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FINAL ENVIRONMENTAL IMPACT STATEMENT FOR A CONTAINER SYSTEM FOR THE MANAGEMENT OF NAVAL SPENT NUCLEAR FUEL

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Abstract:

This Final Environmental Impact Statement (EIS) addresses six general alternative systems for the loading, storage, transport, and possible disposal of naval spent nuclear fuel following examination. It supersedes the Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel dated May 1996.

This EIS describes environmental impacts of 1) producing and implementing the container systems (including those impacts resulting from the addition of the capability to load the containers covered in this EIS in dry fuel handling facilities at Idaho National Engineering Laboratory (INEL)), 2) loading of naval spent nuclear fuel at the Expended Core Facility or at the Idaho Chemical Processing Plant with subsequent storage at INEL, 3) construction of a storage facility (such as a paved area) at alternative locations at INEL, and 4) loading of containers and their shipment to a geologic repository or to a centralized interim storage site outside the State of Idaho once one becomes available. As indicated in the EIS, the systems and facilities might also be used for handling low-level radiological waste categorized as special case waste.

As identified in the Draft EIS, the following factors were considered in selecting a preferred alternative in this Final EIS: public comments, protection of human health and the environment, cost, technical feasibility, operational efficiency, regulatory impacts, and storage or disposal criteria which may be established for a repository or centralized interim storage site outside the State of Idaho. Based on evaluation of these factors, the Navy's preferred alternative for a container system for the management of naval spent fuel is a dual-purpose canister system. The primary benefits of a dual-purpose canister system are efficiencies in container manufacturing and fuel reloading operations, and potential reductions in radiation exposure.

This EIS evaluates options for a dry storage facility for naval spent nuclear fuel, including existing facilities at INEL and currently undeveloped locations potentially not above the Snake River Aquifer. The Navy’s preferred alternative for a dry storage location for naval spent nuclear fuel is to utilize either a site adjacent to the Expended Core Facility at the Naval Reactors Facility or a site at the Idaho Chemical Processing Plant at INEL. These locations offer several important advantages, including already existing fuel handling facilities and trained personnel. In addition, use of these INEL facilities would protect previously undisturbed areas; development of these undisturbed sites would incur increased environmental impacts while offering no environmental advantage.

This Final EIS includes public comments received on the Draft EIS and responses to those comments. Throughout the document, text revisions and modifications that have occurred since publication of the Draft EIS are indicated by a small vertical line (sidebar) appearing in the margin. The exception is Chapter 11, Comments and Responses, which is an entirely new section. Although sidebars do not appear in Chapter 11, no part of that chapter appeared in the Draft EIS.

Prepared by:
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EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

S.1 Introduction

This U.S. Department of the Navy's (Navy) Final Environmental Impact Statement (EIS) for a Container System for the Management of Naval Spent Nuclear Fuel evaluates a range of alternatives that would provide a system of containers for management of naval spent nuclear fuel following examination at the Idaho National Engineering Laboratory (INEL). The proposed action is to select a container system for the management of naval spent nuclear fuel which would also provide for management of special case low-level radioactive waste. Unless otherwise noted in this EIS, the term "naval spent nuclear fuel" will be used to mean naval spent nuclear fuel after it has been examined at the INEL. This EIS provides the details and results of specific evaluations of environmental effects associated with each alternative.

A container system which allows naval spent nuclear fuel to be loaded and stored dry at the INEL in the same container that would be used to ship the naval spent nuclear fuel outside the State of Idaho could be advantageous in meeting the Navy's current and future needs; such a system would improve the efficiency of fuel management by minimizing the handling of unshielded naval spent nuclear fuel. Four of the six alternatives evaluated, the Multi-Purpose Canister, Dual-Purpose Canister, Transportable Storage Cask, and Small Multi-Purpose Canister Alternatives, would fulfill this objective.

The identification of a preferred alternative in this Final EIS, and the future selection of an alternative in the Record of Decision, takes into consideration the following factors: 1) public comments; 2) protection of human health and the environment; 3) cost; 4) technical feasibility; 5) operational efficiency; 6) regulatory impacts; and 7) storage or disposal criteria which may be established for a repository or centralized interim storage site outside the State of Idaho. Based on these factors, the Navy's preferred alternative for a container system for the management of naval spent nuclear fuel is a dual-purpose canister system. The primary benefits of a dual-purpose canister system are efficiencies in container manufacturing and fuel reloading operations, and potential reduction in radiation exposure. The adverse impacts associated with all the considered alternatives are small. As with all the alternative container systems evaluated in this EIS, the Navy's preferred alternative will allow the safe storage and shipment of naval spent nuclear fuel for ultimate disposition.

This EIS evaluates options for a dry storage facility for naval spent nuclear fuel, including existing facilities at INEL and currently undeveloped locations potentially not above the Snake River Aquifer. The Navy's preferred alternative for a dry storage location for naval spent nuclear fuel is to utilize either a site adjacent to the Expended Core Facility at the Naval Reactors Facility or a site at the Idaho Chemical Processing Plant at INEL. These locations offer several important advantages, including already existing fuel handling facilities and trained personnel. In addition, use of these INEL facilities would protect previously undisturbed areas; development of these undisturbed sites would incur increased adverse environmental impacts while offering no environmental advantage.

Unlike civilian spent nuclear fuel which, after removal from the reactor, is currently stored in plants throughout the country, all pre-examination naval spent nuclear fuel is shipped to one place, INEL, for examination and temporary storage pending ultimate disposition outside the State of Idaho. For this reason, evaluations for the storage and transportation of naval spent nuclear fuel at INEL make use of information specific to that location. The Nuclear Waste Policy Act, as amended, designates Yucca Mountain at the Department of Energy's (DOE's) Nevada Test Site as the only site currently authorized by legislation to be characterized as a geologic repository; its suitability has not yet been determined. Therefore, the analysis in this EIS covers transportation to that location as a representative or notional destination. The Nuclear Waste Policy Act authorizes disposal of spent nuclear fuel, including naval spent nuclear fuel, in a geologic repository. There is a possibility that future legislation will allow centralized interim storage of spent nuclear fuel, possibly including naval spent nuclear fuel. As a convenience for analysis, this EIS examines transportation to the same location as a representative or notional centralized interim storage site. This EIS does not make presumptions concerning the Yucca Mountain site's suitability as a geologic repository or designation for use as a centralized interim storage site. Before the Navy container system would be used for shipments off the INEL site, appropriate environmental documentation will be submitted in support of an interim storage facility or a repository in accordance with the Nuclear Waste Policy Act. This documentation will include the potential impacts of shipments of spent nuclear fuel and high-level waste from reactor sites and DOE facilities to the recommended location and the site specific impacts of operations at that location.

In addition to a discussion of container systems, the scope of this EIS also includes several actions that are related to the container system choice:

- Manufacturing of the container system.

- Handling, storage and transportation impacts associated with the container system including unloading of containers at a representative or notional repository.

- Modifications at the Expended Core Facility and the Idaho Chemical Processing Plant at INEL to support loading naval spent nuclear fuel into containers suitable for dry storage. Specifically, expansions evaluated at both locations would allow loading operations to take place in either a shielded, filtered-air, dry cell facility or in an underwater loading facility.

- The location of the dry storage area at INEL. Areas investigated include the current naval spent nuclear fuel handling facilities at the Naval Reactors Facility and storage facilities of Idaho Chemical Processing Plant that are above the Snake River Plain Aquifer, as is most of INEL, and two areas that might not be above the aquifer but that are not currently in the industrial-use areas of INEL.

- The storage, handling and transportation of certain kinds of low-level radioactive waste (characterized as a type of special case waste, associated with naval spent nuclear fuel, that has concentrations of certain short- and long-lived isotopes which are greater than those specified for Class C in 10 CFR Part 61.55) that might reasonably utilize the same container system as is used for naval spent nuclear fuel. This EIS does not presume that naval special case waste will be shipped to the same repository or centralized interim storage facility as spent nuclear fuel and the EIS does not lead to such a decision.

Two time frames are used for analyses in this EIS. For complete system operations, 1996-2035, a time period of 40 years is used. For analyses concerning transportation to a repository and handling of naval spent nuclear fuel at INEL, the period 2010 to 2035 (25 years) is used because a repository is not expected to be accepting spent nuclear fuel before 2010. The actual date that a repository begins accepting spent nuclear fuel would have minimal impacts on the results of the EIS and in particular would have similar effects on the results reported for each of the alternatives since it would not change the number of shipments to be made. Therefore, the use of the actual date would not affect the inter-alternative comparisons of this EIS.

There is also the possibility that a centralized storage site may be designated for interim storage of civilian spent nuclear fuel until a repository is available. If such a centralized interim storage site were opened and if naval spent nuclear fuel were allowed by law to be stored there, transportation of naval spent nuclear fuel might begin before 2010. The transportation analyses completed for this EIS result in conclusions which would also be suitable for inter-alternative comparison of the impacts associated with transportation to a centralized interim storage site.

DOE is a cooperating agency in this EIS because DOE, under the Nuclear Waste Policy Act, is responsible for the ultimate disposition of all spent nuclear fuel including civilian and military. DOE is also responsible for the facilities at INEL where naval spent nuclear fuel is currently stored.

During management of naval spent nuclear fuel, which includes removal of excess non-fuel bearing structural portions of fuel assemblies to facilitate examination, a type of special case waste associated only with naval spent nuclear fuel is generated. The containers designed for management of naval spent nuclear fuel could also be used for management of this special case waste because radiation levels on the exterior of the containers holding special case waste from naval spent nuclear fuel would be lower than the levels outside these same containers if they were holding naval spent nuclear fuel. Therefore, the use of these containers for the management of this special case waste is also analyzed in this EIS.

Shipments of special case waste from naval spent nuclear fuel management could also be made to a repository or centralized storage location. However, the Navy has no proposals under evaluation at the current time concerning ultimate disposition and/or designation of a site for such disposition. Although the DOE is currently developing a repository for the disposal of transuranic waste (the Waste Isolation Pilot Plant in southern New Mexico) and is developing an EIS to evaluate a proposal to construct, operate and eventually close a separate geologic repository (Yucca Mountain) for the disposal of spent nuclear fuel and high-level radioactive waste, special case waste is not authorized under current regulations for disposition in those repositories. Nevertheless, in order to assess the complete environmental impacts that result from management of naval spent nuclear fuel, an evaluation of handling, storage, and transportation of special case waste from naval spent nuclear fuel management is included in this EIS. Strictly for purposes of this evaluation, this EIS evaluates transportation to Yucca Mountain as a representative or notional site. This EIS does not presume that special case waste would be shipped to Yucca Mountain, but rather this location is used purely for analytical purposes.

S.2 Container Alternatives

This EIS considers six general alternative systems for the storage, transport, and disposal of naval spent nuclear fuel and management of special case waste. The alternatives are described in detail in Chapter 3 and Appendix D of this EIS and make use either of existing containers or of containers that could be produced by manufacturers of such equipment. For all alternatives, the loaded containers would be shipped from INEL by rail directly to a repository or to interim storage using commercial rail lines. For purposes of analysis in this EIS, the location of a potential centralized interim storage site (if legislation were passed to include interim storage of naval spent nuclear fuel) has been assumed to be the same as the candidate repository.

A *container shipment* (hereafter referred to as "shipment") is defined as a single loaded container (cask or canister in overpack) that is transported to a repository or to a centralized interim storage site. Several casks or canisters may be shipped together in the same train, so the number of trains will likely be smaller than the number of container shipments. For reusable casks, such as the M-140 transportation cask currently used to transport pre-examination naval spent nuclear fuel, each reuse is counted as a container shipment. A total of 300 to 500 shipments of naval spent nuclear fuel would be required during the period extending to 2035, depending on the alternative selected. The addition of special case waste would increase the number of containers required under any alternative by about 15-20%.

Because of differences in configurations and sizes of naval spent nuclear fuel and assemblies, all of the alternatives would require containers to have internal baskets designed for specific spent nuclear fuel types. Some naval spent nuclear fuel can use the same internal basket as is expected to be designed for civilian spent nuclear fuel from commercial pressurized or boiling water reactors; however, other naval fuel would require internal baskets different from those proposed for civilian spent nuclear fuel because of differences in dimensions. Some special baskets would be required no matter which container alternative is chosen.

Each alternative is briefly described in the following sections. The order in which the alternatives are listed is the same as that employed in the EIS which the DOE had been preparing on multi-purpose canisters, but which subsequently was terminated due to programmatic decisions and funding changes. The Navy assumed lead responsibility for the EIS which was announced in the *Federal Register* notice of December 7, 1995 (60 FR 62828).

S.2.1 Multi-Purpose Canister Alternative

Under this alternative, naval spent nuclear fuel would be placed in about 300 canisters designated as 125-ton multi-purpose canisters. Multi-purpose canisters are metal containers for spent nuclear fuel that are permanently sealed by welding. They require overpacks to provide necessary radiation shielding and impact resistance. Different canister overpacks would be required at every stage of the process: for handling on the INEL site, for dry storage, for transportation by rail from INEL to a repository or centralized interim storage site, and for disposal. The canisters are called multi-purpose because the fuel would remain sealed in the same canister for all phases of spent fuel management; once sealed, only the canister would be handled, not individual fuel assemblies. Other alternatives require movement of naval spent nuclear fuel from one container to another container, for example, from a transportation container to a disposal container. Up to 60 additional canisters would be needed for the management of special case waste along with approximately 30 additional storage overpacks, 3 additional transportation overpacks and 60 additional disposal overpacks.

S.2.2 No-Action Alternative (Current Technology)

The No-Action Alternative is based on using current technology at INEL to handle, store, and subsequently transport naval spent nuclear fuel to a geologic repository or centralized interim storage site. This alternative would be based on the M-140 transportation cask. Prior to shipment to a repository or centralized interim storage site, individual assemblies of naval spent nuclear fuel managed at INEL, either at the Naval Reactors Facility or at the Idaho Chemical Processing Plant, would be loaded into M-140 transportation casks. The loaded M-140 transportation casks would be shipped by rail to a repository or centralized interim storage site. At a repository or centralized interim storage site, the individual naval spent nuclear fuel assemblies would be unloaded from the M-140 transportation casks and placed in the surface facilities for loading into disposal containers. Following unloading, the M-140 transportation casks would be returned to INEL for reuse. Because existing M-140 transportation casks are needed to maintain scheduled fleet refuelings and defuelings, approximately 24 additional M-140 transportation casks would have to be manufactured to handle the shipment of about 425 cask loads of naval spent nuclear fuel to a repository between 2010 and 2035, the period of time used for analyses of shipments. Up to 30 additional storage containers would be needed for the management of special case waste along with approximately 4 additional M-140 transportation casks and 60 additional disposal containers. Prior to shipment to a geologic repository or centralized interim storage site, naval spent nuclear fuel and special case waste would be stored at INEL primarily in commercially available single-purpose dry storage containers.

S.2.3 Current Technology/Rail Alternative (Current Technology Supplemented by High-Capacity Rail)

This alternative would use the same storage methods at INEL and the same M-140 transportation casks as the No-Action Alternative. However, redesigned internal structures for the M-140 transportation casks would accommodate a larger amount of naval spent nuclear fuel per cask. Thus, there would be fewer container shipments required. For purpose of analysis, we have assumed that approximately 24 additional M-140 transportation casks would be needed in order to expedite shipments. For this alternative, approximately 325 containers of naval spent nuclear fuel would be shipped by rail to a repository or centralized interim storage site. Up to 26 additional storage containers would be needed for the management of special case waste along with approximately 4 additional M-140 transportation casks and 60 additional disposal containers. Prior to shipment to a geologic repository or centralized interim storage site, naval spent nuclear fuel and special case waste would be stored at INEL primarily in commercially available single-purpose dry storage containers.

S.2.4 Transportable Storage Cask Alternative

An existing, commercially available transportable storage cask would be used for storage at INEL as well as for transportation to a repository or centralized interim storage site. At a repository, individual assemblies of naval spent nuclear fuel would be unloaded from the casks and placed in the surface facilities for loading into disposal containers. The unloaded transportable storage casks would be returned to INEL for further storage and transport. Approximately 325 shipments of the reusable transportable storage cask (150 casks required) are necessary for the shipment of all naval spent nuclear fuel. Up to 21 additional storage casks would be needed for the management of special case waste along with approximately 60 additional disposal containers.

S.2.5 Dual-Purpose Canister Alternative

An existing, commercially available canister and overpack system suitable for both storage and transportation would be used under this alternative for storage at INEL and for shipment to a repository or centralized interim storage site. At a repository, individual assemblies of naval spent nuclear fuel would be unloaded from the canisters and placed in surface facilities for loading into disposal containers.

Under this alternative, approximately 300 canisters would be required for dry storage and shipment of naval spent nuclear fuel by rail to a repository or centralized interim storage site. Up to 45 additional canisters would be needed for the management of special case waste along with approximately 23 additional storage overpacks, 3 additional transportation overpacks and 60 additional disposal containers.

S.2.6 Small Multi-Purpose Canister Alternative

Under this alternative a canister system designated as the 75-ton multi-purpose canister would be used. The small multi-purpose canister was identified as an alternative as a result of public concern expressed in a scoping meeting, for potential damage to railway trackage from the weight of the 125-ton canister system. This alternative would require about 500 small multi-purpose canisters for naval spent nuclear fuel that would be shipped by rail to a repository or centralized interim storage site during the period evaluated. Up to 85 additional canisters would be needed for the management of special case waste along with approximately 39 additional storage overpacks, 5 additional transportation overpacks and 85 additional disposal overpacks. Like the larger 125-ton multi-purpose canister, the 75-ton multi-purpose canister will be suitable for disposal, therefore, eliminating the need to re-handle the individual naval spent nuclear fuel assemblies at a geologic repository.

S.2.7 Alternatives Eliminated from Detailed Analysis

This section briefly describes alternatives that were considered and subsequently eliminated from detailed analysis.

The universal cask, or multi-purpose unit, is a concept for a single cask that would function as the multi-purpose canister system does, but the various overpacks would be integral parts of the universal cask. As with the multi-purpose canister, the individual spent fuel assemblies would not be handled again after sealing. Because the two systems are functionally similar, and because no feasible universal cask design currently exists that would be capable of receiving Nuclear Regulatory Commission certification, the universal cask was not considered further.

License applications for other systems of the types already described might be submitted in the future by vendors. Any potential impacts of using such proposed canisters or casks are expected to be bounded by the alternatives evaluated in this EIS. Therefore, other potential designs were not analyzed further. All of the designs currently certified by the Nuclear Regulatory Commission or in the process of being certified are covered under one or more of the alternatives evaluated in this EIS.

All of the alternatives addressed in this EIS utilize dry storage of naval spent nuclear fuel at INEL. The Nuclear Regulatory Commission concluded that for dry storage, all areas of safety and environmental concern (e.g., maintenance of systems and components, prevention of material degradation, and protection against accidents and sabotage) have been addressed and shown to present no more potential for adverse impact on the environment and public health and safety than storage of spent nuclear fuel in water pools. The Nuclear Regulatory Commission also concluded that dry container storage involves a simpler technology than that represented by water storage systems (NRC 1984). Moreover, water pool storage does not facilitate transportation or storage of naval spent nuclear fuel outside the State of Idaho. Therefore, water pool storage as an alternative for naval spent nuclear fuel management was not further analyzed. However, the impacts of storing naval spent nuclear fuel in water pools until dry storage in containers can be implemented were analyzed and are reported in this EIS. It should be noted that the agreement among the State of Idaho, the United States Navy, and the United States Department of Energy (U.S. District Court, 1995) calls for dry storage of all spent nuclear fuel by 2023.

Analyses in this EIS are based on the use of rail transportation for naval spent nuclear fuel, as is current practice. The use of trucks as the principal means for transporting naval spent nuclear fuel was eliminated from detailed analysis because, unlike truck transport, rail transport permits the shipment of a greater number of large assemblies per container, resulting in fewer shipments. Truck shipments also pose a higher risk of accidents (DOE 1995). Further, some container systems, such as the M-140 transportation cask, cannot be accommodated by truck. Those container systems which can be physically accommodated by trucks would require many more shipments, with resultant increased environmental impacts. The ultimate decision, however, on transportation options (legal-weight truck, some combination of legal-weight truck and rail, or rail/heavy-haul truck) will be made by the DOE on the basis of analyses to be performed in the repository EIS.

S.2.8 Representative Container Designs Used for Analytical Purposes

The alternatives chosen for analysis are representative of families or classes of container types. The evaluations of the Multi-Purpose Canister and the Small Multi-Purpose Canister Alternatives, for example, are based on a DOE multi-purpose canister conceptual design report (TRW 1993). However, other multi-purpose canister systems may be developed by other manufacturers and ultimately chosen for naval spent nuclear fuel. The evaluations of the other categories of containers are based on information from currently existing container designs certified by the Nuclear Regulatory Commission or undergoing Nuclear Regulatory Commission design review. For analytical purposes, the transportable storage cask designed by Nuclear Assurance Corporation International has been used in this EIS as a representative design for the transportable storage cask type. The existing M-140 transportation cask designed by the Naval Nuclear Propulsion Program was used for the No-Action and Current Technology/Rail Alternatives. The NUHOMS-MP187® design (VECTRA Fuel Services) has been used in this EIS as a representative design for dual-purpose canisters. Additional containers appropriate for use under all of the alternatives either are available (e.g., the Holtec HI-STAR dual-purpose canister) or may become available in the future and might be selected for use with naval spent nuclear fuel depending on which alternative is finally selected in the Record of Decision.

S.3 Impacts of Manufacturing Alternative Canister and Cask Systems

S.3.1 Environmental Impacts

The impacts on air quality, health and safety, material availability, waste generation, socio-economics and environmental justice from manufacturing the various containers for any alternative container system are very small. No land-use impacts would be expected because manufacturing would likely occur at existing facilities. Disproportionately high and adverse impacts on minorities or low-income groups are not expected, based on the evaluation in Chapter 4 of the EIS.

Manufacturing canisters, casks, and other components of these container systems would result in the consumption of nonrenewable materials. Although some of the components might eventually be recyclable, other materials would be processed as waste or disposed of in a repository as part of the waste container. Manufacturing would also consume nonrenewable fuels, primarily fossil-based products. The relatively small amounts of these materials needed for the program do not represent a significant commitment of resources.

Many of the impacts associated with manufacturing container systems would be unavoidable. Manufacturing alternative container systems would consume nonrenewable resources (energy and various materials such as steel, hafnium, aluminum, or other metals) and produce some emissions and wastes. These materials would be needed to help ensure adequate isolation of naval spent nuclear fuel from the environment and as shielding to reduce external radiation doses to regulatory levels.

Components would be reused whenever possible throughout the life of the project to minimize impacts. At the end of the entire program, equipment and hardware not disposed of in the repository would be reused, recycled or otherwise disposed. In general, scrap metals would be recycled; concrete would be disposed of as non-radiological solid waste. Some containers would need to be radiologically decontaminated prior to recycling or they would be managed as low-level radioactive waste. Table S.1 summarizes the equipment that would be manufactured for each alternative and highlights equipment for reuse, recycling or disposal at the end of the program.

TABLE S.1 Hardware Requirements for Each Alternative Container System for Naval Spent Nuclear Fuel and Special Case Waste

	Total Life of Project Requirement per Alternative[a,b,c]					
Hardware Component	MPC	NAA	CTR	TSC	DPC	SmMPC
Canisters	[360]	-	-	-	345	[585]
TSCs	-	-	-	171	-	-
Storage overpacks	180	255	176	-	173	264
Storage containers	-	255	176	-	-	-
Transportation overpacks	18	-	-	-	18	30
M-140 transportation casks	-	28	28[d]	-	-	-
Disposal containers	-	[360]	[360]	[360]	[360]	-
Disposal overpacks	[360]	-	-	-	-	[585]

[a] Notation: Storage containers = single-purpose storage canisters or storage casks, MPC = Multi-Purpose Canister; NAA = No-Action; CTR = Current Technology/Rail; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister.

[b] Assumes a repository or centralized interim storage site will be available by 2010.

[c] Items in brackets are disposed of at a repository. All other items would be reused, recycled or disposed of as waste.

[d] High-Capacity M-140 transportation cask

S.3.2 Socioeconomic Impacts

The socioeconomic impacts of implementing each of the alternatives would be very small. The primary socioeconomic impact of the alternatives considered would be increases in output, income, and employment associated with manufacturing, but all impacts would be quite small in relative terms and generally would be considered positive. The number of additional jobs would be so small that there would be no discernible impact on local services, infrastructure, or economics from manufacturing, operations at INEL, a geologic repository, or a centralized interim storage site, or transportation to a geologic repository or centralized interim storage site.

S.4 Impacts of Handling and Storage of Naval Spent Nuclear Fuel at INEL

Evaluation of the full range of environmental impacts and other effects associated with the loading and storage of naval spent nuclear fuel shows that for all alternatives considered, the impacts would be so small and differ so little among alternatives that they would be of little assistance in differentiating among the alternatives. Among the areas considered in the evaluation were the effects on the public health, ecology, cultural resources, aesthetic and scenic values, air and water resources, and geology. Impacts on such areas as noise, traffic and transportation, and utilities normally associated with routine daily activities were also considered. All environmental impacts in these areas would be small. The radiological impacts of each alternative were evaluated over the same time period, 40 years for INEL operations.

S.4.1 Public Health Impacts

A primary concern for most people is the risk to the public from exposure to radiation or radioactive material for each of the alternatives. *Risk* is defined as the product of the consequences of an event multiplied by the probability of that event. The exposure to radiation could be a result of normal operations or of an accident. The most common method used to characterize the public risk resulting from actions involving exposure to radioactive materials is to estimate the number of immediate fatalities and latent cancer fatalities that might result. Health effects other than fatalities have also been evaluated.

The analyses in this EIS show that no immediate fatalities due to radiation exposure would be expected from the radiation exposure associated with accidents or normal operations for any of the alternatives considered. Analyses further indicate that for normal operations there would be less than one latent cancer fatality under any of the alternatives for the entire 40-year period. Other health effects would be similar.

S.4.1.1 Public Health Impacts From Normal Handling and Storage Operations

No immediate fatalities from radiation exposure or latent cancer fatalities would be expected from normal operations including handling, loading, and dry storage. Table S.2 provides a comparison of the alternatives in terms of the calculated increase in the risk of latent cancer fatalities that might occur in the general population from normal operations (40 years) at INEL due to naval spent nuclear fuel. For normal operations, the number of latent cancer fatalities (consequences) and the risk (consequence times probability) of latent cancer fatalities are identical since the probability of occurrence of normal operations is one.

Similarly for all alternatives, the risk from normal operations at INEL is estimated to be one chance in 2,900 or smaller (derived from the largest risk value from Table S.2) that there would be a single latent cancer fatality in the population surrounding the site for the period considered. The risk to an average individual would be even smaller since that value (1 chance in 2,900) would be divided by the number of people in the community. The risks of all other health effects would be similar.

It is important to emphasize that these latent cancer fatalities are calculated estimates rather than actual expected fatalities. A calculation was required because the exposures would be so small that the expected number of such fatalities during normal operations could not be distinguished from the much larger number of such deaths from naturally occurring conditions and other man-made effects not related to naval spent nuclear fuel operations. In all the alternatives, thousands of years of facility operations would be required before a single fatal cancer might be expected to occur.

TABLE S.2 Summary of Total Radiological Risks (latent cancer fatalities to the general population) for Normal Operations at INEL[a,b]

	Number of Latent Cancer Fatalities		
Alternative	NRF[b]	ICPP[b]	Total of Both Sites
Multi-Purpose Canister	2.2×10^{-6}	2.0×10^{-5}	2.2×10^{-5}
No-Action	1.9×10^{-4}	1.5×10^{-4}	3.4×10^{-4}
Current Technology/Rail	1.9×10^{-4}	1.5×10^{-4}	3.4×10^{-4}
Transportable Storage Cask	2.2×10^{-6}	2.0×10^{-5}	2.2×10^{-5}
Dual-Purpose Canister	2.2×10^{-6}	2.0×10^{-5}	2.2×10^{-5}
Small Multi-Purpose Canister	2.2×10^{-6}	2.0×10^{-5}	2.2×10^{-5}

[a] Notation: NRF = Naval Reactors Facility; ICPP = Idaho Chemical Processing Plant.
[b] Values represent the risk of increase in latent cancer fatalities for the entire 40-year period and include special case waste. These values are also found in Table 3.2

S.4.1.2 Public Health Impacts From Accidents at INEL Facilities

Accident analyses were performed for reasonably foreseeable accidents, defined conservatively in this EIS as accidents that might have the probability of occurring more frequently than once in 10 million years. The range of accidents considered includes those resulting from human errors or mechanical failure (e.g., improper handling of spent nuclear fuel or an airplane crash into storage facilities). Natural disasters such as earthquakes and tornadoes have also been analyzed. The goal in selecting hypothetical accidents to be analyzed has been to evaluate events that would produce effects that would be as severe or more severe as those from any accident that might be reasonably postulated. Because of conservative assumptions, the risks presented are believed to be at least 10 to 100 times larger than would actually occur. Table S.3 presents the estimated annual risks of latent cancer fatalities from a maximum foreseeable facility accident. The annual risk is defined as the number of latent cancer fatalities if the accident were to occur times the probability (number of times per year) of occurrence of the accident.

TABLE S.3 Estimated Annual Risk of Latent Cancer Fatalities in the General Population from an INEL Facility Accident with the Most Severe Risk[a b c]

	Latent Cancer Fatalities	
Alternative	NRF [d]	ICPP [d]
Multi-Purpose Canister	1.7×10^{-7}	2.4×10^{-6}
No-Action	1.7×10^{-7}	2.4×10^{-6}
Current Technology/Rail	1.7×10^{-7}	2.4×10^{-6}
Transportable Storage Cask	1.7×10^{-7}	2.4×10^{-6}
Dual-Purpose Canister	1.7×10^{-7}	2.4×10^{-6}
Small Multi-Purpose Canister	1.7×10^{-7}	2.4×10^{-6}

[a] Notation: NRF = Naval Reactors Facility; ICPP = Idaho Chemical Processing Plant.
[b] Values represent a single accident event.
[c] No immediate fatalities due to radiation exposure would be expected under any alternative.
[d] The limiting risk accident is a drained water pool at NRF and ICPP (see Table A.3).

No immediate fatalities due to radiation exposure would be expected to result from facility accidents under any alternative. The highest risk for a maximum foreseeable facility accident was determined to be from a drained water pool at the Idaho Chemical Processing Plant. This accident, if it were to occur, was calculated to result in less than one latent cancer fatality and has a probability of occurring approximately once in 100,000 years. This accident has been calculated to produce a risk of less than one chance in 400,000 of a latent cancer fatality per year. The risks from all other accidents associated with the handling, loading, and dry storage of naval spent nuclear fuel would be even smaller. The risks of other health effects would be similar.

S.4.1.3 Other Accident Impacts on Public Health

In addition to the human health effects which are presented in Tables S.2 and S.3, in the unlikely event of a facility accident involving naval spent nuclear fuel, it is estimated that as much as 600 acres of land might be affected for the most severe case (airplane crash into dry storage at the Idaho Chemical Processing Plant). In the other facility accidents analyzed, smaller areas of land would be affected. The affected area might require decontamination, and during this cleanup, access controls might have to be established. However, because of the limited land area affected, any restrictions would likely only be temporary and the impact on issues such as socioeconomics, treaty rights, tribal resources, ecology, and land use would be small and limited in time. With prudent controls and remediation operations, the affected land and buildings could be recovered. As demonstrated in the accident analyses in Appendix A of this EIS, the human health effects would be small. The effects on wildlife and other biota would also be small, partly because of the relatively small area affected and partly because of the limited effects of the accident.

S.4.2 Health Impacts on Radiation Workers

An assessment of the occupational radiation dose that workers are expected to receive during loading and storage of naval spent nuclear fuel was also performed. It is expected that most radiation workers would receive annual radiation doses near or less than the Naval Reactors Facility historical average of about 100 mrem and that no radiation workers involved in these activities will exceed 500 mrem annually, which is 10% of the allowable annual federal limit. If an individual were to receive a 100 mrem dose during the year, this would result in a likelihood of a latent cancer fatality of 4.0×10^{-5} (0.00004 or about 1 in 25,000).

S.4.3 Environmental Impacts at the INEL Site From Construction for Any Alternative

Dry Storage at Existing INEL Facilities Minimal construction of facilities at INEL would be needed to accommodate the dry storage of naval spent nuclear fuel until a geologic repository or centralized interim storage site outside the State of Idaho is available if existing areas already used for industrial purposes at the Expended Core Facility or the Idaho Chemical Processing Plant were used. Construction activities associated with dry storage of naval spent nuclear fuel would produce very little impact on the environment and would comply with all applicable laws and regulations, using established procedures for preserving air and water quality, for protecting previously unknown archeological or cultural artifacts, and for minimizing such impacts as noise and disturbances or destruction of habitat. No additional impact on land use would occur if paved areas or simple structures needed to protect workers were developed on the already existing industrial sites.

Dry Storage at Locations Not Above the Snake River Aquifer The technical feasibility of building a dry storage facility within INEL at a point not above the Snake River Plain Aquifer is being considered by DOE pursuant to the October 17, 1995 Court Order in Civil Case No. 91-00540-5-EJL (U.S. District Court, 1995) and the agreement with the State of Idaho, the U.S. Navy and the U.S. Department of Energy. Two possible locations have been identified, one located along the west boundary of INEL and the other in the northwest corner of the INEL reservation. A facility located at either of these sites would be closer to the site boundaries and the local population than existing INEL facilities approximately 1 mile from the INEL boundary at its closest point. If such a location were selected, impacts would result from construction of a road and possibly a rail spur to the location as well as construction of facilities at the location and possibly rail access. A review of these areas indicates that the development of a dry storage facility at either of these remote locations might have a greater impact on Native American cultural resources, ecological resources, and land use than providing for dry storage at the Expended Core Facility or the Idaho Chemical Processing Plant. The two possible locations are in areas of higher seismic activity and, while not appearing to be above the Snake River Aquifer may ultimately drain to that aquifer. These potential impacts of choosing either of the two locations are assessed in Appendix F of this EIS.

Modifications of the Facilities For the Container Systems 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 1995, Volume 2, Part B, Appendix C) [referred to as the Programmatic SNF and INEL EIS] covered the potential environmental impacts of construction of dry fuel handling facilities at the Expended Core Facility and at the Idaho Chemical Processing Plant, which were shown to be small. Therefore, the environmental impacts of projects within the existing major facility areas such as the Expended Core Facility and the Idaho Chemical Processing Plant would also be small based on the analysis in the Programmatic SNF and INEL EIS (DOE 1995). For an existing industrial area, at the Expended Core Facility for example, only previously disturbed soil would be affected, no significant animal displacement or mortality would be expected, and there would be small additional non-radiological emissions. No additional radiological exposure would occur as a consequence of facility construction.

It may be necessary to modify and enlarge existing or planned facilities so that they can load the containers described in the current EIS. Since the environmental impacts of the facility construction itself were evaluated in the Programmatic SNF and INEL EIS as small, the impacts for the modifications would be small with minimal differences among the alternatives.

S.5 Impacts of Unloading Naval Spent Nuclear Fuel at Surface Facilities of a Repository or Centralized Interim Storage Site

The evaluation of environmental effects associated with the unloading of naval spent nuclear fuel at a repository or centralized interim storage site shows that, for all alternatives considered, the impacts would be small. The radiological risks associated with both of the multi-purpose canister alternatives are smaller than those for the other alternatives since the naval spent nuclear fuel does not need to be removed from the canisters.

The analyses in this EIS show that no immediate fatalities due to radiation exposure would be expected from the radiation exposure associated with accidents or normal operations for any of the alternatives considered. Analyses further indicate that for normal operations there would be less than one latent cancer fatality under any of the alternatives for the entire program. Other health effects would be similar.

S.5.1 Public Health Impacts From Unloading at a Repository or Centralized Interim Storage Site

No immediate fatalities from radiation exposure (i.e. those where death occurs from other than cancer, and in a short period of time) or latent cancer fatalities would be expected from normal operations of unloading of naval spent nuclear fuel. Table S.4 provides a comparison of the alternatives in terms of the calculated increase in the risk of latent cancer fatalities that might occur in the general population and during unloading at a repository or centralized interim storage site. For normal operations, the number of latent cancer fatalities (consequences) and the risk (consequence times probability) of latent cancer fatalities are identical since the probability of occurrence of normal operations is one.

TABLE S.4 Summary of Total Radiological Risks (latent cancer fatalities in the general population) for Normal Operations at a Repository or Centralized Interim Storage Site[a]

Alternative	Latent Cancer Fatalities
Multi-Purpose Canister	0[b]
No-Action	0.00030
Current Technology/Rail	0.00030
Transportable Storage Cask	0.00030
Dual Purpose Canister	0.00030
Small Multi-Purpose Canister	0[b]

[a] Numerical values for normal operations include special case waste and represent the risk of increase in latent cancer fatalities for the entire 40-year period; numbers are also found in Table 3.2.
[b] Sealed multi-purpose canisters do not contribute any airborne releases; they do not need to be re-opened.

In all the alternatives, thousands of years of facility operations would be required before a single fatal cancer might be expected to occur.

S.5.2 Public Health Impacts From Accidents at a Repository or Centralized Interim Storage Site

Accident analyses were performed for reasonably foreseeable accidents, defined conservatively in this EIS as accidents that might have the probability of occurring more frequently than once in 10 million years. The range of accidents considered includes those resulting from human errors or mechanical failure and natural disasters. At a repository or centralized interim storage site the limiting risk accident would be a wind driven projectile into a cask or canister. Risks associated with that accident are shown in Table S.5 for all alternatives.

TABLE S.5 Estimated Annual Risk of Latent Cancer Fatalities in the General Population from a Repository or Centralized Interim Storage Site Facility Accident with the Most Severe Risk[a b c]

Alternative	Latent Cancer Fatalities
Multi-Purpose Canister	1.5×10^{-8}
No-Action	1.0×10^{-8}
Current Technology/Rail	1.8×10^{-8}
Transportable Storage Cask	1.8×10^{-8}
Dual-Purpose Canister	1.8×10^{-8}
Small Multi-Purpose Canister	1.0×10^{-8}

[a] Values represent a single accident event.
[b] No immediate fatalities due to radiation exposure would be expected under any alternative.
[c] The limiting risk accident is a wind driven projectile into a cask/canister at a repository or centralized interim storage site (see Table A.3).

No immediate fatalities due to radiation exposure would be expected to result from facility accidents under any alternative. All risks of latent cancer fatalities from accidents associated with the unloading of naval spent nuclear fuel at a repository or centralized interim storage site would be expected to be less than one chance in 55 million. The risks of other health effects would be similar.

S.6 Impacts of Transportation of Naval Spent Nuclear Fuel to a Repository or Centralized Interim Storage Site

The range of environmental impacts and other effects associated with the transportation of naval spent nuclear fuel shows that, for all alternatives considered, the impacts would be small. The radiological impacts of each alternative were evaluated over a time period of 25 years for transportation to a geologic repository or centralized interim storage site.

The analyses in this EIS show that no immediate fatalities would be expected from the radiation exposure associated with accidents or normal operations for any of the alternatives considered. Analyses further indicate that for normal operations there would be less than one latent cancer fatality under any of the alternatives for the entire transportation period. Other health effects would be similar.

S.6.1 Public Health Impacts From Incident-Free Transportation

No immediate fatalities from radiation exposure or latent cancer fatalities would be expected from transportation of naval spent nuclear fuel. For all the alternatives, the risk of latent fatal cancer to the general population or other health effect along transportation routes to a repository or centralized interim storage site or within a 50-mi (approximately 80-km) radius of INEL from normal naval spent nuclear fuel transportation would be very small. Table S.6 provides a comparison of the alternatives in terms of the calculated increase in the risk of latent cancer fatalities and non-radiological fatalities from pollution that might occur in the general population for the total program from incident-free transportation (25 years) for naval spent nuclear fuel shipments to a repository or centralized interim storage site.

