will include (see Table 4.1-1):

\$4.12 million for preconstruction

\$16.48 million for construction

\$1.7 million/year for the first four years of operation

4.3.2 Benefit of the Proposed Action

The benefit of the proposed action is the elimination of vulnerabilities associated with the current TAN Pool SNF storage. As described in Section 4.2, Impacts Associated with the No Action Alternative, of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997), the vulnerabilities of the TAN Pool involve:

Although the TAN Pool, in its current condition, poses minimal threat to human health and the environment, the no action alternative would not ensure compliance with the Settlement Agreement (U.S. Department of Energy, 1995c). The TAN Pool ventilation system is not adequate and there is no secondary containment system for the TAN Pool water. Continued use of the pool storage could require extensive modifications to meet environmental and safety requirements. Additionally, storage of the TMI-2 core debris in the TAN Pool would require continuing maintenance of the Hot Shop and pool until the ultimate storage location or disposition of the TMI-2 core debris is determined.

5.0 EFFLUENT AND ENVIRONMENTAL MONITORING PROGRAM

5.1 Preoperational

This section discusses the radiological environmental and effluent monitoring programs to be conducted before the construction of the Independent Spent Fuel Storage Installation (ISFSI) and after the horizontal storage modules (HSMs) are placed on the concrete basemat for storage. A description of the U.S. Department of Energy (DOE) preoperational monitoring programs is provided in the Section 6, Effluent and Environmental Measurements and Monitoring Programs, of the DOE Environmental Report (ER) (U.S. Department of Energy-Idaho Operations Office, 1996b):

As identified in Section 2.0 of this document [the U.S. Department of Energy-Idaho Operations Office (DOE-ID) ER], the Idaho National Engineering and Environmental Laboratory (INEEL) has a comprehensive environmental monitoring program conducted on and around the INEEL. Environmental monitoring associated with the Three Mile Island Unit 2 (TMI-2) ISFSI would not be a separate program but would be conducted as part of the overall INEEL monitoring program. The INEEL Environmental Surveillance Program has the following organizations charged with the responsibility for environmental monitoring: National Oceanic and Atmospheric Administration (NOAA) onsite and offsite meteorological monitoring; Lockheed Martin Idaho Technologies Company (LMITCO) - onsite environmental surveillance; Environmental Science and Research Foundation - offsite environmental surveillance; and the U.S. Geological Survey (USGS) - onsite and offsite groundwater surveillance. These programs provide a comprehensive and timely base for the environmental impact evaluations of the proposed ISFSI including DOE activities such as canister dewatering. The results of this environmental surveillance and monitoring are reported to the public and DOE Headquarters in an annual site environmental report (U.S. Department of Energy-Idaho Operations Office, 1996d).

In January 1994, the State of Idaho's INEEL Oversight Program took over the independent verification program operated by the Idaho State University since 1989. The University continued to perform radiological analyses for the State program. Results of this monitoring are made available to the public in the Oversight Program's quarterly progress reports.

Additional information on the preoperational radiological and nonradiological environmental monitoring is provided in Volume 2, Part B, Appendix F, Section F-3.2, The Idaho National Engineering Laboratory Site Environment, of the DOE Spent Nuclear Fuel (SNF) Environmental Impact Statement (EIS) (U.S. Department of Energy, 1995a):

The average annual [background] exposure measured by the thermoluminescent dosimeters for 1991 was 123 milliroentgen [3.17×10^{-2} X-units] (which corresponds to a dose of 127 millirem [1.27 milliSieverts]) for distant locations, and 121 milliroentgen [3.12×10^{-2} X-units] (125 millirem [1.25 milliSieverts]) for boundary community locations (Hoff et al., 1992).

...

As used here, the term background air quality refers to the levels of nonradiological air pollutants in ambient air that are not attributable to INEEL site activities. Limited

information is available for characterization of background air quality levels, since only particulate matter has been monitored at locations beyond the influence of the INEEL site. The INEEL Environmental Surveillance Program, which is conducted by the Independent Spent Fuel Storage Installation Radiological and Environmental Sciences Laboratory (RESL), monitors airborne particulate matter concentrations at INEEL site boundary communities and distant and onsite locations, as illustrated in Figure 5.1-1. Onsite data are considered to include background levels plus contributions from INEEL site activities. ...

Monitoring of other pollutant levels, including nitrogen dioxide and sulfur dioxide, is performed at onsite locations. Nitrogen dioxide is monitored at two locations onsite to fulfill one of the conditions in a Permit to Construct issued by the State of Idaho. Sulfur dioxide is also measured at one of these locations.

The State of Idaho has conducted particulate monitoring at the Craters of the Moon Wilderness Area. ... Since this location is approximately 20 kilometers (12.4 miles) from the INEEL site boundary (and much further from most major emissions sources), these levels can be considered representative of general background.

5.2 Operational

A description of the DOE operational monitoring programs is provided in Section 6, Effluent and Environmental Measurements and Monitoring Programs, of the DOE-ID ER (U.S. Department of Energy-Idaho Operations Office, 1996b):

... The INEEL operational and radiological monitoring programs will be continued through the life of the TMI-2 ISFSI. Then programs will also serve as the operational monitoring program of the ISFSI. ... In addition to the onsite and offsite sampling and monitoring conducted in support of the INEELs annual National Emissions Standard for Hazardous Air Pollutants (NESHAPs) and environmental reporting, sampling of the dry shielded canister (DSC) internal gases will be made on a frequency sufficient to ensure that hydrogen concentrations are maintained at safe levels.

5.2.1 Effluent Radiological Monitoring

Information on the DOE operational effluent monitoring programs is provided in Section 6.2, Applicant's Proposed Operational Monitoring Programs, of the DOE-ID ER (U.S. Department of Energy, 1996b):

... Periodic and confirmatory measurements of radiological emissions will be conducted, as necessary, for NESHAPs compliance purposes. ... Portable radiological monitoring equipment will be used to detect potential releases from the DSC system.

5.2.2 Environmental Radiological Monitoring

Additional information on environmental radiological monitoring at INEEL is provided in Volume 2, Part B, Appendix F, Section F-3.2.1.2, Radiological Environmental Monitoring, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

Figure 5.1-1 The airborne radioactivity monitoring network at the Idaho National Engineering and Environmental Laboratory (onsite and offsite) (U.S. Department of Energy, 1995a)

Over the years, radiological conditions in the INEEL site environs have been characterized by various monitoring programs. Monitoring refers to a variety of activities (for example, sampling, analysis, and direct measurements) performed to measure ambient radiation exposure rates and airborne radioactivity levels. The INEEL Environmental Surveillance Program includes a comprehensive network of 23 continuous air samplers. Twelve of the sampling locations are located within the boundaries of the INEEL site; 11 are located offsite, including seven stations near the INEEL site boundary and four distant stations located within the communities of Blackfoot, Idaho Falls, and Rexburg, and in Craters of the Moon Wilderness Area (Figure 5.1-1). It is assumed that results from onsite and boundary community locations include contributions from background conditions and INEEL site emissions, while distant locations represent background conditions beyond the influence of INEEL site emissions. ...

The Environmental Surveillance Program also includes direct measurements of ambient (environmental) radiation levels using thermoluminescent dosimeters (TLDs). These devices measure ionizing radiation exposure rates due to the combined sources of natural radioactivity in the air and soil, cosmic rays, residual fallout from nuclear weapons tests, and radioactivity from INEEL site operations. Dosimeters are placed at seven distant community locations and six boundary locations.

Information on radiological environmental monitoring specific to the Idaho Chemical Processing Plant (ICPP) is provided in Section 6, Effluent and Environmental Measurements and Monitoring Programs, of the DOE-ID ER (U.S. Department of Energy-Idaho Operations Office, 1996b):

... The ICPP air sampler is located approximately 1,100 ft (335 m) northwest of the proposed ISFSI site near the ICPP entrance and West Perimeter Road. The Environmental Surveillance Program also includes direct measurements of ambient (environmental) radiation levels using TLDs. Figure 5.2-1 identifies the location of TLDs in the proximity of ICPP. These devices measure ionizing radiation exposure rates due to the combined sources of natural radioactivity in the air and soil, cosmic rays, residual fallout from nuclear weapons-tests, and radioactivity from INEEL site operations.