For all alternatives, the radiological risk from incident-free transportation is estimated to be about one chance in 100 that there would be a single latent cancer fatality in the entire population along the transportation routes for the entire period evaluated. The risks of all other radiological health effects would be similar.

For all alternatives, the risk of non-radiological fatalities which would be expected to result from pollutants, such as diesel air emissions, would be less than one chance in 1,100.

The risks of latent cancer fatalities for transportation of naval spent nuclear fuel shown in Table S.6 for the No-Action and the Current Technology/Rail Alternatives are about ten times smaller than those for the other alternatives because the M-140 transportation cask is already being used to ship pre-examination naval spent nuclear fuel so measured radiation levels were available to be used in the calculations. The containers for the other alternatives have never been used with naval spent nuclear fuel so the maximum radiation level allowed by the applicable regulations were used and that level is about ten times greater than the values measured for the M-140. The risks for all of the alternatives are so small that this difference has no effect on the comparison of impacts among the alternatives.

TABLE S.6 Summary of Total Risks (latent cancer fatalities and non-radiological fatalities to the general population) for Incident-Free Transportation

Alternative	Latent Cancer Fatalities[a]	Estimated Nonradiological Fatalities
Multi-Purpose Canister	7.5×10^{-3}	5.2×10^{-4}
No-Action	1.0×10^{-3} [b]	6.9×10^{-4}
Current Technology/Rail	8.0×10^{-4} [b]	5.5×10^{-4}
Transportable Storage Cask	7.2×10^{-3}	5.3×10^{-4}
Dual-Purpose Canister	7.4×10^{-3}	5.0×10^{-4}
Small Multi-Purpose Canister	1.2×10^{-2}	8.4×10^{-4}

[a] Numerical values for transportation include special case waste and represent the risk of increase in latent cancer fatalities for the entire 25-year period; numbers are also found in Tables 3.2 and 7.4.
[b] Actual historic measured dose rates have been used for the M-140 casks whereas container design dose rates were used for the other alternatives.

It is important to emphasize that these latent cancer fatalities are calculated estimates rather than actual expected fatalities. A calculation was required because the exposures would be so small that the expected number of such fatalities during normal operations could not be distinguished from the much larger number of such deaths from naturally occurring conditions and other man-made effects not related to naval spent nuclear fuel operations. In all the alternatives, thousands of years of transportation of naval spent nuclear fuel would be required before a single fatal cancer might be expected to occur.

S.6.2 Public Health Impacts From Transportation Accidents

The risks of transportation accidents were calculated in terms of the estimated risk of latent cancer fatalities to the general population from the total number of container shipments (Table S.7). No immediate fatalities due to radiation exposure would be expected to result from a transportation accident under any alternative. The risk of increases in latent fatal cancers from transportation accidents associated with the naval spent nuclear fuel container shipments to a repository or centralized interim storage site would be very low. For 25 years of container shipments under any of the alternatives, there would be less than one chance in 250,000 that there would be an additional latent fatal cancer in the general population from a transportation accident. Risks for other health effects would be just as low.

The non-radiological risks of a transportation accident resulting in a fatality for the entire 25 years of shipments would be expected to be less than one fatality.

TABLE S.7 Accident Risk from the Total Number of Container Shipments [a,b]

Alternative	Shipments of SNF Containers	Shipments of SCW Containers	Latent Cancer Fatalities	Non-Rad Fatalities
Multi-Purpose Canister	300	60	3.2×10^{-6}	0.055
No-Action	425	55	2.5×10^{-6}	0.073
Current Technology/Rail	325	55	2.4×10^{-6}	0.058
Transportable Storage Cask	325	45	3.9×10^{-6}	0.056
Dual-Purpose Canister	300	45	3.3×10^{-6}	0.052
Small Multi-Purpose Canister	500	85	3.0×10^{-6}	0.089

[a] Notation: SNF = Naval Spent Nuclear Fuel; SCW = special case waste; Non-Rad = non-radiation.
[b] Values are from Table 7.5. The accident risks are for the total 25-year program.

S.6.3 Health Impacts on Radiation Workers

In addition to looking at the health impacts on the general public, the risk to workers who receive occupational radiation exposure was also estimated (Table S.8).

TABLE S.8 Summary of Total Radiological Risks (latent cancer fatalities to the occupational population) for Incident-Free Transportation[a]

Alternative	Latent Cancer Fatalities
Multi-Purpose Canister	4.4×10^{-3}
No-Action	7.2×10^{-4}
Current Technology/Rail	5.7×10^{-4}
Transportable Storage Cask	4.3×10^{-3}
Dual-Purpose Canister	4.2×10^{-3}
Small Multi-Purpose Canister	7.1×10^{-3}

[a] Values are based on Table B.10.

For all alternatives thousands of years of transportation of naval spent nuclear fuel would be required before a single cancer might be expected to occur among workers.

S.7 Summary of Environmental Justice Assessments

Environmental justice assessments have been performed for manufacturing operations, handling and storage at INEL facilities, and for transportation of naval spent nuclear fuel. The environmental consequences and impacts on health and safety for the actions described in this EIS would be small for all population groups and therefore, it would be expected that there would be no disproportionately high or adverse impacts to any minority or low-income population.

S.8 Cumulative Impacts, Pollution Prevention and Other Considerations

S.8.1 Cumulative Impacts

A cumulative impact results when the incremental impact associated with implementation of an alternative is added to the impacts of other past, present, or reasonably foreseeable future actions. The implementation of any of the alternatives considered in this EIS would not significantly contribute to cumulative impacts. Although impacts to human health and the environment have been analyzed, the individual and cumulative impacts would be very small for all alternatives, especially when considered on a national, state, or regional basis. In fact, the detailed analyses in this EIS show that the impacts would not make a substantial contribution to cumulative effects at a single site. Cumulative effects do not provide a basis for distinguishing among the alternatives considered in this EIS.

Manufacturing. The cumulative environmental impacts resulting from the manufacturing of container systems would be very small. The containers needed for naval spent nuclear fuel represent about 1 to 4 percent of the total number of containers needed for both naval and civilian spent nuclear fuel which would be shipped to a repository or centralized interim storage site. The total material use over the 40-year period for naval spent nuclear fuel and special case waste is less than 0.3 percent of the annual material use in the United States except for depleted uranium and lead. Use of depleted uranium and lead are also small percentages of the available materials in the United States.

Facilities. For facility operations at INEL involving handling and storage of naval spent nuclear fuel, the cumulative environmental impacts are small when compared to the impacts of operation of the entire INEL. The loading and storage operations for naval spent nuclear fuel would not result in discharges of radioactive liquids. None of the alternatives considered would cause the total air emissions to exceed any applicable air quality requirement or regulation in any radiological or non-radiological category. No additional land would have to be withdrawn from public use as a result of the handling and storage of naval spent nuclear fuel because the INEL is a federal reservation. There would be only minor cumulative impacts associated with the INEL facilities.

At a repository or a centralized interim storage site, the naval spent nuclear fuel and special case waste would be about 1 to 4 percent of the total number of containers of civilian spent nuclear fuel received at a facility over 25 years. Therefore, it is expected that the impacts of unloading naval spent nuclear fuel at a facility would have little effect on the environment and population surrounding the site.

Transportation. The total impact of the transportation of naval spent nuclear fuel and special case waste would be approximately 1 to 4 percent of the total impact of all spent nuclear fuel shipments to a geologic repository or a centralized interim storage site. The transportation risks, both radiological and non-radiological, are extremely small when compared to the cumulative impacts of the shipment of all nuclear materials in the United States (DOE 1995).

S.8.2 Pollution Prevention

Implementation of any of the alternatives for the management of naval spent nuclear fuel would generate some waste with the potential for releases to air and water. To control both the volume and toxicity of waste generated and to reduce impacts on the environment, pollution prevention practices would be implemented. Program components include waste minimization, source reduction and recycling, and procurement practices that preferentially procure products made from recycled materials.

Implementation of the pollution prevention plans would continue to minimize the amount of waste generated during the manufacturing, handling, storage and transportation of naval spent nuclear fuel.

S.8.3 Other Considerations

In all cases for all alternatives, appropriate mitigative measures would be employed to further reduce the already small unavoidable adverse environmental effects, so this does not assist in discriminating among alternatives. The only discernible irreversible and irretrievable commitments of resources are the relatively small amounts of energy and metals used to construct the containers and these commitments are small on a national scale and would represent only about 1 to 4% of the commitments required for management of spent nuclear fuel from commercial reactors.

In summary, the impacts associated with all of the alternatives considered are small and selection of an appropriate alternative would allow the safe storage and shipment of naval spent nuclear fuel for ultimate disposition, leading to the conclusion that the short-term use of the environment would not compromise the long-term productivity of the environment.

1.0 PURPOSE AND NEED FOR ACTION

Proposed Action The proposed action of this Final Environmental Impact Statement (EIS) is to select a container system for the management of naval spent nuclear fuel after it has been examined at the Idaho National Engineering Laboratory (INEL). In addition, this EIS includes several actions which are related to the container system choice:

- Manufacturing the container system,
- Handling and transportation associated with the container system,
- Modifications at the Expended Core Facility and the Idaho Chemical Processing Plant to support loading naval spent nuclear fuel into containers for dry storage,
- The location of the dry storage at the INEL, and
- The storage, handling and transportation of special case waste associated with naval spent nuclear fuel.

Both the Department of Energy (DOE) and the U.S. Department of the Navy (Navy) are committed to removing all naval spent nuclear fuel from Idaho by 2035, pursuant to a court ordered agreement among the State of Idaho, the U.S. Department of the Navy, and the U.S. Department of Energy, discussed further below. To manage the naval spent nuclear fuel at INEL, the Navy needs to ensure its spent nuclear fuel is transported from INEL to a geologic repository or centralized interim storage site outside the State of Idaho when either would become available. The Yucca Mountain site is the only site currently authorized by legislation, specifically the Nuclear Waste Policy Act, for site characterization as a geologic repository for spent nuclear fuel, including naval spent nuclear fuel. Its suitability as a repository has not yet been determined nor has it yet been authorized by law as a location for a centralized interim storage site.

Additionally, it will be necessary to have the naval spent nuclear fuel accepted at a repository or centralized interim storage site. The naval spent nuclear fuel must be loaded into containers that meet specific government regulations for storage, transport, and possible disposal. The naval spent nuclear fuel also needs to be safely stored until it can be shipped to either a repository or a centralized interim storage site.

The Navy needs to choose among the several general types of containers that could be used for storage, shipment, and possible disposal of naval spent nuclear fuel following examination at INEL. The purpose of this EIS is to assess the environmental impacts associated with the various types of container systems to support that choice.

It should be noted that the designs of the container systems presented in this EIS are intended solely for use of naval spent nuclear fuel. The dimensions and weight of naval spent nuclear fuel assemblies would allow them to fit into the same container system as those designed and licensed by the Nuclear Regulatory Commission for civilian spent nuclear fuel; however, the structural integrity characteristics of naval and civilian spent nuclear fuel are not the same. Therefore, the ultimate container design utilized for naval spent nuclear fuel may not be appropriate for use for civilian nuclear fuel.

Basis for Need More than 40% of the Navy's principal combatants are nuclear powered. Since 1955, U.S. nuclear powered warships have steamed safely more than one hundred million miles and accumulated over 4,600 reactor years of safe operation. Continued operation of the Navy's nuclear powered warships remains a vital element of the Navy's ability to fulfill its national security mission in support of our nation's defense.

The Navy creates spent nuclear fuel through the operation of its nuclear powered warships and training reactors. When a warship is refueled and overhauled for continued service or is defueled because it is being inactivated, its spent nuclear fuel is removed at the shipyard. Similarly, pre-examination naval spent nuclear fuel is removed from afloat and land-based training reactors when they are refueled or deactivated. In all cases, the pre-examination naval spent nuclear fuel is transported to the DOE's INEL in southeastern Idaho. At INEL, all naval spent nuclear fuel is examined at the Expended Core Facility located at the Naval Reactors Facility. This examination is essential to ensure that maximum performance and use is obtained from current naval nuclear fuel and to support the design of naval fuel with longer lifetimes. After examination, the naval spent nuclear fuel is transferred to the Idaho Chemical Processing Plant for storage in water pools pending final disposition. There are approximately 12 metric tons of heavy metal of naval spent nuclear fuel at INEL and a total of approximately 65 metric tons of naval spent nuclear fuel will exist by the year 2035.

The Navy needs to ensure that naval spent nuclear fuel, after examination, is managed in a fashion which:

- facilitates ultimate safe shipment to a permanent geologic repository or centralized interim storage site outside the State of Idaho;

- is protective of the Idaho environment while being temporarily stored at INEL; and

- complies with a court ordered agreement among the State of Idaho, DOE, and the Navy discussed below.

Idaho Agreement The settlement of the U.S. District Court action in Civil Case No. 91-00540-5-EJL (U.S. District Court, 1995) by agreement among the State of Idaho, the U.S. Navy, and the U.S. Department of Energy included funding of a dry storage container loading station and an obligation of DOE to commence moving spent nuclear fuel currently in water pool storage into dry storage by July 1, 2003. The dry storage location was to be selected after consultation with the State of Idaho and was to be at a point removed from above the Snake River Aquifer to the extent technically feasible. This EIS includes proposed actions by the Navy that would commence placing naval spent nuclear fuel into dry storage on a schedule consistent with that required of the DOE in the Idaho Agreement.

Current DOE and Navy Actions Recognizing the need to safely dispose of the materials associated with use of atomic energy for national security, DOE is allocating space available in a geologic repository for naval spent nuclear fuel. Until a geologic repository or centralized interim storage site outside the State of Idaho (discussed in Section 2.8.2) is available, the Navy (specifically, the Naval Nuclear Propulsion Program) is committed to a number of actions to ensure uninterrupted operation of the Navy's nuclear powered fleet, including transfer of all naval spent nuclear fuel at INEL out of wet storage facilities into dry storage, completion of a Dry Cell expansion project at the Expended Core Facility, and construction of an Expended Core Facility dry storage container loading station. As discussed in detail in the following sections, the high integrity and rugged nature of naval spent nuclear fuel makes it exceptionally well-suited for safe transport, storage, and ultimate disposal after service.

Proper management and transportation of pre-examination naval spent nuclear fuel were evaluated in detail in 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 1995) [referred to as the Programmatic SNF and INEL EIS].

The Planned Actions This EIS focuses on the loading, storage, and transportation of naval spent nuclear fuel and special case waste. To facilitate the Navy's decision on how to carry out the above actions, this EIS analyzes the impacts of six container system alternatives including the associated Expended Core Facility dry cell modifications, dry storage container loading station operation, potential dry storage locations at the INEL site, and transportation of naval spent nuclear fuel to a geologic repository or a centralized interim storage site.

Public Involvement. On October 24, 1994, the DOE published a Notice of Intent in the *Federal Register* (59 FR 53442) for a multi-purpose canister system for the management of civilian spent nuclear fuel. As part of the public scoping process, the scope of the EIS for the multi-purpose canister system was broadened to include naval spent nuclear fuel. This determination was included in the Implementation Plan whose availability was announced in the *Federal Register* on August 30, 1995 (60 FR 45147). However DOE has halted its proposal to fabricate and deploy a multi-purpose canister based system and has ceased preparation of that EIS.

On December 7, 1995 the Department of the Navy published a notice in the *Federal Register* (60 FR 62828) assuming the lead responsibility for an Environmental Impact Statement evaluating container systems for the management of naval spent nuclear fuel. The Department of the Navy assumed the lead responsibility from the Department of Energy and narrowed the focus of the EIS to include only naval spent nuclear fuel. The Department of Energy is now the cooperating agency rather than the lead agency in the preparation for this EIS.

Despite the narrowing of the focus to only naval nuclear spent fuel and the change in lead agency, the range of container alternatives being considered did not change. Thus the EIS did not require another scoping process.

In the Navy notice, interested individuals were invited to request a copy of the Draft EIS. The Navy also indicated that public hearings would be held after the Draft EIS was published and that there would be a 45-day comment period. The comment period was subsequently extended to 60 days. Issuance of the Draft EIS was announced in the *Federal Register* on May 14, 1996 along with the locations and dates of the public hearings. In addition to distributing the Draft EIS to those requesting it, the Navy has also widely distributed the Draft EIS to public officials, tribal officials, and state agencies in the areas affected by the Draft EIS.

As indicated in the notice, the Draft EIS did not contain a preferred alternative. This Final EIS identifies the preferred alternative as a dual-purpose canister system. It also identifies the preferred alternative for a dry storage location for naval spent nuclear fuel as either a site adjacent to the Expended Core Facility at the Naval Reactors Facility or a site at the Idaho Chemical Processing Plant at INEL.

SECTION 2.0
BACKGROUND AND ORGANIZATION OF EIS

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FIGURES

2.0 BACKGROUND AND ORGANIZATION OF EIS

This container system EIS for the management of naval spent nuclear fuel evaluates a range of alternatives that would provide a system of containers for storage, transport, and possible disposal of post-examination naval spent nuclear fuel. It identifies the Navy's preferred alternative for a container system for the management of naval spent fuel as a dual-purpose canister system. It also identifies the Navy's preferred alternative for a dry storage location for naval spent nuclear fuel as either a site adjacent to the Expended Core Facility at the Naval Reactors Facility or a site at the Idaho Chemical Processing Plant at INEL.

Since 1957, pre-examination naval spent nuclear fuel has been shipped by rail to a single site, the Naval Reactors Facility at INEL. There it is removed from the shielded shipping containers and put into the water pools at the Expended Core Facility for examination. All naval spent nuclear fuel at the Expended Core Facility is visually examined for unusual conditions and about 10 to 20% of the fuel is given more detailed examinations. The examination program is essential in supporting the Navy's continued safe operation of naval reactors and in designing new, improved reactor cores having a longer lifetime. After examination, the naval spent nuclear fuel is loaded into shielded containers and transferred to the water pools of DOE's Idaho Chemical Processing Plant at the INEL for storage pending final disposition. This EIS contains analyses and information consistent with that in the Programmatic SNF and INEL EIS (DOE 1995), which is a major reference supporting this document. The Programmatic SNF and INEL EIS, which covered in Volume 1 the DOE complex-wide aspects of management of spent nuclear fuel and in Volume 2 the environmental management and remediation at INEL, is closely related to this container system EIS because all naval spent nuclear fuel, after removal from the reactor, is shipped to INEL, where it is examined and then managed at the Expended Core Facility or the Idaho Chemical Processing Plant.

The Programmatic SNF and INEL EIS (DOE 1995) focused on establishing an integrated complex-wide program for the safe and effective management for present and reasonably foreseeable quantities of spent nuclear fuel pending its ultimate disposition. The Programmatic SNF and INEL EIS evaluated the impacts of various alternative locations where naval spent nuclear fuel should be managed and considered both wet storage in water pools and dry storage in containers in evaluating the impacts at each location. The Record of Decision selected INEL as the location for managing naval spent nuclear fuel rather than at Navy shipyards, the Savannah River Site, the Hanford Reservation, the Nevada Test Site, or the Oak Ridge Site.

This EIS follows the Programmatic SNF and INEL EIS to select the container system for managing naval spent nuclear fuel at INEL, provides a comparison of alternate locations on the INEL site for dry storage, and evaluates the impacts of transportation of naval spent nuclear fuel from INEL to a representative repository or centralized interim storage site.

Information from the Programmatic SNF and INEL EIS is repeated in this EIS where necessary to facilitate reader comprehension. Frequently, throughout this EIS the reader will be referred to specific sections of the Programmatic SNF and INEL EIS where the more elaborate descriptions, background, or analysis for the subject are presented.

2.1 Naval Nuclear Propulsion Program Overview

The Naval Nuclear Propulsion Program is a joint U.S. Navy/DOE organization responsible for all matters pertaining to naval nuclear propulsion, pursuant to Presidential Executive Order 12344, enacted as permanent law by Public Law 98-525 (42 USC 7158). The Program is responsible for:

- The nuclear propulsion plants aboard approximately 100 warships powered by over 120 naval reactors;
- Moored Training Ships located in Charleston, South Carolina, used for naval nuclear propulsion plant operator training;
- Nuclear propulsion work performed at six shipyards (four public and two private);
- Two DOE government-owned, contractor-operated laboratories devoted solely to naval nuclear propulsion research, development, and design work;
- Two land-based prototype naval reactors used for research and development work and training of naval nuclear propulsion plant operators; and
- The Expended Core Facility, located at the Naval Reactors Facility, which is located at the INEL.

More detailed discussion is available in U.S. Department of Energy and U.S. Department of Defense (1995), Hewlett and Duncan (1974) and Duncan (1990).

2.2 History and Mission of the Program

In 1946, at the conclusion of World War II, Congress passed the Atomic Energy Act, which established the U.S. Atomic Energy Commission (AEC) to succeed the wartime Manhattan Project, and gave it the sole responsibility for developing atomic energy. At that time, Captain Hyman G. Rickover was assigned to the Navy Bureau of Ships, the organization responsible for naval ship design. Captain Rickover recognized the military implications of successfully harnessing atomic power for submarine propulsion and that it would be necessary for the Navy to work with the AEC to develop such a program. By 1949, Captain Rickover had forged an arrangement between the AEC and the Navy that led to the formation of the Naval Nuclear Propulsion Program. In 1954, the nuclear submarine USS NAUTILUS put to sea and established the basis for all subsequent U.S. nuclear-powered warship propulsion designs. In the 1970s, government restructuring moved the AEC part of the Naval Nuclear Propulsion Program from the AEC (which was disestablished) to what became the DOE. Although the Naval Nuclear Propulsion Program grew in size and scope over the years, it retained its dual responsibilities within the DOE and the Department of the Navy, and its basic organization, responsibilities, and technical discipline have remained much as when it was first established.

The advantages of nuclear propulsion for naval vessels are several. By eliminating altogether the need for oxygen for propulsion, nuclear power offers a way to drive a submerged submarine without the need to resurface frequently. In addition, nuclear power offers a way to drive a submerged submarine at high speed without concern for fuel consumption.

Although originally developed for submarines, nuclear propulsion also significantly enhances the military capability of surface ships. Nuclear propulsion provides virtually unlimited high-speed endurance without dependence on tankers and their escorts. Moreover, the space normally required for propulsion fuel in oil-fired ships can be used for weapons and aircraft fuel in nuclear-powered aircraft carriers.

2.3 Characteristics of Naval Nuclear Fuel

Naval nuclear fuel is designed to meet the stringent operational requirements for naval nuclear propulsion reactors. Because it was designed for military application, all naval nuclear fuel designs will maintain their integrity indefinitely under the less demanding conditions encountered during land-based storage.

- Naval fuel is designed to operate in a high-temperature and high-pressure environment for many years. Current designs are capable of more than 20 years of successful operation without refueling.

- Naval spent nuclear fuel examined after 28 years of storage in a water pool exhibited no detectable deterioration. Measurements of the corrosion rates for naval fuel designs have shown that post-examination naval spent nuclear fuel can be safely stored wet or dry for periods much longer than the 40 years considered in this EIS. This is true for current designs which operate over 20 years in a reactor, as well as for earlier designs which operated for fewer years, because in all designs, highly corrosion resistant materials are used for the cladding. In this regard, it should be noted that naval spent nuclear fuel examined after 28 years of storage with no detectable deterioration, as cited above, was of an earlier design which operated for seven years and three months before being removed.

- Naval nuclear fuel is designed, built, and tested to ensure that the fuel structure will contain and hold the radioactive fission products. Naval fuel totally contains fission products within the fuel; there is no fission product release from the fuel in normal operation or when the fuel is removed, transported, or stored. Since the nuclear reactor core contains a large quantity of fission products, it is essential to contain them within the nuclear fuel in order to minimize radiation exposure to a ship's crew.

- Naval nuclear fuel is extremely rugged. It can withstand combat shock loads which are well in excess of 50 times the force of gravity (i.e., 10 times the seismic loads for which civilian nuclear power plant fuel is designed). It routinely operates with rapid changes in power level since naval ships must be able to change speed quickly in operational situations. Naval fuel consists of solid components which are nonexplosive, nonflammable, and noncorrosive. The ruggedness of naval fuel is demonstrated by the fact that two nuclear-powered ships were lost at sea in the 1960s, and subsequent environmental monitoring shows no release of fission products from the fuel despite the catastrophic nature of the loss of the ships (Naval Nuclear Propulsion Program 1994a).

The integrity of naval spent nuclear fuel is due in part to a long-standing program of examining naval spent nuclear fuel after it has been removed from prototype reactor plants and operating ships. These examinations have been conducted at the Expended Core Facility at INEL since 1958. Prior to 1992, naval spent nuclear fuel was reprocessed to permit reuse of the fissile uranium remaining. Since that time, it has been transferred to storage in water pools at the Idaho Chemical Processing Plant until a method for ultimate disposition is selected.

Naval nuclear fuel is highly enriched (93% to 97%) in the isotope U-235 as compared with civilian reactor fuel (about 4%). However, to ensure the design will be capable of withstanding battle shock loads, the naval fuel material is surrounded by large amounts of structural material made of an alloy of zirconium called Zircaloy. Naval spent nuclear fuel assemblies will fit dimensionally into the same container systems designed for civilian spent nuclear fuel. Because of the large amount of Zircaloy structure and the limit on total loaded weight of the container, the amount of fissionable material in a loaded container is similar for naval and civilian fuel in spite of the different enrichments (in each case, about 440 to 660 lb, or 200 to 300 kg, of U-235).

Criticality is also not a problem despite the high enrichment of naval nuclear fuel. Naval fuel contains high integrity burnable poisons which compensate for the depletion of U-235 as a core is depleted. Control rods made of hafnium will be firmly secured in most of the naval fuel assemblies loaded into the containers to ensure subcriticality. Detailed analyses have been made and demonstrate that naval fuel will remain subcritical under accident conditions.

Likewise, decay heat calculations have been made which demonstrate that no fission product releases will occur from naval spent nuclear fuel inside a container even assuming about 3 years of cooling after reactor operation. Releases under such conditions are not a problem because naval reactor volumetric power densities are typically less than those of commercial reactors and the fission product concentrations by volume of spent nuclear fuel are commensurately lower. These matters will be addressed as part of the process of obtaining a certificate of compliance to transport naval spent nuclear fuel.

Appendix E of this EIS also addresses low-level waste generated as a result of removing non-fuel bearing structures from naval fuel assemblies. Some of these structures are classified as special case low-level radioactive waste. This waste is addressed in this EIS because the same container system may be used for special case waste as is used for naval spent nuclear fuel and to ensure that selection of the container system allows for the use of the same container system for special case waste.

2.4 Regulatory Framework

Under the Atomic Energy Act of 1954, as Amended (42 USC §2011 et seq) ownership of United States nuclear fuel was assigned to the Atomic Energy Commission, now the U.S. Department of Energy. When naval fuel is used on board U.S. Navy warships, custody of the naval nuclear fuel rests with the Navy while ownership remains with DOE. When naval spent nuclear fuel leaves the shipyard after being removed from the warship, custody is transferred to DOE, in the person of the Naval Nuclear Propulsion Program, and the naval spent nuclear fuel is shipped to the Expended Core Facility in Idaho for examination. When naval spent nuclear fuel is shipped from the Expended Core Facility to the Idaho Chemical Processing Plant, custody is transferred from the Naval Nuclear Propulsion Program to the DOE Office of Environmental Management.

The Naval Nuclear Propulsion Program includes activities conducted by both the Navy and DOE. Executive Order 12344, enacted as permanent law by Public Law 98-525, and the Atomic Energy Act of 1954 establish the responsibility and authority of the Director of the Naval Nuclear Propulsion Program (who is also the Deputy Assistant Secretary for Naval Reactors within DOE) for all facilities and activities of the Program. These executive and legislative actions establish that the Director is responsible for all matters pertaining to naval nuclear propulsion, including direction and oversight of environmental, safety, and health matters for all program facilities and activities. This authority includes the certification of shipping containers which meet the design and testing requirements of 10 CFR Part 71. Thus certification by the Nuclear Regulatory Commission of shipping and storage containers for naval spent nuclear fuel is not required. However, consistent with long-standing program practice for pre-examination naval spent nuclear fuel any container system selected for post-examination naval spent nuclear fuel transportation will receive Nuclear Regulatory Commission review and certification for transport.

In this EIS, the term “naval spent nuclear fuel” refers to the category of spent nuclear fuel that has been removed from naval reactors (nuclear reactors used aboard naval warships, naval research or training vessels, or at land-based naval prototype facilities operated by the Naval Nuclear Propulsion Program). In this EIS, the term “DOE spent nuclear fuel” refers to any spent nuclear fuel which DOE has responsibility for managing with the exception of naval spent nuclear fuel.

Federal statutes, regulations and other requirements that would apply to the fabrication and deployment of the alternative container systems considered in this EIS are described in Chapter 8 of this EIS and additional details are provided in the Programmatic SNF and INEL EIS (DOE 1995 Volume 1, Chapter 7). In Chapter 8 of the current EIS, the federal statutes and regulations, Executive Orders, hazardous and radiological materials transportation regulations including the U.S. Nuclear Regulatory Commission regulations, and the application of the Resource Conservation and Recovery Act to naval spent nuclear fuel management are discussed. The discussion of the Resource Conservation and Recovery Act is covered in Section 8.1.5 under the Federal Facility Compliance Act and in Section 8.1.13 under the Solid Waste Disposal Act. DOE implements its responsibilities for the protection of public health, safety, and the environment through a series of Departmental Orders that are mandatory for operating contractors of DOE-owned facilities, including INEL. These DOE Orders are listed in Table 8.1 of Chapter 8 of the current EIS.

State regulations may apply to manufacturing container systems or to the handling, storage, or transportation of naval spent nuclear fuel. These are not discussed since the location of manufacturing and the location of a repository are not known. Requirements that would be applicable exclusively to the operation of a repository or to a centralized interim storage site are not discussed because these operations are beyond the scope of this EIS. Such requirements and pertinent environmental impacts would be covered in separate environmental documents prepared for each facility.

The National Environmental Policy Act (NEPA) requires that federal, state, and local agencies with jurisdiction or special expertise with respect to any environmental impact be consulted (42 USC § 4332 (2)(c)(v)). The NEPA implementing regulations require the Navy to obtain comments on the Draft EIS from these agencies and from Indian Tribes when effects may be on their reservations (40 CFR 1503.1(a)(1) and (2)). NEPA implementing procedures require consultation with other agencies, when appropriate, to incorporate any relevant requirements as early as possible in the NEPA process. To obtain comments, copies of this Draft EIS have been or are being provided to federal, state, and local agencies with jurisdiction by law or special expertise, and to affected Indian tribes. All comments received by the Navy have been considered in the Final EIS for the alternative container systems.

2.5 Summary of Naval Spent Nuclear Fuel Operations

Since 1957, over 660 container shipments of pre-examination naval spent nuclear fuel have been made to the Naval Reactors Facility at INEL. All of the shipments were made safely by rail and without release of radioactivity. At INEL, the naval spent nuclear fuel is removed from the shielded shipping containers and placed into the water pools at the Expended Core Facility. All naval spent nuclear fuel received at the Expended Core Facility is visually examined externally for evidence of any unusual condition such as unexpected corrosion, unexpected wear, or structural defects. After the fuel assembly structural components have been removed, the interior of the assembly is examined for the conditions discussed above. In addition, the assembly is examined for distortions from irradiation, heat, or the fission process which could interfere with the even distribution of primary coolant and consequent heat removal. The inspection also checks for possible flow obstructions due to foreign material or excessive corrosion product buildup.

About 10 to 20% of the naval spent nuclear fuel is given more detailed examinations for such purposes as confirming the adequacy of new design features, exploring materials performance concerns, and obtaining detailed information to confirm or adjust computer predictions of neutron physics, heat transfer, or hydraulic flow and distortion. These detailed non-destructive examinations (which do not breach the fuel cladding and thus do not affect fuel integrity) include eddy current techniques to determine corrosion film and cladding thicknesses, dimensional measurements to determine fuel assembly distortion, gamma scan technology to determine core fuel depletions, and other inspections. These examinations consist of detailed visual inspection, measurements of dimensions or distortion, evaluation of corrosion product build-up, or other non-destructive evaluations which do not penetrate the fuel cladding or otherwise reduce the integrity of the fuel. After examination, naval spent nuclear fuel is loaded into shielded containers and transferred to the DOE's Idaho Chemical Processing Plant at the INEL for storage.

These detailed examinations also include a very small number of fuel elements which are destructively examined by cutting through the cladding to allow evaluation of the interior of the fuel element. They represent less than one-tenth of one percent of the total amount of naval spent nuclear fuel to be managed at INEL. Currently, naval spent nuclear fuel in this form (a total of less than 0.05 metric ton) is managed in metal canisters that are located in the Expended Core Facility and Idaho Chemical Processing Plant water pools. Prior to placing this fuel in a dry storage container, it would be repackaged in canisters made of highly corrosion resistant metal that ensures the canister’s ability to withstand harsh environments indefinitely. The total volume of fuel in this form can be fit within a single storage container analyzed in any of the alternatives considered in this EIS.

Some naval spent fuel assemblies currently at the Idaho Chemical Processing Plant or the Expended Core Facility were separated into smaller units to remove fuel elements for detailed examination or to facilitate reprocessing before the DOE ceased reprocessing in 1992. The separation did not entail cutting through the fuel element cladding but rather through other portions which joined the parts of the fuel assemblies together. The total amount of naval spent nuclear fuel in this form is less than 0.76 metric ton. Since such fuel retains its structural integrity and corrosion resistance because the cladding is intact, it can be managed in the same fashion as naval spent fuel that has not been separated by using appropriately configured container baskets.

At the Idaho Chemical Processing Plant, naval spent nuclear fuel is stored in water pools to shield workers from radiation. Naval nuclear fuel is designed to operate for decades in high-temperature, high-purity, and controlled pH water without substantial corrosion. The corrosion rate of naval nuclear fuel decreases rapidly as the water temperature decreases. Existing knowledge of the corrosion of the materials used in the cladding of naval spent nuclear fuel is extensive and shows that the cladding corrosion rate is more sensitive to changes in temperature than to changes of purity and pH of the water. This means that naval spent nuclear fuel can be stored in cool water storage pools not having the same stringent controls on purity and pH as reactor plants without substantial corrosion. This has been validated by experience at the Expended Core Facility and Idaho Chemical Processing Plant.

2.6 INEL Facilities Related to Loading and Storage of Naval Spent Nuclear Fuel

2.6.1 Expended Core Facility

The Expended Core Facility is located within the fenced perimeter of the Naval Reactors Facility at INEL. The Expended Core Facility is a large laboratory facility used to receive, examine, prepare for storage, and ship naval spent nuclear fuel and irradiated test specimen assemblies. The information derived from the examinations performed at the Expended Core Facility provides engineering data on nuclear reactor environments, material behavior, and design performance. These data are used to develop new longer-lived nuclear fuel, to support operation of fuel in existing nuclear powered warships, and to reduce the cost of manufacturing fuel. Post-examination naval spent nuclear fuel is prepared at the Expended Core Facility for storage and shipment to the Idaho Chemical Processing Plant. A comprehensive description of the Expended Core Facility and its operations is presented in the Programmatic SNF and INEL EIS (DOE 1995, Volume I, Attachment B to Appendix D).

The building which houses the Expended Core Facility is a concrete block structure approximately 1,000 ft (approximately 300 m) long by 194 ft (approximately 60 m) wide. This structure provides offices and enclosed work areas, including an array of interconnected reinforced concrete water pools which permit visual observation of naval spent nuclear fuel during handling and inspection while shielding workers from radiation. Adjacent to the water pools are shielded cells used for operations which must be performed dry. Access to the Expended Core Facility for the receipt and shipping of large containers is provided by large roll-up doors that allow railcar and truck entry. A schematic view of the Expended Core Facility is shown in Figure 2.1 and a photograph of the water pool area is provided in Figure 2.2.

The Expended Core Facility has been specifically designed to provide the unique physical and administrative controls required by the Naval Nuclear Propulsion Program to ensure safe handling of irradiated nuclear fuel and contaminated components with a high degree of worker safety and protection for the environment. The original Expended Core Facility building was constructed in 1957 and consisted of a water pool and a shielded cell with a connecting transfer canal. The facility has been modified and upgraded to accomplish the expanding mission of the facility since then, including the addition of three more water pools, several shielded cells, and other capabilities dictated by the nature of the work required.

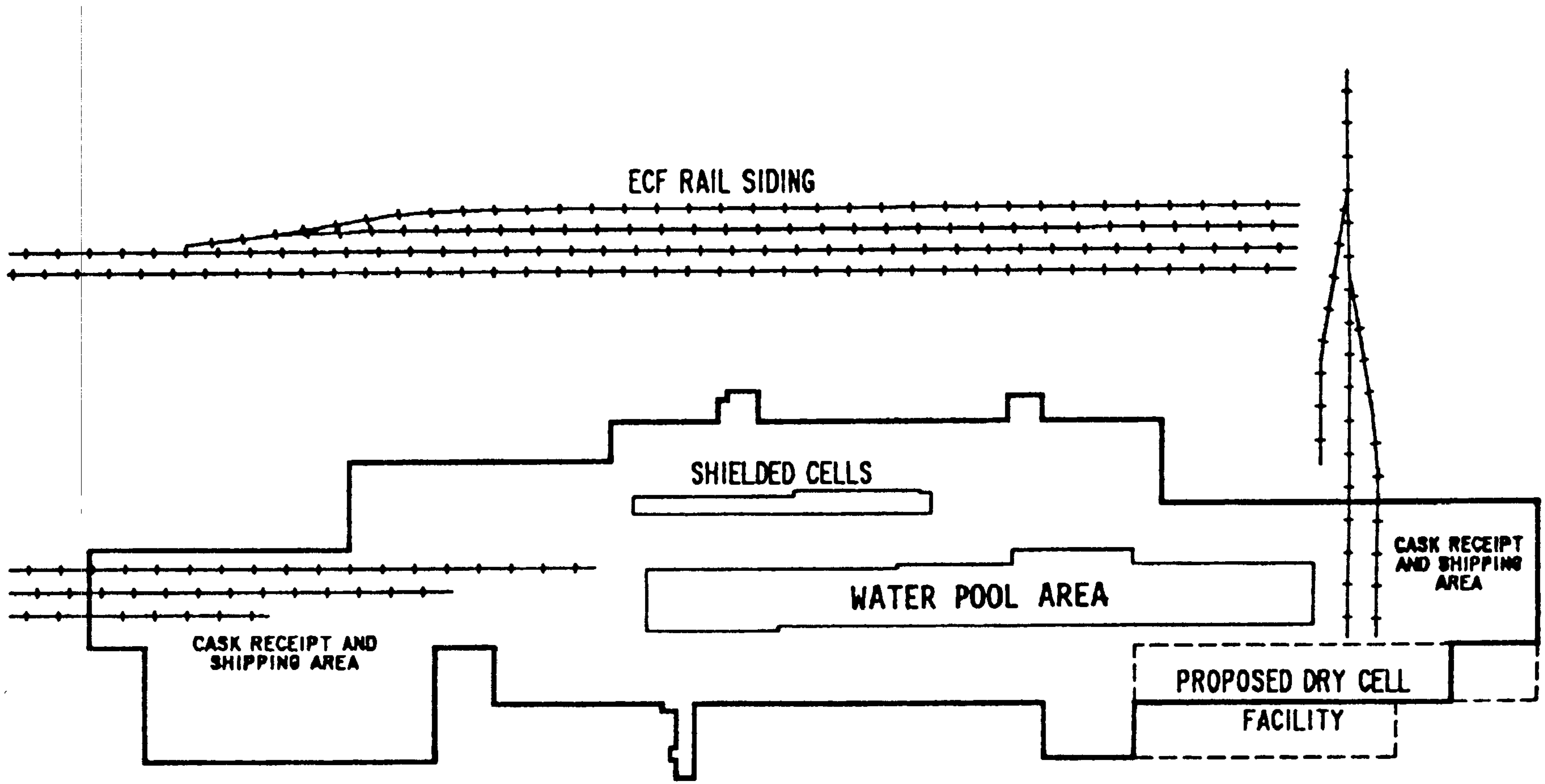

FIGURE 2.1 Schematic View of Expended Core Facility

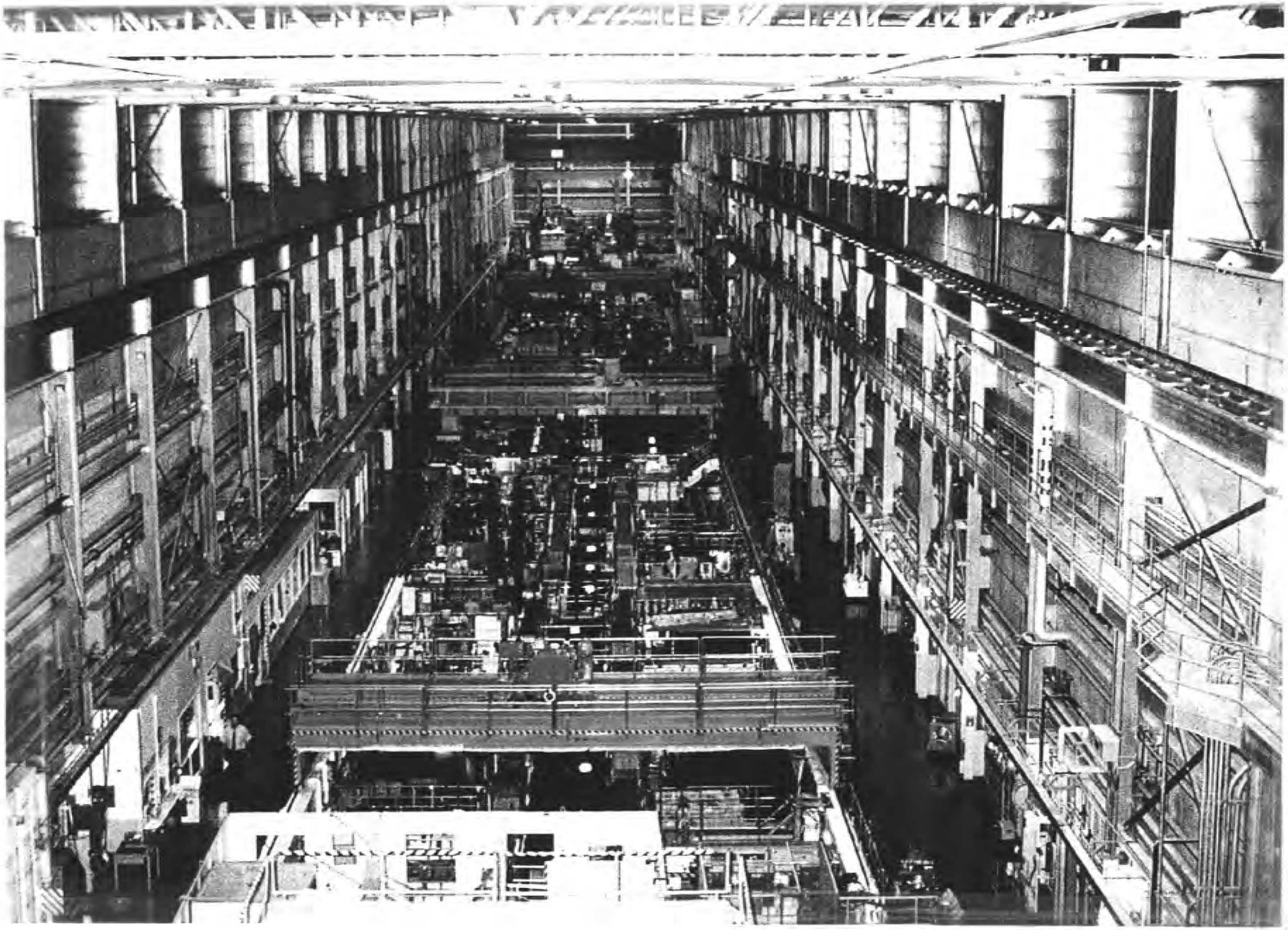

FIGURE 2.2 Water Pool Area of the Expended Core Facility

2.6.2 Idaho Chemical Processing Plant Storage Facility

The Idaho Chemical Processing Plant covers approximately 250 acres (approximately 100 ha) and comprises 150 buildings. It is located in the southwestern part of the INEL site, near the Test Reactor Area.

The original purpose of the Idaho Chemical Processing Plant was to reprocess government-owned nuclear fuel from research and defense reactors. Since 1953, approximately 20 tons (approximately 18 metric tons) of uranium-235 has been recovered (of which about 5 tons [or approximately 4.5 metric tons] came from reprocessing naval spent nuclear fuel). In 1992 the DOE decided to phase out the reprocessing activities. Therefore, there is a need for storage of naval spent nuclear fuel generated from operations of naval reactors now that the DOE is no longer reprocessing spent nuclear fuel to recover the fissile material.

The current purpose of the Idaho Chemical Processing Plant is to receive and store naval spent nuclear fuel and other DOE spent nuclear fuel until a permanent repository or interim storage site outside the State of Idaho becomes available. In addition, high-level radioactive liquid and solid wastes also will be prepared for disposition in a permanent repository. The Idaho Chemical Processing Plant develops technologies for the disposition of civilian and naval spent nuclear fuel, sodium-bearing waste, and high-level radioactive waste, and also develops technologies to minimize waste generation and manage radioactive and hazardous wastes for the DOE.

The major operating facilities at the Idaho Chemical Processing Plant provide for both storage and treatment of both naval spent nuclear fuel and spent nuclear fuel from other DOE programs. The storage facilities provide water pools and dry storage for naval spent nuclear fuel, calcine (dry, granular waste) storage, and liquid high-level radioactive waste storage in underground tanks. A photograph of one of the water pool areas at the Idaho Chemical Processing Plant is provided as Figure 2.3. Treatment facilities include a waste solidification facility for treatment of liquid high-level radioactive waste and sodium-bearing waste (the New Waste Calcining Facility) and evaporators to concentrate high-level radioactive liquid waste, low-level radioactive waste and mixed low-level radioactive waste. Another treatment facility prevents radioactive waste from being discharged to the percolation ponds and recovers nitric acid for reuse. Mixed and low-level radioactive wastes are handled and stored in the Radioactive Mixed Waste Staging Area and the Hazardous Chemical/Radioactive Waste Facility. Other operating facilities include process development and robotics laboratories.

2.7 Planned Reductions in the Number of Nuclear-Powered Naval Vessels

Following the successful operation of the USS NAUTILUS in 1954, the number of nuclear-powered submarines and surface ships in the U.S. Navy grew steadily until it reached a peak of just over 150 ships in 1987. Figure 2.4 is a graph of the total number of nuclear-powered vessels (historical and projected) in the U.S. Navy (Naval Nuclear Propulsion Program 1994b). Since 1988, the number of nuclear-powered vessels in the U.S. Navy has decreased as the overall size of the Navy has decreased as a result of the end of the Cold War. The Navy has been able to accomplish its mission with fewer ships, partly because the ships and crews became more capable over the years and partly because the development of longer-lived nuclear reactor cores makes it possible for nuclear-powered ships to spend more time on duty and less time in shipyards being refueled. A major factor in the reduction in the number of nuclear-powered vessels is that, since the end of the Cold War, the Navy has embarked on a program to reduce the number of warships in its fleet. With the Navy

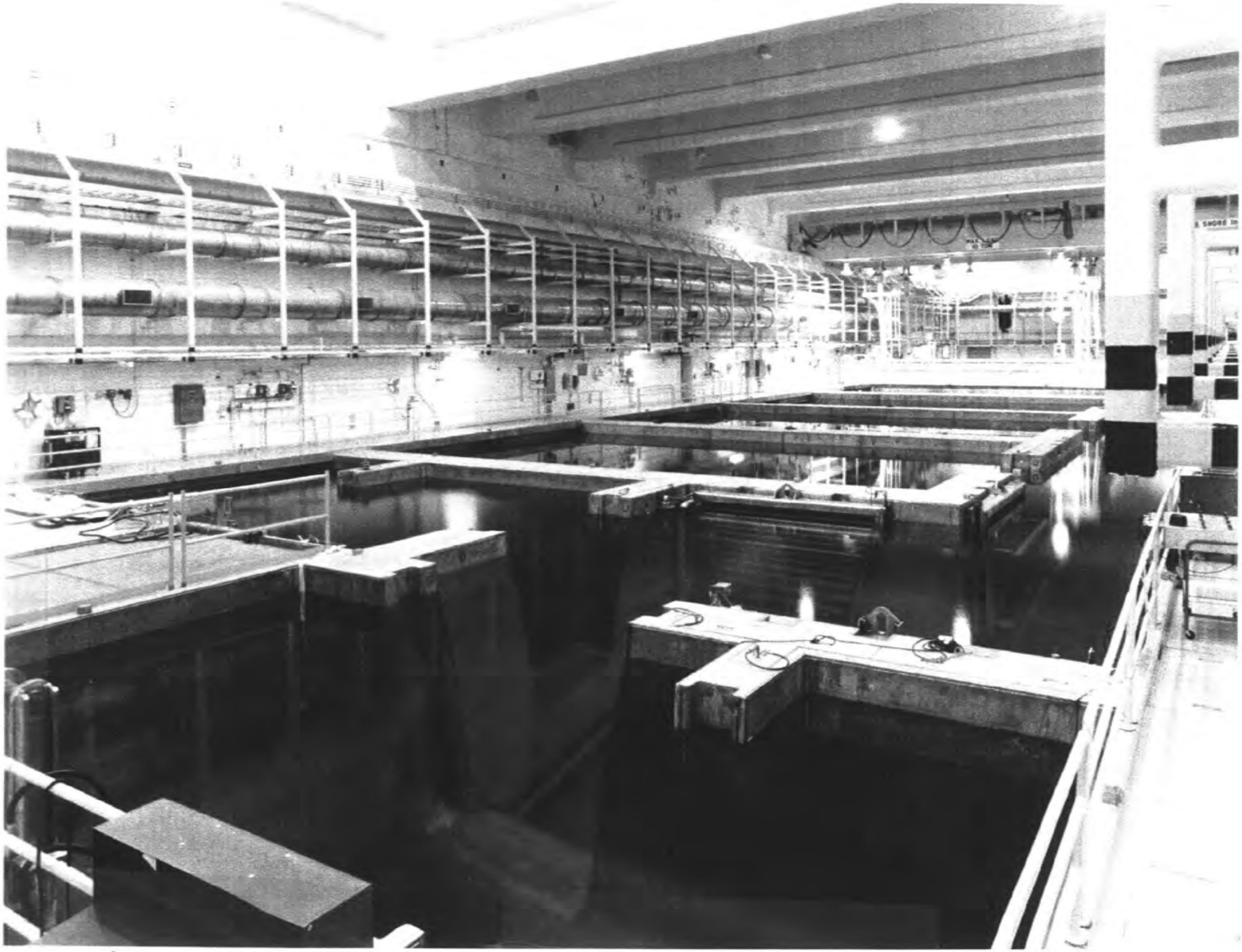

FIGURE 2.3 Water Pool Area of the Idaho Chemical Processing Plant

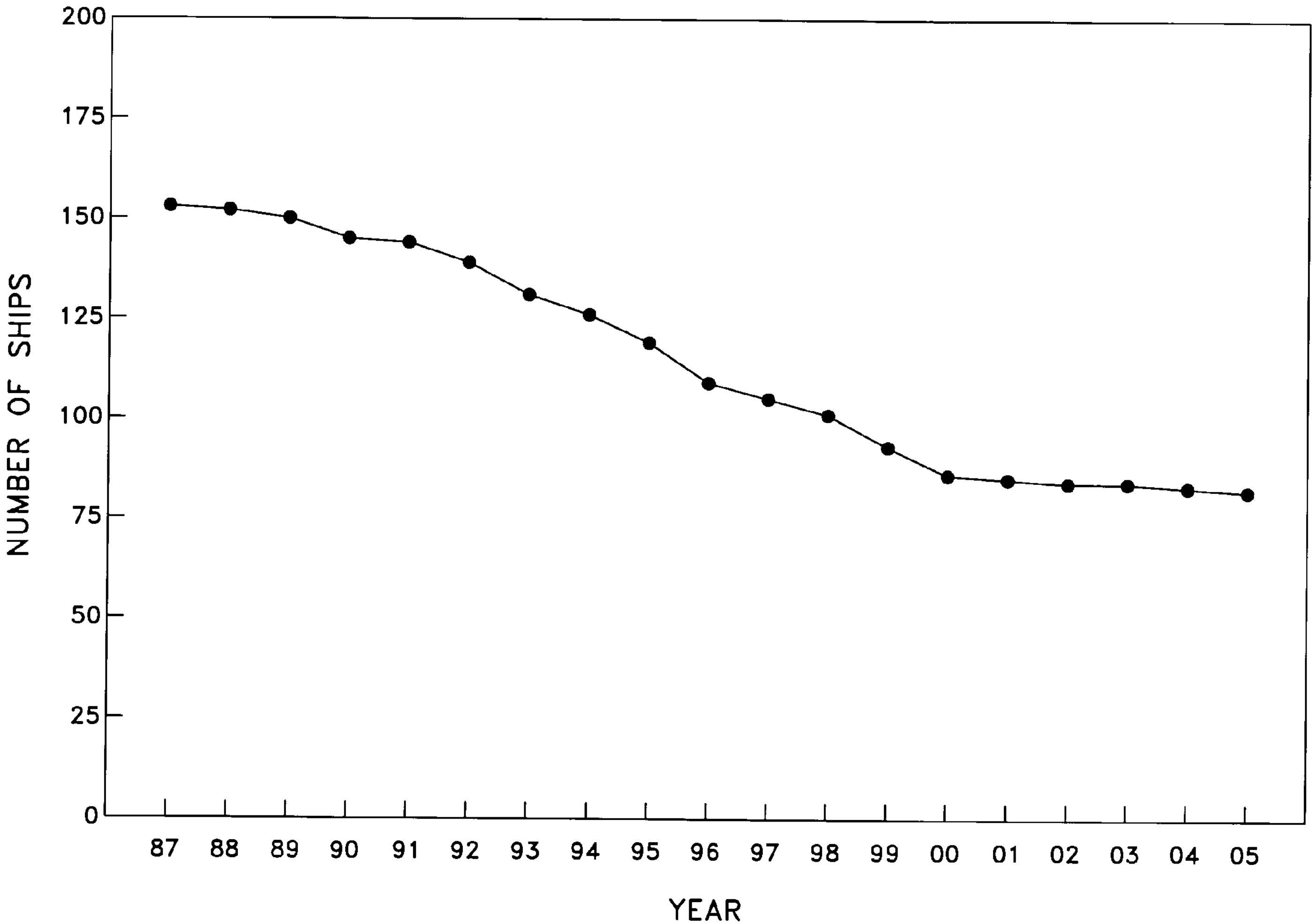

FIGURE 2.4 Total Number of Nuclear-Powered Ships in the U.S. Navy

downsizing from a fleet of almost 600 warships to a fleet of just over 300, the number of nuclear-powered warships is also diminishing. The actual size of the nuclear-powered fleet by the year 2000 is expected to be between 80 and 90 vessels having between 95 and 110 reactors (since surface ships have two or more reactors).

Figure 2.4 shows the peak number of nuclear-powered naval vessels in 1987 and the number of nuclear-powered ships in the fleet under current planning. This planned reduction reflects the most recent changes in the mission of the U.S. Navy, including the effects of the end of the Cold War. Under this plan, the number of nuclear-powered naval vessels will be reduced by the end of the next 10 years to approximately one-half the number at its peak. The Navy is moving ahead with this plan, but it should be remembered that such plans may change in the future if Congress alters the Navy's mission in light of world developments.

This plan for reducing the number of nuclear-powered naval vessels served as the basis for establishing the amount of naval spent nuclear fuel to be generated, which then was reflected in the development of environmental impacts in this EIS. For example, the planned reduction in the number of ships in future years is incorporated into all of the impacts associated with storage or shipment of naval spent nuclear fuel reported in this EIS. Similarly, the timing and number of naval spent nuclear fuel shipments used in the calculation of impacts associated with transportation are based on this plan.

2.8 Other NEPA Reviews

The Record of Decision for the *DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* was issued on May 30, 1995. On October 17, 1995, the federal District Court entered a Court Order that incorporated as requirements all of the terms and conditions of the parties' Settlement Agreement, including a reduction in the number of spent nuclear fuel shipments coming to the State of Idaho. Some of the projects described in the Court Order which are not related to the management of naval nuclear spent fuel may require further project definition or NEPA evaluation by the DOE. All additional NEPA evaluations will be timely to assure full compliance with the Court's Order.

Other NEPA reviews pertinent to this EIS, because they address impacts directly related to naval spent nuclear fuel or the impacts covered in the other reviews and must be cumulatively evaluated with the impacts in this EIS, are discussed in Sections 2.8.1 and 2.8.2. Included in the discussions are reviews currently in preparation, planned for the future, or specified through pertinent legislation but not planned.

2.8.1 NEPA Documents Completed or in Progress

The following NEPA documents have been completed or are in progress:

- *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) — This Programmatic SNF and INEL EIS evaluates the impacts over the next four decades of transporting, receiving, processing, and storing spent nuclear fuel for which DOE is responsible. It also analyzes the site-specific consequences of spent nuclear fuel management and environmental restoration at INEL. The fuel considered consists of that generated by DOE production reactors and by research and development reactors; naval reactors; foreign research reactors; other miscellaneous generators; and special-case commercial reactors. The final Programmatic SNF and INEL EIS was issued April 28, 1995, and the Record of Decision was issued on June 1, 1995. An amended Record of Decision (61 FR 9441) was issued on March 8, 1996. Naval spent nuclear fuel is analyzed in both the Programmatic SNF and INEL EIS and in the current EIS.

- *Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel* (DOE/EA-0912) — This Environmental Assessment and associated Finding of No Significant Impact were issued on April 22, 1994. The Environmental Assessment considered the receipt, overland transport, and temporary pool storage at the Savannah River Site of 409 spent nuclear fuel elements from foreign research reactors. The proposed action analyzed in this Environmental Assessment was intended to ensure that the organizations responsible for eight foreign research reactors from which urgent-relief spent nuclear fuel shipments would be accepted would continue to participate in the Reduced Enrichment for Research and Test Reactors Program, a key nuclear weapons nonproliferation program proposed by the United States, until completion of the EIS on proposed policy for foreign research reactor spent nuclear fuel.

- *Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel* (DOE/EIS-0218-F) — The nonproliferation policy EIS, issued on February 23, 1996, addresses adoption and implementation of policy for the United States to accept and provide storage and ultimate disposition of spent nuclear fuel from foreign research reactors containing uranium produced or enriched in the United States. DOE issued a Record of Decision on May 13, 1996 (61 FR 25092) and an amended Record of Decision on July 25, 1996 (61 FR 38720).

- *Draft Site-Wide Environmental Impact Statement for the Nevada Test Site and Off-Site Locations Within Nevada* (DOE/EIS-0243) — The Draft EIS was issued on February 2, 1996. This sitewide EIS will address management decisions regarding alternatives for the future use of the Nevada Test Site and related areas. The EIS addresses defense programs, waste management, environmental restoration, nondefense research and development, and resource management planning. The sitewide EIS does not address any aspect of civilian or naval spent nuclear fuel management or disposal, including any issues associated with a potential repository in Nevada.

- *Final Generic Environmental Impact Statement: Handling and Storage of Spent Light Water Power Reactor Fuel* (NUREG-0575) — This EIS, issued in August 1979 by the Nuclear Regulatory Commission, evaluates the environmental impacts of storing commercial spent nuclear fuel at reactor sites. This EIS is part of the basis for the Nuclear Regulatory Commission's Waste Confidence Decision (44 FR 61372, 49 FR 34658, and 54 FR 49767) that spent nuclear fuel can be stored at reactor sites without harm to the environment.

- *Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes* (NUREG-0170) — This EIS, issued in August 1977 by the Nuclear Regulatory Commission, evaluates the environmental impacts of transporting radioactive material, including spent nuclear fuel.

- *Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* — As directed by the Nuclear Waste Policy Act, DOE initiated preparation of an EIS that would accompany a recommendation if one is made to the President to locate a geologic repository. On August 7, 1995, DOE published a Notice of Intent to prepare the Repository EIS. Following a 90-day scoping period which ended on December 5, 1995, the DOE deferred activities on the repository EIS until Fiscal Year 1997. The Nuclear Regulatory Commission will consider the Repository EIS, to the extent practicable, in the process of issuing the repository construction authorization and license. The EIS will evaluate the potential impacts of developing a repository site, including the effects of construction, operation, and closure. In accordance with the Nuclear Waste Policy Act, the Repository EIS will not consider the need for a repository, alternatives to geologic disposal, or alternative sites to Yucca Mountain.

- *Environmental Assessment for Stabilization of the Storage Pool at Test Area North* — The Draft Environmental Assessment was issued on February 20, 1995, and a Finding of No Significant Impact was issued on March 6, 1996. | The Environmental Assessment was reissued to incorporate public comments and a draft Finding of No Significant Impact on May 10, 1995. The document is currently undergoing final revision and is expected to be released soon. The proposed action would remove Three Mile Island core debris, government owned commercial fuels and "loss of fluid test" (LOFT) fuel assemblies from INEL's Test Area North storage pool. The storage pool would be de-watered and placed in an industrially safe condition. A dry cask storage facility would be constructed at INEL's Idaho Chemical Processing Plant to receive and store the Three Mile Island core debris.

2.8.2 Other NEPA Documents in the Nuclear Waste Policy Act

The Nuclear Waste Policy Act directs DOE to prepare an Environmental Assessment to support a recommendation to Congress of a site for a Monitored Retrievable Storage facility for commercial spent fuel. The Nuclear Waste Policy Act also directs DOE to prepare an EIS to support any license application to the Nuclear Regulatory Commission for a Monitored Retrievable Storage facility construction and operation. To date, DOE has made no recommendation for a site. However, after analyzing public comments received in response to DOE's Notice of Inquiry on Waste Acceptance Issues published on May 25, 1994 (59 FR 27007), DOE has concluded that it does not have an unconditional statutory or contractual obligation to accept high-level waste and spent nuclear fuel beginning January 31, 1998, in the absence of a repository or interim storage facility constructed under the Nuclear Waste Policy Act. In addition, DOE has concluded that it lacks statutory authority under the Nuclear Waste Policy Act to provide interim storage (60 FR 21793; May 3, 1995). This matter is currently before the Federal Courts and is also the subject of legislation being considered in both houses of Congress.

2.9 Organization of this EIS

This EIS examines and compares the environmental impacts of fabricating and deploying alternative container systems for the management of naval spent nuclear fuel. This environmental evaluation of alternative container systems lends itself to a different format than most site-specific EISs, where the Environmental Setting and Environmental Impacts or Consequences are discussed in separate chapters. The remainder of this EIS is structured as follows:

- Chapter 3 presents the details of the alternative container systems, including the No-Action Alternative. The chapter also provides a summary comparison of the alternatives and impacts estimated in Chapters 4, 5, 6, and 7 and forms the heart of this EIS.

- Chapter 4 addresses the manufacture of canisters, casks, and associated equipment. It includes a discussion of the environmental setting for manufacturing and the potential impacts associated with manufacturing components of the various systems.

- Chapter 5 addresses the loading, handling, and storage of naval spent nuclear fuel assemblies, canisters, and casks at INEL. The chapter includes a discussion of the environmental setting for the facilities and of the potential impacts of loading and storage associated with each alternative.

- Chapter 6 addresses issues related to unloading of containers at a representative or notional repository or centralized interim storage site.

- Chapter 7 addresses the transportation of naval spent nuclear fuel between facilities utilizing the alternative container systems. It includes a discussion of the environmental setting of representative routes and the potential impacts of transportation associated with each alternative.

- Chapter 8 provides a summary of the laws and regulations applicable to the actions discussed in this EIS.

- Chapters 9 and 10 contain a list of preparers and references, respectively.

- Chapter 11 provides the comments to the Draft EIS and the Navy responses. |

- The appendixes provide background information and details of the methodology, evaluations, and analyses presented in this EIS.

- Abbreviations and Acronyms, a Glossary, an Index and a Distribution List are found at the end of the document.

SECTION 3.0
DESCRIPTION AND COMPARISON OF ALTERNATIVES

TABLE OF CONTENTS

TABLES

TABLES (Cont)

3.0 DESCRIPTION AND COMPARISON OF ALTERNATIVES

This EIS describes and compares the environmental impacts of six alternative container systems for the storage, transport, and possible disposal of naval spent nuclear fuel. A range of alternatives has been considered for naval spent nuclear fuel. Each of these alternatives is described, evaluated, and compared in this chapter on the basis of its potential environmental impacts. In addition, this EIS describes and compares the environmental impacts of the same six alternative container systems for the storage, transport, and possible disposal of low-level waste created from naval spent nuclear fuel management and designated as special case waste, as an action related to the choice of a container system. The incremental increase in risk associated with transport and management of this waste would be less than about 20 percent of the risk from naval spent nuclear fuel alone. For the No-Action Alternative, existing technology would be used.

Until a geologic repository or centralized interim storage site is ready to accept naval spent nuclear fuel, most of it is being stored at the Idaho Chemical Processing Plant. Small library samples are also held at the Expended Core Facility. The current water pool storage facilities at the Idaho Chemical Processing Plant require re-racking for temporary storage, and additional storage facilities may be needed. See the Programmatic SNF and INEL EIS (DOE 1995; Volume 1, Appendix B, Chapter 2.) New water-pool storage facilities will not be constructed. Dry storage is required pursuant to the court-ordered Idaho agreement described in Chapter 1 since water-pool storage does not facilitate the transport of spent nuclear fuel out of the State of Idaho. In accordance with the Idaho agreement, all naval spent nuclear fuel will be removed from water pool storage by the year 2023, 28 years after 1995. Alternative dry storage containers have been selected for evaluation and are described below. The environmental impacts of the alternatives are evaluated in detail in Chapters 4, 5, 6, and 7 for the manufacture of alternative container systems, loading and storage at INEL, unloading at a geologic repository site or centralized interim storage site, and transportation from INEL to a geologic repository site or centralized interim storage site, respectively. The results of these evaluations are summarized in this chapter.

Unlike civilian spent nuclear fuel which is stored in plants throughout the country after removal from the reactor, all pre-examination naval spent nuclear fuel is shipped to one place, INEL, for examination and storage. For this reason, evaluations for the loading and storage of naval spent nuclear fuel at INEL make use of information specific to that location. The Nuclear Waste Policy Amendments Act of 1987 designates Yucca Mountain at the DOE's Nevada Test Site as the only site currently authorized by legislation to be characterized as a geologic repository, and its suitability has not yet been determined. The analysis in this EIS covers transportation from INEL to the Yucca Mountain location as a representative or notional destination. This EIS does not make presumptions concerning the Yucca Mountain site's suitability for a geologic repository or designation for use as a centralized interim storage site. Also, as an analytical convenience for the purposes of this EIS, the notional centralized interim storage site is assumed to be at the same location as a repository.

The shipment of pre-examination naval spent nuclear fuel from shipyards to INEL; the examination, handling, and storage of that spent nuclear fuel at INEL; and the associated effects on human health and the environment which might result have been analyzed and described in detail in the Programmatic SNF and INEL EIS (DOE 1995 Volume 1, Appendix D). This chapter summarizes the results of detailed analyses of the possible environmental impacts from manufacturing suitable containers, loading naval spent nuclear fuel into the appropriate container at INEL under each alternative, storage of naval spent nuclear fuel in the containers at INEL (if the container is suitable for storage), shipment of the naval spent nuclear fuel to a geologic repository or centralized interim storage site, and unloading the containers at a repository or centralized interim storage site.

In addition to a discussion of container systems, the scope of this EIS also includes several actions that are related to the container system choice:

- Manufacturing the container system.

- Handling and transportation impacts associated with the container system.

- Modifications at the Expended Core Facility and the Idaho Chemical Processing Plant at INEL to support loading naval spent nuclear fuel into containers suitable for dry storage. Specifically, expansions at both locations would allow loading operations to take place in either a shielded, filtered-air, dry cell facility, or in an underwater loading facility.

- The location of the dry storage in relation to the Snake River Aquifer. The only alternatives for dry storage that might not be above the aquifer are not currently in the industrial-use areas of INEL.

- The storage, handling and transportation of certain kinds of low-level radioactive waste (characterized as special case waste). Special case waste might reasonably utilize the same container system as is used for naval spent nuclear fuel. For the purposes of this EIS, it is assumed that this action would be implemented.

Several options for container systems have been examined and are described below. The container systems could employ a series of single purpose containers with naval spent nuclear fuel assemblies being individually moved from a site storage container to a transportation container and again to a disposal container. Alternatively, there could be a more integrated system where the assemblies are put into a single container and overpacks are used to meet the special requirements of storage, transportation, and disposal. There are also existing container systems that are various combinations of both. Both the single purpose and the combination systems are typical of current container designs, but there is also interest in fully integrated or multi-purpose container systems.

The principal basis for evaluating the alternatives in this EIS has been radiological and other environmental impacts. These impacts are shown to be small for all alternatives. The evaluation is complicated by the fact that no repository or centralized interim storage site exists to accept the naval spent nuclear fuel from INEL, and the container requirements that might be imposed by these facilities are not known.

The manufacture of alternative container systems would likely be accomplished at one or more of existing manufacturing facilities that are currently producing such containers. Specific vendors would be selected by competitive bidding based on approved specifications. Ideally, the selected container would facilitate handling and disposal operations by minimizing or eliminating the need to remove spent nuclear fuel from containers during storage or transportation. Although naval spent nuclear fuel represents only a very small fraction of the spent nuclear fuel that must be handled at a geologic repository or centralized interim storage site, it is still desirable to ensure that as much as possible of the fuel received at the site can be handled with a single set of facilities and equipment.

The environmental consequences of manufacturing alternative container systems are discussed in Chapter 4 of this EIS and are summarized in this chapter.

For naval spent nuclear fuel, temporary storage could be accomplished at INEL in available space that is conveniently located in the vicinity of the Idaho Chemical Processing Plant and the Naval Reactors Facility, where the Expended Core Facility is located, or at a previously undeveloped location at the INEL not above the Snake River Plain Aquifer, if technically feasible. The siting considerations for a dry storage facility are discussed in Appendix F. Additional information on dry storage is available in the Programmatic SNF and INEL EIS (DOE 1995; Volume 1, Appendix D, Attachment C).

After the necessary containers are procured, naval spent nuclear fuel would be loaded into the containers at INEL for storage and ultimate shipment to a geologic repository or centralized interim storage site. The Yucca Mountain site is used as a representative geologic repository and centralized interim storage site. The possible effects on human health and the environment from handling and storage at INEL and at the repository or centralized interim storage site are presented in Chapters 5 and 6.

Once a geologic repository or centralized interim storage site is available to receive naval spent nuclear fuel, the fuel would be transported to the site by rail in heavily shielded containers. The possible environmental impacts associated with the transportation of naval spent nuclear fuel are described in Chapter 7. The ultimate decision, however, on transportation options will be made by the DOE on the basis of analyses to be performed in the repository EIS. (See also Sections 5.13 and 7.1.) Once at a geologic repository or centralized interim storage site, the containers would be unloaded from the railcars at a surface facility and prepared for ultimate disposition. The extent of this preparation would depend on the container system selected and would involve transferring the naval spent nuclear fuel from shipping containers to disposal containers under all alternatives not using multi-purpose canisters, which can be placed in a disposal container (overpack) without reopening.

Under all alternatives considered, naval spent nuclear fuel would be stored at INEL until 2035 or until the time that a geologic repository or centralized interim storage site is ready to accept it, whichever comes first. Naval spent nuclear fuel is planned to be among the early shipments to a repository or centralized interim storage site. Legislation pending before Congress may require establishment of a centralized interim storage site outside the State of Idaho to which naval spent nuclear fuel could be shipped awaiting placement in a geologic repository. Based on the projected inventory of naval spent nuclear fuel at INEL and current plans for refueling and defueling of naval nuclear-powered vessels, approximately 300 to 500 container shipments of naval spent nuclear fuel would be sent from INEL to a repository or centralized interim storage site between 2010, when a repository (or centralized interim storage site) is planned to begin accepting naval spent nuclear fuel, and 2035, when naval spent nuclear fuel generated up to that time would be completely removed from INEL. Approximately 45 to 85 shipments of special case waste would also be made if the repository or centralized interim storage site were designated to receive it.

If naval spent nuclear fuel could not be accepted by a repository or centralized interim storage site and the spent nuclear fuel shipments commenced later than 2010, more containers may be needed for interim storage of naval spent nuclear fuel at INEL. Between 360 to 585 container shipments would still be required to occur between the time when a repository or centralized interim storage site could begin accepting naval spent nuclear fuel and 2035, when naval spent nuclear fuel generated up to that time would be completely removed from INEL. The actual number of shipments is dependent upon the alternative selected since the capacities of the shipping containers employed in each alternative are somewhat different. Details on shipments of naval spent nuclear fuel are provided in Appendix B. Further information on the need for dry storage is discussed in the Programmatic SNF and INEL EIS (DOE 1995, Volume 1, Appendix B, Chapters 2 and 3).

The following criteria were used to select the alternatives to be assessed for the potential environmental effects of using such containers for storage, transportation, or disposal of naval spent nuclear fuel:

- Designs shall meet the technical requirements found in regulations, specifically 10 CFR Part 72, 10 CFR Part 71, or 10 CFR Part 60 for storage, transportation, or disposal, respectively. If necessary, spent nuclear fuel may be re-loaded at a repository surface facility (or centralized interim storage site) into disposal containers that comply with 10 CFR Part 60.

- Commercial containers that are representative types and licensed by the Nuclear Regulatory Commission shall be assessed.

- Large capacity shall be provided to minimize the need for movement of naval spent nuclear fuel from container to container, container handling, and shipments. One alternative with smaller capacity shall be included to provide flexibility in the choice of a design.

- A No-Action Alternative shall be included using containers that are currently available.

- An appropriate variation of currently-available containers shall be included to assess the effects of such variations.

- The alternatives shall be economical and consistent with technical requirements.

Consideration of these criteria, the currently available containers, the representative commercial containers, and existing technology led to the following list of alternatives selected for environmental analysis:

1. Multi-Purpose Canister —- a metal canister, sealed by welding, and used with separate, specialized overpacks for storage, transportation, and disposal in a geologic repository of spent nuclear fuel. Overpacks provide the necessary confinement, radiation shielding, impact resistance, and environmental protection for a canister to meet the regulatory requirements cited above in the criteria for selecting alternatives.

2. No-Action Alternative — currently available shielded transportation casks (M-140 or M-130) that are approved by the Nuclear Regulatory Commission are used to transport naval spent nuclear fuel from naval sites to INEL. Commercially available dry storage containers would be procured and used for dry storage. The existing M-140 and M-130 casks are sealed with a gasketed and bolted lid and could be approved for dry storage. Additional M-140s would be procured and used to transport

naval spent nuclear fuel from INEL to a geologic repository or centralized interim storage site.

3. Current Technology/Rail — this is equivalent to the No-Action Alternative except that this alternative uses new internal structures in the M-140 to increase the capacity for spent nuclear fuel and reduce the required number of shipments.

4. Transportable Storage Cask — a commercially available cask that is licensed by the Nuclear Regulatory Commission for both storage and transport of spent nuclear fuel.

5. Dual-Purpose Canister — a commercially available canister that is licensed by the Nuclear Regulatory Commission for both storage and transport of spent nuclear fuel. Specialized overpacks would be procured for storage and transport.

6. Small Multi-Purpose Canister — a canister system, but smaller in capacity than the first alternative, to provide flexibility in a choice of design.

The estimated quantities of required equipment for each alternative are provided in Table 3.1. The table entries show the separate requirements for naval spent nuclear fuel shipments and for special case waste shipments. For example, for the Multi-Purpose Canister Alternative 300 canisters would be required for naval spent nuclear fuel shipments and 60 canisters would be required for special case waste shipments. In addition, 150 storage overpacks, 15 transportation overpacks, and 300 disposal overpacks would be required for the total number of naval spent nuclear fuel shipments. The corresponding values for the total number of special case waste shipments are also shown in Table 3.1. The characteristics of the required equipment are described in Chapter 4.

TABLE 3.1 Summary of Estimated Required Equipment for Shipments Starting in 2010[a]

Alternative	Canisters	Storage Overpacks or Containers[b]	Transportation Overpacks or Casks	Disposal Containers	Disposal Overpacks
	SNF/SCW	SNF/SCW	SNF/SCW	SNF/SCW	SNF/SCW
MPC	300 / 60	150(so) / 30(so)	15(to) / 3(to)	0 / 0	300 / 60
No-Action	0 / 0	225(sc) / 30(sc)	24(tc) / 4(tc)	300 / 60	0 / 0
Current Technology/Rail	0 / 0	150(sc) / 26(sc)	Fewer than 24(tc) / 4(tc)	300 / 60	0 / 0
Transportable Storage Cask	0 / 0	150(sc) / 21(sc)	0 / 0	300 / 60	0 / 0
Dual-Purpose Canister	300 / 45	150(so) / 23(so)	15(to) / 3(to)	300 / 60	0 / 0
Small MPC	500 / 85	225(so) / 39(so)	25(to) / 5(to)	0 / 0	500 / 85

[a] Notation: SNF = Naval Spent Nuclear Fuel; SCW = special case waste; MPC = Multi-Purpose Canister; (so) = storage overpack; (sc) = storage container; (to) = transportation overpack; (tc) = transportation cask.
[b] Storage Containers = Single-purpose storage canisters or storage casks.

Further details on the selected alternatives are provided in the following sections.

3.1 Multi-Purpose Canister Alternative

Under the Multi-Purpose Canister Alternative, naval spent nuclear fuel would be placed in a large (125-ton), multi-purpose canister. Several types of internal canister baskets would be used because of differences in fuel dimensions in naval spent nuclear fuel types. These different baskets do not affect the environmental impacts of the canisters. This difference applies to all of the alternatives.

The manufacturing processes for the multi-purpose canisters are similar to those currently used for large storage and transportation containers. The processes are discussed in Section 4.1.1.1 of Chapter 4, including fabrication of the canister overpacks that would be required for storage, transportation, and disposal. Licensed container systems similar to the TRW conceptual design, cited in Section 4.1.1 and used for analysis purposes for this alternative, may become available in the future and might be selected.

Under this alternative, approximately 300 multi-purpose canisters would be needed for naval spent nuclear fuel, and 60 more for special case waste. The number of containers has been overestimated so that the corresponding analyses will produce conservative results.

The multi-purpose canisters would be loaded at the facilities for handling naval spent nuclear fuel at INEL: the Idaho Chemical Processing Plant or the Expended Core Facility. Following loading into multi-purpose canisters, the naval spent nuclear fuel could be stored at INEL in multi-purpose canisters, inside a suitable shielded overpack, until a repository or centralized interim storage site is ready to receive it. Prior to shipment of the naval spent nuclear fuel, the multi-purpose canisters would be transferred from the storage overpacks to suitable transportation overpacks and loaded onto railcars for the trip to a repository or centralized interim storage site. The storage overpacks and transportation overpacks used for naval spent nuclear fuel would be re-used as appropriate. At the end of the entire program, about 180 storage overpacks and 18 transportation casks would need to be reused or recycled. Scrap metals would be recycled and concrete material would result in non-radiological solid waste. Recycling and management of end-of-life equipment for each alternative is discussed in Section 4.5.2 of Chapter 4.

The containers loaded with naval spent nuclear fuel or special case waste would be shipped by rail, using commercial rail lines as part of commonly scheduled trains traveling to the vicinity of a geologic repository or centralized interim storage site. This is an extension of the proven safe, historical practices used to transport naval spent nuclear fuel from shipyards to INEL since 1957. Dedicated trains may be used when appropriate. Approximately 360 container shipments using a multi-purpose canister system would be required; the actual number of trains required would be lower than the number of container shipments since each train would likely contain several multi-purpose canisters. Once at the surface facility of a geologic repository or centralized interim storage site, the containers would be unloaded from the railcars, naval spent nuclear fuel and special case waste would be unloaded from transportation casks and placed into disposal overpacks, and other preparations for disposal or interim storage would be performed. This EIS evaluates in Chapter 6 the impacts of unloading naval spent nuclear fuel and special case waste from the railcars to determine if there would be any differences among container systems associated with unloading actions. Activities concerning the disposal of naval spent nuclear fuel or special case waste beyond this point in the process would be evaluated in an appropriate EIS.