5.3 Decommissioning

When the proposed TMI-2 ISFSI ceases operation, the DOE will be required to submit an updated decontamination and decommissioning plan, including monitoring activities, for NRC review and approval. Current planned monitoring activities that will be conducted during decommissioning are described in Section 3.2, Phase 1: Decommissioning Operations and License Termination, of the Conceptual Plan for Decommissioning included as part of the Part 72 license application submitted by DOE (U.S. Department of Energy-Idaho Operations Office, 1996b):

For components or structures at the ISFSI that are determined to be activated above site release levels, the following activities will be performed for the DECON alternative approach for the ISFSI:

- Conduct full radiation survey to assure that all radioactive materials have been removed. This may be performed by Nuclear Regulatory Commission (NRC)-

Figure 5.2-1. Location of thermoluminescent detectors (TLDs) at the Idaho Chemical Processing Plant (U.S. Department of Energy-Idaho Operations Office, 1996b)

approved vendors for final check survey. This survey may coincide with final NRC site inspection.

- Following notification by DOE-ID of completion of the decontamination and disposal of components and materials from the facility, the NRC regional staff conducts an onsite survey to verify that the acceptable activity and contamination levels are satisfied. When the requirements are satisfied, the NRC can terminate the 10 Code of Federal Regulations (CFR) Part 72 license for the facility.

6.0 FEDERAL AND STATE ENVIRONMENTAL REQUIREMENTS

6.1 [Federal] Permits and Regulatory Requirements

A discussion of the permitting and regulatory requirements for the construction and operation of the Independent Spent Fuel Storage Installation (ISFSI) at the Idaho Chemical Processing Plant (ICPP) is provided in Section 5, Permit and Regulatory Requirements, of the U.S. Department of Energy (DOE) Environmental Assessment (EA) (U.S. Department of Energy-Idaho Operations Office, 1997):

Prior to project implementation, an air emission evaluation would be conducted to determine air permitting requirements (Idaho Administrative Procedures Act, 1996) applicable to the project. A permit to construct (PTC), if required, would address potential emissions associated with the fuel and debris removal from the Test Area North (TAN) Pool and the operation of the ISFSI. Following removal of the commercial fuel, debris, and hardware from the pool, an air evaluation of the pool water treatment and disposal process would be conducted and required air permits would be obtained.

The Siting Analysis Summary for the Three Mile Island (TMI) Debris and Commercial Fuel Interim Storage System (Appendix B of [the 1996 U.S. Department of Energy-Idaho Operations Office (DOE-ID) EA (U.S. Department of Energy-Idaho Operations Office, 1996a)]) identified that the ISFSI site is not in a radiologically controlled requirements area (RCRA), CERCLA [Comprehensive Environmental Response, Compensation and Liability Act], or radiologically controlled area. During site investigation, preparation, and construction at ICPP, the activities would be monitored to ensure ongoing compliance with RCRA, CERCLA, and radiological control requirements and ensure proper management of environmental media such as soils.

Radionuclide emissions from DOE facilities are regulated under the 40 CFR Part 61, National Emissions Standards for Hazardous Air Pollutants (NESHAP), at Subpart H and the Idaho Administrative Procedures Act (IDAPA) (Idaho Administrative Procedures Act, 1996). The regulations require a NESHAP PTC approval if the modeled unmitigated effective dose equivalent (EDE) to a maximally exposed individual (MEI) is above 1 percent of the 10 mrem/yr [0.1 mSv/yr] standard (0.1 mrem/yr [1 μ Sv/yr]). A permit to construct [PTC] applicability determination was submitted to the Idaho Department of Health and Welfare, Division of Environmental Quality (DEQ) for the proposed ISFSI installation at ICPP (Mitchell, 1997).

...

A stormwater pollution prevention plan would be completed before construction of the ISFSI at ICPP. The plan would be prepared in accordance with the INEEL Stormwater Pollution Prevention Plan (U.S. Department of Energy-Idaho Operations Office, 1993b) and the regulations for "National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction Sites" (40 CFR 122 et. seq.) The purpose of a stormwater pollution prevention plan is to prevent erosion products and sediment from running off the site during construction.

Following are the major laws, regulations and other requirements that are applicable to the proposed action analyzed in this EA [U.S. Department of Energy-Idaho Operations Office, 1997]. Detailed summaries of these laws can be found in the Volume 1, Chapter 7 of the [DOE spent nuclear fuel] SNF environmental impact statement (EIS) (U.S. Department of Energy, 1995a) which is incorporated by reference.

- National Environmental Policy Act of 1969, as amended (42 USC §4321 et seq.)
- Atomic Energy Act of 1954, as amended (42 USC §2011 et seq.)¹
- Nuclear Waste Policy Act of 1982, as amended, (42 USC §10101-10270).
- Clean Air Act, as amended (42 USC §7401 et seq.)
- Safe Drinking Water Act, as amended (42 USC §300{F} et seq.)
- Clean Water Act, as amended (33 USC §1251 et seq.)
- Resource Conservation and Recovery Act, as amended (42 USC §6901 et seq.)
- Comprehensive Environmental Response, Compensation, and Liability Act, as amended (42 USC §9601 et seq.)
- Emergency Planning and Community Right-to-Know Act of 1986 (also known as "SARA Title III") (42 USC §11001 et seq.).
- Toxic Substances Control Act (15 USC §2601 et seq.)
- Pollution Prevention Act of 1990 (42 USC §13101 et seq.)
- Federal Facility Compliance Act (42 USC §6921 et seq.)
- National Historic Preservation Act, as amended (16 USC §470 et seq.)
- Archaeological Resource Protection Act, as amended (16 USC §470aa et seq.)
- Native American Grave Protection and Repatriation Act of 1990 (25 USC §3001).
- American Indian Religious Freedom Act of 1978 (42 USC §1996).
- Religious Freedom Restoration Act of 1993 (42 USC §2000bb et seq.)
- Endangered Species Act, as amended (16 USC §1531 et seq.)
- Migratory Bird Treaty Act, as amended (16 USC §703 et seq.)
- Bald and Golden Eagle Protection Act, as amended (16 USC §668-668d).
- Occupational Safety and Health Act of 1970, as amended (29 USC §651 et seq.)
- Noise Control Act of 1972, as amended (42 USC §4901 et seq.)
- Hazardous Material Transportation Act (49 USC §703 et seq.)
- Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (42 USC §6901 et seq.)
- Executive Order 11988 (Floodplain Management)
- Executive Order 11990 (Protection of Wetlands)
- Executive Order 12898 (Environmental Justice)

¹ On December 19, 1996, Secretary of Energy, Hazel O'Leary, announced the intent of DOE to transition all DOE nuclear facilities into full regulation by the Nuclear Regulatory Commission in a little over 10 years. During this period the policies, procedures, and approaches of the NRC regulation of DOE facilities will be phased-in.

Both the DOE EA (U.S. Department of Energy-Idaho Operations Office, 1997) and the DOE SNF EIS (U.S. Department of Energy, 1995a) discuss statutes and regulations pertinent to actions that are broader in scope than the proposed construction and operation of the TMI-2 ISFSI. All statutes and regulations listed in the DOE EA are summarized here for completeness. Detailed summaries of the major federal laws, regulations, and other requirements that are applicable to the proposed action are provided in Volume 1, Section 7.1, Laws and Regulations, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

6.2 [Federal] Laws and Requirements

This section identifies and summarizes the major laws, regulations, executive orders, and DOE orders that may apply to the programmatic alternatives for SNF.

Section 6.2.1 discusses the major Federal statutes that impose environmental protection and compliance requirements upon DOE. In addition, there may be other Federal, state, and local measures applicable to the SNF Management Program because Federal law delegates enforcement or implementation authority to state or local agencies. These state- and local-specific requirements are addressed in the site-specific appendices. Section 6.2.2 addresses environmentally-related presidential executive orders that clarify issues of national policy and set guidelines under which Federal agencies, including DOE, must act. DOE implements its responsibilities for protection of public health, safety, and the environment through a series of departmental orders that are mandatory for operating contractors of DOE facilities. Section 6.2.3 discusses those DOE orders related to environmental, health, and safety protection. Hazardous and radioactive materials transportation regulations are summarized in Section 6.2.4.

6.2.1 Federal Environmental Statutes and Regulations

National Environmental Policy Act of 1969, as amended (42 USC §4321 et seq.). The National Environmental Policy Act (NEPA) establishes a national policy promoting awareness of the environmental consequences of the activity of humans on the environment and promoting consideration of the environmental impacts during the planning and decisionmaking stages of a project. The NEPA requires all agencies of the Federal Government to prepare a detailed statement on the environmental effects of proposed major Federal actions that may significantly affect the quality of the human environment.

This DOE SNF EIS has been prepared in response to these NEPA requirements and policies. It discusses reasonable alternatives and their potential environmental consequences of proposed SNF activities at various locations in the country and has been prepared in accordance with the Council on Environmental Quality Regulations for implementing the procedural provisions of the National Environmental Policy Act Implementing Procedures (40 CFR Parts through 1508) and DOE National Environmental Policy Act Implementing Procedures (10 CFR Part 1021).

Atomic Energy Act of 1954, as amended (42 USC §2011 et seq.). The Atomic Energy Act of 1954 authorizes DOE to establish standards to protect health or minimize

dangers to life or property with respect to activities under its jurisdiction. Through a series of DOE orders, DOE has established an extensive system of standards and requirements to ensure safe operation of its facilities.

The Atomic Energy Act and the Reorganization Plan No. 3 of 1970 [5 USC (app. at 1343)] and other related statutes gave the U.S. Environmental Protection Agency responsibility and authority for developing generally applicable environmental standards for protection of the general environment from radioactive material. The U.S. Environmental Protection Agency has promulgated several regulations under this authority, among which are the Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes, at 40 CFR Part 191.

Nuclear Waste Policy Act of 1982, as amended, (42 USC §10101-10.270). The Act authorizes the Federal agencies to develop a geologic repository for the permanent disposal of SNF and high-level radioactive waste. The Act specifies the process for selecting a repository site and constructing, operating, closing, and decommissioning the repository. The Act also establishes programmatic guidance for these activities.

Clean Air Act as amended (42 USC §7401 et seq.). The Clean Air Act, as amended, is intended to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." Section 118 of the Clean Air Act, as amended, requires that each Federal agency, such as DOE, with jurisdiction over any property or facility that might result in the discharge of air pollutants, comply with "all Federal, state, interstate, and local requirements" with regard to the control and abatement of air pollution.

The Act requires the U.S. Environmental Protection Agency to establish National Ambient Air Quality Standards as necessary to protect public health, with an adequate margin of safety, from any known or anticipated adverse effects of a regulated pollutant (42 USC §7409). The Act also requires establishment of national standards of performance for new or modified stationary sources of atmospheric pollutants (42 USC §7411) and requires specific emission increases to be evaluated so as to prevent a significant deterioration in air quality (42 USC §7470). Hazardous air pollutants, including radionuclides, are regulated separately (42 USC §7412). Air emissions are regulated by the U.S. Environmental Protection Agency in 40 CFR Parts 50 through 99. In particular, radionuclide emissions and hazardous air pollutants are regulated under the National Emission Standard for Hazardous Air Pollutants Program (see 40 CFR Part 61 and 40 CFR Part 63).

Safe Drinking Water Act, as amended [42 USC §300 (F) et seq.]. The primary objective of the Safe Drinking Water Act, as amended, is to protect the quality of the public water supplies and all sources of drinking water. The implementing regulations, administered by the U.S. Environmental Protection Agency unless delegated to the states, establish standards applicable to public water systems. They promulgate maximum contaminant levels, including those for radioactivity, in public water systems, which are defined as public water systems that serve at least 15 service connections used by year-round residents or regularly serve at least 25 year-round

residents. Safe Drinking Water Act requirements have been promulgated by the U.S. Environmental Protection Agency in 40 CFR Parts 100 through 149. For radionuclides, the regulations in effect now specify that the average annual concentration of beta particle and photon radioactivity from manmade radionuclides in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 0.004 rem (4 millirem [0.4 mSv])/year. The maximum contaminant level for gross alpha particle activity is 15 picocuries per liter [555 Bq/m³]. The U.S. Environmental Protection Agency proposed revisions to limits on regulating radionuclides July 18, 1991. The proposed rule has not been finalized. For purposes of analysis, however, the more conservative standards were used. Other programs established by the Safe Drinking Water Act include the Sole Source Aquifer Program, the Wellhead Protection Program, and the Underground Injection Control Program.

Clean Water Act, as amended (33 USC §1251 et seq.). The Clean Water Act, which amended the Federal Water Pollution Control Act, was enacted to "restore and maintain the chemical, physical and biological integrity of the Nation's water." The Clean Water Act prohibits the "discharge of toxic pollutants in toxic amounts" to navigable waters of the United States. Section 313 of the Clean Water Act, as amended, requires all branches of the Federal Government engaged in any activity that might result in a discharge or runoff of pollutants to surface waters to comply with Federal, state, interstate, and local requirements.

In addition to setting water quality standards for the Nation's waterways, the Clean Water Act supplies guidelines and limitations for effluent discharges from point-source discharges and provides authority for the U.S. Environmental Protection Agency to implement the National Pollutant Discharge Elimination System permitting program. The National Pollutant Discharge Elimination System program is administered by the Water Management Division of the U.S. Environmental Protection Agency pursuant to regulations in 40 CFR Part 122 et seq. Idaho has not applied for National Pollutant Discharge Elimination System authority from the U.S. Environmental Protection Agency. Thus, all National Pollutant Discharge Elimination System permits required for the Idaho National Engineering Laboratory are obtained by DOE through the U.S. Environmental Protection Agency Region 10 (40 CFR Part 122 et seq.).

Sections 401 and 405 of the Water Quality Act of 1987 added Section 402(p) to the Clean Water Act. Section 402(p) requires that the Environmental Protection Act establish regulations for issuing permits for stormwater discharges associated with industrial activity. Stormwater discharges associated with industrial activity are permitted through the National Pollutant Discharge Elimination System. General Permit requirements are published at 40 CFR Part 122.

Resource Conservation and Recovery Act, as amended (42 USC §6901 et seq.). The treatment, storage, or disposal of hazardous and nonhazardous waste is regulated under the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act and the Hazardous and Solid Waste Amendments of 1984. Pursuant to Section 3006 of the Act, any state that seeks to administer and enforce a hazardous waste program pursuant to the Resource Conservation and Recovery Act may apply

for U.S. Environmental Protection Agency authorization of its program. The U.S. Environmental Protection Agency regulations implementing the Resource Conservation and Recovery Act are found in 40 CFR Parts 260 through 280. These regulations define hazardous wastes and specify hazardous waste transportation, handling, treatment, storage, and disposal requirements.

The regulations imposed on a generator or a treatment, storage, and/or disposal facility vary according to the type and quantity of material or waste generated, treated, stored, and/or disposed of. The method of treatment, storage, and/or disposal also impacts the extent and complexity of the requirements (see also Section 6.2.5).

Comprehensive Environmental Response, Compensation, and Liability Act as amended (42 USC §9601 et seq.). The CERCLA, as amended, provides a statutory framework for the cleanup of waste sites containing hazardous substances and - as amended by the Superfund Amendments and Reauthorization Act - provides an emergency response program in the event of a release (or threat of a release) of a hazardous substance to the environment. Using the Hazard Ranking System, Federal and private sites are ranked and may be included on the National Priorities List. The CERCLA, as amended, requires such Federal facilities having such sites to undertake investigations and remediation as necessary. The Act also includes requirements for reporting releases of certain hazardous substances in excess of specified amounts to state and Federal agencies.