3.2 No-Action Alternative

The No-Action Alternative is based on using existing technology to handle, store, and subsequently transport naval spent nuclear fuel or special case waste to a geologic repository or centralized interim storage site. Currently, either the M-140 or the smaller M-130 transportation casks, which are approved in accordance with Nuclear Regulatory Commission and U.S. Department of Transportation requirements, are used to transport pre-examination naval spent nuclear fuel from naval sites to INEL. The M-140 transportation cask is designed for dry shipment and dry storage and uses passive cooling. (The M-130 cask is similar in design and ruggedness to the M-140, and either cask could be approved for dry storage.) The Naval Nuclear Propulsion Program has used these and similar shipping containers to transport spent nuclear fuel from naval shipyards to INEL since 1957 without adverse environmental impact. Naval spent nuclear fuel and special case waste have been stored safely at INEL in water pools over the same period. Storage in dry storage systems, such as those currently available from several companies, will be used in the future, as analyzed in the recent Programmatic SNF and INEL EIS concerning management of spent nuclear fuel under DOE cognizance (DOE 1995). Additional storage capacity will be needed in the future. Commercially available dry storage containers would be procured and used for dry storage.

All of the Navy's currently available M-140 transportation casks will be required to transport pre-examination naval spent nuclear fuel from scheduled refuelings and defuelings of naval nuclear reactors to INEL for examination over the next 40 years, so additional M-140 transportation casks would have to be manufactured to accommodate the shipment of naval spent nuclear fuel and special case waste from INEL to a geologic repository or centralized interim storage site. The M-130 casks are not planned to be used to transport naval spent nuclear fuel from INEL to a geologic repository or centralized interim storage site; therefore additional M-130 casks would not be required. These transportation casks would make use of the same or similar internal equipment for supporting the naval spent nuclear fuel assemblies as is used for shipment to INEL. Approximately 28 additional M-140 transportation casks would be needed to handle the number of shipments required each year to move all the naval spent nuclear fuel and the special case waste generated through 2035 to a repository or centralized interim storage site. The additional transportation casks would be manufactured by one or more commercial heavy equipment manufacturers who would be chosen using a competitive bidding process. The manufacturing processes for the M-140 casks are discussed in Section 4.1.1.2.

Prior to shipment to a geologic repository or centralized interim storage site, naval spent nuclear fuel and special case waste would be stored at INEL primarily in commercially available dry storage containers. The naval spent nuclear fuel or special case waste would be loaded from storage into M-140 transportation casks for shipment from INEL to a geologic repository or centralized interim storage site as soon as a repository or centralized interim storage site is ready to receive it. The containers of naval spent nuclear fuel or special case waste would be shipped by rail, using commercial rail lines as part of commonly scheduled trains traveling to the vicinity of a repository or centralized interim storage site. Dedicated trains may be used when appropriate. No rail link to the Yucca Mountain site currently exists, and if Yucca Mountain were to become the site of a repository or centralized interim storage facility, heavy-haul transport might be used instead of a rail connection, as discussed in Appendix B, Section B.4. All of the alternative container systems would be suitable for heavy-haul transportation, as illustrated by prior use of the M-140 containers in heavy-haul transport. However, it is accurate to state that the M-140 based alternatives would be less suitable due to size, height, and weight. Approximately 425 container shipments would be required to complete the transfer of naval spent nuclear fuel by the end of the year 2035.

The naval spent nuclear fuel or special case waste would be unloaded from the M-140 transportation casks and placed in the surface facilities of a geologic repository for loading into disposal containers. Of all the alternatives, the two that use the M-140 transportation casks have the potential to significantly impact the final design of the repository surface facilities or centralized interim storage site facilities due to the size and weight of the casks. It is expected that the special requirements that the M-140 casks present can be accommodated such that operations anticipated for unloading naval spent nuclear fuel from M-140 transportation casks do not present any increased risks when compared to the operations required to unload the other container alternatives. Naval spent nuclear fuel and special case waste would not normally be stored at the surface facility of a repository site, but would be prepared for disposal directly after unloading from the M-140 transportation casks. The fuel or waste may be placed in temporary storage at a repository for a short period for operational purposes. Following unloading, the shipping casks would be returned to INEL for use in other shipments of naval spent nuclear fuel and special case waste. At the end of the entire program, about 255 storage overpacks, 255 storage containers and 28 casks would need to be reused or recycled. Scrap metals would be recycled, concrete would be disposed of as non-radiological solid waste. The casks and storage containers would need to be radiologically decontaminated prior to recycling or they would need to be managed as low-level radioactive waste. (Section 4.5.2)

3.3 Current Technology/Rail Alternative (Current Technology Supplemented by High-Capacity Rail Casks)

This alternative differs from the No-Action Alternative only in the use of different internal baskets in the same M-140 casks. These redesigned internal baskets support the naval spent nuclear fuel and would accommodate a larger amount of naval spent nuclear fuel and special case waste than the current design. The M-140 would be used for this alternative since its design can accommodate all naval spent nuclear fuel assembly configurations. The manufacturing processes for the high-capacity M-140 casks are discussed in Section 4.1.1.2. The primary difference between this alternative and the No-Action Alternative would be in the smaller total number of shipments to a geologic repository or centralized interim storage site, totaling about 325 container shipments of naval spent nuclear fuel through 2035. At the end of the entire program, about 176 storage overpacks, 176 storage containers, and 28 casks would need to be reused or recycled as discussed in Section 3.2 above for the No-Action Alternative.

3.4 Transportable Storage Cask Alternative

Under this alternative, an existing cask that is available from a commercial manufacturer and designed to Nuclear Regulatory Commission standards for storage and shipment of civilian spent nuclear fuel would be used to transport naval spent nuclear fuel and special case waste to a geologic repository or centralized interim storage site. A cask is a heavily shielded container and uses a gasketed and bolted closure; unlike a canister, no overpack is required. The cask could also be used for dry storage of naval spent nuclear fuel and special case waste at INEL. Transportable storage casks are suitable for storage and shipment without additional shielding. The NAC-STC container, recently licensed by Nuclear Assurance Corporation for both uses, is an example of such a cask that is commercially available at the present time. The design of the NAC-STC cask has been used in this EIS to represent this type of container, though this does not mean that it is the design which would be chosen. Similar, licensed transportable storage casks are likely to become available in the future and any one of the available designs might be selected.

The transportable storage cask could also be used for storage at INEL. Transportable storage casks would be procured and used when storage capacity in other INEL facilities becomes exhausted or as the opportunity arises to transport naval spent nuclear fuel or special case waste to a geologic repository or centralized interim storage site. The manufacturing processes for the transportable storage casks are discussed in Section 4.1.1.2 of Chapter 4.

Naval spent nuclear fuel or special case waste would be loaded into the casks at the existing facilities for handling naval spent nuclear fuel and special case waste at INEL. The fuel or waste would be loaded from its current storage location into the transportable storage casks and would be stored at INEL until the time that a geologic repository or centralized interim storage site is ready to receive it.

Naval spent nuclear fuel and special case waste would be shipped in the transportable storage casks from INEL to a geologic repository or centralized interim storage site by rail, using commercial rail lines as part of commonly scheduled trains traveling to the vicinity of a repository or centralized interim storage site. Dedicated trains may be used when appropriate. At a repository, the naval spent nuclear fuel or special case waste would be unloaded from the transportable storage casks and loaded into disposal containers. Approximately 325 transportable storage cask container shipments of naval spent nuclear fuel would be needed through 2035. The unloaded transportable storage casks would be returned to INEL, as necessary, for further storage and transport. At the end of the entire program, about 171 casks would need to be reused or recycled. (Section 4.5.2)

3.5 Dual-Purpose Canister Alternative

This alternative would make use of a licensed canister system such as the NUHOMS-MP187® system offered by VECTRA, with suitable internal baskets designed to accommodate naval spent nuclear fuel and special case waste for both storage and shipment to a geologic repository or centralized interim storage site. This alternative differs from the transportable storage cask described in Section 3.4 primarily in the nature of the container system used. In this case, the spent nuclear fuel would be placed and sealed in a single canister which would be inserted, in turn, into different overpacks for storage or for shipment. As in the case of the transportable storage casks, a commercial design (the NUHOMS-MP187®) has been used in the analyses in this EIS to represent this type of container, but that does not mean that it is the design which would be chosen. Similar, licensed dual-purpose canister systems may become available in the future and any one of the available designs might be selected. The manufacturing processes for the dual-purpose canister are essentially the same as those for the multi-purpose canister. The processes are discussed in Section 4.1.1.1, including the associated overpacks that would be required.

As in the Transportable Storage Cask Alternative, naval spent nuclear fuel or special case waste would be loaded into the dual-purpose canisters at the Idaho Chemical Processing Plant or the Expended Core Facility. If the naval spent nuclear fuel or special case waste were to be stored prior to shipment, each canister would be placed into an overpack or facility designed to provide shielding and other characteristics needed for safe storage. When a geologic repository or centralized interim storage site is ready to accept the spent nuclear fuel or special case waste, the canisters would be removed from the storage system and be placed into overpacks which would satisfy shielding, structural strength, and other requirements for shipment. The Dual-Purpose Canister Alternative would require about 300 container shipments of naval spent nuclear fuel from INEL through 2035. At a repository, the individual naval spent nuclear fuel assemblies or special case waste would be transferred to disposal containers at the surface facilities to be prepared for placement in a repository. The transportation overpacks would be returned to INEL for reuse. At the end of the entire program, about 345 canisters, 173 storage overpacks, and 18 transportation overpacks would need to be reused or recycled. (Section 4.5.2)

3.6 Small Multi-Purpose Canister Alternative

Under this alternative, naval spent nuclear fuel or special case waste would be placed in a smaller, 75-ton multi-purpose canister rather than a larger, 125-ton canister. The 75-ton alternative was identified as an alternative to the 125-ton canister as a result of public concern, expressed in a scoping meeting, for potential damage to railway trackage from the weight of the 125-ton canister system. Either size could be used for naval spent nuclear fuel or special case waste. Both sizes are described and evaluated as separate alternatives to provide flexibility in the choice of a design.

The small multi-purpose canister system would function in a manner identical to that described in Section 3.1 for storage, transport, and disposal. Approximately 500 small multi-purpose canisters would be needed for naval spent nuclear fuel shipments under this alternative. Approximately 200 more small multi-purpose canisters would be required than if the larger, Multi-Purpose Canister counterpart were selected. However, the number of containers required for naval spent nuclear fuel and special case waste would still represent a small percentage of the total number of containers that would need to be handled at a geologic repository or centralized interim storage site. The manufacturing processes for the small multi-purpose canisters and overpacks are essentially the same as those for the larger multi-purpose canister. They are discussed in Section 4.1.1.1. At the end of the entire program, about 264 storage overpacks and 30 transportation overpacks would need to be reused or recycled as discussed for the Multi-Purpose Canister Alternative. (Section 4.5.2)

3.7 Alternatives Eliminated from Detailed Analysis

Most types of spent nuclear fuel container systems either in use or proposed for use have been included as alternatives to be analyzed in this EIS. This section describes alternatives that were considered and subsequently eliminated from detailed analysis.

The universal cask, or multi-purpose unit, is a concept for a single cask that would satisfy all the requirements for storage, transportation, and disposal of naval spent nuclear fuel and special case waste. The multi-purpose unit would function as the multi-purpose canister system does, but the various overpacks would be integral parts of the universal cask. As with the multi-purpose canister, the individual spent fuel assemblies would not be handled again after sealing. Because the two systems are functionally similar, and because no feasible universal cask design currently exists that would be capable of receiving Nuclear Regulatory Commission certification, the universal cask was not considered further.

License applications for other systems of the types already described might be submitted in the future by vendors. Any potential impacts of using such proposed canisters or casks are expected to be bounded by the alternatives evaluated in this EIS. Therefore, other potential designs were not analyzed further.

All of the alternatives addressed in this EIS utilize dry storage of naval spent nuclear fuel at INEL. Storage of naval spent nuclear fuel in water pools compared with dry storage has been described in detail in the Programmatic SNF and INEL EIS (DOE 1995 Volume 1, Appendix D, Attachment C). That EIS concluded that naval spent nuclear fuel could be stored either way without significant impact on human health or the environment, and presented Nuclear Regulatory Commission conclusions on these two storage methods. The Nuclear Regulatory Commission concluded that for dry storage, all areas of safety and environmental concern (such as maintenance of systems and components, prevention of material degradation, and protection against accidents and sabotage) have been addressed and shown to present no more potential for adverse impact on the environment and public health and safety than storage of spent nuclear fuel in water pools. The Nuclear Regulatory Commission also concluded that dry container storage involves a simpler technology than that represented by water storage systems (NRC 1984). In addition, the use of water pools was eliminated from detailed analysis because the agreement between the State of Idaho and the Federal government involving the shipment of additional spent nuclear fuel to the INEL includes a provision that all spent nuclear fuel at INEL will be transferred from wet storage to dry storage (U.S. District Court, 1995).

Analyses in this EIS are based on the use of rail transportation for naval spent nuclear fuel because it is current practice for pre-examination naval spent nuclear fuel. Since 1957, over 660 container shipments of pre-examination naval spent nuclear fuel have been made safely to INEL by rail from shipyards and prototypes. It is a reasonable extension of proven technology to evaluate alternative container systems for rail shipments of post-examination naval spent nuclear fuel from

INEL to a notional or representative repository. With this experience base of safe transportation by rail, it is not the purpose of this EIS to change to another mode of transportation for naval spent nuclear fuel, such as to transportation by legal-weight truck. The proposed action of this EIS does not entail actual shipment to a geologic repository or to a centralized interim storage site. Including the impacts of transporting the container system to, and unloading at a representative or notional interim storage facility or repository, ensures that the container system selected is compatible with these operations at the facilities to the extent they are understood at this time.

The use of trucks as the principal means for transporting naval spent nuclear fuel was also eliminated from detailed analysis in this EIS for other reasons. Rail transport permits the shipment of a greater number of spent fuel assemblies in each shipment than truck transport, resulting in fewer shipments. Those container systems which can be physically accommodated by truck would require many more shipments, with resultant increased environmental impacts. Preliminary estimates show that at least five times the number of shipments would be required for transport by truck as compared to rail. Since each container must be designed to the same regulatory requirements (10 CFR 71), each container would be expected to produce about the same radiological dose rate on the exterior surface of the container. However, considering the population distribution and proximity of people along and on the truck route, each truck shipment results in about five times greater radiation exposure than a rail shipment. Thus the five times greater number of shipments required for truck rather than rail transportation would be expected to result in about twenty-five times greater radiological dose to the public and workers. Transportation accident rates in general commerce are higher per truck mile than per rail mile (Saricks and Kvitek, 1994). While the accident rate is not large for either rail or truck, the number of accidents could be about five times larger for truck shipments than for rail due to the greater number of shipments.

In addition, the location of an interim storage facility or a repository is not known at this time. Since the location is not known, there are no details concerning the method of access into the site. A possible location (Yucca Mountain) has been included in this EIS only for transportation analysis purposes, since it is the only location identified for characterization in the Nuclear Waste Policy Act.

In view of the above, the Naval Nuclear Propulsion Program has eliminated from consideration a shift to legal-weight truck transportation as a reasonable alternative to be evaluated in detail in this EIS for naval spent nuclear fuel. The ultimate decision on transportation options (legal-weight truck, some combination of legal-weight truck and rail or rail/heavy-haul truck) will be made by the Department of Energy on the basis of analyses to be performed in the repository EIS.

3.8 Comparison of Alternatives

This section provides comparisons among the alternatives as they relate to the activities associated with naval spent nuclear fuel and special case waste. The comparisons focus on those topics that are projected to have the more important environmental impacts during manufacturing, during loading, storage, and unloading at facilities, or along transportation routes, as discussed in Chapters 4, 5, 6, and 7. The impacts for most impact categories are small or nonexistent. The topics not discussed in detail because of small or nonexistent impacts include noise and visual resources, water resources, ecological resources, cultural resources, soils and geology, and utilities and energy.

The principal differences among the alternatives occur in the categories of occupational and public health and safety (including normal operations and accidents for facility operations and transportation operations) and total radiological impacts. Even in these categories, the overall impacts and the differences among the alternatives are small and indicate that only negligible unavoidable adverse effects are anticipated.

Some of the activities described in this EIS would result in radiation exposures to the workers and the public from facility operations and transportation activities. Additional radiation exposures could occur as a result of transportation or facility accidents. Any radiation exposures from these activities would be in addition to exposures that normally occur from natural sources such as cosmic radiation (involuntary exposure) and from artificial sources such as chest x-rays (voluntary exposure).

Summaries of radiological impacts resulting from normal operations and from hypothetical accidents are provided in Tables 3.2 and 3.3, respectively.

Table 3.2 provides an overall comparison of the alternatives during normal operations. This comparison is presented in terms of the increase in the latent cancer fatalities that could occur in the general population due to loading, dry storage, unloading, or transportation to a geologic repository or centralized interim storage site during the 40-year period after an alternative has been implemented. This increase in latent cancer fatalities is subdivided to show how much is associated with normal operations at the facilities and with incident-free transportation operations involving naval spent nuclear fuel and special case waste.

For example, it is calculated that for the Multi-Purpose Canister Alternative in which naval spent nuclear fuel might be stored, shipped, and disposed of, there would be:

- An increase of between about 2.2 one millionths (2.2×10^{-6}) to 2.0 one hundred thousandths (2.0×10^{-5}) of a latent cancer fatality in the 40-year period for the general population around the Naval Reactors Facility or Idaho Chemical Processing Plant due to loading and storage of naval spent nuclear fuel before shipment to a geologic repository or centralized interim storage site. That is, over the next 40 years, less than one additional latent cancer fatality would be expected among the 120,000 people who live within 50 miles (approximately 80 km) of the facility, or about one latent cancer fatality if the entire handling and storage program for this fuel were repeated more than 50,000 times.

- No increase in latent cancer fatalities in the 25-year period for the general public around a geologic repository or centralized interim storage site if either the large or the small multi-purpose canister were selected, because the multi-purpose canister would be sealed and would not contribute any airborne releases. Any of the other alternatives would increase the latent cancer fatalities in the general public by about 0.00030 during the 25-year period.

- An increase of about 0.0075 latent cancer fatalities in the 25-year period for the general population along the transportation routes due to incident-free transportation of naval spent nuclear fuel to a geologic repository or centralized interim storage site. That is, during those 25 years, less than one latent cancer fatality would result, or about one fatality if the entire transport program for this fuel were to be repeated about 130 times.

TABLE 3.2 Summary of Collective Doses and Latent Cancer Fatalities (and Risk) in the General Population Due to the Normal Operations of Loading, Dry Storage, Unloading, and Incident-Free Transportation of Naval Spent Nuclear Fuel and Special Case Waste, 1996-2035[a,b]

Alternative	NRF		ICPP		Repository/Centralized Interim Storage Facility		Transportation[c]	
	Collective Dose Person-Rem	Latent Cancer Fatalities	Collective Dose Person-Rem	Latent Cancer Fatalities	Collective Dose Person-Rem	Latent Cancer Fatalities	Collective Dose Person-Rem	Latent Cancer Fatalities
MPC	0.0044	2.2×10^{-6}	0.039	2.0×10^{-5}	0[d]	0[d]	15	7.5×10^{-3}
NAA	0.37	1.9×10^{-4}	0.31	1.5×10^{-4}	0.60	3.0×10^{-4}	2.0	1.0×10^{-3} [e]
CTR	0.37	1.9×10^{-4}	0.31	1.5×10^{-4}	0.60	3.0×10^{-4}	1.6	8.0×10^{-4} [e]
TSC	0.0044	2.2×10^{-6}	0.039	2.0×10^{-5}	0.60	3.0×10^{-4}	14	7.2×10^{-3}
DPC	0.0044	2.2×10^{-6}	0.039	2.0×10^{-5}	0.60	3.0×10^{-4}	15	7.4×10^{-3}
SmMPC	0.0044	2.2×10^{-6}	0.039	2.0×10^{-5}	0[d]	0[d]	24	1.2×10^{-2}

[a] Notation: SNF = naval spent nuclear fuel; SCW = special case waste; MPC = Multi-Purpose Canister; NAA = No-Action Alternative; CTR = Current Technology/Rail; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister, NRF = Naval Reactors Facility (including the Expended Core Facility), and ICPP = Idaho Chemical Processing Plant. Both NRF and ICPP are at INEL.

[b] Values from Tables A.10, A.11, A.12, and B.10. This table assumes 40 years of exposure to loading and dry storage operations for NRF (28 years for ICPP loading) and 25 years of exposure to transportation and repository operations.

[c] Transportation values from Table B.10 are for 25 years of shipments.

[d] Sealed MPCs would not contribute any airborne releases; they would not have to be re-opened.

[e] Actual historic measured dose rates have been used for the M-140 casks.

The results in Table 3.2 indicate that the collective doses and latent cancer fatalities for 40 years of normal operations at the Naval Reactors Facility and at the Idaho Chemical Processing Plant are noticeably higher for the No-Action Alternative and the Current Technology/Rail Alternative. This is due mainly to the assumed release of carbon-14 from opening of containers in dry storage to place fuel assemblies into the M-140 transportation cask at the Naval Reactors Facility and the Idaho Chemical Processing Plant, but the corresponding risks of latent cancer fatalities are less than 0.0002. Additional details are provided in Section A.2.4. At a repository or centralized interim storage facility, the collective doses and the latent cancer fatalities are expected to be zero for both the Multi-Purpose Canister Alternative and the Small Multi-Purpose Canister Alternative because these canisters are sealed, would not have to be re-opened, and would not contribute any airborne release of radioactive material. The collective doses and latent cancer fatalities associated with incident-free transportation are noticeably lower for both the No-Action Alternative and the Current

Technology/Rail Alternative because the calculations are based on actual historic measured dose rates for the M-140 casks. This indicates that the transportation impacts for the other alternatives have been calculated conservatively and as a group are about the same.

It is important to emphasize that these latent cancer fatalities are calculated results rather than actual expected fatalities. This is because the expected number of such fatalities during normal operations is so small as to be unmeasurable and indistinguishable relative to the larger number of such deaths expected from naturally occurring conditions and other man-made effects not related to naval spent nuclear fuel operations. This is not meant to trivialize the importance of radiation-induced cancer fatalities but, rather, to put the issue in perspective.

How should one interpret a noninteger number of latent cancer fatalities, such as 0.05? The answer is to interpret the result as a statistical estimate. That is, 0.05 is the *average* number of deaths that would be expected if the same exposure situation were applied to many different groups of 100,000 people. In most groups, nobody (0 people) would incur a latent cancer fatality from the 0.001 rem (1 millirem) dose each member would have received. In a small fraction of the groups, 1 latent fatal cancer would result; in exceptionally few groups, 2 or more latent fatal cancers would occur. The *average* number of deaths over all the groups would be 0.05 latent fatal cancers (just as the average of 0, 0, 0, and 1 is 1/4, or 0.25). The most likely outcome is 0 latent cancer fatalities.

These same concepts apply to estimating the effects of radiation exposure on a single individual. Consider the effects, for example, of exposure to background radiation over a lifetime. The "number of latent cancer fatalities" corresponding to a single individual's exposure over a (presumed) 72-year lifetime to 0.3 rem (300 millirem) per year is the following:

1 person x 0.3 rem (300 millirem)/year x 72 years x 0.0005 latent cancer fatalities/person-rem = 0.011 latent cancer fatalities.

Again, this should be interpreted in a statistical sense; that is, the estimated effect of background radiation exposure on the exposed individual would produce a 1.1 percent chance that the individual might incur a latent fatal cancer caused by the exposure. Said another way, about 1.1 percent of the population is estimated to die of cancers induced by the radiation background.

The dose-to-risk conversion factors presented above and used in this EIS to relate radiation exposures to latent cancer fatalities are based on the "1990 Recommendations of the International Commission on Radiation Protection" (ICRP 1991). These conversion factors are consistent with those used by the U.S. Nuclear Regulatory Commission in its rulemaking "Standards for Protection Against Radiation" (U.S. Nuclear Regulatory Commission, 1991). In developing these conversion factors, the International Commission on Radiological Protection reviewed many studies, including *Health Effects of Exposure to Low Levels of Ionizing Radiation, BEIR V* (National Academy of Sciences/National Research Council 1990) and *Sources, Effects and Risks of Ionizing Radiation* (United Nations 1988). These conversion factors represent the best-available estimates for relating a dose to its effect; most other conversion factors fall within the range of uncertainty associated with the conversion factors that are discussed in the National Academy of Sciences/National Research Council publication (1990). The conversion factors apply where the dose to an individual is less than 20 rem (20,000 millirem) and the dose rate is less than 10 rem (10,000 millirem) per hour. At doses greater than 20 rem (20,000 millirem), the conversion factors used to relate radiation doses to latent cancer fatalities are doubled. At much higher doses, prompt effects, rather than latent cancer fatalities, may be the primary concern. Unusual accident situations that may result in high radiation doses to individuals are considered special cases.

Table 3.3 presents the estimates of the average annual risk of latent cancer fatalities in the general population from hypothetical accidents involving naval spent nuclear fuel at the facilities or during transportation. The values are subdivided to show how many are estimated to occur at the Naval Reactors Facility, the Idaho Chemical Processing Plant, at a geologic repository or centralized interim storage facility, or along the transportation route to a repository or centralized interim storage site. The risks with special case waste alone would be smaller by a factor of about five.

TABLE 3.3 Average Annual Risk of Latent Cancer Fatalities in the General Population from Hypothetical Accidents Involving Naval Spent Nuclear Fuel at Facilities or during Transportation[a]

Alternative	NRF	ICPP	Repository/Centralized Interim Storage Facility	Transportation[b,c]
Multi-Purpose Canister	1.7×10^{-7}	2.4×10^{-6}	$1.5 \text{ x } 10^{-8}$	1.1×10^{-7}
No-Action	1.7×10^{-7}	2.4×10^{-6}	1.0×10^{-8}	8.8×10^{-8}
Current Technology/Rail	1.7×10^{-7}	2.4×10^{-6}	1.8×10^{-8}	8.4×10^{-8}
Transportable Storage Cask	1.7×10^{-7}	2.4×10^{-6}	1.8×10^{-8}	1.4×10^{-7}
Dual-Purpose Canister	1.7×10^{-7}	2.4×10^{-6}	1.8×10^{-8}	1.2×10^{-7}
Small Multi-Purpose Canister	1.7×10^{-7}	2.4×10^{-6}	1.0×10^{-8}	1.0×10^{-7}

[a] Values from Tables A.3 and B.12. Notation: NRF = Naval Reactors Facility; ICPP = Idaho Chemical Processing Plant.
[b] The larger value for either submarine or surface ship fuel assemblies was used.
[c] Values from Table B.12 divided by 25 years to estimate the average annual risk.

For example, it is calculated that for the Multi-Purpose Canister Alternative in which naval spent nuclear fuel might be stored, shipped, and disposed of, there would be:

- An increase of about 2.4 one millionths ($2.4 \text{ x } 10^{-6}$) in the usual risk of a latent cancer fatality per year for the general population due to the facility accident with the highest risk. That is, about one in 400,000 years of continuous operations. In this case, the accident presenting the highest risk would be associated with the handling and storage of naval spent nuclear fuel at the Idaho Chemical Processing Plant location at INEL.

- An increase of about 1.5 one hundred millionths ($1.5 \text{ x } 10^{-8}$) per year in the usual risk of a latent cancer fatality for the general population due to hypothetical accidents at the repository surface facilities. That is, one additional fatality in about 60 million years.

- An increase of about 1.1 ten millionths (1.1×10^{-7}) in the usual risk of a latent cancer fatality per year for the general population due to hypothetical transportation accidents en route from INEL to a geologic repository or centralized interim storage site. That is, one additional fatality in about 9 million years of continuous operations.

Table 3.3 above shows the risks of latent cancer fatalities due to the potential accidents associated with handling, storage, and transportation of naval spent nuclear fuel for any of the alternatives. In all of these cases, many additional years of repetition of the actions considered would be required before a single additional latent cancer fatality would be expected to occur. The results also indicate that the risks of latent cancer fatalities from the hypothetical accidents at these facilities and during transportation are about the same for all of the alternatives evaluated; among the alternatives in each category, the ranges of results are all within a factor of two.

Hypothetical accidents are evaluated to estimate the highest number of latent cancer fatalities. In the unlikely event of a serious accident involving a plane crash into a dry storage area for naval spent nuclear fuel, it is estimated that about 600 acres (approximately 240 ha) of land would be affected in the most severe case (see Appendix A). Smaller areas of land would be affected in the other accidents analyzed. The affected area would require decontamination, and during this cleanup, temporary access controls would have to be established. The impact on issues such as socioeconomics, treaty rights, tribal resources, ecology, and land use would be relatively small and would be limited in time. The remediation actions would be simpler in rural areas than in urban areas, and provided that prudent controls and remediation operations were promptly implemented, the affected land and facilities could be recovered in either case. The accident analyses, provided in Appendices A and B and summarized in these sections, indicate that the human health effects would be small and the effects on wildlife and other biota would also be small, due partly to the limited area affected.

The slightly increased number of latent cancer fatalities associated with any alternative is based on the calculated increase in radiation dose that would be received by the general public as a result of using that alternative. The average annual dose from natural background radiation to a member of the population in the United States is approximately 0.3 rem (300 mrem) (National Council on Radiation Protection and Measurements [NCRP] 1987a). The average annual collective dose to all of the population in the United States from natural background radiation is approximately 79 million person-rem. When people are exposed to additional radiation, the number of additional radiation-induced cancers and other health effects needs to be considered. An estimate for radiation-induced latent cancer fatalities can be briefly summarized as follows:

- In a typical group of 10,000 persons who do not work with radioactive material, a total of about 2,000 (20%) will die of cancer from all causes (for example, cigarette smoking, improper diet, and chemical carcinogens).

- If each of the 10,000 persons received an additional 1 rem of radiation dose (10,000 person-rem) in their lifetime, then an estimated 5 additional latent cancer fatalities (0.05%) might occur.

- Therefore, the likelihood of a person developing a latent fatal cancer during his or her lifetime could be increased nominally from 20.00% to 20.05% by 1 additional rem of radiation dose.

The "factor" to convert dose to latent cancer fatalities for such a person, considering all possible organs, can be expressed as 0.0005 latent cancer fatality per rem of dose. This is mathematically equivalent to 5 latent cancer fatalities from 10,000 person-rem of collective dose to a large group of persons. (The factor is expressed in exponential notation as 5×10^{-4} latent cancer fatality per rem of dose.) See Section A.2.3 in Appendix A for further details on the calculations of cancer fatalities and risks.

The risks associated with any of the alternatives are low compared to many of the risks encountered in daily life. The risks of normal operations may be placed in perspective by considering other commonly encountered risks. For example, the average U.S. resident is exposed to approximately 0.5 mrem each year from the radioactivity released from combustion of fossil fuels (NCRP 1987b), which produces a lifetime risk of an average individual dying from a latent cancer of about 1 chance in 55,000. As an additional comparison, the naturally occurring radioactive materials in fertilizer used to produce food crops contribute about 1 to 2 mrem per year to an average U.S. resident's exposure to radiation (NCRP 1987b). This results in a calculated risk of death from a latent cancer between 1 chance in 12,500 and 1 chance in 25,000 over a lifetime. Risks associated with other activities encountered in daily life are included in Table 3.4.

TABLE 3.4 Risk Comparisons[a]

Cause of Death	Individual Lifetime Risk of Dying
Cancer: All causes	1 Chance in 5
Cancer: Exposure to Fossil Fuel Emissions	1 Chance in 55,000
Cancer: Naturally Occurring Radiation	1 Chance in 93
Cancer: INEL/ECF Operations	1 Chance in 30,000,000,000
Cancer: Incident-Free Transportation	1 Chance in 9,300,000
Automobile Accident	1 Chance in 87
Naval Spent Nuclear Fuel Transportation Accident	1 Chance in 39,000,000,000
Fire	1 Chance in 500
Poisoning	1 Chance in 1,000
ICPP Water Pool Draining	1 Chance in 600,000,000

[a]Notation: ECF = Expended Core Facility; ICPP = Idaho Chemical Processing Plant

A frame of reference for the risks from accidents associated with spent nuclear fuel management alternatives can be developed by comparing them to the risks of death from other accidental causes. For example, the lifetime risk of death in a motor vehicle accident is about 1 chance in 80 (National Safety Council 1993). Similarly, the lifetime risk of death for the average U.S. resident from fires is approximately 1 chance in 500 and the lifetime risk of death from accidental poisoning is about 1 chance in 1,000. The chance of being killed by lightning is approximately one chance in 39,000. Compared to these risks, the risk of a single latent cancer fatality of one in 400,000 years for an accident with a multi-purpose canister given earlier in this section is small.

The average member of the general public will not receive as much as one-thousandth of a rem of radiation dose due to the normal operations associated with any of the alternatives being considered in this EIS. The tables of radiation doses in Appendices A and B show that the principal sources of the differences in the doses associated with the radiation and radioactive materials released from normal operations and from hypothetical accidents for these alternatives are the different numbers of people who live in the vicinity of the facility being evaluated and where they live relative to the facility itself. When the emissions from the sources are essentially the same, the resulting impacts depend directly on the size of the surrounding population, on the way the population is distributed around the site in terms of the distances and direction from the particular source, and on the characteristics of the local meteorology.

Environmental justice assessments have been performed for manufacturing operations, handling and storage at INEL facilities, and for transportation of naval spent nuclear fuel. The environmental consequences and impacts on health and safety for the actions described in this EIS would be small for all population groups and therefore, it would be expected that there would be no disproportionately high or adverse impacts to any minority or low-income population.

Implementation of any of the alternatives for the management of naval spent nuclear fuel and special case waste would generate some waste with the potential for releases to air and water. To control both the volume and toxicity of waste generated and to reduce impacts on the environment, pollution prevention practices would be implemented.

The Navy and the DOE are responding to Executive Order 12856, Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements, and associated navy instructions or DOE orders and guidelines by reducing the use of toxic chemicals; improving emergency planning, response, and accident notification; and encouraging the development and use of pollution prevention technologies. Pollution prevention programs have been implemented at each Navy and DOE site. Program components include waste minimization, source reduction and recycling, and procurement practices that preferentially procure products made from recycled materials. Portions of the pollution prevention program have been implemented at the existing DOE and naval sites for nearly 10 years. Waste minimization programs have decreased the amount of all waste types generated by making material substitutions.

Implementation of the pollution prevention plans would continue to minimize the amount of waste generated during the manufacturing of containers and the handling, storage and transportation of naval spent nuclear fuel and special case waste.

3.8.1 Manufacturing Impacts

The environmental impacts of manufacturing the required containers and overpacks would be small for any of the alternatives. A summary of potential manufacturing impacts is provided in Table 3.5. Impacts due to material use and recycling and management of end-of-life equipment are discussed in Section 4.5.2 of Chapter 4.

TABLE 3.5 Summary Comparison of Manufacturing Potential Impacts[a]

Parameter	Potential Impacts from the Alternatives [b]					
	MPC	NAA	CTR	TSC	DPC	SmMPC
Air emissions (total, tons)						
Volatile organic compounds	2.7	2.3	2.0	1.9	2.6	4.4
Nitrogen oxides	3.5	3.1	2.7	2.5	3.4	5.7
Industrial accident fatalities (total numbers)	0.022	0.019	0.017	0.016	0.022	0.036
Material use (total as % U.S. annual production)						
Steel	0.018	0.020	0.016	0.018	0.019	0.023
Chromium[c]	0.22	0.24	0.12	0.29	0.18	0.25
Nickel	0.066	0.072	0.036	0.086	0.052	0.073
Lead	0.021	0.000	0.000	1.3	0.15	0.029
Depleted uranium	6.4	0.000	0.000	0.000	0.000	7.5
Waste generated (Annual average, tons)						
Liquid	0.16	0.14	0.12	0.12	0.16	0.27
Solid	0.022	0.019	0.017	0.016	0.022	0.036
Socioeconomics (% change over local baseline)						
Annual average output	0.04	0.04	0.04	0.04	0.04	0.05
Annual average income	0.04	0.04	0.04	0.04	0.04	0.05
Annual average employment	0.04	0.04	0.04	0.04	0.03	0.05

[a] Notation: MPC = Multi-Purpose Canister; NAA = No-Action; CTR = Current Technology/Rail; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister.
[b] Includes the impacts from special case waste.
[c] Compared with the Federal Strategic and Critical Inventory.

People are normally concerned about air quality in the vicinity of manufacturing locations. The small values for the estimated air emissions listed in Table 3.5 are typical of the small environmental impacts that would be involved in the manufacturing of these containers. For example, volatile organic compounds and nitrogen oxides are released from these manufacturing processes into the local atmosphere. Also, volatile organic compounds and nitrogen oxides are released to the atmosphere by other manufacturers in the same locality. The maximum contribution of the container manufacturer in a peak year to the total contributions of all manufacturers in an average year is estimated to be only 0.003% for volatile organic compounds and 0.0003% for nitrogen oxides. This indicates that the air emissions from container manufacturing would be a small part of the prevailing totals. The manufacturing impacts are considered to be small for any alternative. The impacts on air quality, health and safety, material use, waste generation, and socioeconomics from manufacturing the various components would be similar and small for all alternatives. No land-use impacts would be expected because manufacturing would likely occur at existing facilities. Disproportionately high and adverse impacts on minorities or low-income groups are not expected to occur.

The largest impacts on air quality, health and safety, and waste generation would occur under the Small Multi-Purpose Canister Alternative, due primarily to the larger number of canisters and disposal overpacks that would be required. The largest material use impacts would occur if the transportable storage cask system were chosen. The nature of the transportable storage casks as an integral storage and transportation unit means that more materials are required for this system. Total material use of the five major constituent materials over 40 years would be small compared with the current annual U.S. production rates (or, in the case of chromium, the strategic inventory). A higher percentage of depleted uranium would be required for the Multi-Purpose Canister and Small Multi-Purpose Canister Alternatives, but few alternative uses exist for this material. The largest socioeconomic impacts would occur under the Small Multi-Purpose Canister Alternative. The average socioeconomic impact is less than 0.05% for the majority of alternatives when compared to the local economic baseline in the representative manufacturing location. These socioeconomic impacts would be beneficial to the areas affected. Further details on manufacturing impacts are provided in Chapter 4. Waste generation resulting from the management of end-of-life equipment would be minimized by reuse or recycling. (Section 4.5.2)

The cost of the new containers is expressed as the output of the manufacturing operations in terms of the value of the goods and services produced at a representative location during the manufacturing period. The average annual output ranges from a minimum of $10 million (dual-purpose canister) to a maximum of $15 million (small multi-purpose canister).

The jobs associated with the fabrication of the new containers are expressed as the number of person-years of employment that would be required during the manufacturing period. The average annual employment ranges from a minimum of 130 person-years (dual-purpose canister) to a maximum of 180 person-years (small multi-purpose container). These values of output and employment are about 0.04% of the corresponding local totals. Additional details on the manufacturing impacts are provided in Sections 4.7 of Chapter 4 and C.1 of Appendix C.