Emergency Planning and Community Right-to-Know Act of 1986 (42 USC §11001 et seq.) (also known as "SARA" Title III). Under Subtitle A of this Act, Federal facilities, including those owned by DOE, provide various information (such as inventories of specific chemicals used or stored and releases that occur from these sites) to the State Emergency Response Commission and to the Local Emergency Planning Committee to ensure that emergency plans are sufficient to respond to unplanned releases of hazardous substances. Implementation of the provisions of this Act began voluntarily in 1987, and inventory and annual emissions reporting began in 1988 based on 1987 activities and information. DOE also requires compliance with Title III as matter of Agency policy. The requirements for this Act were promulgated by the U.S. Environmental Protection Agency in 40 CFR Parts 350 through 372.

Toxic Substances Control Act (15 USC §2601 et seq.). The Toxic Substances Control Act provides the U.S. Environmental Protection Agency with the authority to require testing of chemical substances, both new and old, entering the environment, and regulates them where necessary. The law complements and expands existing toxic substance laws such as §112 of the Clean Air Act and §307 of the Clean Water Act. The Toxic Substances Control Act came about because there were no general Federal regulations for the potential environmental or health effects of the thousands of new chemicals developed each year before they were introduced into the public or commerce. The Toxic Substances Control Act also regulates the treatment, storage, and disposal of toxic substances, specifically polychlorinated biphenyls, chlorofluorocarbons, asbestos, dioxins, certain metal-working fluids, and hexavalent chromium. The asbestos regulations under the Toxic Substances Control Act were ultimately overturned. However, regulations pertaining to asbestos removal, storage,

and disposal are promulgated through the National Emission Standard for Hazardous Air Pollutants Program (40 CFR Part 61, Subpart M). For chlorofluorocarbons, Title VI of the Clean Air Act Amendments of 1990 requires a reduction of chlorofluorocarbons beginning 1991, and prohibits production beginning 2000.

Pollution Prevention Act of 1990 (42 USC §13101 et seq.). The Pollution Prevention Act of 1990 establishes a national policy for waste management and pollution control that focuses first on source reduction, followed sequentially by environmentally safe recycling, treatment, and lastly, disposal. Disposal or releases to the environment should only occur as a last resort. In response, DOE has committed to participation in the Superfund Amendments and Reauthorization Act Section 313, U.S. Environmental Protection Agency 33/50 Pollution Prevention Program. The goal, for facilities already involved in Section 313 compliance, is to achieve a 33 percent reduction in the release of 17 priority chemicals by 1997, from a 1993 baseline. On August 3, 1993, Executive Order 12856 was issued, expanding the 33/50 program such that DOE must reduce its total releases of all toxic chemicals by 50 percent by December 31, 1999. The DOE is also requiring each DOE site to establish site-specific goals to reduce generation of all waste types.

Federal Facility Compliance Act. The Federal Facility Compliance Act, enacted on October 6, 1992, waives sovereign immunity for fines and penalties for Resource Conservation and Recovery Act violations at Federal facilities. However, a provision postpones fines and penalties after 3 years for mixed waste storage prohibition violations at DOE sites and requires DOE to prepare plans for developing the required treatment capacity for mixed waste stored or generated at each facility. Each plan must be approved by the host state or the U.S. Environmental Protection Agency, after consultation with other affected states, and a consent order must be issued by the regulator requiring compliance with the plan. The Federal Facility Compliance Act further provides that the DOE will not be subject to fines and penalties for land disposal restriction storage prohibition violations for mixed waste as long as it is in compliance with such an approved plan and consent order and meets all other applicable regulations.

National Historic Preservation Act as amended (16 USC §470 et seq.). The National Historic Preservation Act, as amended, provides that sites with significant national historic value be placed on the *National Register of Historic Places*. There are no permits or certifications required under the Act. However, if a particular Federal activity may impact a historic property resource, consultation with the Advisory Council on Historic Preservation will generally generate a Memorandum of Agreement, including stipulations that must be followed to minimize adverse impacts. Coordinations with the State Historic Preservation officer are also undertaken to ensure that potentially significant sites are properly identified and appropriate mitigative actions are implemented.

Archaeological Resource Protection Act, as amended (16 USC §470aa et seq.). This Act requires a permit for any excavation or removal of archaeological resources from public or Indian lands. Excavations must be undertaken for the purpose of furthering archaeological knowledge in the public interest, and resources removed are to remain

the property of the United States. Consent must be obtained from the Indian tribe owning lands on which a resource is located before issuance of a permit, and the permit must contain terms or conditions requested by the tribe.

Native American Grave Protection and Repatriation Act of 1990 (25 USC §3001). This law directs the Secretary of Interior to guide responsibilities in repatriation of Federal archaeological collections and collections held by museums receiving Federal funding that are culturally affiliated to Native American tribes. Major actions to be taken under this law include (a) establishing a review committee with monitoring and policy-making responsibilities, (b) developing regulations for repatriation, including procedures for identifying lineal descent or cultural affiliation needed for claims, (c) oversight of museum programs designed to meet the inventory requirements and deadlines of this law, and (d) developing procedures to handle unexpected discoveries of graves or grave goods during activities on Federal or tribal land.

American Indian Religious Freedom Act of 1978 (42 USC §1996). This act reaffirms Native American religious freedom under the First Amendment and sets United States policy to protect and preserve the inherent and constitutional right of American Indians to believe, express, and exercise their traditional religions. The act requires that Federal actions avoid interfering with access to sacred locations and traditional resources that are integral to the practice of religions.

Religious Freedom Restoration Act of 1993 (42 USC §2000bb et seq.). This Act prohibits the Government, including Federal departments, from substantially burdening the exercise of religion unless the Government demonstrates a compelling governmental interest and the action furthers a compelling Government interest and is the least restrictive means of furthering that interest.

Endangered Species Act as amended (16 USC §1531 et seq.). The Endangered Species Act, as amended, is intended to prevent the further decline of endangered and threatened species and to restore these species and their habitats. The Act is jointly administered by the U.S. Departments of Commerce and the Interior. Section 7 of the Act requires consultation with the U.S. Fish and Wildlife Service to determine whether endangered and threatened species or their critical habitats are known to be in the vicinity of the proposed action.

Migratory Bird Treaty Act, as amended (10 USC §703 et seq.). The Migratory Bird Treaty Act, as amended, is intended to protect birds that have common migration patterns between the United States and Canada, Mexico, Japan, and Russia. It regulates the harvest of migratory birds by specifying things such as the mode of harvest, hunting seasons, and bag limits. The Act stipulates that it is unlawful at any time, by any means, or in any manner to "kill ... any migratory bird." Although no permit for this project is required under the Act, DOE is required to consult with the U.S. Fish and Wildlife Service regarding impacts to migratory birds and to evaluate ways to avoid or these effects in accordance with the U.S. Fish and Wildlife Service Mitigation Policy.

Bald and Golden Eagle Protection Act as amended (16 USC §668-668d). The Bald and Golden Eagle Protection Act makes it unlawful to take, pursue, molest, or disturb bald (American) and golden eagles, their nests, or their eggs anywhere in the United States (Section 668, 668c). A permit must be obtained from the U.S. Department of the Interior to relocate a nest that interferes with resource development or recovery operations.

...
Occupational Safety and Health Act of 1970, as amended (29 USC §651 et seq.). The Occupational Safety and Health Act establishes standards to enhance safe and healthful working conditions in places of employment throughout the United States. The Act is administered and enforced by the Occupational Safety and Health Administration, a U.S. Department of Labor agency. While the Occupational Safety and Health Administration and the U.S. Environmental Protection Agency both have a mandate to reduce exposures to toxic substances, the Occupational Safety and Health Administration's jurisdiction is limited to safety and health conditions that exist in the workplace environment. In general, under the Act, it is the duty of each employer to furnish all employees a place of employment free of recognized hazard, likely to cause death or serious physical harm. Employees have a duty to comply with the occupational safety and health standards and all rules, regulations, and orders issued under the Act. Occupational Safety and Health Administration regulations (published in Title 29 of the Code of Federal Regulations) establish specific standards telling employers what must be done to achieve a safe and healthful working environment. DOE places emphasis on compliance with these regulations at DOE facilities and prescribes through DOE orders the Occupational Safety and Health Act standards that contracts shall meet, as applicable to their work at Government-owned, contractor-operated facilities (DOE Order 5480.1B, 5483.1A). DOE keeps and makes available the various records of minor illnesses, injuries, and work-related deaths as required by Occupational Safety and Health Administration regulations.

Noise Control Act of 1972, as amended (42 USC §4901 et seq.). Section 4 of the Noise Control Act of 1972, as amended, directs all Federal agencies to carry out "to the fullest extent within their authority" programs within their jurisdictions in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health and welfare.

6.2.2 Executive Orders

...
Executive Order 11988 (Floodplain Management) directs Federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for any action undertaken in a floodplain and that floodplain impacts be avoided to the extent practicable.

...
Executive Order 11990 (Protection of Wetlands) directs governmental agencies to avoid, to the extent practicable, any short- and long-term adverse impacts on wetlands wherever there is a practicable alternative.

Executive Order 12898 (Environmental Justice) This order directs Federal agencies to achieve environmental justice by identifying and addressing, as appropriate,

disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions. The order creates an Interagency Working Group on Environmental Justice and directs each Federal agency to develop strategies within prescribed time limits to identify and address environmental justice concerns. The order further directs each Federal agency to collect, maintain, and analyze information on the race, national origin, income level, and other readily accessible and appropriate information for areas surrounding facilities or sites expected to have a substantial environmental, human health, or economic effect on the surrounding populations, when such facilities or sites become the subject of a substantial Federal environmental administrative or judicial action and to make such information publicly available.

...

6.2.3 Department of Energy Regulations and Orders

Through the authority of the Atomic Energy Act, DOE is responsible for establishing a comprehensive health, safety, and environmental program for its facilities. The regulatory mechanisms through which DOE manages its facilities are the promulgation of regulations and the issuance of DOE orders.

The DOE regulations are generally found in Title 10 of the Code of Federal Regulations. These regulations address such areas as energy conservation, administrative requirements and procedures, nuclear safety, and classified information. For purposes of this EIS, relevant regulations include 10 CFR Part 820, Procedures for DOE Nuclear Activities; 10 CFR Part 830.120, Quality Assurance; 10 CFR Part 834, Radiation Protection of the Public and the Environment (proposed); 10 CFR Part 835, Occupational Radiation Protection; 10 CFR Part 1021, Compliance with the National Environmental Policy Act; and 10 CFR Part 1022, Compliance with Floodplains/Wetlands Environmental Review Requirements.

DOE orders generally set forth policy and the programs and internal procedures for implementing those policies. ... The following sections provide a brief discussion of selected orders:

DOE Order 5440.1E, National Environmental Policy Act Compliance Program. This order establishes authorities and responsibilities of DOE officials and sets forth internal procedures for implementing the National Environmental Policy Act. This order was issued by DOE on November 10, 1992.

DOE Order 5480.1B, Environment Safety and Health Program for Department of Energy Operations. This order establishes the Environment, Safety and Health Program for DOE operations.

6.2.4 Hazardous and Radioactive Materials Transportation Regulations

Transportation of hazardous and radioactive materials, substances, and wastes are governed by the U.S. Department of Transportation, U.S. Nuclear Regulatory

Commission, and U.S. Environmental Protection Agency regulations. These regulations may be found in 49 CFR Parts 171 through 178, 49 CFR Parts 383 through 397, 10 CFR Part 71, and 40 CFR Part 262, respectively.

U.S. Department of Transportation regulations contain requirements for identifying a material as hazardous or radioactive. These regulations interface with those of the U.S. Nuclear Regulatory Commission or U.S. Environmental Protection Agency regulations for identifying material, but the U.S. Department of Transportation hazardous material regulations govern the hazard communication (such as marking, hazard labeling, vehicle placarding, and emergency response telephone number) and shipping requirements (such as required entries on shipping papers or U.S. Environmental Protection Agency waste manifests).

U.S. Nuclear Regulatory Commission regulations applicable to radioactive materials transportation are found in 10 CFR Part 71, which includes detailed packaging design requirements and package certification testing requirements. Complete documentation of design and safety analysis and results of the required testing is submitted to the Nuclear Regulatory Commission (NRC) to certify the package for use. This certification testing involves the following components: heat, physical drop onto an unyielding surface, water submersion, puncture by dropping package onto a rigid spike, and gas tightness. Some of the required tests simulate maximum reasonably foreseeable accident conditions.

U.S. Environmental Protection Agency regulations pertaining to hazardous waste transportation are found in 40 CFR Part 262. These regulations deal with the use of the U.S. Environmental Protection Agency waste manifest, which is the shipping paper for transporting Resource Conservation and Recovery Act hazardous waste.

6.2.5 Applicability of the Resource Conservation and Recovery Act to Spent Nuclear Fuel

Historically, DOE chemically reprocessed SNF to recover valuable products and fissionable materials, and as such, the SNF was not a solid waste under the Resource Conservation and Recovery Act.

World events have resulted in significant changes in DOE's direction and operations. In particular, in April 1992 DOE announced the phase-out of reprocessing for the recovery of special nuclear materials. With these changes, DOE's focus on most of its SNF has changed from reprocessing and recovery of materials to storage and ultimate disposition. This in turn has created uncertainty in regard to the regulatory status of some of DOE's SNF relative to the Resource Conservation and Recovery Act.

DOE has initiated discussion with the U.S. Environmental Protection Agency on the potential applicability of the Resource Conservation and Recovery Act to SNF. Further discussions with U.S. Environmental Protection Agency Headquarters and regional offices and state regulators are ongoing to develop a path forward toward meeting any Resource Conservation and Recovery Act requirements that might apply.

6.3 Idaho Laws and Regulations

Detailed summaries of the Idaho laws, regulations, and other requirements that are applicable to the spent nuclear fuel management at the INEEL are provided in Volume 2, Part A, Section 7.2.4, Idaho Laws and Requirements, of the DOE SNF EIS (U.S. Department of Energy, 1995a):

The Idaho Environmental Protection and Health Act (Idaho Code, Title 39, Chapter 101 et seq.) establishes general provisions for the protection of the environment and public health. The Act created the Idaho Department of Health and Welfare and its subordinate Division of Environmental Quality, thus consolidating all State public health and environmental protection activities under one department. The Idaho Department of Health and Welfare is authorized to implement these environmental, health, and social services requirements. The Act authorizes the Department to promulgate standards, rules, and regulations relating to water and air quality, noise reduction, and solid waste disposal and grants authority to issue required permits, collect fees, establish compliance schedules, and review plans for the construction of sewage and public-water treatment and disposal facilities.

Authorization is also granted to the Idaho Department of Health and Welfare by the Idaho Water Pollution Control Act (Idaho Code, Title 39, Chapter 36) for the protection of the waters of Idaho. General language concerning the prevention of water pollution and the provision of financial assistance to municipalities is contained in the law.

The Idaho Department of Health and Welfare is also responsible for enforcement and implementation of the Hazardous Waste Management Act of 1983, as amended (Idaho code, Title 39, Chapter 44), which provides for the protection of health and the environment from the effects of improper or unsafe management of hazardous wastes and for the establishment of a tracking or manifesting system for these wastes. This program is intended to be consistent with and not more stringent than Federal regulations as established under the Resource Conservation and Recovery Act. At this time, Idaho has primacy over hazardous and mixed waste promulgated by the U.S. Environmental Protection Agency. The Hazardous Waste Management Act sets forth requirements for the development of plans that address identification of hazardous wastes, unauthorized treatment, storage, release, use, or disposal of these wastes, and permit requirements for hazardous waste facilities. Rules and regulations concerning the transportation, monitoring, reporting, and record keeping of hazardous wastes have also been promulgated by the Idaho Department of Health and Welfare under authority of this Act.

The following sections discuss the major requirements and regulations pursuant to these State laws.

Idaho Air Pollution Control Regulations. Pursuant to the Rules and Regulations for the Control of Air Pollution in Idaho (Idaho Administrative Procedures Act Title 1, Chapter 1), the Department of Health and Welfare established ambient air quality standards for particulate matter, sulfur dioxide, ozone, oxides of nitrogen, carbon monoxide, and fluorides.