3.8.2 Loading and Storage Impacts for INEL Facilities

During normal operations associated with loading and storage of naval spent nuclear fuel at INEL, there are small impacts on the public and the workers due to direct radiation and due to the release of radioactive materials to the environment. These impacts are presented in Table 3.6 as the total risk of latent cancer fatalities in the maximally exposed individuals (MEI) in the occupational group (facility workers) and in the general public due to exposure to radiation or radioactive materials released. It is important to emphasize that these latent cancer fatalities are calculated results rather than actual expected fatalities. This is because the expected number of such fatalities during normal operations is so small as to be unmeasurable and indistinguishable relative to the larger number of such deaths expected from naturally occurring conditions and other man-made effects not related to naval spent nuclear fuel operations. The differences are small among the alternatives, except that the risks to the maximally exposed individual in the general public from the No-Action Alternative and the Current Technology/Rail Alternative are higher than risks from the other four alternatives by a factor of about six. This is due to the assumed release of carbon-14 from opening of containers in dry storage to place fuel assemblies into the M-140 transportation cask. The risks to the facility worker are the same for all alternatives and do not provide a basis for distinguishing among the alternatives. Further information on the impacts of loading and storage at INEL are provided in Chapter 5.

The socioeconomic impacts associated with operations at INEL involving naval spent nuclear fuel would also be minor with any of the alternatives chosen. About 10 to 50 additional workers might be required to handle the loading of naval spent nuclear fuel into containers under any alternative. This work force would be expected to be available from within the existing INEL work force or from the local work force, so the total effect on local employment would be small. Further information on socioeconomics is provided in Appendix C.

TABLE 3.6 Total Risk of Latent Cancer Fatalities in the Maximally Exposed Individuals in the Occupational Group and in the General Population for Normal Facility Operations at INEL[a]

	Risk of Latent Cancer Fatalities[b]	
Alternative	Facility Worker	MEI, General Public
Multi-Purpose Canister	1.8×10^{-4}	4.9×10^{-9}
No-Action	1.8×10^{-4}	2.8×10^{-8}
Current Technology/Rail	1.8×10^{-4}	2.8×10^{-8}
Transportable Storage Cask	1.8×10^{-4}	4.9×10^{-9}
Dual-Purpose Canister	1.8×10^{-4}	4.9×10^{-9}
Small Multi−Purpose Canister	1.8×10^{-4}	4.9×10^{-9}

[a] Values are derived from Tables A.10 and A.11. This table assumes 40 years of exposure to loading and dry storage operations at Naval Reactors Facility (NRF), and 28 years of exposure to loading operations and 40 years of dry storage operations at Idaho Chemical Processing Plant (ICPP), for naval spent nuclear fuel and special case waste. See Section A.2.3 for perspective on calculations of cancer fatalities and risk. Notation: MEI = Maximally exposed individual.

[b] Maximum values among facility workers and the maximally exposed individuals in the general public due to facility operations at NRF and ICPP.

3.8.3 Impacts of Unloading at a Repository or Centralized Interim Storage Facility

During normal operations at the repository site or at the centralized interim storage site, there would be small impacts on the public and on the workers due to direct radiation and due to the release of radioactive materials to the environment. These impacts have been calculated and are presented in Table 3.7 as the total risk of latent cancer in the maximally exposed individuals in the occupational group and in the general public. The results indicate that the impacts would be small for both the facility worker and the maximally exposed individual in the general public. The risk to the public individual is smaller than the risk to the facility worker. Both of the Multi-Purpose Canister Alternatives are calculated to present no risk of latent cancer fatalities to either the facility worker or the maximally exposed individual in the general public. This is due to the canisters being sealed by welding and would not contribute any airborne releases. The other four alternatives are assessed as presenting equal risks and do not provide any basis for distinguishing among those alternatives. Further information on the environmental consequences of operations at a repository or centralized interim storage site are provided in Chapter 6.

TABLE 3.7 Total Risk of Latent Cancer Fatalities in the Maximally Exposed Individuals in the Occupational Group and in the General Population for Normal Facility Operations at a Repository or at a Centralized Interim Storage Site[a]

	Risk of Latent Cancer Fatalities[b]	
Alternative	Facility Worker	MEI, General Public
Multi-Purpose Canister	0[c]	0[c]
No-Action	5.4×10^{-7}	1.8×10^{-8}
Current Technology/Rail	5.4×10^{-7}	1.8×10^{-8}
Transportable Storage Cask	5.4×10^{-7}	1.8×10^{-8}
Dual-Purpose Canister	5.4×10^{-7}	1.8×10^{-8}
Small Multi-Purpose Canister	0[c]	0[c]

[a] Values are derived from Table A.12. This table assumes 25 years of exposure to unloading operations. See Section A.2.3 for perspective on calculations of cancer fatalities and risk. Notation: MEI = Maximally exposed individual.

[b] Maximum values among facility workers and the maximally exposed individuals in the general public due to unloading operations at a repository site or centralized interim storage site, including the risk from special case waste.

[c] Sealed multi-purpose canister would not contribute any airborne releases.

In contrast to the latent cancer fatalities estimated for the maximally exposed individuals in the occupational group and in the general population, shown in Tables 3.6 and 3.7, an estimate was made for the total latent cancer fatalities in the entire population of radiation workers associated with 40 years of loading and storage operations and 25 years of unloading operations. The collective worker doses ranged from 550 person-rem (Transportable Storage Cask Alternative) to 1500 person-rem (Small Multi-Purpose Canister Alternative). The corresponding latent cancer fatalities ranged from 0.22 to 0.59, or less than one latent cancer fatality in the entire group for the whole period of 40 years.

3.8.4 Transportation Impacts

During normal, incident-free transportation of naval spent nuclear fuel and special case waste, there would be impacts on the public and on the rail crew (occupational) due to direct radiation. These impacts have been calculated and the results are presented in Table 3.8 as the total risk of latent cancer fatalities in the maximally exposed individuals in the occupational group and in the general public. The results indicate that the impacts would be small in either category. The risk to the public maximally exposed individual is smaller than the risk to the occupational maximally exposed individual. Among the alternatives the risks associated with the No-Action Alternative and the Current Technology/Rail Alternative are noticeably lower than the others. This is attributed to using actual historical measured doses for the M-140 containers; the other alternatives were calculated conservatively. The Small Multi-Purpose Canister Alternative presents the largest risk because more shipments are required with the smaller canister. Further information on transportation impacts is provided in Chapter 7.

TABLE 3.8 Total Risk of Latent Cancer Fatalities in the Maximally Exposed Individuals in the Occupational Group and in the General Population for Incident-Free Transportation[a]

	Risk of Latent Cancer Fatalities[b]	
Alternative	MEI, Occupational	MEI, General Public
Multi-Purpose Canister	4.4×10^{-3}	6.7×10^{-4}
No-Action	7.2×10^{-4}	9.0×10^{-5}
Current Technology/Rail	5.7×10^{-4}	7.1×10^{-5}
Transportable Storage Cask	4.3×10^{-3}	6.4×10^{-4}
Dual-Purpose Canister	4.2×10^{-3}	6.6×10^{-4}
Small Multi-Purpose Canister	7.1×10^{-3}	1.1×10^{-3}

[a] Values are derived from Table B.10. This table assumes 25 years of exposure to transportation operations for naval spent nuclear fuel and special case waste. See Section A.2.3 for perspective on calculations of cancer fatalities and risk. Notation: MEI = Maximally exposed individual.

[b] Maximally exposed individuals, occupational and general public, due to transportation operations.

Nonradiological impacts due to incident-free transportation of naval spent nuclear fuel and special case waste have been calculated and are presented in Table 3.9. The incident-free fatalities that occur in the general public are attributed to the effects of such things as exhaust fumes from diesel-powered engines.

Nonradiological impacts due to the risk of traffic accidents are also presented in Table 3.9. These impacts are calculated from statistics that reflect the frequency of train traffic fatalities. The calculated numbers of fatalities due to traffic accidents are greater than the fatalities due to incident-free transportation. Among the alternatives, the values lie in a narrow range; the maximum is due to the Small Multi-Purpose Canister Alternative and is attributed to the larger number of shipments that this alternative requires. All of the alternative container systems would be suitable for heavy-haul transportation, as illustrated by prior use of the M-140 containers in heavy-haul transport. However, it is accurate to state that the M-140 based alternatives would be less suitable due to size, height, and weight.

TABLE 3.9 Nonradiological, Incident-Free Transportation Risk and Accident Risk for the Total Number of Shipments[a]

Alternative	Incident-Free Nonradiological Fatalities[b]	Accident Risk Traffic Fatalities[c]
Multi-Purpose Canister	5.2×10^{-4}	0.055
No-Action	6.9×10^{-4}	0.073
Current Technology/Rail	5.5×10^{-4}	0.058
Transportable Storage Cask	5.3×10^{-4}	0.056
Dual-Purpose Canister	5.0×10^{-4}	0.052
Small Multi-Purpose Canister	8.4×10^{-4}	0.089

[a] This table assumes 25 years of exposure to transportation operations for naval spent nuclear fuel and special case waste.
[b] Values from Table 7.4.
[c] Values from Table 7.5.

3.8.5 Summary of Cumulative Impacts

Manufacturing. The cumulative environmental impacts resulting from the manufacturing of container systems would be very small. The containers needed for naval spent nuclear fuel represent about 1 to 4 percent of the total number of containers needed for both naval and civilian spent nuclear fuel which would be shipped to a repository or centralized interim storage site. The total material use over the 40-year period for naval spent nuclear fuel and special case waste is less than 0.3 percent of the annual material use in the United States except for depleted uranium and lead. Use of depleted uranium and lead are also small percentages of the available materials in the United States.

Facilities. For facility operations at INEL involving handling and storage of naval spent nuclear fuel, the cumulative environmental impacts are small when compared to the impacts of operation of the entire INEL. The loading and storage operations for naval spent nuclear fuel would not result in discharges of radioactive liquids. None of the alternatives considered would cause the total air emissions to exceed any applicable air quality requirement or regulation in any radiological or non-radiological category. No additional land would have to be withdrawn from public use as a result of the handling and storage of naval spent nuclear fuel because the INEL is a federal reservation. There would be only minor cumulative impacts associated with the INEL facilities.

At a repository or a centralized interim storage site, the naval spent nuclear fuel and special case waste would be about 3 percent of the total number of containers of civilian spent nuclear fuel received at a facility over 25 years. Therefore, it is expected that the impacts of unloading naval spent nuclear fuel at a facility would have little effect on the environment and population surrounding the site.

Transportation. The total impact of the transportation of naval spent nuclear fuel and special case waste would be approximately 1 to 4 percent of the total impact of all spent nuclear fuel shipments to a geologic repository or a centralized interim storage site. The transportation risks, both radiological and nonradiological, are extremely small when compared to the cumulative impacts of the shipment of all nuclear materials in the United States (DOE 1995).

3.9 Preferred Alternative for Naval Spent Nuclear Fuel

Although the Navy did not have a single preferred alternative at the time the Draft EIS was issued, the Draft EIS noted that, ideally, the selected container system will economically allow naval spent nuclear fuel to be loaded and stored dry at INEL in the same container which will be used to ship the spent nuclear fuel outside the State of Idaho. The Multi-Purpose Canister, Dual-Purpose Canister, Transportable Storage Cask, and Small Multi-Purpose Canister Alternatives could effectively meet current and future needs, whereas the Current Technology/Rail and No-Action Alternatives would require movement of individual spent nuclear fuel assemblies from one container to another for transportation, storage, and disposal.

The identification of a preferred alternative in this Final EIS takes into consideration the following factors: (1) public comments; (2) protection of human health and the environment; (3) cost; (4) technical feasibility; (5) operational efficiency; (6) regulatory impacts; and (7) storage or disposal criteria which may be established for a repository or centralized interim storage site outside the State of Idaho. The direction of the commercial nuclear industry, standardization and technical uncertainties and risks were considered with the factors above. The selection of an alternative in the Record of Decision will consider the same factors. Based on an evaluation of these factors, summarized below, the Navy's preferred alternative for a container system for the management of naval spent nuclear fuel is a dual-purpose canister system. The overriding benefit of a canister system is that it minimizes fuel handling operations. This benefit represents efficiencies in container manufacturing, fuel reloading operations, and radiation exposure. In addition, the use of dual-purpose canisters would result in the fewest number of shipments. As with all the alternative container systems evaluated in this EIS, the Navy's preferred alternative will allow the safe storage and shipment of naval spent nuclear fuel for ultimate disposition.

This EIS also evaluates options for a dry storage facility for naval spent nuclear fuel, including existing facilities at INEL and currently undeveloped locations potentially not above the Snake River Aquifer. The technical feasibility of building a dry storage facility within INEL at a point removed from above the Snake River Plain Aquifer was considered in this EIS pursuant to the October 17, 1995 Court Order in Civil Case No. 91-00540-5-EJL (U.S. District Court, 1995) and the agreement with the State of Idaho, the U.S. Navy and the U.S. Department of Energy. Two possible locations have been identified, one located along the west boundary of INEL and the other in the northwest corner of the INEL reservation. However, neither of these locations is hydrologically removed from above the Snake River Plain and, because of their close proximity to seismic faults, they are technically undesirable locations. In addition, a facility located at either of these sites would be closer to the site boundaries and the local population than existing INEL facilities (approximately 1 mile from the INEL boundary at its closest point). If such a location would be selected, impacts would result from construction of a road and possibly a rail spur to the location as well as construction of facilities at the location and possibly rail access. A review of these areas indicates that the development of a dry storage facility at either of these remote locations might have a greater impact on Native American cultural resources, ecological resources, and land use than providing for dry storage at a site adjacent to the Expended Core Facility at the Naval Reactors Facility or at a site at the Idaho Chemical Processing Plant. These locations are assessed in Appendix F of this EIS.

The Navy's preferred alternative for a dry storage location for naval spent nuclear fuel is to utilize either a site adjacent to the Expended Core Facility at the Naval Reactors Facility or a site at the Idaho Chemical Processing Plant at INEL. These locations offer several important advantages, including already existing fuel handling facilities and trained personnel. In addition, use of these INEL facilities would protect previously undisturbed areas; development of these undisturbed sites would incur increased adverse environmental impacts while offering no environmental advantage.

3.9.1 Preferred Alternative Evaluation

In order to identify the Dual-Purpose Canister System Alternative as the preferred alternative, the Navy evaluated each of the six alternatives using several criteria. The Draft EIS identified the following factors to be considered in selecting a preferred alternative:

- Public comment
- Protection of human health and the environment
- Cost
- Technical feasibility
- Operational efficiency
- Regulatory impacts
- Storage or disposal criteria outside of the State of Idaho which may be established.

Other considerations implicit in the factors above include the direction of the commercial nuclear industry, standardization and technical uncertainties and risks.

All of the considerations cited above were weighed, as criteria, for each alternative system. A discussion of each criterion and the evaluation of the alternatives against each criterion is provided below.

Public Comments. Thirteen commenters out of approximately fifty stated a preference for one alternative or another, and there were no objections to any specific alternative. Therefore, there was no obvious preference based on public comments.

Protection of Human Health and Environment. The environmental and public health impacts from the manufacture of any of the container systems, the operations of handling, storage, transportation, and unloading at a repository, and the construction of any facilities would be small and would differ little among the alternatives.

The estimated increase in radiological risk for the No-Action and the Current Technology/Rail Alternatives is smaller than for the other alternatives because actual measured radiation levels on the M-140 were used for the incident-free transportation risk calculation. These actual measured levels are significantly lower than the levels allowed by regulation. For the other four alternatives, the maximum radiation levels allowed by regulation were used in the incident-free transportation risk calculations because no data exist showing radiation levels for naval spent fuel in such containers. For the four alternatives that used maximum allowed radiation levels, the risk increase was small and essentially the same. The increase in non-radiological risk for any of the alternatives is approximately equal, with any variations being due to differences in the number of shipments.

Because the impacts to human health and the environment for all six alternatives would be very small, all alternatives are considered to be comparable and indistinguishable under this criterion.

Cost. To compare the overall costs of each alternative, the following elements of cost were considered:

- Container procurement costs
- Handling costs
- Storage costs
- Transportation costs
- Container disposal costs
- Facility construction or modification costs.

Table 3.10 provides a summary of costs which is based mostly on procurement costs for equipment. The handling, storage, transportation and container disposal costs are factored into the overall cost ranking.

TABLE 3.10 Cost Comparisons of Alternatives

Alternative	Container Procurement Cost	No. of Times Fuel Assemblies Handled	No. of Shipments	Storage No. of Containers	Overall Cost Ranking
Multi-Purpose Canister	$280 million	1	300	150	1
No-Action	$450 million	3	425	225	3
Current Technology/Rail	$405 million	3	325	150	2
Transportable Storage Cask	$725 million	2	325	150	2
Dual-Purpose Canister	$460 million	2	300	150	2
Sm Multi-Purpose Canister	$830 million	1	500	225	2
Dual-Purpose Canister[1]	$280 million	1	300	150	1[1]

[1] Assumes that the canister is acceptable for disposal based on its similarities to the multi-purpose canister.

Notation:
1 = highest rating = lowest comparative cost
2 = medium rating = medium comparative cost
3 = lowest rating = highest comparative cost

The basis and assumptions used to estimate and compare overall costs are summarized below:

The estimated number of containers required for each alternative was used with the estimated cost per container to compare alternatives. The numbers of containers required were estimated assuming initiation of shipments to a repository in 2010 and continued disposal through the year 2035 and assuming that all of the naval spent nuclear fuel would be placed into the same type of disposal container.

The basic hardware cost includes the manufacturing of the various hardware components such as canisters; storage, transportation and disposal overpacks; casks for storage and/or transportation; and disposal containers.

The cost to develop and license a container system, costs to construct or modify facilities, and storage site construction costs were considered in the evaluation, but are considered to be small compared to the total cost and similar among alternatives.

For comparison purposes, it was assumed that for all alternatives, except the transportable storage cask, all post-examination naval spent nuclear fuel pending final disposal would be placed in a storage canister in a concrete overpack. Use of a metal cask storage overpack would be expected to increase cost proportionately for all alternatives.

The cost of actual spent fuel disposal was estimated to be approximately the same for all alternatives.

The comparison of costs other than procurement is based on the number of containers required. This comparison assumes that a shipment in any of the alternatives costs about the same, and that disposal of the storage or transportation overpacks for any of the alternatives costs about the same.

Based on the comparison of potential facility modifications required, it appears that modifications required for implementing a canister-based technology would be slightly higher than for a cask-based technology. However, the costs would be small when compared to the total facility costs and other container system procurement costs. Therefore, the facility modification costs for all of container system alternatives were estimated to be about the same.

The overall cost comparisons are based mostly on relative procurement and handling costs.

While the design criteria for the disposal packages have not yet been completely specified, it seems reasonable at this time to assume that the Dual-Purpose Canister Alternative may also meet the disposal acceptance criteria. In this event the dual-purpose canister and multi-purpose canister would entail similar costs for the ultimate disposal in a geologic repository.

To summarize, the principal differences in cost are due to the container procurement costs and handling expenses associated with spent fuel containerization.

Technical Feasibility. The technical feasibility of each container system alternative has been evaluated for two representative naval fuel configurations: a submarine and a surface ship. The difference in these configurations is simply dimensional with the surface ship spent fuel being larger. Structural, criticality, shielding, and thermal performance of the representative fuels in each of the six container system alternatives have been considered. The conclusion is that all of the container alternatives technically support the storage, shipment, and disposal of naval spent nuclear fuel.

All of the alternatives would be equally satisfactory under this criterion.

Operational Efficiency. The processes which must be performed for any of the alternatives include: loading fuel into storage containers, unloading fuel from storage containers for shipment, off-site transport, and loading or reloading fuel at a geologic repository surface facility for ultimate disposal. Each of these general operations may be performed once, multiple-times, or not at all, depending on the system implemented.

Each of the alternatives can be categorized as either a cask or a canister system based on whether the naval spent nuclear fuel would be transferred from storage for shipment as individual fuel assemblies or as a unit inside a sealed package (canister). Several steps are required to unload the individual fuel assemblies from a canister; however, canister unloading at INEL is not anticipated. It is assumed that if the canister is unacceptable for placement in the repository, it will be unloaded at the repository and the fuel recontainerized there for ultimate disposal. The unloading of individual fuel assemblies is not assumed for the Multi-Purpose Canister Alternatives since it is assumed those canisters meet repository waste acceptance criteria.

It is concluded from the process evaluation that multi-purpose canister systems would be more efficient systems when considering the handling of fuel. The most inefficient systems from this standpoint are the No-Action and the Current Technology/Rail Alternatives because individual fuel assemblies must be handled for each packaging operation.

Individual fuel assemblies would not have to be unloaded from the canisters once they had been loaded for the multi-purpose canister alternatives. The individual fuel assemblies would be handled only one time: during the initial loading of the canister.

For the dual-purpose canister system, the individual fuel assemblies would be loaded into a canister prior to storage. The canister would not need to be reopened prior to packaging the canister for transportation. It is possible that at a geologic repository the individual fuel assemblies may need to be handled in the process of packing disposal containers. If the canisters meet the disposal criteria, when they are established, the dual-purpose canister system in effect becomes the multi-purpose canister system in that the individual fuel assemblies will be handled only once.

For the transportable storage cask the individual fuel assemblies will be placed into the cask prior to storage and transportation of the naval spent nuclear fuel. At a geologic repository the individual fuel assemblies would be handled a second time for packaging into the disposal containers.

Although handling fuel is routinely accomplished safely without impact on human health or the environment, doing it multiple times is inefficient, incurs additional occupational radiation exposure, and some risk.

Based on both the process evaluation and the comparison of operational complexities associated with each alternative, it is concluded that the multi-purpose canister systems are ranked highest in regard to operational efficiency. The dual-purpose canister and the transportable storage cask alternatives require that the fuel assemblies are handled two times. However, if a dual-purpose canister is found to be acceptable for disposal, it would be considered equivalent to the multi-purpose canister system. The two current technology alternatives clearly require the most handling of individual fuel assemblies.

Regulatory and Disposal Criteria Impacts. This criterion includes the impact that changes to regulations for spent nuclear fuel may have on any of the alternatives. The regulations on storage, transportation, and repository disposal and the repository requirements on the material to be disposed are subject to revisions.

At this time, the only anticipated changes that may affect the preferred alternative are in the area of repository disposal regulations. The Nuclear Regulatory Commission has stated that the repository disposal regulations of 10 CFR 60 will be revised. The Environmental Protection Agency is expected to issue revised draft standards for a geologic repository by the end of 1996. The Nuclear Regulatory Commission will issue changes to 10 CFR 60 to establish design criteria within one year of the issue of the Environmental Protection Agency standards.

Based on the uncertainties and far term nature of the disposal regulations, there are no discernible advantages or disadvantages associated with any of the alternatives based on potential impact of disposal regulations. No impacting changes in the storage and transportation regulations are anticipated and all of the alternatives would meet the current regulations.

All of the alternatives are considered to be equal under this criterion.

Direction of Industry and Standardization. In implementing a container system for the management of naval spent nuclear fuel, there is an advantage in utilizing a system compatible with the systems in use or planned for use by operators of reactors which commercially generate electricity. The reason for this criterion is that all spent nuclear fuel, commercial and naval, is likely to be destined for the same geologic repository or centralized interim storage site with naval spent nuclear fuel containers representing only about 1 to 4 percent of the total number of containers that would be shipped to such a facility. Therefore, to the extent that the most widely used systems for commercial spent nuclear fuel drive any repository design or acceptance criteria, it is considered prudent to utilize a system which is similar to the systems being used or planned for use by commercial electrical utilities. In addition, there are other advantages to using the same system or one similar to that the commercial utilities have recently licensed through the Nuclear Regulatory Commission. The advantages are that extensive technical reviews have already been conducted, peer and public review have been accomplished, and some proven applications may be in operation.

The majority of the new spent nuclear fuel storage systems being designed or in review by the Nuclear Regulatory Commission are dual-purpose systems with different overpacks for storage and transport.

The 125-ton multi-purpose canister, the 75-ton multi-purpose canister, the transportable storage cask and the dual-purpose canister system all fulfill this criterion. The No-Action and the Current Technology/Rail Alternatives do not meet this criterion.

Technical Uncertainties and Risks. There are no substantial technical uncertainties associated with the loading of naval nuclear spent fuel into storage containers, the storage of the containers at INEL, or the transportation off-site to a geologic repository. All of the alternatives assume the use of containers which will meet the storage requirements of 10 CFR 72 and the transportation requirements of 10 CFR 71. Several licensed systems are currently in use and other new systems are in the review cycle for Nuclear Regulatory Commission approval for use.

The waste acceptance criteria for a geologic repository have not yet been established. As a result there is some uncertainty in implementing a multi-purpose canister system. Since the current design uses welded closures, if the canister would not be compatible with the geologic repository criteria, the fuel canisters may need to be reopened, the individual fuel assemblies may have to be rehandled, and placed into acceptable disposal containers. In this event the multi-purpose canister system would be similar to the dual-purpose canister system. For the dual-purpose canister system or the cask-based systems rehandling of the individual fuel assemblies has been considered in the evaluation of the alternatives.

3.9.2 Preferred Alternative Summary

After consideration of the factors discussed above, the preferred alternative for a container system for the management of naval spent nuclear fuel is the Dual-Purpose Canister Alternative. A system allowing the naval spent fuel assemblies to be loaded into a canister with a welded closure which can be placed into separate shielded storage overpacks and transportation overpacks would allow the Navy to take advantage of savings in costs, occupational exposure, handling complexity, and environmental impacts associated with handling and waste generation in comparison to the No-Action and Current Technology/Rail Alternatives which require additional handling of individual fuel assemblies.

While a multi-purpose canister system has the potential to produce even greater savings in these areas, the disposal container design and waste acceptance requirements for a geologic repository have not yet been established. This means that multi-purpose canister systems do not provide any definite functional advantages over the dual-purpose canister system at this time.

SECTION 4.0
ENVIRONMENTAL IMPACT OF MANUFACTURING
ALTERNATIVE CONTAINER SYSTEMS

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TABLES

4.0 ENVIRONMENTAL IMPACTS OF MANUFACTURING ALTERNATIVE CONTAINER SYSTEMS

This chapter discusses the environmental impacts of manufacturing alternative container systems for the management of naval spent nuclear fuel and special case waste. For each alternative, the impacts on air quality, health and safety, material availability, waste generation, socioeconomics and environmental justice from manufacturing the various alternatives would be very small. No land-use impacts would be expected because manufacturing would likely occur at existing facilities. Disproportionately high and adverse impacts on minorities or low income groups are also not expected.

Additional information on the environmental impacts of manufacturing specific existing spent nuclear fuel containers can be found in Environmental Assessments prepared by the Nuclear Regulatory Commission (NRC 1994a,b). This chapter describes the environmental setting of a representative manufacturing facility, the analytical approaches used to assess environmental impacts of manufacturing, and the results of these assessments.

4.1 Overview

The evaluation of manufacturing impacts focuses on ways in which manufacturing the various container systems could affect environmental attributes and resources at a representative manufacturing site. The assessment is not site-specific because the ultimate location or locations of facilities chosen to manufacture hardware components for any of the alternatives is not known. The actual manufacturing site will be determined by competitive bidding open to all manufacturers, and ultimately more than one manufacturer might be selected if needed. To perform the assessment, a representative manufacturing site was defined based on five facilities that currently produce casks, canisters, and related hardware for the management of spent nuclear fuel. These facilities fabricate components on behalf of firms with cask and canister designs approved by the Nuclear Regulatory Commission. The operations of the five manufacturing facilities are used as the basis for the assessment of manufacturing impacts. It is likely that these facilities and their environmental settings would be representative of facilities that might be chosen to manufacture hardware components for any of the alternatives. The evaluation of environmental impacts from manufacturing Navy container systems considers fabrication processes used at existing facilities together with the total number of hardware components required to implement each alternative.

Illustrations of loading operations and schematic diagrams of the container systems and dry storage and transportation overpacks appear in Appendix D. These illustrations provide an overview of some of the key types of hardware that would have to be manufactured under the various alternatives.

4.1.1 Manufacturing Processes

The alternatives defined in Chapter 3 identify the major components required for each hardware system. The alternatives consider a variety of storage and transportation container designs which consist of a few different components: canisters (with storage, transportation, and possibly, disposal overpacks), casks (including storage casks, transportable storage casks, and M-140 transportation casks) and disposal containers (canisters and overpacks). The hardware components required for each alternative for naval spent nuclear fuel and special case waste are listed in Table 4.1.

The numbers are based on the assumption that a repository or centralized interim storage site would be opened by 2010. Additional storage containers (approximately 10%) for the Current Technology/Rail Alternative and storage overpacks (approximately 10%) for the Small Multi-Purpose Canister Alternative might be required if the opening of a repository were delayed 5 years. The additional equipment required by a delayed opening would not alter any conclusions for manufacturing of alternative container systems. The number of storage overpacks or containers might be slightly less if a repository or centralized interim storage site were opened before 2010. Note that a transfer overpack was not included in Table 4.1 because only three or four would be required at INEL.

For each alternative, basket assembly designs were developed for naval spent nuclear fuel based on: 1) the geometry of the fuel relative to the container geometry, 2) the structural capability of the basket assemblies to support the fuel in a hypothetical shipping accident, and 3) the fuel and basket weights relative to the weight capacity of the container. Using these basket assembly designs, the number of containers required for each alternative was projected for the estimated number of naval spent nuclear fuel assemblies identified for shipment to a repository or centralized interim storage site.

TABLE 4.1 Hardware Requirements for Each Alternative Container System for Naval Spent Nuclear Fuel and Special Case Waste

	Total Life of Project Requirement per Alternative[a,b]					
Hardware Component	MPC	NAA	CTR	TSC	DPC	SmMPC
Canisters	360	-	-	-	345	585
TSC	-	-	-	171	-	-
Storage overpacks	180	255	176	-	173	264
Storage containers	-	255	176	-	-	-
Transportation overpacks	18	-	-	-	18	30
M-140 transportation casks	-	28	28[c]	-	-	-
Disposal containers	-	360	360	360	360	-
Disposal overpacks	360	-	-	-	-	585

[a] Notation: Storage containers = single-purpose storage canisters or storage casks, MPC = Multi-Purpose Canister; NAA = No-Action; CTR = Current Technology/Rail; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister.
[b] Assumes a repository or centralized interim storage site will be available by 2010.
[c] High-Capacity M-140 transportation cask

The designs and materials needed for the Multi-Purpose Canister Alternatives are based on the conceptual design described by TRW (1994) because no multi-purpose canister system yet exists. The designs and material needs for other cask and canister systems are based on information provided in Safety Analysis Reports submitted to the Nuclear Regulatory Commission for each system chosen to represent an alternative. Other similar containers could be developed and could be chosen. Fabricating the equipment is expected to involve manufacturing processes similar to those currently used to fabricate large storage and transportation containers and related transportation equipment.

The processes and materials that would be used or are expected to be used to manufacture each component of the system are described in Sections 4.1.1.1 through 4.1.1.3. As noted below, some uncertainty surrounds the specific materials that would ultimately be used for some of the hardware components in each alternative system being evaluated in this EIS. General descriptions of the hardware components are provided below.

4.1.1.1 Canisters and Canister Overpacks

Canisters. Canisters would likely be made by welding two stainless steel half-cylinders together, welding a thick circular plate onto the bottom of the cylinder, and securing a stainless steel basket assembly inside the cylinder. The basket assembly serves to position fuel assemblies inside the cylinder providing uniform spacing of the assemblies for better heat transfer control. Special neutron-absorbing materials would be added during manufacture of the baskets for criticality control. After the fuel assemblies were inserted, a heavy metal shield plug would be used to cover the open end and a stainless steel inner lid would be welded in place over the shield plug to close the container. A stainless steel honeycomb spacer would be placed over the inner lid and a stainless steel outer lid would be welded to the canister.

Storage Overpacks. Storage overpacks, also referred to as storage vaults, would consist of large concrete and steel structures designed to hold sealed canisters during periods of dry storage. The concrete structure would be designed to maintain structural integrity during design-basis earthquakes, tornadoes, or other natural phenomena. Either horizontal or vertical dry storage systems could be used. Such systems are already in use and hold civilian spent nuclear fuel at many commercial nuclear power plants.

Transportation Overpacks. Transportation overpacks made of stainless steel plate would be welded to form inner and outer cylindrical shells. End plates and shield plugs would be welded to the bottom ends of the shells. A plate of stainless steel would be welded to the tops of the shells to form a flange onto which a top cover could be bolted. A lead or depleted uranium gamma shield liner would then be cast or otherwise formed and inserted between the two shells. A solid, high-hydrogen, neutron shield jacket would then be placed around the outer shell and a stainless steel jacket would be placed over the neutron shield to provide surface protection to the neutron shield during handling and shipment. With the canister inserted, shield plugs would then be put into the open end and the cover plate bolted on. Large removable impact limiters made of wood, plastic foam, aluminum honeycomb, or other crushable, impact-absorbing material would be placed over the ends to protect the cask and its contents during transportation.

Disposal Overpacks. Cylindrical overpacks constructed of highly corrosion-resistant metal alloys would be loaded with previously sealed multi-purpose canisters, and the overpack would be sealed and disposed of in a repository.

4.1.1.2 Casks

Casks are heavily shielded, robust containers that are sturdy enough to be transferred, stored, and transported without the need for an additional overpack for structural support and radiation shielding.

Transportable Storage Casks. Transportable storage casks would be manufactured by making inner and outer shell cylindrical stainless steel shells from stainless steel plate welded together. Casks would be made with a gap between the inner and outer shells. Stainless steel bottoms would be welded to both the inner and outer shells to close one end of each shell. Various forged or cast trunnions and other mechanical features would be welded to the outer shell during manufacture for handling, positioning, and securing. A top flange made of machined plate would be welded to both the outer and inner shells so that the inner shell would be suspended inside the outer shell leaving a uniform gap at the sides and bottom of the cask. The gap would be filled with appropriate material for radiation shielding. A basket assembly of stainless steel or other materials would be secured inside the inner shell. Radial copper fins would be fused to the outside of the outer shell to transmit heat away from the cask. The spaces between the copper fins would be filled with a high-hydrogen-content material for neutron shielding. A stainless steel cover plate would be bolted to the top flange to close the cask but allow easy access for future removal of the fuel elements at a repository or centralized interim storage site.

M-140 Transportation Casks. The M-140 transportation cask used for naval spent nuclear fuel is unique to the Naval Nuclear Propulsion Program. The M-140 transportation cask is a large stainless steel shipping container that is transported in the vertical position on a specially designed well-type railcar. The major components of the M-140 transportation cask include the shielded container, closure head, and protective dome. Internal baskets are installed inside the container to hold the irradiated fuel assemblies in place and can be modified to accept different sized fuel assemblies. The container is shipped dry. Cooling fins on the outside of the container are designed to dissipate the heat generated by the fuel.

The M-140 transportation cask and rail car weigh approximately 190 tons (approximately 172,000 kg) in the loaded condition. The container is approximately 16 ft (approximately 5 m) tall with a maximum outer diameter of 10.5 ft (approximately 3 m). The container body is made from stainless steel forgings with 14-in. (approximately 36-cm) thick walls and a 12-in. (approximately 31-cm) thick bottom. The closure head and protective dome have a total thickness of 17.5 in. (approximately 45 cm) of stainless steel.

High-Capacity M-140 Transportation Cask. The high-capacity M-140 transportation cask will be the same as the standard M-140 but will have a basket that holds more fuel assemblies.

Storage Cask. Typically a storage cask is a thick-walled, heavily shielded, cylindrical metal container with concrete or lead layers for shielding. It is a complete single unit that does not require specialized overpacks for loading, transfer, or storage.

4.1.1.3 Disposal Containers

Disposal containers would be made of stainless steel or other corrosion-resistant material and manufactured in the same general manner as canisters. The disposal containers for naval spent nuclear fuel assemblies would have an internal basket assembly to position the fuel assemblies inside the disposal container for heat transfer control. For added longevity an outer cylindrical container made of steel with a slightly larger diameter and slightly greater length would be manufactured in the same manner as the stainless steel inner container. The loaded stainless steel inner container would be placed into the outer container, and a steel cover plate would be welded to the outer container end as a final closure and seal of the contents.

Naval spent nuclear fuel arriving at a repository in multi-purpose canisters would be placed directly inside a disposal overpack, which would consist of the same double-walled (stainless steel inside, carbon steel outside) design that would be used for uncanistered spent nuclear fuel.

4.2 Existing Environmental Settings at Manufacturing Facilities

Assessment of the environmental impacts of manufacturing the various container systems assumed a representative manufacturing site based on information regarding the environmental attributes and resources at each of the five facilities currently producing spent nuclear fuel hardware systems. The assessment was not site-specific because the ultimate locations of facilities chosen to manufacture hardware components for any of the alternatives are not known. It is likely that these facilities and the environmental settings in which they are located would be similar to any facilities that might be chosen to manufacture hardware components for any of the alternatives. The evaluation of environmental impacts from manufacturing considers fabrication processes used at existing facilities, together with the total number of hardware components required to implement each alternative. Pertinent information on environmental settings for air quality, health and safety, and socioeconomics is provided in Sections 4.2.1 through 4.2.3. The environmental impacts on air quality, health and safety, material use, waste generation, socioeconomics, and environmental justice are provided in Sections 4.3 through 4.8. Other areas of impact are discussed in Section 4.9.

4.2.1 Air Quality

The air quality attainment status representative of the manufacturing location was assessed with respect to ozone, carbon monoxide, and particulate matter. Air quality attainment areas are regions where the regulatory air standards are not exceeded. Nonattainment areas exist where sources of air pollution lead to air quality that currently violates state and/or federal regulations. For the counties in which the five manufacturing sites were located, an average of 3,800 tons (approximately 3,400 metric tons) of volatile organic compounds and 43,000 tons (approximately 39,000 metric tons) of nitrogen oxides, which are related to the production of ozone, were released into the environment in 1990, the latest year in which county-level data were available. There are no ambient air quality standards for volatile organic compounds. However, volatile organic compounds, nitrogen oxides, and, to a lesser extent, carbon monoxide are precursors to the formation of ozone in the atmosphere. Ozone has a human health air quality standard. The majority of existing sites were in nonattainment areas for ozone but not for carbon monoxide. All five sites were in attainment areas for particulates.

4.2.2 Health and Safety

There were no fatalities at any of the five existing manufacturing sites in 1994. To be conservative, representative data on the number of accidents and fatalities associated with cask and canister fabrication at the manufacturing location were based on national incidence rates for the relevant sector of the economy. In 1992, the last year for which statistics are available, the occupational fatality rate for the sector that includes all manufacturing was 3 per 100,000 workers; the occupational illness and injury rate for fabricated plate work manufacturing in 1992 was 6.3 per 100 full-time workers (U.S. Bureau of Labor Statistics 1994).

Hardware for each of the alternatives is expected to be manufactured in facilities that have had years of experience in rolling, shaping, welding, and then fabricating large metal canisters and casks. Machining operations at these facilities would involve standard procedures using established metal-working equipment and techniques. Trained personnel familiar with the manufacture of large metal canisters and casks and with the necessary equipment used to fabricate such items would typically be used. The injury and illness rate is expected to be equal to or lower than the industry rates.

4.2.3 Socioeconomics

Each of the five manufacturing facilities examined in this EIS is located in a Metropolitan Statistical Area. The counties composing each Metropolitan Statistical Area define the affected socioeconomic environment for each facility. The population of the affected environment associated with the five facilities ranged from about 431,200 to 967,300 in 1992 (U.S. Bureau of Census 1994). Output, which is the value of goods and services produced in the five locations, ranged from $18.2 billion to $55.3 billion in 1995. Income, which is wages, salaries, and property income, ranged from $9.2 billion to $26.4 billion in 1995. Employment ranged from 245,000 to 668,000 in 1995 (Minnesota IMPLAN Group 1995). Plant employment ranged from 25 to 995 in 1995. Based on this information the representative manufacturing location has a population of 643,000 and hosts a facility employing 483. Local output in the area is $29.6 billion, local income is $15.0 billion, and local employment is 385,000.

4.3 Impacts on Air Quality

Air emissions from manufacturing sites were conservatively estimated for production of the various casks and canisters. Criteria pollutants and hazardous air pollutants were predicted, and these emissions were compared with total annual emissions from existing manufacturing sites and with typical regional or county-wide emissions to determine the importance of these emissions to local air quality. Because the exact location of cask and canister manufacturing is not known for any alternative, potential emissions for existing manufacturing sites in both attainment and nonattainment areas were evaluated to provide a range of impacts.