Title 1, Chapter 1, of the Rules and Regulations for the Control of Air Pollution in Idaho is intended to provide authority and standards in compliance with the Clean Air Act. The Department of Health and Welfare has been granted authority to implement the requirements of the Clean Air Act and to adopt rules to implement the requirements of the Clean Air Act for that purpose. These rules and regulations include provisions for establishing compliance schedules and emission limits, reporting and correction of emissions that exceed established limits, and permitting requirements for construction and operation of facilities or activities that may generate emissions in excess of the prescribed standards. The Prevention of Significant Deterioration, control of open burning, and fugitive dust are addressed by these rules, as are specified types of facilities that may exceed emission limits. Also required by the Idaho Air Pollution Control Regulations is the formulation of a plan for the prevention and alleviation of air pollution emergencies. The plan includes definitions of the severity of the emergency, requirements for public notification, and recommended actions to be taken in abating an air pollution emergency.

Idaho Water Quality Standards and Wastewater Treatment Requirements and Wastewater Land Application Permit Regulations. Provisions are set forth by these regulations (Idaho Department of Health and Welfare, Rules and Regulations, Title 1, Chapter 2) for protection of designated water uses and the establishment of water quality standards that will protect those uses. The Department of Health and Welfare has been authorized to develop and enforce these regulations by Section 39-105 of the Idaho Code. Restrictions are outlined by these regulations for control of point-source and nonpoint-source discharges and other activities that may adversely affect waters of the State of Idaho, including surface water and groundwater. These regulations identify water-use classifications, specifically prohibited discharges, water quality criteria, and requirements for treatment of wastewater before discharge in the waters of Idaho. In addition, State regulations require that a permit be obtained for the application of wastewater to the land surface.

Idaho Regulations for Public Drinking Water Systems. Maximum contaminant levels for public drinking water systems are provided by these regulations. The Water Quality Bureau, as a subdivision of the Department of Health and Welfare, sets forth monitoring and reporting requirements for inorganic and organic chemicals and radiochemicals. Other water quality and locational standards are also included in these regulations. The Department reserves the authority to determine whether the contamination is caused by nuclear facilities and to require further monitoring.

Idaho Hazardous Waste Management Regulations. Pursuant to the Hazardous Waste Management Act, the Department of Health and Welfare (Title 1, Chapter 5) has adopted by reference the Federal regulations regarding hazardous waste rulemaking, hazardous waste delisting, and identification of wastes. Included in these regulations are requirements for hazardous waste generators, transporter, and management facilities as well as detailed procedures for permitting these activities. The general requirements for generators, transporters, and management facilities have been incorporated by reference; however, some sections have been revised to reflect Idaho's permitting program. Section 39-4404 (14) of the Act identifies "restricted hazardous waste" that includes liquid hazardous wastes containing specified

concentrations of constituents as well as hazardous wastes containing concentrations of halogenated compounds.

Idaho Solid Waste Management Regulations. These regulations, as developed by the Idaho Department of Health and Welfare in Title 1, Chapter 6, of the *Solid Waste Management Regulations and Standards Manual*, provide standards for the management of solid wastes to minimize the detrimental effects of disposal. These standards include requirements for the review of plans and approval of procedures and operational and postoperational standards for landfills, incinerators, and processing facilities and for transportation and storage of solid waste.

Idaho Rules and Regulations for Construction and Use of Injection Wells. Requirements for the construction, location, and use of injection wells within the State of Idaho are set forth in these regulations. The Department of Water Resources has been granted administrative authority over injection wells. Injection of radioactive or hazardous materials through an existing well or above a drinking water source is prohibited. Parameters for quality of fluids discharged and allowable uses of injection wells are included in these regulations as are classifications of well types and permitting requirements for injection wells.

7.0 AGENCIES AND INDIVIDUALS CONSULTED

The National Environmental Policy Act (NEPA) of 1969, as amended requires that Federal, State, and local agencies with jurisdiction or special expertise regarding any environmental impact be consulted and involved in the NEPA process. Agencies involved include those with authority to issue applicable permits, licenses, and other regulatory approvals, as well as those responsible for protecting significant resources (for example, endangered species, critical habitats, or historic resources). These agencies will be sent copies of the Final Environmental Impact Statement.

A summary of the agencies and individuals consulted concerning the proposed licensing action is provided in Section 6, Agencies and Persons Consulted, of the U.S. Department of Energy-Idaho Operations Office (DOE-ID) environmental assessment (EA) (U.S. Department of Energy-Idaho Operations Office, 1997):

DOE is required to review as guidance the most current U.S. Fish and Wildlife Service (USFWS) list for threatened and endangered species (T&E). If, after reviewing the list, DOE determines that the proposed action would not impact any T&E species, DOE may determine or document that formal consultation with the USFWS is not required for an action. The Environmental Science and Research Foundation performs independent T&E species reviews for DOE. They have advised DOE that a biological assessment is not needed for the proposed action as stated in Section 4.1.2.4 [of the DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1997)].

The DOE also consulted with a number of agencies and individuals during the preparation of the DOE spent nuclear fuel (SNF) environmental impact statement (EIS) (U.S. Department of Energy, 1995a). Copies of letters regarding consultation under the Endangered Species Act and National Historic Preservation Act are provided in Volume 2, Part B, Appendix B of the DOE SNF EIS (U.S. Department of Energy, 1995a).

8.0 ENVIRONMENTAL IMPACT STATEMENT PREPARERS

The organizations and individuals listed below are the principal contributors to the preparation of this Environmental Impact Statement. Table 8.1 summarizes the specific chapters to which each principal contributor provided input.

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Principal Contributor	Summary and Conclusions	Section								Appendix
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no entries

APPENDIX A

RESPONSES TO COMMENTS

Specific comments and responses related to the proposed action are provided in Appendix A, Responses to Comments, of the 1996 U.S. Department of Energy-Idaho Operations Office (DOE-ID) Environmental Assessment (EA) (U.S. Department of Energy-Idaho Operations Office, 1996a):

RESPONSES TO PUBLIC COMMENTS

Public Comment

Comment: Commentor asked why (nuclear) waste continues to be produced if there are problems finding places to put it.

Response: *The purpose of the Test Area North (TAN) Pool Stabilization Project (PSP) Environmental Assessment (EA) is to evaluate the environmental impacts associated with the stabilization of the existing TAN Pool and its replacement with a passive, dry storage system to store these existing fuel and debris. The EA does not address production of new spent nuclear fuel or shipment of fuels to the INEEL [Idaho National Engineering and Environmental Laboratory], and continued production and disposal of nuclear waste is outside the scope of this document.*

RESPONSES TO STATE OF IDAHO'S COMMENTS

A. General Comment

1. Comment: The State of Idaho and the Snake River Alliance expressed concern over the level of NEPA analysis (EA vs EIS) for the proposed action.

Response: *Appendix D to Subpart D of DOE's NEPA [National Environmental Policy Act] Implementing Procedures (10 CFR 1021) lists classes of actions that normally require an EIS [Environmental Impact Statement]. Item D10 of appendix D to Subpart D lists the "Siting, construction, operation, and decommissioning of major treatment, storage and/or disposal facilities for high-level and/or spent nuclear fuel, such as spent fuel storage facilities and geologic repositories" as one of the classes of actions normally requiring an EIS.*

The FEIS (U.S. Department of Energy, 1995a) analyzes the cumulative environmental impacts of spent nuclear fuel management on the INEEL including the consolidation of spent nuclear fuel at ICPP and the proposed TAN Pool Stabilization Project. The Record of Decision (ROD) for this FEIS makes a decision to consolidate spent fuels currently stored at various locations at the INEEL at the ICPP as funding allows but deferred the decision on the TAN Pool Stabilization Project pending further project definition, funding priorities, or appropriate review under NEPA.

This EA was prepared to provide the further NEPA review identified in the ROD and

address the site specific environmental impacts of the TAN Pool Stabilization Project. An EA is the appropriate level of NEPA review because neither the TAN Pool nor the proposed Interim Storage System [ISS] at ICPP are major storage facilities within the meaning of DOE's NEPA Implementing Procedures. The meaning of the term "major" in the context of actions requiring EIS's is addressed in DOE's proposed amendment to the NEPA Implementing Procedures (61 FR 6414). Also, the analyses in this EA did not disclose any potential significant environmental impacts associated with the proposed action.