Estimates to identify air emissions associated with the manufacture of canisters and casks were developed by using the emissions from similar canisters and casks currently manufactured based on the number of person-hours in the manufacturing process. These emissions were prorated on a per unit basis to calculate annual emissions at the typical manufacturing site, assuming that the emissions from similar activities would be proportional to the number of person-hours in the manufacturing process. To provide reasonable estimates of emissions, it was assumed that the volatile organic compounds used as cleaning fluids would fully evaporate into the atmosphere as a result of the cleaning processes used in the manufacture of canisters and casks for each alternative. Estimates of emissions were based on the total number of casks and canisters manufactured over 40 years for each alternative.

No plant expansions are expected for the manufacture of any alternative container system. Fabrication would be a normal part of the usual yearly work load of the site. Therefore, no additional air emission permits would likely be needed.

States in nonattainment areas for ozone might place requirements on many stationary pollution sources to achieve attainment in the future. This might include a variety of controls on emissions of volatile organic compounds and nitrogen oxides. Various options would be available to control emissions of these compounds to comply with emission limitations.

The analysis of air quality impacts associated with manufacturing considered whether the conformity requirements of a State Implementation Plan might apply to emissions from the manufacturing sites located in nonattainment areas. The Clean Air Act conformity rules could be met in that the planned casks and canisters would be part of the regular annual work load of the manufacturing facility. However, if an additional shift were added to handle this work load, emissions might be 50% greater than usual for the days on which the casks and canisters were manufactured on that shift. All of the alternatives were examined for additional emissions of volatile organic compounds and nitrogen oxides and compared with *de minimis* levels (*de minimis* refers to the emission levels below which the conformity regulations do not apply) for these compounds. Although the exact location or locations of the manufacturing facilities are not known at this time, there should not be a need for a general conformity determination for the manufacturing facility because the manufacturing activity would be part of the regular workload of the facility.

All estimated emissions are very small compared to annual emissions from other sources, but variation exists among the alternatives. The annual average and the total 40 year emissions from the manufacture of components for each alternative are presented in Table 4.2. Nitrogen oxides would be the largest emission, varying from 0.063 to 0.14 tons/yr (approximately 0.057 to 0.13 metric tons/yr). Estimated annual average emissions of volatile organic compounds vary from 0.048 to 0.11 tons/yr (approximately 0.044 to 0.10 metric tons/yr). Annual emissions from other sources in the typical manufacturing location for all activities are estimated to be 3,800 tons/yr (approximately 3,400 metric tons/yr) of volatile organic compounds and 43,000 tons/yr (approximately 39,000 metric tons/yr) of nitrogen oxides. Annual average emissions due to cask and canister manufacturing under any of the alternatives would be less than 0.003% of local emissions for volatile organic compounds and 0.0003% for nitrogen oxides — both unlikely to result in air quality deterioration leading to nonattainment status for these compounds.

TABLE 4.2 Air Emissions at the Representative Manufacturing Location for Alternative Container Systems

		Air Emissions (tons) per Alternative[a]					
Compound		MPC	NAA	CTR	TSC	DPC	SmMPC
Volatile organic compounds	Total	2.7	2.3	2.0	1.9	2.6	4.4
	Annual Average	0.068	0.058	0.050	0.048	0.065	0.11
Nitrogen oxides	Total	3.5	3.1	2.7	2.5	3.4	5.7
	Annual Average	0.088	0.078	0.068	0.063	0.085	0.14

[a] Alternatives: MPC = Multi-Purpose Canister; NAA = No-Action; CTR = Current Technology/Rail; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister.

Conversion factor: to convert tons to metric tons, multiply by 0.9072.

Where the manufacture of casks and canisters would involve the use of lead, it is unlikely that any lead fumes would be released into the environment. Manufacturers typically hire private companies to undertake manufacturing with lead, and these companies capture lead fumes and dispose of lead waste off-site. Some emissions of particulates and lead would occur with welding activities. However, as welding is an intermittent process, the associated emissions would be small for each alternative.

If a manufacturing site were located in a nonattainment area, limitations might be placed on increased emissions at the site in accordance with Title I of the Clean Air Act or on the basis of conformity requirements of the State Implementation Plan aimed at meeting the state's reduction in emissions of volatile organic compounds, nitrogen oxides, and carbon monoxide. For the manufacturing sites in attainment areas, air quality meets air quality standards and no additional limitations would be expected.

4.4 Impacts on Health and Safety

Data from the Bureau of Labor Statistics for metal fabrication and welding industries were used to compile baseline occupational health and safety information for industries fabricating and welding steel and steel objects similar to each alternative cask and canister system. The expected number of injuries and fatalities were computed by multiplying the number of worker-years by the injury and fatality rate for each occupation.

Table 4.3 shows the expected number of injuries, illnesses, and fatalities for each alternative based on the number of casks and canisters that would be produced over 40 years. Injuries and illnesses would range from 33 for the Transportable Storage Cask Alternative to 76 for the Small Multi-Purpose Canister Alternative. Expected fatalities over 40 years would range from 0.016 for the Transportable Storage Cask Alternative to 0.036 for the Small Multi-Purpose Canister Alternative.

TABLE 4.3 Total Number of Injuries, Illnesses, and Fatalities over 40 Years at the Representative Manufacturing Location for Alternative Container Systems[a]

	Number per Alternative[b]					
Parameter	MPC	NAA	CTR	TSC	DPC	SmMPC
Injuries and Illnesses	46	41	35	33	45	76
Fatalities	0.022	0.019	0.017	0.016	0.022	0.036

[a] Assumes one worker-year of effort of a fabricated plate manufacturing worker to produce one canister or cask (excluding storage overpacks).

[b] Alternatives: MPC = Multi-Purpose Canister; NAA = No-Action; CTR = Current Technology/Rail; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister.

The number of canisters and casks required over the life of each alternative would not place unusual demands on existing manufacturing facilities. None of the alternatives is likely to lead to a deterioration in worker safety and a resultant increase in accidents.

4.5 Impacts on Material Use

4.5.1 Material Use

Calculation of the quantity of materials used for the fabrication of each alternative canister or cask systems is based on engineering specifications of each relevant hardware component. This information has been provided by existing manufacturers for systems currently being produced or under licensing review or has been taken from conceptual design specifications for those technologies still in the planning stages. Data on per unit material quantities for each component were combined with information on the number of canisters or casks to be manufactured under each alternative. Also assessed was the impact of manufacturing the components for each alternative on the total U.S. production (or availability in the United States, if not produced in this country) of each relevant input material. Results of the assessment are expressed in terms of percent impact on total U.S. domestic production.

Table 4.4 lists the estimated total quantities of materials that would be required for each alternative over a 40 year period if a repository or centralized interim storage site facility were available in 2010. For each alternative the largest material requirement by weight, excluding concrete which is readily available, would be carbon steel, which ranges from 8,700 to 14,800 tons (approximately 7,890 to 13,400 metric tons). Smaller quantities of additional materials would be required, the most important of these being stainless steel and aluminum.

TABLE 4.4 Material Use for Alternative Container Systems

	Total Material Use (tons) per Alternative[a]					
Material	MPC	NAA	CTR	TSC	DPC	SmMPC
Aluminum	550	480	420	520	600	450
Carbon steel	10,400	12,100	11,000	8,700	12,300	14,800
Chromium[b]	2,800	3,100	1,500	3,700	2,200	3,100
Concrete	20,700	29,300	20,200	0	19,900	19,100
Copper	19	0	0	140	0	11
Depleted uranium	940	0	0	0	0	1,100
Lead	86	0	0	5,400	630	120
Nickel[c]	1,800	2,000	990	2,400	1,400	2,000
Stainless steel	9,800	10,700	5,300	12,900	7,700	10,800

[a] Alternatives: MPC = Multi-Purpose Canister; NAA = No-Action; CTR = Current Technology/Rail; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister.
[b] Stainless steel assumed to be 29% chromium.
[c] Stainless steel assumed to be 18.5% nickel.
Conversion factor: to convert tons to metric tons, multiply by 0.9072.

Table 4.5 compares the annual U.S. production capacity to the total 40 year requirements of the materials required for each alternative. Most chromium, which is an important constituent of stainless steel, is imported into the United States and is classified as a Federal Strategic and Critical

Inventory material. For comparative purposes, the data in the table were estimated as a percentage of the 1992 chromium inventory quantity rather than the U.S. production quantity.

Except for depleted uranium and lead, total material consumption for each alternative for the 40 year period of manufacturing would be less than 1.0% of the annual U.S. production. Since manufacturing would be spread across the 40 year period, the actual amount of material use in any given year would be much less than 1% of the annual U.S. production. The use of lead or steel would not produce a noteworthy increased demand and should not significantly impact the supply of either material. Use of aluminum, steel, stainless steel (nickel and chromium), concrete, and copper for the fabrication of storage and disposal components for each of the alternatives would not impact the supply of these commodities adversely.

The total amount of depleted uranium used over a 40 year period (in multi-purpose canisters only) would range from 6.4% to 7.5% of total U.S. annual production. Although considerably higher in relative terms than the use of other key materials, these requirements are small. Given the limited alternative uses of this material and the large current inventory of surplus depleted uranium hexafluoride owned by DOE, such impacts should be considered to be positive.

Lead or steel could be substituted for depleted uranium for radiation shielding in some cases. If other materials are used for this purpose, the thickness of the substituted material would increase in inverse proportion to the ratio of the density of the substituted material to the density of the depleted uranium. If lead or steel were used, the shielding thickness would increase by about 170% and 240%, respectively, resulting in a much larger container. Therefore, the use of depleted uranium is preferred.

TABLE 4.5 The Total Amount of Material Used Over 40 Years, Expressed as a Percent of Annual U.S. Domestic Production, for Each Alternative Container System

	Alternative[a]					
Material	MPC	NAA	CTR	TSC	DPC	SmMPC
Aluminum	0.012	0.011	0.009	0.012	0.013	0.010
Chromium[b]	0.22	0.24	0.12	0.29	0.18	0.25
Concrete	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	0.001	0	0	0.007	0	0.001
Depleted uranium	6.4	0	0	0	0	7.5
Lead	0.021	0	0	1.3	0.15	0.029
Nickel	0.066	0.072	0.036	0.086	0.052	0.073
Steel[c]	0.018	0.020	0.016	0.018	0.019	0.023

[a] Notation: MPC = Multi-Purpose Canister; NAA = No-Action; CTR = Current Technology/Rail; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister; < = less than.

[b] Chromium is compared with Federal Strategic and Critical Inventory.

[c] “Steel” includes the amount of steel in the stainless steel, assumed to be 52.5%.

4.5.2 Recycling and Management of End-of-Life Equipment

It is expected that all container system components not disposed of with the naval spent nuclear fuel, including the storage and transportation containers, overpacks or casks and dual-purpose canisters would be reused or recycled. Some pieces of equipment may need to be decontaminated prior to recycling. It is possible that some low-level radiological waste may result but it is not expected that the large pieces of equipment (canisters and casks) would need to be disposed of as radiological waste. Table 4.6 provides information on the container system components for all alternatives which would be reused or recycled.

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TABLE 4.6 End-of-Life Hardware for Reuse or Recycling for Each Alternative Container System for Naval Spent Nuclear Fuel and Special Case Waste

	Hardware per Alternative[a]					
Hardware Component	MPC	NAA	CTR	TSC	DPC	SmMPC
Canisters	-	-	-	-	345[b]	-
TSC	-	-	-	171[bc]	-	-
Storage overpacks	180	255	176	-	173	264
Storage containers	-	255[b]	176[b]	-	-	-
Transportation overpacks	18[c]	-	-	-	18[c]	30[c]
M-140 transportation casks	-	28[b]	28[bd]	-	-	-

[a] Notation: Storage containers = single-purpose storage canisters or storage casks, MPC = Multi-Purpose Canister; NAA = No-Action; CTR = Current Technology/Rail; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister.

[b] Hardware would require radiological decontamination.

[c] Hardware contains lead shielding.

[d] High-Capacity M-140 transportation cask.

4.5.2.1 Multi-Purpose Canister Alternative

For the Multi-Purpose Canister Alternative about 180 storage overpacks and 18 transportation overpacks would need to be managed at the end of the program. The scrap metal (including lead) would be recycled, if possible. The concrete in the storage overpacks would be managed as non-radiological solid waste. These materials are not expected to be radiologically contaminated because the naval spent nuclear fuel would be contained within the multi-purpose canister. The canisters and the disposal overpacks would be disposed of with the naval spent nuclear fuel.

4.5.2.2 The No-Action Alternative

For the No-Action Alternative about 255 storage overpacks, 255 storage containers and 28 casks would need to be managed at the end of the program. The concrete in the storage overpacks would be managed as non-radiological solid waste and the scrap metal recycled. The casks and storage containers would be reused or radiologically decontaminated prior to recycling. The disposal containers along with the naval spent nuclear fuel would be disposed of in the repository.

4.5.2.3 The Current Technology/Rail Alternative

For the Current Technology/Rail Alternative about 176 storage overpacks, 176 storage containers and 28 casks would need to be managed at the end of the program in the same manner described for the No-Action Alternative.

4.5.2.4 The Transportable Storage Cask Alternative

At the end of the program about 171 casks for the Transportable Storage Cask Alternative would be reused or radiologically decontaminated prior to recycling. It is expected from the cask design, which includes lead shielding material, that the lead would not be radiologically contaminated. The metal portions would be recycled following any radiological decontamination of surfaces. The disposal containers and naval spent nuclear fuel would be placed in a repository.

4.5.2.5 The Dual-Purpose Canister Alternative

At the end of the program about 345 canisters for the Dual-Purpose Canister Alternative would be reused or radiologically decontaminated prior to recycling. In addition 173 storage overpacks and 18 transportation overpacks would be prepared for recycling of metals including lead and disposal of the concrete as non-radiological solid waste. The disposal containers and naval spent nuclear fuel would be placed in a repository.

4.5.2.6 The Small Multi-Purpose Canister Alternative

For the Small Multi-Purpose Canister Alternative about 264 storage overpacks and 30 transportation overpacks would be managed at the end of the program in the same manner as the Multi-Purpose Alternative describes.

4.6 Impacts on Waste Generation

The primary material used in the fabrication of each container system would be stainless steel, with either depleted uranium or lead used for canister and cask shielding. The manufacture of shielding would generate hazardous or low-level radioactive waste depending on the material used. Other organic and inorganic chemicals generated by the manufacture of each alternative container system and the amounts generated have also been identified.

The annual volumes and quantities of waste produced for each alternative per canister and cask were estimated. These data were compared on the basis of information collected from current cask and canister manufacturers, and projected number of canisters and casks required. The same sources were used to estimate the amounts of waste for disposal.

The potential for impacts was evaluated in terms of existing and projected waste-handling and disposal procedures and regulations. Current fabrication facilities are regulated by the U.S. Environmental Protection Agency and the Occupational Safety and Health Administration.

Fabrication of the alternative container systems would produce liquid and solid waste at the manufacturing locations. To control volume and toxicity of wastes generated, manufacturers would comply with existing regulations. Pollution prevention and reduction practices would be implemented (see Section 4.14).

4.6.1 Liquid Waste

The liquid waste produced during manufacturing would consist of spent lubricating and cutting oils from machining operations and the cooling of cutting equipment. This material is currently recycled for reuse. Ultrasonic weld testing would generate some unpotable water containing glycerin. Water used for cooling and washing operations would be treated for release by filtration and ion exchange, which would remove contaminants and permit discharge of the treated water into the sanitary system.

Table 4.7 lists the estimated amounts of liquid waste generated by the shaping, machining, and welding of the stainless steel and steel alloy vessels required for each alternative. The annual average amount of liquid waste generated would range from 0.12 to 0.27 tons/yr (approximately 0.11 to 0.24 metric tons/yr), depending on the alternative chosen. The small quantities of waste produced during manufacturing of each alternative would not exceed the capacities of the existing equipment for waste stream treatment at the manufacturing facility.

4.6.2 Solid Waste

The solid waste generated during manufacturing operations is shown in Table 4.7. The annual average amount of solid waste generated would range from 0.016 to 0.036 tons/yr (approximately 0.015 to 0.033 metric tons/yr). This waste would consist of nickel, manganese, copper, and chromium. These chemicals could be added to existing steel product manufacturing waste streams for treatment and disposal or recycling.

The analysis assumes that depleted uranium incorporated into the canisters would be delivered to the manufacturing facility properly shaped to fit inside the canister and encased in stainless steel. This practice would not result in any waste being generated at the manufacturing location. Depleted uranium waste would be recycled at the depleted uranium manufacturing location and would not pose a threat to worker health and safety at the container manufacturing location. Lead used for gamma shielding would be cast between stainless steel components of the canisters and casks. Although it is unlikely that any substantial quantity of lead waste would be produced under any of the alternatives, if it were generated it would be recycled.

TABLE 4.7 Annual Average Waste Generated at the Typical Manufacturing Location for Alternative Container Systems

	Waste Generated (tons) per Alternative[a]					
Waste Type	MPC	NAA	CTR	TSC	DPC	SmMPC
Liquid waste	0.16	0.14	0.12	0.12	0.16	0.27
Solid waste	0.022	0.019	0.017	0.016	0.022	0.036

[a] Alternatives: MPC = Multi-Purpose Canister; NAA = No-Action; CTR = Current Technology/Rail; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister.

Conversion factor: to convert tons to metric tons, multiply by 0.9072.

4.7 Impacts on Socioeconomics

The assessment of socioeconomic impacts resulting from fabrication activities involved three elements. Engineering cost data for existing and proposed spent nuclear fuel management systems provided information on the unit cost for the various components of each existing and planned storage, transportation, and disposal technology. Second, information on the handling of naval spent nuclear fuel under each alternative provided the total number of containers and associated components to be manufactured. Finally, economic data for the county or counties composing the environmental setting for each facility were used to calculate the direct and secondary economic impacts of cask and canister manufacture on the local economy. Direct effects would occur as manufacturing facilities purchased materials, services, and labor required for each container system. Secondary effects would occur as industries and households supplying the industries that are directly affected adjusted their own production and spending behavior in response to increased production and income thereby generating additional socioeconomic impacts. Impacts were measured in terms of output (the value of goods and services produced), income (wages, salaries, and property income), and employment.

The socioeconomic analysis of manufacturing used county-level input-output economic calculations provided by a computer program called IMPLAN to project impacts of fabrication on the local economy (Minnesota IMPLAN Group 1995; see also Appendix C). To perform the analysis, IMPLAN output, income, and employment multipliers were calculated for each of the counties in which the five existing manufacturing facilities are located. Multipliers are used to estimate the secondary effects on an area's economy in response to the introduction of direct effects on its economy. The county-specific multipliers were then averaged to produce composite multipliers for a representative manufacturing location. The composite multipliers were used to analyze the impacts of each alternative.

The assessment of socioeconomic impacts was limited to estimating the direct and secondary impacts of manufacturing activities. No assessment was made of the impacts of manufacturing activities on local jurisdictions. Such an analysis would include the estimation of impacts on county, municipal government, and school district revenues and expenditures. Because production of casks and canisters would likely take place at existing facilities alongside existing product lines, it is unlikely that there would be any substantial population increase due to workers moving into the vicinity of the manufacturing sites in any given year under any alternative. Due to this lack of demographic impacts, no significant change in the disposition of local government or school district revenues and expenditures would be likely to occur. Because substantial population increases would not be expected, impacts on other areas of socioeconomic concern, such as housing and public services, were not considered.

Average annual impacts were calculated for the manufacturing period associated with each alternative. Impacts of each alternative are compared to the baseline in the representative location in 1995, with all results expressed in millions of 1995 dollars. No attempt was made to forecast local economic growth or inflation rates for the representative location because of the non-site-specific nature of the analysis. The impacts of manufacturing all major components of each alternative, which includes canisters with various overpacks, casks, and disposal containers, were calculated in the analysis.

Table 4.8 presents the impacts of each alternative on output, income, and employment in the representative manufacturing location. The results presented include the percent impact of each alternative relative to overall output, income, and employment in the economy of the manufacturing location. Additional information on the socioeconomic impacts of each alternative is presented in Appendix C.

4.7.1 Local Output

Average annual output impacts of each alternative range from about $10 million for the Dual-Purpose Canister Alternative to about $15 million for the Small Multi-Purpose Canister Alternative (Table 4.8). Output generated from each alternative would increase total local output from between 0.04% and 0.05% on average over the entire manufacturing period.

4.7.2 Local Income

Average annual income impacts of each alternative range from between $6 million to about $8 million (Table 4.8). Income generated from each alternative would increase total local income from between 0.04% and 0.05% on average over the entire manufacturing period.

4.7.3 Local Employment

Average annual employment impacts of each alternative range from between 130 person-years for the Dual-Purpose Canister Alternative to 180 person-years for the Small Multi-Purpose Canister Alternative (Table 4.8). Employment generated from each alternative would increase total local employment from between 0.03% and 0.05% on average over the entire manufacturing period.

TABLE 4.8 Socioeconomic Impacts for Alternative Container Systems at the Representative Manufacturing Location

Alternative	Average Annual Output[a]		Average Annual Income[a]		Average Annual Employment	
	$\$10^6$	% impact[b]	$\$10^6$	% impact[b]	person-years	% impact[b]
Multi-Purpose Canister	11	0.04	6	0.04	140	0.04
No-Action	12	0.04	7	0.04	150	0.04
Current Technology/Rail	12	0.04	6	0.04	140	0.04
Transportable Storage Cask	12	0.04	7	0.04	150	0.04
Dual-Purpose Canister	10	0.04	6	0.04	130	0.03
Small Multi-Purpose Canister	15	0.05	8	0.05	180	0.05

[a] Annual output and income impacts are expressed as millions (10^6) of 1995 dollars.
[b] % impact refers to percent compared with the 1995 local baseline rounded to the nearest 0.01%.

4.8 Impacts on Environmental Justice

The purpose of this environmental justice assessment is to determine if disproportionately high and adverse health or environmental impacts associated with any of the alternatives considered in this EIS would affect minority or low-income populations, as outlined in Executive Order 12898 and the President's accompanying cover memorandum (February 11, 1994). Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs and activities on minority and low-income populations. 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.

For purposes of this study, definitions of minority and low income are consistent with those used by the U.S. Bureau of the Census in the 1990 census of population and housing (U.S. Bureau of Census 1992). Minority populations consisted of individuals who reported themselves as belonging to Black (persons who defined themselves as Black or Negro, African American, Afro-American, Black Puerto Rican, Jamaican, Nigerian, West Indian, or Haitian); American Indian, Eskimo, or Aleut; Asian or Pacific Islander; White Hispanic; and “Other Race” categories. Low-income populations consisted of those families that fell below the 1989 poverty line.

The environmental justice assessment considered human health and environmental impacts from the examination of impacts on air quality, waste generation, and health and safety for each alternative canister and cask system. The assessment used demographic data to provide information on the degree to which minority or low-income populations would be affected disproportionately. The evaluation identifies as areas of concern those in which disproportionately high and adverse impacts affect minority and low income populations.

This evaluation of environmental justice considered the characteristics of five facilities that currently manufacture casks or canisters for spent nuclear fuel. Table 4.9 presents the percent minority and low-income population associated with these five facilities. For each facility the analysis considered a region defined by a 10-mi (approximately 16-km) radius around the site. The percentages of minority and low-income persons composing the population of each of the states in which existing manufacturing facilities are located are presented as references for the purpose of defining disproportionality. Except for the Akron, Ohio facility, the percentages of minority and low-income population are below those of the state in which each is located.

TABLE 4.9 Percent Minority and Low-Income Populations in Typical Manufacturing Locations, 1990

	Minority Population (%)		Low-Income Population (%)	
Existing Manufacturing Locations	Local[a]	State	Local[a]	State
Westminster, Mass.	8.6	12.0	8.1	8.9
Greensboro, N.C.	22.6	24.9	8.6	13.0
Akron, Ohio	14.4	12.9	13.4	12.5
York, Pa.	6.9	12.2	9.6	11.1
Chattanooga, Tenn.	20.0	20.1[b]	13.6	15.5[b]

[a] Local percentages refer to populations within a 10-mi (approximately 16-km) radius of each facility.
[b] Weighted averages over portions of the two states of Tennessee and Georgia.
Source: Data from U.S. Bureau of the Census (1992, 1994).

4.8.1 Environmental Justice Assessment

To explore potential environmental justice concerns, this assessment examined the composition of populations living within 10 mi (approximately 16 km) of five manufacturing facilities used to identify the number of minority and low-income individuals in each area. This radius was selected because it would capture the most broadly dispersed environmental consequence associated with the manufacturing activities considered in this EIS, namely impacts to air quality. The number of persons contained in each target group within the circumscribed area was compared with the total population in its respective area to yield the proportion of minority and low-income populations within 10 mi (approximately 16 km) of each facility.

A geographic information system was used to define areas within 10 mi (approximately 16 km) of each facility. Linked to 1990 census data, this analytical tool enabled the identification of block groups within 10 mi (approximately 16 km) of each facility. In cases where the 10 mi boundary cut block groups, the geographic information system calculated the fraction of the total area of each interested block group lying within the prescribed distance. This fraction provided the basis for estimating the total population in the area, as well as the minority and low-income components, calculated as proportional to the percentage of the block group area within the boundary.

The analysis indicated that for one site (Akron, Ohio) the proportion of minority population within the area associated with a manufacturing facility was higher than the proportion of minority population in the associated state (Table 4.9). The difference between the percentage of minority population living within the 10-mi (approximately 16-km) radius and the state is 1.5%. Because very small impacts are anticipated for the total population from manufacturing activities associated with all alternatives, there would be no disproportionately high and adverse impacts to the minority population near this facility.

The percentage of the total population that consists of low-income families living within a 10-mi (approximately 16-km) radius of a manufacturing facility would also exceed that of the associated states in one instance (Akron, Ohio). The difference in this case was only 0.9%. Because very small impacts are anticipated for the total population there would be no disproportionately high and adverse impacts on the low-income population living near the facility.

Only small human health and environmental impacts resulting from the manufacture of each alternative cask and canister system are anticipated, so high and adverse impacts that would disproportionately affect minority or low-income populations similarly are not expected.

4.9 Other Areas of Impact

Since facilities exist which are capable of meeting the projected container system requirements, the assessment concludes that no new construction would be needed and there would be no change in land use for the fabrication of the additional containers. Similarly, cultural, aesthetic, and scenic resources would remain unaffected by the fabrication of the additional containers. Ecological resources, including wetlands, would not be affected since existing facilities can accommodate the fabrication of the additional containers and no new or expanded facilities would be required. No discernible increase in noise, traffic, or utilities would be expected from the fabrication of the additional containers.

Water consumption and effluent discharge during manufacture of the additional container systems would be typical of the heavy manufacturing facility and would represent only a small change, if any, from the existing use of the facilities selected. Similarly, effluent discharges would not increase enough to cause difficulty in complying with applicable local, state, and federal regulatory limits and it would not be expected that the effluent discharges would result in any discernible increase in pollutant activity.

4.10 Cumulative Impacts

The manufacture of alternative container systems, which would be used for naval spent nuclear fuel dry storage and transportation to a repository or storage at a centralized interim storage site, represents 1% to 4% of the total number of container systems for both naval and civilian spent nuclear fuel which would be manufactured for all spent nuclear fuel available for emplacement in a geologic repository or storage at a centralized interim storage site during the time period from 2010 to 2035 (TRW 1995). The total amount of material used over the 40-year period for naval spent nuclear fuel and special case waste container systems is less than 0.3% of the annual material use except for depleted uranium and for lead. The Transportable Storage Cask Alternative would require about 1.3% of annual U.S. domestic production of lead. The multi-purpose canister options would require between 6.4% and 7.5% of annual U.S. domestic production of depleted uranium. The cumulative environmental impacts resulting from the manufacturing of container systems would be small. The naval spent nuclear fuel container system manufacturing impacts, which include special case low-level radioactive waste would not result in discernible environmental consequences for the duration of the program.

4.11 Unavoidable Adverse Effects

Most of the impacts associated with manufacturing container systems would be unavoidable. Manufacturing alternative container systems would consume nonrenewable resources (energy and various metals) and produce some emissions and wastes. These materials would be needed to ensure adequate isolation of naval spent nuclear fuel from the environment and as shielding to reduce external radiation dose to regulatory levels. Casks would be reused whenever possible throughout the life of the project to minimize impacts. Under some alternatives, naval spent nuclear fuel would be removed from various canisters and eventually placed in a disposal container. For the No-Action, Current Technology/Rail, and Dual-Purpose Canister Alternatives, recycling canisters might eventually be feasible and would reduce impacts of material use. Even without recycling, the amounts of materials needed for production would be small compared with national levels of use and supply. Emission releases and waste disposal would comply with existing regulations.

4.12 Irreversible and Irretrievable Commitment of Resources

Manufacturing canisters, casks, and other components of these container systems would result in the consumption of nonrenewable materials. Although some of the components might eventually be recyclable, other materials would be processed as waste or disposed of at the repository. Manufacturing would also consume nonrenewable fuels (mostly fossil-based products). The amounts of these materials needed for the program are not considered to be a significant commitment of resources.

4.13 Relationship Between Short-Term Use of the Environment and the Maintenance and Enhancement of Long-Term Productivity

The alternative container systems would ultimately lead to permanent disposal of much of the naval spent nuclear fuel. Indefinite storage or disposal are the only viable options for isolation of this material under existing laws and regulations. Although there would be short-term impacts resulting from implementing any of the alternatives (e.g., minor air quality impacts at manufacturing locations) and some relatively small long-term impacts resulting from the consumption of nonrenewable resources in manufacturing canisters and casks, these impacts would be incurred to improve long-term productivity. Long-term productivity of the environment would not be compromised by any of the alternatives under consideration.

4.14 Impact Avoidance and Mitigative Measures

4.14.1 Pollution Prevention

Under Executive Order 12856, Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements, the Navy is required to eliminate or reduce the unnecessary acquisition of products containing extremely hazardous substances or toxic chemicals. Although the alternative container systems would contain lead or depleted uranium, these substances are necessary to safely and efficiently shield spent nuclear fuel. Therefore, the Navy would use current technologies for pollution prevention and would meet pollution prevention standards for the manufacture of alternative container systems.

4.14.2 Potential Mitigative Measures

Under each alternative, only very small adverse impacts are anticipated, associated with air quality, health and safety, and the generation of solid and liquid waste. These impacts are expected to be relatively minor and within regulatory limits governing releases to the environment. It is also expected that manufacturers would provide adequate measures to minimize risks to workers, the public, and the environment through employee health and safety training programs and waste reduction and recycling programs. No additional mitigation is proposed.

SECTION 5.0
ENVIRONMENTAL IMPACTS OF LOADING AND STORAGE AT INEL FACILITIES

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5.0 ENVIRONMENTAL IMPACTS OF LOADING AND STORAGE AT INEL FACILITIES

5.1 Overview

Naval spent nuclear fuel is transported from shipyards and prototype sites to the Naval Reactors Facility's Expended Core Facility for examination and processing. Naval spent nuclear fuel is then transferred for storage at the Idaho Chemical Processing Plant at the INEL site.

This chapter addresses issues related to the handling and loading of naval spent nuclear fuel and special case low-level waste into the alternative container systems at INEL. These operations include handling and removal of the spent nuclear fuel from the existing water pools at the Expended Core Facility and the Idaho Chemical Processing Plant. Actual loading of the fuel into the container system would take place either underwater or in a shielded, filtered facility like the proposed Dry Cell Facility at the Expended Core Facility or a similar facility at the Idaho Chemical Processing Plant. This chapter also addresses issues related to the storage of the loaded alternative container systems at INEL. Three locations have been evaluated for dry storage of naval spent nuclear fuel at INEL. Two of these locations, the Naval Reactors Facility and the Idaho Chemical Processing Plant, have been previously evaluated in the Programmatic SNF and INEL EIS (DOE 1995). Possible storage locations at the Naval Reactors Facility and the Idaho Chemical Processing Plant are shown in Figures 5.1 and 5.2. Site remediation efforts would be completed in these areas to ensure that any radiological or chemical hazards are corrected prior to construction of dry storage facilities. A third dry storage location, one which is representative of a location not directly above the Snake River Plain Aquifer, was selected for evaluation in this EIS and is referred to as the Birch Creek Area. For more detailed information on other potential dry storage locations at INEL, like the Lemhi Range Area, refer to Appendix F.

Chapter 6 addresses issues related to unloading of containers at a representative or notional repository or centralized interim storage site. Additional details are presented in Appendix A. Chapter 7 and Appendix B address issues related to transportation from INEL to the representative repository location.

For most of the issues discussed in this chapter, the impacts on the INEL area environment from the alternative container systems considered in this EIS are shown to be small and about the same magnitude. This is because a similar amount of naval spent nuclear fuel would be handled, loaded, and stored in any given year at INEL regardless of the size or type of container selected. Therefore, a separate discussion of the impacts of each alternative container system is only presented in this chapter when it is expected that there would be differences. The analyses of normal operations have shown that the impacts on the public health and safety are lowest for the alternatives which minimize the handling of naval spent nuclear fuel and do not require the containers to be reopened. The multi-purpose canister alternatives, therefore, result in the lowest radiological exposures to the public. For the analyses which have been completed for hypothetical accidents, the amount of naval spent nuclear fuel which is in a particular container has the greatest effect on the resultant consequences. For example, a hypothetical accident involving a 125-ton multi-purpose canister will have greater consequences than a similar accident involving a 75-ton multi-purpose canister, since more naval spent nuclear fuel is involved in the accident.

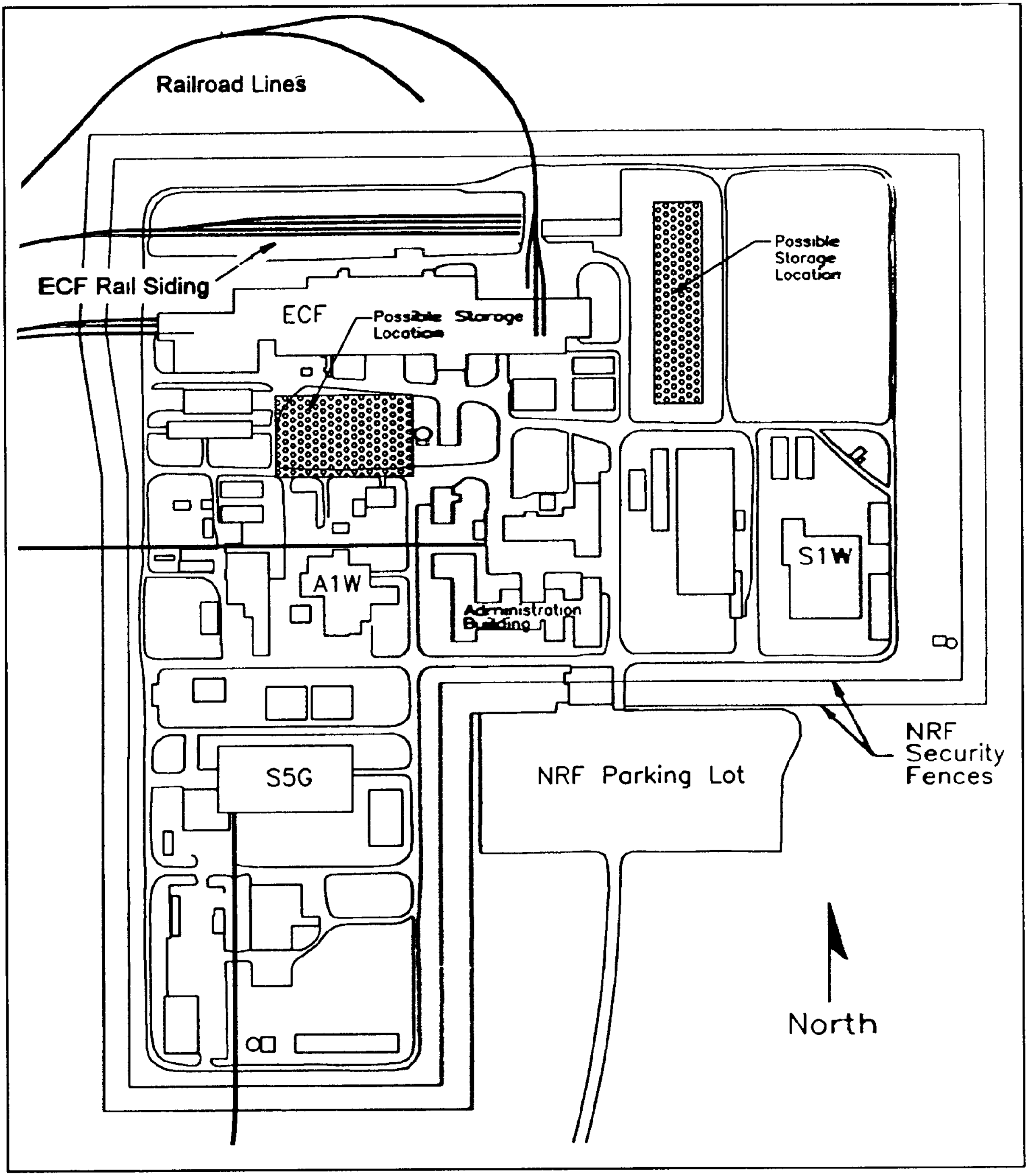

FIGURE 5.1 Possible Dry Storage Locations at Naval Reactors Facility

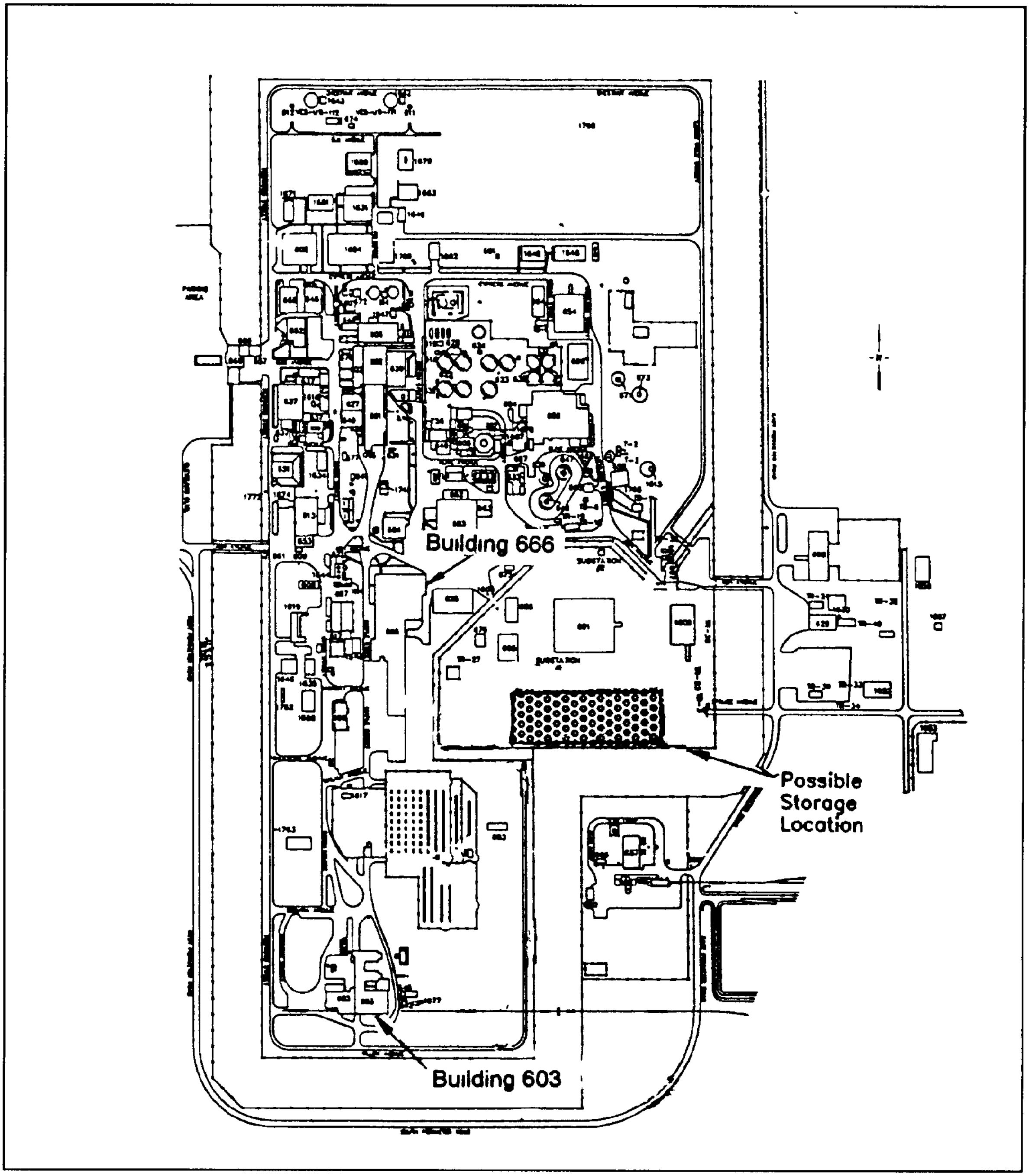

FIGURE 5.2 Possible Dry Storage Location at the Idaho Chemical Processing Plant

5.2 Air Quality

Relative to existing conditions and operations at INEL, no significant impacts to air quality can be attributed to the handling, loading, and dry storage of naval spent nuclear fuel at INEL under any of the alternative container systems. The following sections provide the basis for this conclusion.