If DOE applies for NRC licensing of the ISS, an independent NEPA analysis would be conducted by the NRC for proposed actions conducted subject to their regulatory authority such as: a) the transportation of the spent nuclear fuel and debris to ICPP and b) the construction and operation of the ISS.

B. Specific Comments

1. Comment: The statement is made that miscellaneous hardware will be removed from the pool and disposed of in the RWMC [Radioactive Waste Management Complex]. There are some "skeletons," fuel assembly hardware, in the pool that may be Greater Than Class C low level waste, which could not be disposed of at the RWMC. DOE needs to address this issue.

Response: Greater than Class C waste is a radioactive low level waste that exceeds the NRC concentration limits for Class C low level waste as specified in 10 CFR 61. The miscellaneous hardware, described in Section 2.1.1 [of the 1996 DOE-ID EA], is not fissile materials and is less than Class C waste. This hardware is LLW [Low Level Radioactive Waste] and meets the waste acceptance criteria for disposal at RWMC.

2. Comment: The statement is made that future programmatic missions have not been identified for TAN. Why, then, is DOE proposing to store fuel at TAN?

Response: Section 1.0 has been revised to eliminate the storage of SNF [spent nuclear fuel] at TAN as an alternative and Section 2.2.2.4 has been added to identify that storage of SNF at TAN would not be consistent with the FEIS Record of Decision (U.S. Department of Energy, 1995b). This revision to the EA is consistent with the decision in the ROD to consolidate the INEEL SNF at ICPP.

3. Comment: The statement is made that the Storage Pool poses a minimal threat to human health and the environment. This seems to contradict the Preferred Alternative and support the No Action Alternative. What is the justification for the Preferred Alternative?

Response: Section 1.1 [of the 1996 DOE-ID EA] has been revised to clarify the need for action and the "Preferred Alternative" has been replaced with the "Proposed Action." It is DOE's intent to comply with the Settlement Agreement between the State of Idaho, Department of Energy, and the Navy, which states at Paragraph E7:

"DOE shall complete construction of the Three Mile Island dry storage facility by

December 31, 1998. DOE shall commence moving fuel into the facility by March 31, 1999, and shall complete moving fuel into the facility by June 1, 2001."

This issue was negotiated to correct vulnerabilities previously identified at the TAN facility.

4. Comment: The statement is made that DOE-HQ [DOE Headquarters] signed an Action Description Memorandum (ADM) on May 26, 1993 stating that an EA would be the appropriate level of NEPA documentation. At that time, the plan was to place the TMI-2 [Three Mile Island Unit 2] debris in Dry Casks and all fuel from the pool was to be stored on a pad at TAN. The change in project description has affected the appropriate level of NEPA documentation.

Response: See Response to A (1).

5. Comment: The statement is made that the TMI-2 fuel must be stored in a vented condition. However, it is already stated in the [DOE-ID 1996] EA that the volatile radionuclides have escaped from the fuel as a result of the meltdown. Generation of hydrogen and oxygen gases from residual water should be minimal as the containers will be dried with hot nitrogen. A better explanation of why venting is required should be supplied.

Response: Section 1.2 [of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a)] has been revised to discuss the condition of the damaged fuel and venting requirements. This EA has also been rewritten to delete the option of drying the canisters. See Section 2.2.2.6 [of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a)].

6. Comment: The statement is made that the ISS would provide retrievability of the canisters to a spare position in the ISS or to a transfer cask that could interface with other ICPP fuel handling equipment. DOE needs to explain why this is required.

Response: Retrievability is an NRC requirement (10 CFR 72.122) that mandates that an ISS be designed to allow ready retrieval of spent fuel for further processing or disposal. Section 2.1.3 [of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a)] has been revised to identify this NRC requirement and rationale.

7. Comment: The statement is made that there are several types of ISS facilities available that could be modified to accommodate the TMI core debris and provides some description of them. DOE needs to provide more specific detail for the decisionmaker and the public to evaluate this issue.

Response: Figures 5 through 10 have been added to the [1996 DOE-ID] EA to identify various existing commercial dry SNF storage systems that could be available. Any existing design would require modifications to accommodate the unique requirements of the TMI-2 core debris. The extent of modifications required is not known at this time, since procurement of a storage system has not yet occurred. The environmental impacts of these

different hypothetical designs do not differ from one design to the next.

8. Comment: "The ISS facility would be sized to accommodate 344 TMI canisters with a minimum of 5 spare storage positions for recovery purposes and would include space for appropriate support functions." From this statement the questions have to be addressed: what is the maximum storage capacity of this new facility: what is the cost; and, what other fuel types could be stored there?

Response: Retrievalability is an NRC requirement for SNF storage systems. Many storage facilities are preconstructed modular units with a specific number of storage units (cells) per module. It is reasonable to assume that use of a modular type facility would result in a few (5 to 10) additional cells or storage positions. The estimated range of costs for the facility is 10 to 20 million dollars. The ISS design is specific to the TMI-2 debris and commercial, fuel stored in the TAN Pool. Any potential future expansion of this ISS would be required to be in compliance with the Settlement Agreement (U.S. Department of Energy, 1995c) and the February 28, 1996 Amended Record of Decision for the FEIS (U.S. Department of Energy, 1995b).

9. Comment: Why is this DOE's preferred alternative? There are no reasons given other than the following speculative statement on (page 31, Para. 1) [of the 1995 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1995)] "The LET&D [Liquid Effluent Treatment and Disposal] and PEW [Process Equipment Waste] facilities at ICPP are Resource Conservation and Recovery Act (RCRA)-regulated facilities and analysis of the pool water would determine whether the water would meet the waste acceptance criteria for these facilities."

An explanation of why DOE prefers this alternative must be given when the following statements make it clear that the preferred alternative would not afford a higher degree of environmental protection: (Page 31, Section 4.1.2.3 Para. 2) [of the 1995 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1995)] "There is currently no defined DOE policy regarding de minimis quantities of radionuclides that can be discharged into the TAN TSF-07 sanitary and industrial wastewater pond or other radionuclide discharges to the soil column at the INEEL." ... "Because there is no treatment technology for tritium, the tritium concentration in the treated water would be equivalent to the concentration before treatment."

Response: Any of the identified treatment systems for the Storage Pool water would treat the water to meet the State and Federal requirements applicable at the time of treatment, currently projected to occur in 2001. The preferred option would not involve transportation of nearly 780,000 gallons [2,950 m³] of water to ICPP. It is anticipated that the release criteria applicable at the time of treatment can be met by the preferred treatment alternative. No treatment technology is capable of removing tritium since tritiated water is simply water with 2 additional protons on the hydrogen atom (³H) and is, consequently, released by evaporation or volatilization.

10. Comment: The statement is made that the unfueled upper core support structures will

be removed from the LOFT [Loss-of-Fluid Test] fuel. What will happen to these support structures? Are they Greater Than Class C waste? If so, they cannot be disposed of in the RWMC. On page 31, it says this waste would be considered low level waste. DOE needs to address the characterization of this waste stream in more detail.

Response: Section 2.1.1 [of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a)] has been modified to identify that the LOFT upper support structure may be disposed of at RWMC as LLW. These support structures are not fissile material, and are less than Class C waste.

11. Comment: Why isn't CPP-666 considered as a possible storage location for the TMI-2, LOFT and commercial fuels?

Response: CPP-666 is proposed to undergo a fuel storage rack reconfiguration to provide storage capacity for the fuels identified in the FEIS.

12. Comment: The statement is made that even though CPP-749 contains 14 wells specifically designed for the LOFT fuel, the drainage, monitoring and shielding is inadequate. A better explanation is needed as to why 14 wells specifically built for this fuel are inadequate. The potential to upgrade this facility should be addressed. Further, what is the status of the monitoring system for the fuel currently stored at CPP-749?

Response: The sentence in question was removed from the EA and language was added to Section 2.2.2.3 [of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a)] to clarify why the CPP-749 dry wells were not considered further. Upon review of this statement, DOE determined it was not accurate as the CPP-749 wells were designed as a generic underground storage system that can accommodate numerous fuel types (including LOFT fuel) and provide adequate monitoring, shielding, draining and venting capacity. This alternative was dismissed from further evaluation because other ICPP and TRA [Test Reactor Area] fuels have been identified for storage in the wells.

13. Comment: The statement is made that storage in the IFSF [Irradiated Fuel Storage Facility] would be unsafe because the TMI-2 canisters would extend 18 inches [0.46 m] above the IFSF canisters. What modifications would be necessary for the IFSF to accept the TMI-2 canisters? It seems appropriate to discuss whether modifications can be made before rejecting storage at IFSF.

Response: Section 2.2.2.3 [of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a)] was revised to address the rationale for rejecting this alternative.

14. Comment: The statement is made that the preferred alternative for treating the pool water is ion exchange or some other suitable treatment system. This statement is followed a short time later by statements that prior to draining the pool, the water would be analyzed and testing would be conducted to determine the appropriate treatment process. Hasn't at least some of this analysis and testing already been done?

Response: This sentence in Section 2.1.4 [of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a)] has been modified to clarify the intent of the paragraph. The water is tested on a regular basis. However, during the canister transfers and dewatering activities, the water would be churned and changes in the pool water concentrations could occur. Following water treatment, sampling of the treated water would also be conducted to ensure that the treatment system meets the discharge requirements.

15. Comment: Would there be no release of gaseous or particulate fission products from the dewatering (as opposed to drying) process, even though the drying process would be bounding?

Response: Releases from dewatered canisters would occur and the releases have been discussed in the EA in section 4.1.2.1 [of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a)]. This section has been rewritten to address current ISS design information. The estimated doses for the proposed action of dewatering are well below the NESHAP [National Emissions Standards for Hazardous Air Pollutants] limit of 10 mrem/yr [0.1 mSv/yr].

16. Comment: Modeled doses should probably be expressed as rem and person-rem, not rem/yr and person-rem/yr. Only a one year emission period is being modeled. Also, cancer risk should be compared to the average lifetime probability of cancer death of about 18 percent.

Response: This table discussed the maximum dose consequence from drying, an alternative that has been eliminated [see Response B(5)]. Table 3 now identifies the EDE [effective dose equivalent] to the maximally exposed individual (MEI) for the proposed action. Though only a one-year emission period is modeled the doses are expressed as rem and person-rem per year for consistency and comparison value throughout the EA. Average lifetime probabilities are not typically compared to risks to the (individual) MEI as the maximally exposed individual is not an average value, but an estimate of risk of health effects (i.e. fatal cancers) from one action such as an accident or a specific activity with a definitive life-span.

17. Comment: The statement: "Anticipated emissions of tritium (which has a half-life of 12.5 years) from the discharged water would result in doses that would cause no adverse health effects to the public and as evidenced by worker doses of less than two rem/yr [0.02 Sievert/yr] in the pool area." [underline added]. The underlined portion of this sentence is unclear and misleading, since a previous sentence states that the tritium release rate from an evaporative system would be higher than from the present pool. If the rate is higher, then exposures to a worker adjacent to an evaporation pond would be higher than the rate experienced next to the indoor pool. In fact, if the exposure occurs on a hot day, the rate and therefore the dose may be considerably higher.

Response. Exposures to INEEL workers from tritium releases from an evaporation pond such as TSF-07 were modeled and the results were added to this discussion in Section 4.1.2. 1 [of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office,

1996a)]. Currently, releases from the storage pool are a result in worker doses of less than 2 rem/yr [0.02 Sievert/yr]. The modeled dose for a worker standing next to an uncovered, unlined pond is below this value and below the DOE worker dose limit.

18. Comment: The statement is made that an individual would have to stand next to a loaded dry storage cask for 28 years to receive a 1 rem [0.01 Sievert] dose from neutrons. It is unclear why the analysis includes a discussion of neutrons, since this source of radiation is insignificant. As stated later in the same paragraph, greater than 97% of the radiation field around the outside of the cask would be from Cs-137 which is a gamma emitter.

Response: This paragraph was revised to reflect that the majority of the dose rate on the outside of the cask is due to Cs-137. The doses due to neutron emissions are insignificant, do not affect the outcome of the impact evaluation and were, therefore, deleted from the discussion in Section 4.1.2.2 [of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a)].

19. Comment: "The highest latent cancer fatality from potential accidents would result from the nitrogen gas line rupture accident"... is unclear. Presumably, "The highest probability of cancer fatality to the MEI..." is intended.

Response: The [1996 DOE-ID] EA has been revised to delete canister drying as an alternative [see response B(5)]. As a gas-line rupture was associated with drying, the accident scenario associated with the use of nitrogen has also been eliminated. In addition, the highest probability of cancer fatality to the MEI is now from the commercial fuel assembly drop and the language in the [1996 DOE-ID] EA has been revised.

20. Comment: How can the "Total effective dose equivalent (rem)" for the "Onsite worker at 300 m of $8.4\text{E-}05$ " be so much smaller than the "Maximally exposed individual at $1.1\text{E}+00$." Wouldn't the workers receive more of a dose than offsite individuals?

Response: The MEI dose is higher because the release would be from the 45 ft [13.7 m] TAN stack. Due to wind direction and speed, and other parameters, the worker at 300 m would potentially receive a lower dose.

21. Comment: Why is the dose (and corresponding cancer risk) to the MEI from the fuel assembly drop higher by a factor of about 10,000 than the dose to the onsite worker at 300 m, while for the other accidents the dose to the MEI is lower by a factor of about $\frac{1}{2}$? Is an ingestion pathway being considered for this accident that leads to a higher MEI dose, or is this simply a typographical or transcription error? Note that this result is also inconsistent with the statement on p. 34, para. 5 [of the 1995 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1995)] quoted above.

Response: Table 5 [of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a)] has been revised to identify the exposure pathways. The fuel assembly drop gives no inhalation dose, therefore the ingestion pathway becomes a larger player in the total dose than a canister drop accident and worker exposures are

proportionally much smaller (due to no ingestion). In addition, a different source term was used for each accident scenario as identified in Table 4 of the [1996 DOE-ID] EA. The source term for the fuel assembly drop is very different than for the other accidents. C-14, which is present in the fuel assembly drop source term, but not the canister drop accident scenario, adds a significant amount of ingestion potential for the MEI. For the canister drop, ingestion accounts for approximately 70% of the dose. Consequently, dividing the MEI dose (which includes ingestion) by a very low worker dose (300-m, no ingestion), results in the large ratio presented in the comment above.

22. Comment: The statement is made that exposures along the south side of the pool were not analyzed for an accident that drains the pool as there is no access and the Hot Shop walls provide shielding in that direction. Based on the facility description and diagram in this EA, if the pool were to drain, the pool vestibule would also and radiation could enter the Hot Shop through the normally submerged passage way between them.

Response: *This comment is correct. Section 4.2 [of the 1996 DOE-ID EA (U.S. Department of Energy-Idaho Operations Office, 1996a)] has been revised to clarify the statement and identify the administrative controls that are in place to ensure workers leave the Hot Shop if an incident were to occur.*

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10. SUPPLEMENTARY NOTES

Docket No. 72-20

11. ABSTRACT (200 words or less)

This Final Environmental Impact Statement (FEIS) was prepared by the U.S. Nuclear Regulatory Commission in accordance with the requirements of 10 CFR Part 51. The FEIS contains an assessment of the potential environmental impacts of the construction and operation of an Independent Spent Fuel Storage Installation (ISFSI) for the Three Mile Island Unit 2 (TMI-2) fuel debris at the Idaho National Engineering and Environmental Laboratory (INEEL). The NRC proposes to issue a license to the U.S. Department of Energy-Idaho Operations Office (DOE-ID) which will authorize DOE-ID to store the TMI-2 fuel debris in an ISFSI. DOE-ID is proposing to design, construct, and operate at the Idaho Chemical Processing Plant (ICPP). The TMI-2 fuel debris would be removed from wet storage at the Test Area North pool, transported to the ISFSI at the ICPP, and placed in storage modules on a concrete basemat.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)

Geology	spent nuclear fuel	environmental assessment
Seismology	storage	
hydrology	TMI-2 fuel	
climatology	storage modules	
radiological	construction	
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