5.2.1 Environmental Setting

Radioactivity and radiation levels resulting from INEL site emissions are very low, well within applicable standards, and negligible when compared to doses received from natural background sources. In addition, the air quality is good and within applicable guidelines. The area around the INEL site is in attainment or unclassified for all National Ambient Air Quality Standards. For a more detailed discussion of the air resources of the INEL site and the surrounding area, refer to the Programmatic SNF and INEL EIS (DOE 1995; Volume 2, Part A, Chapter 4.7).

5.2.2 Impacts

Impacts of airborne releases of radioactive materials at INEL due to loading and storage of naval spent nuclear fuel were evaluated. Calculations were performed to estimate the impact on INEL workers and the public due to radiological air emissions. The specific methodology and computer codes used for these analyses are presented in Appendix A, Section A.2.3. Impacts of non-radiological air emissions were assessed qualitatively.

Minor construction of buildings, roadways, and possibly railways would be needed at INEL for loading and dry storage of naval spent nuclear fuel in any of the containers considered. This increase in construction-related airborne emissions or fugitive dust would be the same under any container alternative. Dry storage containers at INEL will require graded and paved areas, or a concrete storage pad, for storing the containers. Depending on the alternative selected, concrete vaults may be constructed. A simple structure to serve as a weather enclosure for the containers might also be built. The planned Dry Cell Facility or the facilities at the Idaho Chemical Processing Plant could be enlarged to simplify loading of containers. This construction would be expected to generate relatively small amounts of combustion products from heavy equipment and fugitive dust emissions from excavation operations, but the quantity of dust generated would be small, consistent with typical excavation activities, and controlled within local requirements for dust control.

Another possibility is that a new naval spent fuel dry storage facility could be constructed at INEL at a location not directly above the Snake River Plain Aquifer, if one is found to be technically feasible. Use of a new location would require more extensive construction, including a new container handling facility, a road and a rail spur. A discussion of a potential new dry storage location at INEL which is not directly above the aquifer is presented in Appendix F.

No airborne radioactivity releases would be expected to occur as a result of normal dry storage operations. The fuel would be contained such that at least two barriers exist to prevent fission products from becoming airborne. These barriers would retain the naval spent nuclear fuel in a sealed, air-tight containment until it is moved to a permanent disposal site or centralized interim storage site outside the State of Idaho and there would be no airborne radioactive material released from routine handling or storage of any of the container alternatives. Very small amounts of airborne radioactive material might be produced during the loading of naval spent nuclear fuel into the containers, but the amounts would be low and well within the Clean Air Act limits of 40 CFR 61, Subpart II because the fuel would be handled under water or in containments which completely enclose the connections between shielded transfer containers and the containers used for storage or shipping. High-efficiency particulate air filters that reduce the amount of airborne radioactivity by more than 99% would be used to filter the air exhausted from the containments surrounding the sources.

Loading or storage operations would not involve carcinogenic toxins, criteria pollutants, or other hazardous or toxic chemicals except for small quantities of industrial cleaning agents and paint thinner that may be used for housekeeping and cleanliness control, and the types and amounts of these materials would be similar to those already used at INEL. Consequently, there would be no impact on ambient air quality as a result of implementing any of the alternatives at the INEL. No additional emergency diesel generators, heating plants, or similar sources of combustion products would be required for either loading or storing naval spent nuclear fuel in the types of containers evaluated in this EIS. Consequently, there would be no increase in airborne emissions of gases or particulates from combustion under any of the alternatives considered. However, the location of the dry storage facility could result in small amounts of combustion products if a location outside of existing industrial areas is selected.

In summary, there would be little difference in the small impacts produced at INEL by any of the container alternatives considered for naval spent nuclear fuel. The results of specific analyses are provided in Appendix A. The amount of naval spent nuclear fuel which must be loaded into containers would be the same for all alternatives, so the small release of airborne radioactive material would be the same for all alternatives. There would be no release from the sealed storage containers.

5.3 Health and Safety

Relative to existing conditions and operations at INEL, no significant impacts to the health and safety of workers and the public can be attributed to the handling, loading, and dry storage of naval spent nuclear fuel at INEL under any of the alternative container systems. The following sections provide the basis for this conclusion.

5.3.1 Environmental Setting

Workers at the INEL may be exposed either internally or externally to radiation. The largest fraction of dose received by INEL workers is from external radiation. All personnel who enter radiologically controlled areas are assigned a thermoluminescent dosimeter that is worn at all times during work on the INEL site. The dosimeter measures the amount and type of external radiation dose (or occupational dose) the worker receives. Internal radiation doses constitute a small fraction of the occupational dose at the INEL. All instances of measurable internal radioactivity are investigated to determine the cause and to assess the potential for additional internal dose to the work force.

The human health effects associated with radiological air emissions is assessed based on risk factors contained in "1990 Recommendations of the International Commission on Radiological Protection" (ICRP 1991). Population effects are reported as collective radiation dose (in person-rem) as well as the estimated number of fatal cancers and the total health effects in the affected population. The maximum individual effects are reported as individual radiation dose (in millirem) and the estimated lifetime probability of fatal cancer or total health effects. For the calculation of health effects from exposure to airborne radionuclides, the modeled annual doses were multiplied by the appropriate risk factors from the ICRP (1991). The effect from one year of exposure is expressed as the increased lifetime chance of developing fatal cancer.

Between 1987 and 1991, out of an average of 10,980 workers per year, about 6,000 individuals were monitored annually at the INEL for radiation exposure. Of those monitored, about 32% received measurable radiation doses. For those 5 years, the average annual occupational dose to individuals with measurable doses was about 0.16 rem, yielding an average annual collective dose of about 300 person-rem. The resulting number of expected excess fatal cancers would be less than one for each year of operation (about 0.12 fatal cancers). During that same period, the annual collective dose received by those workers from naturally occurring sources of radioactivity would be over 600 person-rem.

Table 5.1 provides summaries of the annual dose from all current operations at INEL, including spent nuclear fuel management, in millirems, risk factor, and estimated increased lifetime risk of developing fatal cancer based on the annual exposure due to estimated routine airborne releases at all INEL facilities. These calculated data are presented for the maximally exposed individual (on-site worker) and the maximally exposed individual (off-site individual) near the site boundary for the year 1995. The total number of detrimental health effects (i.e., latent fatal cancers plus genetic effects and other non-fatal cancers) can be calculated by multiplying the latent fatal cancers by 1.46 (ICRP 1991).

TABLE 5.1 Lifetime Excess Latent Fatal Cancers Due to Annual Dose to Routine Airborne Releases at the Idaho National Engineering Laboratory [a]

Maximally Exposed Individual	Dose (mrem)	Risk Factor (risk/mrem)	Latent Cancer Fatalities
On-site worker	3.2×10^{-1}	4.0×10^{-7}	1.3×10^{-7}
Off-site individual (public)	5.0×10^{-2}	5.0×10^{-7}	2.5×10^{-8}

[a] Data taken from the Programmatic SNF and INEL EIS (DOE 1995 Volume 2, Part A, Section 4.12.1.1.1).

The off-site individual annual dose of 0.05 mrem corresponds to a lifetime increased latent fatal cancer risk of approximately 1 in 40 million, or a risk of less than 1 in 25 million, for any health detriment related to radiation or radioactive material from current INEL operations. The worker dose of 0.32 mrem corresponds to a lifetime increased fatal cancer risk of approximately 1 in 7 million, or a lifetime increased health detriment risk of less than 1 in 5 million.

The surrounding population consists of approximately 120,000 people within a 50-mile (approximately 80-km) radius of the INEL. These individuals experience a collective population dose of 0.30 person-rem from normal operations at INEL, corresponding to approximately 0.0002 fatal cancers or less than 0.0003 health detriments occurring within the population over the next 70 years (DOE 1995; Volume 2, Part A, Section 4.12.1.1.1).

5.3.2 Impacts

Impacts of radiological air emissions and direct radiation exposures at INEL due to loading and storage of naval spent nuclear fuel and special case low-level waste were evaluated. Calculations were performed to estimate the impact on INEL workers and the public due to radiological air emissions and direct radiation exposure. The specific methodology and computer codes used for these analyses are presented in Appendix A, Section A.2.3. Impacts of non-radiological air emissions and exposures to hazardous chemicals were assessed qualitatively.

5.3.2.1 Occupational Health and Safety

Occupational radiation exposures to workers at the Expended Core Facility have averaged approximately 100 mrem/yr, compared to the Federal government's established limit of 5,000 mrem/yr (10 CFR Part 20). There are about 280 workers at Expended Core Facility who work in radiological areas. Since the health risk per worker is estimated to be approximately 0.0004 occurrences of fatal cancer per rem of dose (ICRP 1991), less than one fatal cancer could be expected among all Expended Core Facility workers throughout the rest of their lives due to operation of the Expended Core Facility for an additional 40 years. The average doses and effects for workers at INEL has been about 160 mrem/year (DOE 1995; Volume 2, Part A, Section 4.12.2.1).

An assessment of the occupational radiation dose that workers would receive related to the loading, storage, and unloading of naval spent nuclear fuel and special case low-level waste was performed. It is expected that most workers would receive annual radiation dose near the historical average of about 100 mrem, and that no radiation workers involved in these activities will exceed the 500 mrem annual control value which is applied in the Naval Reactors program. However, if an individual received the annual 500 mrem dose for the entire 40-year period, a total cumulative dose of 20 rem would result. This would result in a likelihood of a fatal cancer of 8×10^{-3} or one chance in 125. This is less than the one in 5 chance for the general population of dying from cancer.

For each container alternative, the total occupational dose over the entire 40-year period was evaluated. Table 5.2 presents the results of this evaluation. These collective occupational doses apply to the container loading and dry storage operations to be performed at INEL, either at the Idaho Chemical Processing Plant or the Expended Core Facility, and unloading operations to be performed at a surface facility, either at a centralized interim storage site or a geologic repository. For all alternatives, the total occupational dose results in less than one cancer death in the worker population involved in these activities.

TABLE 5.2 Summary of Incident-Free Collective Dose to Workers and Latent Cancer Fatalities for all Alternatives

Alternative	Collective Worker Dose (person-rem)	Latent Cancer Fatalities
Multi-Purpose Canister	890	0.36
No-Action	640	0.26
Current Technology/Rail	730	0.29
Transportable Storage Cask	550	0.22
Dual-Purpose Canister	1,100	0.43
Small Multi-Purpose Canister	1,500	0.59

Limited quantities of some materials classified as hazardous chemicals might be used in activities, such as cleaning, associated with naval spent nuclear fuel loading or storage in dry containers at INEL, but the precautions used during the work would prevent exposure of the workers to these materials. An evaluation of normal operations showed that no ambient air quality standards would be exceeded for toxic chemical releases (DOE 1995; Volume 1, Appendix D, Part B, Section F.2). Therefore, none of the alternatives considered would be expected to increase or decrease the exposure of INEL workers to potentially hazardous chemicals.

Projections of the number of occupational accidents that might occur during construction and operation of naval spent nuclear fuel facilities have been made (DOE 1995; Volume 1, Appendix D, Part B, Section F.5). Based on the results of these projections, there would be no occupational fatalities and the number of injuries or illnesses caused by construction activities and operations associated with naval spent nuclear fuel loading and storage would be small for any container alternative. This conclusion applies even if a new dry spent nuclear fuel storage site at a location not above the Snake River Plain Aquifer were to be technically feasible.

5.3.2.2 Public Health and Safety

The comprehensive INEL site radiation monitoring program (Hoff et al. 1990) shows that radiation exposure to persons who do not work at INEL is too small to be measured. In order to provide an estimate of the effects of radiation exposure which might be caused by INEL operations, calculations have been performed of the radiological exposures to the member of the general public who might receive the highest exposure (called the maximally exposed individual) and to the population surrounding the INEL. These calculations include all types of radioactive particles or gases released into the atmosphere from naval spent nuclear fuel and special case waste loading and storage operations. The calculation results are summarized in Table 5.3.

Putting the risk into perspective, it could be stated that one member of the population might experience a fatal cancer due to combined effects of naval spent nuclear fuel and special case waste loading and dry storage operations at INEL if operations continued 166,000 years. The calculations show that the risks are so small that there would be essentially no health effects resulting from radioactivity released by all operations associated with the alternatives considered in this EIS at INEL.

Operations associated with any of the alternative container systems considered for loading or storage of naval spent nuclear fuel at INEL would have no effect on the groundwater of the Snake River Plain Aquifer, because there would be no releases of toxic chemicals, solvents, or laboratory chemicals to the groundwater. The alternative selected for loading or storage of naval spent nuclear fuel would therefore have no effect on nonradiological public health and safety in the vicinity of INEL.

TABLE 5.3 Estimated Annual Health Effects from Naval Spent Nuclear Fuel and SCW at INEL[a]

	Estimated Exposure					
	Facility Worker		MEI		General Population	
Activity/ Location	Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities
Loading operations - MPC, TSC, DPC, and SmMPC Alternatives						
NRF	2.8×10^{-6}	1.1×10^{-9}	1.7×10^{-8}	8.4×10^{-12}	1.1×10^{-4}	5.4×10^{-8}
ICPP	3.7×10^{-5}	1.5×10^{-8}	2.6×10^{-7}	1.3×10^{-10}	1.4×10^{-3}	7.2×10^{-7}
Loading operations - NAA and CTR Alternatives						
NRF	2.3×10^{-4}	9.4×10^{-8}	1.4×10^{-6}	7.0×10^{-10}	9.2×10^{-3}	4.6×10^{-6}
ICPP	2.7×10^{-4}	1.1×10^{-7}	1.9×10^{-6}	9.4×10^{-10}	1.1×10^{-2}	5.3×10^{-6}
Dry Storage - All Alternatives						
NRF	1.1×10^{-2}	4.4×10^{-6}	6.5×10^{-14}	3.3×10^{-17}	1.7×10^{-12}	8.6×10^{-16}
ICPP	1.1×10^{-2}	4.4×10^{-6}	6.1×10^{-8}	3.1×10^{-11}	8.1×10^{-8}	4.1×10^{-11}
Birch Creek Area	1.1×10^{-2}	4.4×10^{-6}	4.7×10^{-4}	2.4×10^{-7}	5.1×10^{-5}	2.6×10^{-8}

[a] Notation: SCW = special case waste; ICPP = Idaho Chemical Processing Plant; MEI = individual at nearest site boundary; NRF = Naval Reactors Facility; MPC = Multi-Purpose Canister; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister; NAA = No-Action Alternative; CTR = Current Technology/Rail.

5.4 Land and Cultural Resources

Relative to existing conditions and operations at INEL, no significant impacts to the land use and cultural resources can be attributed to the handling and loading of naval spent nuclear fuel at INEL under any of the alternative container systems. An incremental impact to land use would be attributed to the establishment of a new dry storage facility outside of the existing industrial areas at INEL. Since there is a potential to impact cultural resources, there would need to be a detailed evaluation following the selection of a new dry storage location not above the Snake River Plain Aquifer. The following sections provide the basis for this conclusion.

5.4.1 Environmental Setting

A detailed discussion of the existing land uses at the INEL and in the surrounding region, and land use plans and policies applicable to the surrounding area, is contained in the Programmatic SNF and INEL EIS (DOE 1995, Volume 2, Part A, Chapter 4.2). This includes fossil localities, campsites, lithic workshops, cairns, hunting blinds, archeological sites and many other features of the INEL landscape that are important to contemporary Native American groups for historical, religious and traditional reasons. Because Native American people hold the land sacred, in their terms the entire INEL reserve is culturally important. Geographically, the INEL site is included within a large territory once inhabited by and still of importance to the Shoshone-Bannock Tribes. For a thorough discussion of all cultural resources at the INEL site, including prehistoric and historic archaeological sites, historic sites and structures, paleontological localities, and traditional resources that are of cultural or religious importance to local Native Americans, refer to the Programmatic SNF and INEL EIS (DOE 1995; Volume 2, Part A, Chapter 4.4).

5.4.2 Impacts

The methodology used in this assessment consisted of comparing proposed land uses to existing land uses and plans. Some areas that may not be directly above the Snake River Plain Aquifer, like the Birch Creek and the Lemhi Range Areas, have been identified in the Programmatic SNF and INEL EIS as being important areas with respect to prehistoric, Native American cultural, and paleontological resources. The impacts were assessed qualitatively.

No on-site land use restrictions due to Native American treaty rights would exist for any of the alternatives. The INEL site does not lie within any of the land boundaries established by the Fort Bridger Treaty. Furthermore, the entire INEL site is land occupied by the U.S. Department of Energy, and therefore that provision in the Fort Bridger Treaty that allows the Shoshone and Bannock Indians the right to hunt on the unoccupied lands of the United States does not presently apply to any land upon which the INEL is located.

The environmental consequences of the use of land resources would be small as long as loading operations and dry storage take place within existing industrial sites at INEL. An enlargement of the Dry Cell Facility or facilities at the Idaho Chemical Processing Plant may be required for loading of containers for dry storage or shipment. The environmental consequences of the use of land resources would be slightly larger if a new naval spent nuclear fuel dry storage facility was constructed at an INEL location not over the Snake River Plain Aquifer, if technically feasible. Additional buildings may not be required at INEL for loading naval spent nuclear fuel at existing facilities into any of the containers considered since spent fuel handling facilities already exist at the Expended Core Facility and the Idaho Chemical Processing Plant. It is possible that the location could be inside the existing fenced areas at the Expended Core Facility or the Idaho Chemical Processing Plant. Some graded and paved areas would be required and possibly a simple structure might be provided to protect workers from the weather. If existing areas were used for naval spent nuclear fuel storage in dry containers they would be industrial sites and have adequate room to accommodate the storage locations; therefore, there would be no additional impact on land use. DOE would expand the facilities in developed areas that have already been dedicated to industrial use and that previous activities have used. Consequently, Native American rights and interests would not be modified by construction or operations associated with any of the alternatives considered in this EIS.

If a new dry storage facility not over the Snake River Plain Aquifer is selected, construction of a new road, rail spur, buildings, and secured area would be required. This would require the use of about 12 acres in the previously unused portion of the INEL. This additional construction would result in environmental consequences on land use which are greater than those described above for a dry storage area at either the Expended Core Facility or the Idaho Chemical Processing Plant. With respect to prehistoric cultural resources, Native American cultural resources, and paleontological resources, both the Birch Creek and Lemhi Range Area appear to be important (DOE 1995; Volume 2, Part A, Chapter 4.4). Should this location be selected as the INEL dry storage site, due to its potential for not being located directly above the Snake River Plain Aquifer, procedures as required by the National Historic Preservation Act and the Cultural Resources Management Plan for the INEL would be followed during the planning stages of project development to minimize the impacts on the use of this land.

5.5 Socioeconomics

Relative to existing conditions and operations at INEL, no significant socioeconomic impacts to communities around INEL can be attributed to the handling, loading, and dry storage of naval spent nuclear fuel at INEL under any of the alternative container systems. The following sections provide the basis for this conclusion.

5.5.1 Environmental Setting

Socioeconomic resources include employment, income, population, housing, community services, and public finance. These resources are often interrelated in their response to a particular action. Changes in employment demand, for example, may lead to population movements into or out of a region, causing changes in the demand for housing and community services.

The region of influence for the socioeconomic analysis is based on the work force of the entire INEL site rather than the work force of just the Expended Core Facility and Idaho Chemical Processing Plant sites. This provides the appropriate base for describing the socioeconomic resources that may be affected by the alternative actions. On this basis, it was determined to be a seven-county area composed of Bingham, Bonneville, Butte, Clark, Jefferson, Bannock, and Madison counties. Based on a survey of INEL personnel, over 97% of the employees reside in this region of influence. The region of influence also includes the Fort Hall Indian Reservation and Trust Lands (home of the Shoshone-Bannock Tribes), located in Bannock, Bingham, Caribou, and Power counties (DOE 1995; Volume 1, Appendix B, Section 4.3).

Historically, the regional economy has relied predominantly on natural resource use and extraction. Today, farming, ranching, and mining remain important components of the 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. Tourism is also important to the area; for example, Craters of the Moon National Monument is near INEL. Agriculture and ranching, including buffalo ranching, are important contributors to the economy of the Fort Hall Indian Reservation.

The labor force in the region of influence has increased from 92,159 in 1980 to 104,654 in 1991 at an average annual growth rate of approximately 1.2%. In 1991, the economic region of influence accounted for approximately 20% of the total state labor force of 504,000 (ISDE 1992). The labor force in the region of influence is expected to increase to 117,128 by 2004. Note that these labor force statistics are different from the general population statistics which are used for radiological evaluations in Appendix A.

5.5.2 Impacts

The methodology used in this assessment consisted of comparing proposed increases in INEL employment requirements needed to support loading and dry storage of naval spent nuclear fuel at INEL to the existing plans for the INEL workforce. The impacts on the INEL area workforce were assessed qualitatively.

The facilities of the Expended Core Facility and the Idaho Chemical Processing Plant and even a new dry storage site are remote from ordinary public access. The main impact on the socioeconomics of the affected population would be in terms of the jobs that are generated by the activities at the facilities.

One potential socioeconomic consequence of loading or storing naval spent nuclear fuel at INEL is that a relatively small number of construction workers (a maximum of fewer than 50) would be required for construction of the storage area, whether at an existing facility or a new location not located above the Snake River Plain Aquifer. The work force would consist of skilled craftsmen and unskilled laborers. This work force would only be needed during the storage facility construction and would be available from within the area.

The loading or storage of naval spent nuclear fuel using any of the containers considered in this EIS would require some additional workers to perform the actual loading and to support surveillance and monitoring activities for storage in dry containers. The containers would be sealed and have no operating equipment, so storage would require very little worker support. About 10 to 20, and certainly fewer than 50, additional workers might be required to handle the loading of naval spent nuclear fuel into the containers. The work force required to operate the water pools used for loading is already employed at INEL by the existing facilities at the Expended Core Facility and the Idaho Chemical Processing Plant. The number required for the actual loading or storing of naval spent nuclear fuel under any of the alternatives would be small and is expected to be supplied from either within the existing INEL work force or from the local work force. Considering that the DOE employs several thousand workers at INEL and expects to reduce the staffing at INEL in the coming years (DOE 1995; Volume 1, Appendix B, Section 5.16), the addition of the small number of workers needed to support any of the alternatives would have no discernible impact on the local socioeconomic conditions in the vicinity of INEL.

Analysis of possible impacts on socioeconomics in the vicinity of INEL shows that there is very little difference among the alternatives considered. Possible impacts on socioeconomics do not assist in discriminating among the alternatives.

5.6 Water Resources

Relative to existing conditions and operations at INEL, no significant impacts to water resources can be attributed to the handling, loading, and dry storage of naval spent nuclear fuel at INEL under any of the alternative container systems. The following sections provide the basis for this conclusion.

5.6.1 Environmental Setting

Other than intermittent streams and surface water bodies and manmade percolation, infiltration, and evaporation ponds, there is little surface water at the INEL site. INEL site activities do not directly affect the quality of surface water outside the INEL site because discharges are made to manmade seepage and evaporation basins, rather than to natural surface water bodies in accordance with the Clean Water Act.

The Snake River Plain Aquifer is the source of all water used at the INEL site. INEL site activities withdraw water at an average rate of 1.9×10^9 gallons per year (7.4×10^6 cubic meters per year). For a complete description of existing regional and INEL site hydrologic conditions, and existing water quality for surface and subsurface water, water use, and water rights, refer to the Programmatic SNF and INEL EIS (DOE 1995; Volume 2, Part A, Chapter 4.8).

5.6.2 Impacts

The methodology used in this assessment consisted of comparing increases in INEL water requirements needed to support loading and dry storage of naval spent nuclear fuel at INEL to the existing INEL water usage. The impacts on the INEL water resources were assessed qualitatively.

All water used during the loading of naval spent nuclear fuel at the INEL would be reused or recycled at the site and no new water pools would be required for any of the alternatives considered, so there would be no discernible increase in the amount of water consumed at INEL. No water is required for storage of naval spent nuclear fuel in dry containers, so storage would not have any impact on the consumption of water at INEL with the exception that a small amount of drinking and service water would be required for a small guard force and monitoring personnel at a new dry storage facility not located above the Snake River Plain Aquifer, if such a facility were constructed.

No radioactive liquids are discharged to the environment at Expended Core Facility or Idaho Chemical Processing Plant. Loading or storing naval spent nuclear fuel at INEL would not result in discharges of radioactivity in liquid effluents during routine operation regardless of the particular alternative chosen. Other than chemicals used to clean or maintain the loading or storage area, no hazardous wastes would be generated by the loading or storage of naval spent nuclear fuel at INEL. Any hazardous liquids that might be generated at INEL would be disposed of at an Environmental Protection Agency approved disposal site.

The only source for liquid discharges to the environment from the naval spent nuclear fuel loading or storage operations (but not from the naval spent nuclear fuel itself) consists of storm water runoff, which would be consistent with the type of discharges associated with common light industrial facilities and related activities. There would be no impact to the human environment due to runoff water from the areas used for naval spent nuclear fuel loading or storage.

A flood at INEL due to overflow of any source of surface water within the INEL boundaries is a low-probability event. With the construction of the INEL flood control diversion system in 1958, the threat of a flood from overflowing of the Big Lost River, the primary source of surface water at the INEL, has become very small.

The maximum water elevation postulated at the Expended Core Facility, at the Idaho Chemical Processing Plant, or at a potential new dry storage facility at the INEL would be caused by a hypothetical Probable Maximum Flood resulting from failure of the Mackay Dam, located approximately 35 mi (approximately 56 km) northwest of the INEL. This flood is postulated to result from water flowing over the top of the Mackay Dam and causing it to fail due to high water levels. This flood is highly unlikely (Koslow and Van Haaften 1986). Dam failure due to other causes, such as seismic activity, is more likely. Although the Mackay Dam survived the 1983 Borah Peak earthquake without damage, it was built before seismic design criteria were widely used. Additionally, it is not clear how resistant the dam structure is to seismic events. The MacKay Dam segment of the Lost River Fault runs within 3.7 mi (approximately 6 km) of the Mackay Dam.

Flooding of the buildings and possible dry container storage areas associated with naval spent nuclear fuel at INEL is possible should the Mackay Dam fail. The hypothetical flood could result in a maximum water level a few feet above the floor elevation of Building 666 at the Idaho Chemical Processing Plant or at the Expended Core Facility. Following the dam break, it would take approximately 16 hours for the flood water to reach the Idaho Chemical Processing Plant, which is closer to the Mackay Dam than the Expended Core Facility. This allows at least some time to complete emergency procedure preparations, such as filling and placing sandbags, for the expected flood conditions.

Flooding would have no effect on the heavy, sealed containers used for shipping or dry storage of naval spent nuclear fuel. Flooding of the buildings at INEL housing water pools would not create a nuclear criticality hazard because the assemblies are already surrounded by moderating water and the configuration of assemblies would not be altered by the flooding. Flooding of the buildings could result, however, in the release of water containing low levels of radioactive contamination to the environment and damage to equipment in flooded areas. In the event a water pool facility used for loading naval spent nuclear fuel were flooded, the exchange of pool water with the flood waters could occur. Any release of radioactivity would have to result from the exchange of floodwater with the pool water and such an exchange would reduce the concentration of radioactivity even further. Consequently, only limited adverse environmental impacts would result from flooding of water pools at naval spent nuclear fuel storage sites, since the pool water already meets the liquid effluent free-release limits of 10 CFR Part 20 with the exception of Cobalt-60, which is about a factor of five greater than the limit (see Appendix A, Section A.2.5).

The net result of the analysis of possible environmental impacts on water resources at INEL is that the impacts are small and there is very little difference among the alternatives considered. Possible impacts on water resources do not assist in discriminating among the alternatives.

5.7 Other Areas of Impact

Several resources or environmental attributes are not discussed in detail because the potential impacts from handling, loading, and dry storage of naval spent nuclear fuel tend to be very small and would not distinguish among alternatives. These areas were assessed qualitatively.

5.7.1 Environmental Setting

For a complete discussion of ecological, aesthetic and scenic resources; geological, seismic, and volcanic characteristics; noise characteristics; water, electricity, and fuel capacities and consumption; and waste water disposal, refer to the Programmatic SNF and INEL EIS (DOE 1995; Volume 2, Part A, Chapters 4.5, 4.6, 4.9, 4.10 and 4.13).

5.7.2 Impacts

The individual buildings at the Expended Core Facility and the Idaho Chemical Processing Plant are difficult to see from any point generally accessible to the public, so aesthetic and scenic resources in the vicinity of INEL would not be affected by the alternative selected for loading or storage of naval spent nuclear fuel at INEL. Even if the sites can be observed, the only actions which could alter the landscape at either location would be architecturally compatible with the buildings and settings.

The geology in the vicinity of the INEL will not be affected by the alternative selected for loading or storage of naval spent nuclear fuel since no changes which could impact the geology would occur under any of the alternatives. Ecological resources (i.e., the terrestrial ecology, wetlands, aquatic ecology, and endangered and threatened species) in the vicinity of a new dry storage facility would be affected due to the construction of a road, rail spur, and handling facility should such a site be found to be technically feasible.

The small amounts of noise generated by work associated with loading or storage of naval spent nuclear fuel at INEL could not be discerned beyond the site boundaries, so the alternative selected would make no difference in noise in the vicinity of INEL. The similarly small amount of noise associated with railcar movement produced during shipment of the naval spent nuclear fuel would not differ among alternatives since all alternatives considered would use rail transportation and the number of shipments would not differ greatly among alternatives. This noise would be indistinguishable from that produced by other rail traffic. There would also be almost no difference in the effects on traffic and transportation in the vicinity among the alternatives considered.

Operations associated with the loading or storage of naval spent nuclear fuel at INEL would not cause any significant change in the consumption of electricity each year since existing buildings would be used for loading under all alternatives considered. Storage of naval spent nuclear fuel in dry containers would consume no additional energy beyond the energy required to maintain heating or cooling in any building used to provide protection of workers from the weather.

Loading naval spent nuclear fuel at the INEL will generate small amounts of waste contaminated with radioactive material. This material would result from activities such as cleaning the access openings of the containers or periodically replacing the high efficiency particulate air filters used in containment areas and would be classified as low-level radioactive waste. The volume of low-level radioactive waste would represent a small increase in the amount of such waste managed at INEL and could be accommodated within the existing low-level waste management practices. Storage of naval spent nuclear fuel at INEL would not be expected to generate any significant additional amounts of radioactive waste.

Loading or storage of naval spent nuclear fuel at INEL would not generate any additional waste classified as hazardous under the Resource Conservation and Recovery Act or any mixed waste. Loading or storage of naval spent nuclear fuel at INEL would cause only a very small increase in solid municipal waste or liquid waste (sewage) over that currently generated at the site.

Waste management practices at Expended Core Facility, Idaho Chemical Processing Plant, and any new dry storage facility are governed by strict regulations. The existing facilities have operated for many years within the regulatory requirements that apply to their work. These requirements and practices will continue to be observed, and loading or storage of naval spent nuclear fuel under any of the alternatives considered in this EIS would not result in any problems in complying with the applicable regulations.

5.8 Impacts on Environmental Justice

As discussed in the preceding paragraphs, the impacts on human health or the environment resulting from normal operations or accidents associated with the loading or storage of naval spent nuclear fuel at the INEL would be small under any of the alternatives considered in this EIS. For example, it is unlikely that a single fatal cancer would occur over the 40 years considered in this project as a result of naval spent nuclear fuel loading or storage under any alternative. Since the potential impacts due to normal operations or accident conditions for any of the alternatives considered present no significant risk and do not constitute a credible adverse impact on the surrounding population, no adverse effects would be expected for any particular segment of the population, minorities and low-income groups included.

The conclusion that there would be no disproportionately high and adverse impacts on human health or the environment is not affected by the prevailing winds or direction of surface or subsurface water flow. This is true for normal operations because the effects of routine operations are so small. It is also true for postulated accident conditions because the consequences of any accident would depend on the random conditions at the time it occurred. Similarly, the conclusion that there are no disproportionately high and adverse impacts on human health or the environment is not affected by concerns related to subsistence consumption of fish or game since the incremental effect of the alternatives would not result in a measurable increase in the amounts of radioactivity present in the air, soil, or surface water outside the boundaries of the INEL from levels which environmental monitoring has already determined to be low.

To place the impacts on environmental justice in perspective, the risk associated with routine operations or hypothetical accidents associated with loading or storage of naval spent nuclear fuel at INEL under any of the alternatives considered would be less than one fatality per year for the entire population within 50 miles of INEL. For comparison, in 1990 there were approximately 510,000 cancer deaths in the U.S. population, and there were about 64,000 cancer deaths in minority populations in the United States. Even if all of the impacts associated with one of the alternatives considered for naval spent nuclear fuel loading or storage at INEL were assumed to occur only in minority populations, they would be unlikely to experience a single cancer fatality in any year. Therefore, the risk for minority populations from naval spent nuclear fuel management would not constitute a disproportionately high and adverse impact on human health or the environment. The same conclusion can be drawn for low-income groups.

5.9 Impacts from Accidents

There has never been an accident in the history of the Naval Nuclear Propulsion Program that resulted in a significant release of radioactivity to the environment or that resulted in radiation exposure to workers in excess of normal limits on exposure. Appendix A, Section A.2.2, provides a description of radiological accidents which could occur during water pool handling or storage in dry containers for naval spent nuclear fuel at INEL. Calculations of the cancer fatalities which might occur as a result of all the postulated accidents are provided in Appendix A, Section A.2.5. A comparison of the accident consequences for all alternatives is provided in Table 5.4. The accidents which result in the maximum foreseeable consequences to the general public at each location are the drained water pool at the Expended Core Facility, the airplane crash into dry storage at the Idaho Chemical Processing Plant, and the wind-driven projectile impact into a storage container at a repository.

In Table 5.4, the potential impacts of facility accidents with the greatest consequences are expressed in terms of latent cancer fatalities per accident. The consequences are based on hypothetical occurrences of the accidents and do not reflect the very low probabilities of the accidents actually occurring. The analyses have been done conservatively, as discussed in Section A.2.7 of Appendix A.

The results in Table 5.4 indicate that the greatest potential consequences are associated with naval spent nuclear fuel storage at the Idaho Chemical Processing Plant. This would be due to an airplane crash into a dry storage container. Details are provided in Appendix A.

TABLE 5.4 Latent Cancer Fatalities in the General Population from a Maximum Foreseeable Facility Accident[a]

Alternative	Latent Cancer Fatalities	
	NRF[b]	ICPP[c]
Multi-Purpose Canister	0.017	2.6
No-Action	0.017	1.6
Current Technology/Rail	0.017	2.4
Transportable Storage Cask	0.017	2.4
Dual-Purpose Canister	0.017	2.4
Small Multi-Purpose Canister	0.017	1.3

[a] Values from Table A.2. Notation: NRF = Naval Reactors Facility; ICPP = Idaho Chemical Processing Plant.

[b] Drained waterpool

[c] Airplane crash into dry storage containers.

Effects from accidents at the Expended Core Facility involving toxic chemicals were not evaluated in detail since there are no uses of such materials that are associated with loading or dry storage of naval spent nuclear fuel at INEL which are not already present for current operations. The only chemicals involved with loading or storing naval spent nuclear fuel in dry containers would be relatively small amounts of such common items as cleaners or paint thinners. The amounts and types of chemicals stored at INEL do not pose a risk to the public or the maximally exposed off-site individual following any of the postulated accidents, and the hazards to workers at the site would be minimized through evacuation and the use of other protective measures.

In addition to the possible human health effects associated with accidents described in the preceding sections, other effects such as the impacts on socioeconomics and land use in the area and the costs of cleanup have been estimated in order to develop a perspective and to evaluate potential differences among alternatives. The analyses provided in Appendix A show that for the most severe hypothetical accidents associated with loading or storing naval spent nuclear fuel, an area of approximately 629 acres (approximately 255 ha), extending about 2.2 mi (approximately 3.5 km) downwind, might be contaminated to the point where exposure could exceed 100 mrem per year. Beyond this distance, exposures would be below 100 mrem/yr, the Nuclear Regulatory Commission's standard for protection of the general population from radiation. Persons who work at the federal facilities within this area might be prevented from going to their jobs until measures had been taken to reduce the potential for exposure.

The area affected by the hypothetical accidents would not extend beyond the boundaries of the INEL and, in fact, would not come close to approaching the boundaries. However, if a dry storage facility were constructed adjacent to the boundary of INEL not directly above the Snake River Aquifer, there is a greater chance for contamination outside the site boundary. An accident might result in short-term restrictions on access to a relatively small area of the federally owned site, or private lands adjacent to the site. It would not be expected to produce enduring impacts on cultural or similar resources or concerns such as Native American rights or interests, partially because the area involved would be small and partly because all remedial actions would be conducted in a careful, controlled manner and in full compliance with applicable laws and regulations. The affected area would vary only slightly among the alternatives considered. Overall, the risks are small, so these considerations do not assist in distinguishing among alternatives.

Accidents associated with any of the alternatives would not have an appreciable effect on the ecology of the area, considering the potential for human health effects and the amount of land which might be affected, as described in earlier parts of this section. There is little consensus among scientists on methods for estimating the effects of radiation on ecological resources such as plant or animal life. However, since human health effects for all the accidents analyzed are small and most plants and animals are not thought to be more sensitive to radiation than human beings, the small impacts on human health provide an indication that the impacts on animal and plant species in the area would also be small for all alternatives considered. Similarly, since the areas which might be contaminated by chemicals or radioactive material to measurable levels during the hypothetical accidents would be relatively small, any effects on the ecology would be limited to small areas. There are no endangered or threatened species unique to the areas at INEL, so an accident would not be expected to result in extinction of any species for any of the alternatives considered. The effects of accidents associated with any of the alternatives and any cleanup which might be performed would be localized within an area extending only a short distance from the affected facility and thus would not be expected to appreciably affect the potential for survival of any species.

5.10 Cumulative Impacts

Up to this point, the potential environmental consequences of loading or storing naval spent nuclear fuel in dry containers at INEL have been discussed in terms of annual impacts (i.e., radiological exposures and health effects, accident risks, and quantities of wastes that would be generated during operation) based on maximum annual activity rates. To determine the upper limit for the potential consequences of up to 40 years of future naval spent nuclear fuel loading or storage operations (from 1996 to 2035), an evaluation of the accumulated environmental consequences and risks was performed.

Loading and storage operations for naval spent nuclear fuel would not result in discharges of radioactive liquids; therefore, there would be no changes to the surface water or groundwater as a result of normal operations for any alternative. There might be small quantities of radioactivity in the air released during loading operations which would contribute to the total air quality impacts. The radiation dose to the general population since the beginning of operations (approximately 1957) associated with naval spent nuclear fuel at INEL is less than 2 person-rem, which corresponds to approximately 0.001 latent cancer fatalities over the lifetime of the population surrounding INEL (DOE 1995; Volume 1, Appendix D, Part A, Section 4.2.12.3). The annual radiological impacts associated with the alternatives considered are very small and are described in Section 5.3, with the detailed results of analyses provided in Appendix A. To calculate total impacts for the period between 1996 and 2035, the annual radiological impacts associated with each location and alternative were summed over 40 years.

The total dose to the general public from the naval spent nuclear fuel loading and storage operations considered at INEL would range between 0.05 and 0.68 person-rem (see Table 3.2) for the alternatives evaluated in this EIS. This means that there would be between 0.00002 and 0.0003 fatal cancers from these operations over the entire 40-year period evaluated. This exposure is between 0.2% and 2.3% of the estimated dose to the general public from all other INEL activities (29 person-rem) from 1995 to 2005. The doses from these other activities include those related to loading and storage of DOE spent nuclear fuel as described in the INEL Environmental and Waste Management Programs EIS (DOE 1995; Volume 2, Part A, Section 5.12.1.1.1). The dose to the maximally exposed off-site individual is calculated to be approximately 0.06 mrem from 40 years of loading and storing naval spent nuclear fuel at INEL. The corresponding risk of a cancer fatality to the maximally exposed off-site individual is about 3.0×10^{-9} during his or her lifetime. This exposure is less than 1% of the estimated dose to the maximally exposed offsite individual due to all other INEL activities of 6.3 mrem from 1995 to 2005 (DOE 1995; Volume 2, Part A, Section 5.12.1.1.1). A worker at the INEL site located simultaneously 330 ft (approximately 100 m) from the facilities involved in loading and storage of naval spent nuclear fuel would receive about 440 mrem over 40 years of operation, corresponding to a risk of fatal cancer of about 1.8×10^{-4} (one chance in 5,500) during the worker's lifetime. Analyses of hypothetical accidents which might occur as a result of these alternatives show that the risk of cancer fatalities is small.

No contribution to total impacts from accidents involving naval spent nuclear fuel is included in the analyses presented in this EIS because there has never been a naval nuclear reactor accident, criticality accident, transportation accident, or any release of radioactivity which had a significant effect on the environment.

Total socioeconomic impacts associated with operations involving naval spent nuclear fuel at the INEL are expected to be minor. The INEL currently employs approximately 9,000 people, and all of the alternatives considered would result in increases in employment of approximately 20 persons. Considering that the labor force in the region of influence consists of almost 105,000 people, the number of jobs involved would be expected to have only a minor impact in the INEL area. This increase in the number of jobs is minimal when compared to the expected decrease in total INEL staffing of about 2,300 between 1995 and 2035 (DOE 1995; Volume 1, Appendix B, Section 5.16).

The loading or storage of naval spent nuclear fuel in dry containers at INEL is not expected to result in any appreciable impacts on total non-radiological emissions. Current operations at INEL are in compliance with 40 CFR Part 61, "National Emission Standards for Hazardous Air Pollutants." None of the alternatives considered would cause the total air emissions to threaten to exceed any applicable air quality requirement or regulation in radiological and nonradiological categories, either federal, state, or local. Analysis results for all other INEL activities show that the highest potential concentrations of criteria pollutants remain well below applicable standards (DOE 1995; Volume 1, Appendix B, Section 5.16.4).

The withdrawal of groundwater to support loading or storage of naval spent nuclear fuel in dry containers would represent such a small percentage of existing water use at INEL that it could be accommodated well within the total capabilities of the local water resources (DOE 1995; Volume 1, Appendix B, Section 5.8). Any associated discharges of nonradioactive and nonhazardous liquid effluents at INEL would be small and would not affect water quality or cause any discernible impact on the local ecology. The total impacts associated with nonradiological waste management are also small since the volume of hazardous, municipal, and sanitary wastes produced by any of the alternatives considered for naval spent nuclear fuel loading or storage in dry containers would be very small.

Operations associated with loading of naval spent nuclear fuel or its storage in dry containers would have a minor effect on total land use impacts. The INEL site occupies approximately 571,000 acres (approximately 232,000 ha). No land would be disturbed for those alternatives which involve only loading naval spent nuclear fuel into shipping containers, and alternatives which include storage of naval spent nuclear fuel in dry containers would occupy less than 12 acres (approximately 5 ha). No additional land would have to be withdrawn from public use because the INEL is already a federal reservation.

In summary, the environmental impacts associated with the loading and storage of naval spent nuclear fuel at INEL are small when compared to the impacts of operation of the entire INEL site. Therefore, when these impacts are added to other more significant impacts (DOE 1995; Volume 1, Appendix B, Section 5.16), there is only a minor effect on the cumulative environmental impacts in all areas evaluated.

5.11 Unavoidable Adverse Effects

Small amounts of radioactivity would be released as a result of loading naval spent nuclear fuel in containers at INEL, resulting in much less than one latent cancer fatality in the entire population surrounding INEL (see Appendix A, Table A.10). The effects of these small releases, combined with the other factors described above, would produce no discernible total effects. Similarly, loading and storage operations would produce very limited amounts of liquid sanitary waste, solid municipal waste, and solid low-level radioactive waste. These amounts of waste would not differ from those produced in the past by operation of INEL and would not produce any major impacts in the vicinity of INEL. The amounts of waste would not differ significantly under any of the alternatives.

5.12 Irreversible and Irretrievable Commitments of Resources

No new buildings would be required for the loading of naval spent nuclear fuel at the INEL unless a new dry storage facility not located directly above the Snake River Plain Aquifer should prove technically feasible, and then a small facility would be required to handle containers, house guards and house radiological monitoring personnel. Storage of naval spent nuclear fuel in dry containers would entail the use of graded and paved areas for storing the containers or concrete vaults. A simple structure to serve as a weather enclosure would also be constructed. An additional road, approximately 4 miles in length, and a new rail spur, approximately 25 miles in length may be needed if a new dry storage facility not located above the Snake River Plain Aquifer were selected. Some resources, such as structural materials, would be committed for the alternatives which include storage of naval spent nuclear fuel in dry containers at INEL, and these materials might become contaminated and not be reusable or recyclable. None of the materials that are contemplated to be used is rare or has strategic importance, and none is unusually costly to procure or to fabricate (see Section 4.5).

5.13 Relationship between Short-Term Use of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Implementation of any of the alternatives considered in this EIS would produce a short-term impact on the environment. The alternatives would require the short-term use of resources, including relatively small amounts of energy, construction materials, and labor for the handling and storage of naval spent nuclear fuel at INEL, transportation to a geologic repository and unloading at that site, and for minimizing the risk to workers, the public, and the environment.

In the long term, implementation of any of the alternatives would have no effect on INEL since all activities would take place within the existing industrial areas or at a remote, unused dry storage location and none of the land used would be contaminated with radioactivity or chemicals. Some grading and paving would be required at INEL, but no new large industrial facilities will be constructed. Such structures and the paving would only be needed until naval spent nuclear fuel could be transferred to a repository location and then the structures could be removed. Ecological resources would not be affected because existing buildings or previously disturbed land would be used unless a new dry storage facility were to be built. Since no radioactive liquids would be discharged and only a small additional amount of water might be used by additional workers, there would be very little impact on water resources. There might be small quantities of radioactivity released into the air during loading operations or from an accident, but the risk of health effects, even for the most severe reasonably foreseeable accident, is small. All of the effects on the environment from any of the alternatives would be minimal and short-term. Therefore, the long-term environmental productivity of the area will not be affected negatively.

Transportation from INEL to a repository under all of the alternatives considered would use railroad rights of way which, except for the hypothetical dry storage location at INEL, are assumed to already exist and would not affect railway operations. (It is recognized that a rail access does not exist for about the last 100 miles to Yucca Mountain. This location was used as a representative repository for transportation purposes. Rail access into a specific repository location should be considered as part of the EIS on selection of a repository.) Activities related to naval spent nuclear fuel at a repository would occur in a repository industrial area. Those alternatives which would make use of containers that would not require handling of individual spent nuclear fuel assemblies at a repository would entail no release of radioactive material to the environment. The releases from those alternatives which would require handling of individual assemblies would produce only very small risks to human health or the environment.

Because the alternatives of this EIS concern a container system for dry storage and transportation of naval spent nuclear fuel for final disposal after all examinations have been completed, there are no long-term defense or industrial productivity issues. Interim storage of spent nuclear fuel will be dependent on the availability of a repository.

The short-term use of resources associated with loading, storing, and transporting naval spent nuclear fuel in any of the containers considered in this EIS would have very small impact on human health and the environment in the short term or the long term. This use of the environment would help achieve the placement of spent nuclear fuel in a mined deep geological repository.

5.14 Impact Avoidance and Mitigative Measures

5.14.1 Pollution Prevention

The Navy is committed to comply with applicable guidance documents in planning and implementing pollution prevention. The Navy views source reduction as the first priority in its pollution prevention program, followed by an increased emphasis on recycling. Waste treatment and disposal are considered only when prevention or recycling is not possible or practical.

Radiological pollution prevention actions include controls to reduce radiological emissions and doses, based on the nature of the process and the types and amounts of radionuclides that may be released. Means such as adsorption on charcoal or similar media are used for radionuclides of a gaseous nature. High-efficiency particulate air filters are used extensively to reduce emissions of nuclides of a particulate nature.

Nonradiological pollution prevention actions include monitoring and surveillance programs which are reviewed and supplemented as necessary to allow for early detection of accidental air or water pollution (radiological or nonradiological) resulting from the proposed alternatives and to manage conditions such as storm water runoff and habitat disturbance.

Minimizing the use of hazardous substances reduces the quantity of hazardous waste and mixed (radioactive/hazardous) waste generated. Minimization efforts include replacement of hazardous substances with nonhazardous substances, revising operating practices, and implementing technology improvements. Hazardous wastes and mixed wastes generated are recycled, reused, or treated to reduce the volume to be disposed.

5.14.2 Construction

Mitigative measures will be taken during all construction activities, including the facility expansion for container loading, the dry storage area construction, and any roadway or rail spur expansions needed for a dry storage location outside of existing industrial areas. Potential soil erosion in areas of ground disturbance are mitigated by minimizing the surface areas affected, by controlling storm water runoff (using sediment catchment basins or slope stability), and by protecting soil stockpiles from wind and water erosion. Fugitive dust due to construction activities is controlled by spraying disturbed areas with water and other appropriate methods.

5.14.3 Normal Operations

The ALARA (as low as reasonably achievable) concept is applied to work at INEL to minimize radiological exposure to the work force and to the general public. Workers are trained to perform their assigned tasks using approved procedures in a safe, efficient manner to reduce the likelihood of personal injury, equipment or facility damage, and environmental consequence and to enhance the use of natural resources.

5.14.4 Accidents

INEL facilities employ emergency response programs to mitigate impacts of accidents to workers and the general public. These programs typically involve emergency planning, emergency preparedness, and emergency response. Each plan utilizes resources specifically dedicated to assist the facility in emergency management. The response activities are coordinated with state and local officials. INEL personnel are trained and drilled in the protective actions to be taken if a release of radioactive or otherwise toxic material occurs.

SECTION 6.0
ENVIRONMENTAL IMPACTS OF UNLOADING NAVAL SPENT NUCLEAR FUEL AT A REPOSITORY SURFACE FACILITY OR A CENTRALIZED INTERIM STORAGE FACILITY

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6.0 ENVIRONMENTAL IMPACTS OF UNLOADING NAVAL SPENT NUCLEAR FUEL AT A REPOSITORY SURFACE FACILITY OR A CENTRALIZED INTERIM STORAGE FACILITY

6.1 Overview

This chapter addresses issues related to the unloading and handling of naval spent nuclear fuel at a notional or representative geologic repository surface facility in preparation for disposal or at a centralized interim storage facility for storage prior to being moved to a repository for disposal. For the multi-purpose canister alternatives, the naval spent nuclear fuel will arrive at a repository surface facility or centralized interim storage site in the same container that will be used for interim storage or for disposal. The multi-purpose canisters would only need to be removed from the shipping overpack and inserted into either storage or disposal overpacks. However, once at a repository surface facility, the other container system alternatives require that the individual naval spent nuclear fuel assemblies must be removed from the containers which were used for shipping and the naval spent nuclear fuel must be placed into a disposal container. Therefore, the impact on the environment surrounding a repository surface facility is different for the alternatives which make use of multi-purpose canisters than for the other container alternatives. A detailed discussion of all resources and environmental attributes is not presented here due to the uncertainty in the location of these facilities. Rather, this chapter presents a discussion of the impacts on the environment which are related to different operations at either of these facilities due to the container system alternatives. Thus, this chapter is intended to identify any particular issues associated with the selection of a container system that arise from repository or interim storage operations.

Site-specific repository operations and accident analyses will be the subject of the site-specific EIS for the particular facility. The Navy will participate and contribute to that EIS, as appropriate. This participation will include, at a minimum, the contribution of naval spent nuclear fuel to the cumulative impact for all of the spent nuclear fuel operations at the repository.

6.2 Assumptions

It is assumed that naval spent nuclear fuel will be disposed of at the same geologic repository that is used for civilian spent nuclear fuel and that a repository surface facility will be designed to accept and handle naval spent nuclear fuel in the same conceptual fashion as civilian spent nuclear fuel. As previously discussed in Section 3.2, the alternatives which use M-140 transportation casks have the potential to significantly impact the final facility designs. For operations involving the unloading of naval spent nuclear fuel from M-140 transportation casks, it is assumed that the final design of the facilities would allow for the operations to take place inside of the building with high efficiency particulate air filtering capability. Some special adapters may be required to handle the M-140 casks. In anticipation that transfer container operations, similar to those in use at the Expended Core Facility, may be required, a hypothetical accident scenario involving a dropped transfer container was evaluated for the M-140 alternatives to cover these unique operations. Therefore, the operations anticipated for unloading naval spent nuclear fuel from M-140 transportation casks do not present any increased risks when compared to the operations required to unload the other container alternatives.

Since the location of a geologic repository and detailed design of a repository surface facility have not yet been finalized, the site and operational characteristics of a hypothetical repository site and spent nuclear fuel unloading facility had to be assumed for the purpose of comparing the environmental impacts of the different container system alternatives. A site specific environmental setting cannot be presented here since the exact location of the repository would be needed.

For purposes of analysis in this EIS, it is assumed that a representative centralized interim storage site would be located at or near a representative repository surface facility and would be the same as that for civilian spent nuclear fuel. Therefore, the same assumptions concerning methodology, population, meteorology, and distance to the boundary of the facility apply to either unloading at a repository or unloading at a centralized interim storage site.

6.3 Impacts

6.3.1 Methodology

Impacts due to airborne releases of radioactive materials at a hypothetical repository or a hypothetical centralized interim storage site due to unloading of naval spent nuclear fuel were evaluated. Calculations were performed to estimate the impact on surface facility workers and the public due to estimated radiological air emissions resulting from the handling of naval spent nuclear fuel inside of the shielded, filtered cells of the spent nuclear fuel handling facility. The specific methodology and computer codes used for these analyses are presented in Appendix A, Section A.2.3.

6.3.2 Population

For calculational purposes, a population density of 45 persons per square mile was used for a hypothetical repository or centralized interim storage site. This density is equivalent to the average population density in the western United States. The distribution of the general population is assumed to be uniform in all directions except that no members of the general public are within the site boundary. The site boundary is assumed to be three miles from the location of the surface facility.

6.3.3 Meteorology

For meteorological conditions, Pasquill Class D with a wind speed of 13.2 ft/s (approximately 4 m/s) was used for normal operations and Pasquill Class F with a wind speed of 3.3 ft/s (approximately 1 m/s) was used for accident conditions. These are national average values and are further described in Appendix A.

6.3.4 Radiological Results

The airborne release of radioactive materials due to incident free operations associated with unloading naval spent nuclear fuel and special case low-level waste at a surface facility will be extremely small. Results are presented in Table 6.1. There will be no releases for the alternatives which make use of multi-purpose canisters since these containers will be seal welded during loading operations at INEL and would not be opened at a repository or centralized interim storage site. An assessment of the impact on the public of the small amount of radioactive material which could pass through the high efficiency particulate air filters of the surface facility for the other alternatives was performed. The maximum exposure that a member of the public is expected to receive in the busiest year of unloading at a surface facility would be 1.4×10^{-6} rem, resulting in an annual risk of developing latent fatal cancer of 7.2×10^{-10} or 1 chance in 1.3 billion. Radiological impacts of accidents are presented in Table 6.2. Again, the annual risk of public health effects due to these hypothetical accidents is extremely small. Details of the analyses are presented in Appendix A, Section A.2.4.

TABLE 6.1 Estimated Annual Health Effects from Unloading Operations for Naval Spent Nuclear Fuel and SCW at a Hypothetical Surface Facility: Normal Operations, All Container Alternatives Except MPCs[a]

Facility Worker		MEI		General Population	
Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities
5.4×10^{-5}	2.2×10^{-8}	1.4×10^{-6}	7.2×10^{-10}	2.4×10^{-2}	1.2×10^{-5}

[a] Notation: MEI = individual at nearest site boundary; SCW = special case waste; MPC = multi-purpose canisters.

TABLE 6.2 Estimated Health Effects from Hypothetical Surface Facility Accidents for Naval Spent Nuclear Fuel and SCW Due to Storage and Unloading Operations[a]

	Facility Worker		MEI		General Population		
Accident	Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities	Annual Risk
Mechanical Damage (Wind-Driven Projectile)[b]	3.5×10^{-1}	1.4×10^{-4}	2.1×10^{-3}	1.0×10^{-6}	3.6	1.8×10^{-3}	1.8×10^{-8}
Dropped Transfer Container[c]	1.7×10^{-2}	7.0×10^{-6}	1.0×10^{-4}	5.2×10^{-8}	1.8×10^{-1}	9.0×10^{-5}	9.0×10^{-10}

[a] Notation: SCW = special case low-level waste; MEI = individual at nearest site boundary;
[b] Values listed for high-capacity M-140, transportable storage cask, and dual-purpose canister alternatives. Values for other alternatives are less.
[c] Applies only to M-140 and high-capacity M-140 container alternatives.

The environmental impacts on the areas of waste generation and land resources were assessed qualitatively. Radiologically contaminated casks and canisters would be decontaminated prior to recycling or disposed of in a low-level radioactive waste burial facility for all alternatives except the multi-purpose canisters. See Section 4.5.2 for more details. Thus, the container systems which have the least impact on the environment for both low-level waste disposed of and the amount of land required for disposal are the multi-purpose canister alternatives.

6.4 Topics Not Evaluated in Detail

Several other resources and environmental attributes were evaluated for INEL in Chapter 5. These attributes were not evaluated in detail for a hypothetical geologic repository or centralized interim storage site, since a specific site location is not known, the impact on the attributes are not expected to be large, and the evaluation would not help to discriminate among the container alternatives. These areas include ecology, air quality, cultural resources, socioeconomics, water resources, environmental justice, aesthetic and scenic resources, geology, noise, and electricity consumption.

6.5 Cumulative Impacts

Since the amount of naval spent nuclear fuel and special case low-level waste handled at the repository or centralized interim storage surface facility will be extremely small when compared to the amount of civilian spent nuclear fuel, cumulative impacts were evaluated qualitatively. As stated above, naval spent nuclear fuel would be placed in the same geologic repository or located at the same centralized interim storage site that would receive civilian spent nuclear fuel. In Appendix B, an estimated shipping schedule for naval spent nuclear fuel is presented. Depending upon the container alternative, about 15 to 25 containers of naval spent nuclear fuel per year would arrive at the surface facility, which is less than 4% of the total number of containers of spent nuclear fuel arriving at the facility each year. Over the 25 years of unloading operations evaluated in this EIS, about 300 to 500 naval spent nuclear fuel containers and about 45 to 85 special case low-level waste containers would arrive at the surface facility, which is less than 3% of the total number of civilian spent nuclear fuel containers to be received. It is expected that the environmental impacts due to unloading naval spent nuclear fuel and special case low-level waste at the surface facility would be in proportion to the total number of spent nuclear fuel containers received at the facility and, thus, these activities would have a small impact on the environment and the surrounding population at the site.

SECTION 7.0
ENVIRONMENTAL IMPACTS OF TRANSPORTATION OF NAVAL SPENT NUCLEAR FUEL

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7.0 ENVIRONMENTAL IMPACTS OF TRANSPORTATION OF NAVAL SPENT NUCLEAR FUEL

7.1 Overview

This chapter describes representative environmental settings along the transportation routes (as shown in Appendix B, Figure B.2) for the naval spent nuclear fuel as it is shipped from INEL to a geologic repository or a centralized interim storage site. The environmental impacts and the radiological and nonradiological risks of these shipments are also described. The environment would be essentially unaffected by the transportation of naval spent nuclear fuel in the alternative container systems being considered under this EIS. The radiological impacts would be extremely small for incident-free transportation. The risks from a hypothetical transportation accident are also very small. The air quality effects from diesel exhaust are shown to be *de minimis* and therefore, the conformity regulations do not apply.

A range of routes to a repository or centralized interim storage site is used for the transportation analysis in this EIS in order to determine whether different routing characteristics, such as distance or differences in population distribution, would affect the comparison of the alternative container types. Since no repository or centralized interim storage site has yet been selected, the transportation routing in this EIS uses a site being evaluated by the Department of Energy pursuant to the Nuclear Waste Policy Act as the destination point for naval spent nuclear fuel shipments. For the sake of comparing a reasonable range of alternatives the current regulations have been applied conservatively in the EIS transportation analysis.

Specific transportation routes have not been evaluated for shipment of naval spent nuclear fuel to a repository or centralized interim storage site because that will be the subject of the site-specific EIS for the particular facility. Transportation of naval spent nuclear fuel to a repository or centralized interim storage site will be addressed in the repository EIS analysis. The Navy will participate and contribute to that EIS, as appropriate. This participation will include, at a minimum, the contribution of naval spent nuclear fuel to the cumulative impact for all of the spent nuclear fuel shipments to the designated repository.

In this EIS transportation of naval spent nuclear fuel from INEL to a geologic repository or a centralized interim storage site would be conducted primarily by railcar. These shipments would use existing rail systems and in general would be combined with routine freight trains. Short segments at the beginning and the end of the route, that is, between the DOE facility and the nearest rail switchyard, would likely use a dedicated locomotive over a spur track or, if necessary, heavy-haul truck transport. For purposes of evaluation, this EIS only evaluates rail transportation. The ultimate decision, however, on transportation options (legal-weight truck, some combination of legal-weight truck and rail, or rail/heavy-haul truck) will be made by the DOE on the basis of analyses to be performed in the repository EIS.

Transportation risk assessments pertaining to shipments that include special case waste are also included throughout this chapter for comparison purposes. Those cumulative assessments are identified in applicable tables and indicate no discernable increase in health risk.

Sections 7.3 and 7.4 of this chapter present a description of potential environmental impacts. Appendix B provides specific details on transportation, alternative container types, and analyses results for readers seeking more technical information.

7.2 Existing Environmental Settings of Transportation Route

The environmental settings along the transportation route would be a mixture of urban, suburban, and rural environments. Three possible routes were evaluated in this EIS for transport of naval spent nuclear fuel to a repository or centralized interim storage site to ensure the completeness of the calculations. All three routes originated at INEL. The Yucca Mountain site is the only site currently authorized by legislation, specifically the Nuclear Waste Policy Act, for site characterization as a geologic repository for spent nuclear fuel, including naval spent nuclear fuel. Its suitability as a repository has not yet been determined nor has it yet been authorized by law as a location for a centralized interim storage site. The three routes evaluated are designated as the "most direct" route, an "eastern" route and a "western" route. The three routes were evaluated not with the intent to select a route but with the intent to identify the range of potential impacts. It is not possible to select a route since the repository location is unknown.

All three routes pass through the Fort Hall Indian Reservation en route to Pocatello, Idaho. Shipping of naval spent nuclear fuel has occurred through these Native American lands since 1957 without impact. At Pocatello, the most direct route is south through Salt Lake City and then into Nevada. The eastern route heads east to Denver, Colorado and then south to Albuquerque, New Mexico and then into Las Vegas, Nevada. After leaving Pocatello, the western route again passes through the Fort Hall Indian Reservation, heads into Oregon, and then turns south to Sacramento, California and then into Las Vegas, Nevada. Table B.15 of Appendix B provides additional information for each route.

It is expected that over 90% of the transportation route would pass through rural areas and both the point of origin and destination would be in rural areas. The terrain, air quality, and other regional characteristics would vary over a wide range. To assess air quality impacts, Salt Lake City was chosen as a representative location for the analysis. Salt Lake City is a non-attainment area for ozone, carbon monoxide, and particulate matter.

7.3 Impacts of Transportation

This section describes the environmental impacts of transportation of naval spent nuclear fuel from INEL to a geologic repository or a centralized interim storage site for disposal. Although the total number of naval spent nuclear fuel shipments during the period covered by this EIS would range from a low of approximately 300 to a high of approximately 500, depending on the alternative selected, the environmental impacts are so small in each case that the differences among the alternatives are negligible. Details are presented in Appendix B. A projected shipping schedule for the years 2010 to 2035 for each alternative is presented in Table 7.1.

Table 7.2 presents a projected shipping schedule that includes the additional special case waste shipments. As indicated in the table, the total shipments (naval spent nuclear fuel and special case waste) would range from a low of approximately 360 to a high of approximately 585. Even with the additional shipments of special case waste, the environmental impacts for any of the alternatives selected remain minimal in each case, therefore, the differences among the alternatives also remain negligible.

TABLE 7.1 Naval Spent Nuclear Fuel Containers Shipped to a Centralized Interim Storage Site or a Geologic Repository, 2010 to 2035[a,b]

Year	MPC	No Action	Current Technology/Rail	Transportable Storage Cask	Dual-Purpose Canister	Small MPC
2010	1	1	1	1	1	1
2011	1	2	1	1	1	3
2012	3	4	2	2	3	5
2013	6	7	4	4	6	8
2014	8	8	6	6	8	13
2015	9	10	8	8	9	15
2016	10	12	9	9	10	17
2017	11	15	11	11	11	19
2018	12	17	13	13	12	21
2019	14	19	15	15	14	23
2020	15	22	17	17	15	25
2021	15	22	17	17	15	25
2022	15	22	17	17	15	25
2023	15	22	17	17	15	25
2024	15	22	17	17	15	25
2025	15	22	17	17	15	25
2026	15	22	17	17	15	25
2027	15	22	17	17	15	25
2028	15	22	17	17	15	25
2029	15	22	17	17	15	25
2030	15	22	17	17	15	25
2031	15	22	17	17	15	25
2032	15	22	17	17	15	25
2033	15	22	17	17	15	25
2034	15	22	17	17	15	25
2035	0	0	0	0	0	0
TOTAL	300	425	325	325	300	500

[a] Table is not additive across rows. Each column represents the total shipments for the year depending on the alternative selected.

[b] All container shipments are by rail.

TABLE 7.2 Naval Spent Nuclear Fuel and Special Case Waste Containers (Total) Shipped to a Centralized Interim Storage Site or a Geologic Repository, 2010 to 2035[a,b]

Year	MPC	No Action	Current Technology/Rail	Transportable Storage Cask	Dual-Purpose Canister	Small MPC
2010	1	1	1	1	1	1
2011	1	2	1	1	1	3
2012	3	4	2	2	3	5
2013	6	7	4	4	6	8
2014	8	8	6	6	8	13
2015	9	10	8	8	9	15
2016	10	12	9	9	10	17
2017	11	15	11	11	11	19
2018	12	17	13	13	12	21
2019	14	19	15	15	14	23
2020	15	22	17	17	15	25
2021	15	22	17	17	15	25
2022	19	25	20	18	16	28
2023	19	25	20	19	17	28
2024	19	25	20	19	17	28
2025	19	25	20	21	19	31
2026	19	25	20	21	19	32
2027	20	27	22	21	19	32
2028	20	27	22	21	19	33
2029	20	27	22	21	19	33
2030	20	27	22	21	19	33
2031	20	27	22	21	19	33
2032	20	27	22	21	19	33
2033	20	27	22	21	19	33
2034	20	27	22	21	19	33
2035	0	0	0	0	0	0
TOTAL	360	480	380	370	345	585

[a] Table is not additive across rows. Each column represents the total shipments for the year depending on the alternative selected.
[b] All container shipments are by rail.

The average amount of naval spent nuclear fuel in each container shipped from INEL to a repository or centralized interim storage site over the period covered by the EIS is provided in Table 7.3.

TABLE 7.3 Average Amounts of Naval Spent Nuclear Fuel per Container Shipped

Alternative[a]	Number of Containers Shipped	MTHM per Container
MPC	300	0.22
NAA	425	0.15
CTR	325	0.20
TSC	325	0.20
DPC	300	0.22
Sm MPC	500	0.13

Notation: MPC = multi-purpose canister; NAA = no-action alternative; CTR = current technology/rail; TSC = transportable storage cask; DPC = dual-purpose canister; Sm MPC = small multi-purpose canister; MTHM = metric tons of heavy metal

All of the alternative container systems would be suitable for heavy-haul transportation, as illustrated by prior use of the M-140 containers in heavy-haul transport. However, it is accurate to state that the M-140 based alternatives would be less suitable due to size, height, and weight.

7.3.1 Impacts on Land Resources

No additional impact on land resources is expected due to the transportation of the naval spent nuclear fuel to a repository or centralized interim storage site. For this EIS, it is assumed that the transportation routes would use existing rail lines and rail spurs, or new rail spurs to be constructed on the INEL site. At a repository, the naval spent nuclear fuel will traverse rail systems developed for civilian spent nuclear fuel disposal if or when they are available at the facility. Construction of access routes to the facility will be required independent of the decision on the type of containers to use for transport and storage and, in fact, the access routes will be required for ultimate disposition of civilian spent nuclear fuel even if naval spent nuclear fuel were not to be shipped for disposal.

7.3.2 Impacts on Air Quality

Air emissions resulting from the transport of the naval spent nuclear fuel would be inconsequential. The shipping containers will be designed not to leak, even under severe accident conditions. They will meet the regulations specified in 49 CFR Part 173, entitled "Shippers - General Requirements for Shipments and Packaging" and the regulations specified in 10 CFR Part 71, entitled "Packaging of Radioactive Material for Transportation and Transportation under Certain Conditions." Furthermore, since the transport will generally be conducted with other routine commercial freight train shipments, the effect on air quality from the slight increase in locomotive emissions caused by the occasional shipment and the additional weight being pulled in the routine commercial shipments would be inconsequential.

Air pollutant emissions from rail transportation for the alternatives are discussed in Appendix B of this EIS. The representative route (or alternative routes) does include several non-attainment air pollution areas for carbon monoxide, ozone, or particulates. Impacts on a representative non-attainment area (Salt Lake City) are discussed in Appendix B and the effect is demonstrated to be *de minimis* and the conformity regulations do not apply.

If heavy-haul transporters were needed to move the shipping container from a rail head to a centralized interim storage site or repository site the air quality effects due to heavy-haul transporters would be expected to be small due to the distance traveled and the small number of shipments. As discussed earlier in this chapter, the ultimate decision on transportation options will be made by the DOE on the basis of analyses to be performed in the repository EIS.

7.3.3 Impacts on Occupational and Public Health and Safety

The calculated impacts on the health and safety of the affected workers (i.e., train crew and government escorts) and the general public are extremely small. Factoring in the total risk of normal transportation operations and the full range of possible accidents, no fatalities (either radiological or nonradiological related) are calculated over the entire 40-year period covered by this EIS (less than one fatality from all shipments over the 25-year shipment period). This holds true for the affected workers as well as the general public for all alternatives.

Table 7.4 shows the risk of latent cancer fatalities along with the risk of estimated nonradiological fatalities during incident-free transportation to a centralized interim storage site or a geological repository. For example, as indicated in Table 7.4, the risks associated with the 125-ton multi-purpose canister would be:

- 0.0075 (7.5×10^{-3}) cancer fatalities in the 25-year shipment period for the general population along transportation routes. That is, during those 25 years, calculated risks indicate approximately one latent cancer fatality if the entire transport program for the shipments were to be repeated 135 times;

- an increase of about 0.00052 (5.2×10^{-4}) non-radiological fatalities from hypothetical traffic accidents during transportation. That is, during the 25-year shipment period, calculated risks indicate approximately one nonradiological (e.g. emissions, pollution) fatality if the entire transport program for the shipments were to be repeated 2,000 times.

There are no noticeable differences among the alternatives for the estimated nonradiological fatalities. The latent cancer fatalities associated with incident-free transportation are noticeably lower for both the No-Action Alternative and the Current Technology/Rail Alternative because the calculations are based on actual historic measured dose rates for the M-140 casks. This indicates that the transportation impacts for the other alternatives have been calculated conservatively and as a group are about the same.

Table 7.5 shows the risks of latent cancer fatalities expected from hypothetical accidents during transportation. For consistency purposes, if the same example of the 125-ton multi-purpose canister were used to describe the accident risks that appear in Table 7.5, an accident occurring along the transportation route in conjunction with the shipment would be expected to result in:

- 0.0000032 (3.2×10^{-6}) latent cancer fatalities during the 25-year period; and

- 0.055 estimated traffic fatalities during the 25-year shipment period.

TABLE 7.4 Incident-Free Transportation Risk for the Total Predicted Number of Shipments[b,c]

Alternative[a]	Number of Casks	General Population: Latent Cancer Fatalities	Occupational Population: Latent Cancer Fatalities	Estimated Nonradiological Fatalities
MPC	360	7.5×10^{-3}	4.4×10^{-3}	5.2×10^{-4}
NAA	480	1.0×10^{-3}	7.2×10^{-4}	6.9×10^{-4}
CTR	380	8.0×10^{-4}	5.7×10^{-4}	5.5×10^{-4}
TSC[d]	370	7.2×10^{-3}	4.3×10^{-3}	5.3×10^{-4}
DPC[d]	345	7.4×10^{-3}	4.2×10^{-3}	5.0×10^{-4}
SmMPC	585	1.2×10^{-2}	7.1×10^{-3}	8.4×10^{-4}

[a] Notation: MPC = multi-purpose canister; NAA = no-action alternative; CTR = current technology/rail; TSC = transportable storage cask; DPC = dual-purpose canister; SmMPC = small multi-purpose canister.
[b] Numbers in this table come from Table B.10, which includes shipments of naval spent nuclear fuel and special case waste.
[c] The number of shipments assumes 3 casks per train or 3 casks per shipment.
[d] NAC-STC and NUHOMS-MP187® are representative casks for these alternatives.

TABLE 7.5 Accident Risk for the Total Number of Shipments of Each Container[ab]

Alternative	Number of Casks	Latent Cancer Fatalities	Estimated Traffic Fatalities[c]
MPC	360	3.2×10^{-6}	0.055
NAA	480	2.5×10^{-6}	0.073
CTR	380	2.4×10^{-6}	0.058
TSC[d]	370	3.9×10^{-6}	0.056
DPC[d]	345	3.3×10^{-6}	0.052
SmMPC	585	3.0×10^{-6}	0.089

[a] Notation: MPC = multi-purpose canister; NAA = no-action alternative; CTR = current technology/rail; TSC = transportable storage cask; DPC = dual-purpose canister; SmMPC = small multi-purpose canister.
[b] Numbers in this table come from Table B.12 for naval spent nuclear fuel, and include shipments of special case waste.
[c] This assumes that shipment will be made via general freight and 3 out of 63 cars (the average length of a freight train) carry naval spent nuclear fuel.
[d] NAC-STC and NUHOMS-MP187® are representative casks for these alternatives, respectively.

Table 7.6 provides the average annual impacts of transportation operations on maximally exposed individuals, including the general public and workers.

Although there may be up to five transportation workers on the train, one worker (the inspector) will receive almost the entire occupational dose. This is because during transit, crew exposure is negligible due to the relatively long separation distance between the crew and the container and the shielding effects of intervening structures. Therefore, risk calculations for the occupational maximally exposed individual assumed one crew member received the entire occupational dose.

As shown in Table 7.6, the resulting latent cancer fatalities to the maximally exposed individual for the general population range from 2.8×10^{-6} (about one in 350,000 years) for the Current Technology/Rail to 4.4×10^{-5} (about one in 22,000 years) for the Small Multi-Purpose Canister. Occupational maximally exposed individual risks range from 2.3×10^{-5} (about one in 43,000 years) for the Current Technology/Rail to 2.8×10^{-4} (about one in 3,500 years) for the Small Multi-Purpose Canister.

Analytical Approaches. Two separate analytical approaches to transportation accidents are used. One is a probabilistic assessment of impacts to human health and the environment based on the Modal Study (NRC 1987) and the other is a deterministic estimate of maximum consequences of a severe hypothetical transportation accident. The results of both analytical approaches have been used for the comparison of alternatives. The results of the analysis of maximum consequence accidents are presented in Section B.6.3 and in Table B.13.

The range of accidents analyzed produces effects at least as large as the effects of a hypothetical heavy-haul transportation accident at an intersection in a major city on a week day during rush hour or an extremely severe terrorist attack. Severe hypothetical accidents have also been analyzed for the rural and suburban population densities.

Other Impacts. In addition to the possible human health effects associated with accidents described in the preceding sections, other effects such as the impacts on land use in the area and the costs of cleanup have been estimated in order to develop a perspective and to evaluate potential differences among alternatives. The analyses provided in Appendix A show that for the most severe hypothetical accidents associated with naval spent nuclear fuel, an area of approximately 629 acres (approximately 255 ha), extending about 2.2 mi (approximately 3.5 km) downwind of the accident location, might be contaminated to the point where exposure could exceed 100 mrem per year. Beyond this distance, exposures would be below 100 mrem per year, the Nuclear Regulatory Commission's standard for protection of the general population from radiation.

An accident might result in short-term restrictions on access to a relatively small area. It would not be expected to produce enduring impacts on cultural or similar resources or concerns such as Native American rights or interests, partially because the area involved would be small and partly because all remedial actions would be conducted in a careful, controlled manner and in full compliance with applicable laws and regulations. The affected area would vary only slightly among the alternatives considered. Overall, the risks are small, so these considerations do not assist in distinguishing among alternatives.

Accidents associated with any of the alternatives would not have an appreciable effect on the ecology of the area, considering the potential for human health effects and the amount of land which might be affected. There is little consensus among scientists on methods for estimating the effects of radiation on ecological resources such as plant or animal life. However, since human health effects for all the accidents analyzed are small, the affected area is small, the effects are temporary, and most plants and animals are not thought to be more sensitive to radiation than human beings, the small impacts on human health provide an indication that the impacts on animal and plant species in the area would also be small for all alternatives considered. The impacts of hypothetical accidents are limited in extent and small enough that there should be no long-term impact on tourism, marketability of products, or other economic or cultural activities. The possible environmental impacts of hypothetical accidents during shipment of naval spent nuclear fuel are very similar for all of the container systems.

TABLE 7.6 Average Annual Risk of Latent Cancer Fatalities in the Maximally Exposed Individuals in the General Population and in the Occupational Group Due to Incident-Free Transportation Operations[a]

	Latent Cancer Fatalities to MEIs[b,c]	
Alternative	General Population	Occupational
Multi-Purpose Canister	2.7×10^{-5}	1.8×10^{-4}
No-Action	3.6×10^{-6}	2.9×10^{-5}
Current Technology/Rail	2.8×10^{-6}	2.3×10^{-5}
Transportable Storage Cask	2.6×10^{-5}	1.7×10^{-4}
Dual-Purpose Canister	2.6×10^{-5}	1.7×10^{-4}
Small Multi-Purpose Canister	4.4×10^{-5}	2.8×10^{-4}

[a] Numbers in this table are based on values from Table B.10, which includes shipments of naval spent nuclear fuel and special case waste.

[b] Maximally exposed individual (MEI) is the person receiving the greatest exposure in the group analyzed.

[c] Values from Table B.10 divided by 25 years to estimate the average annual risk.

In addition to radiological risks (latent cancer fatalities) to maximally exposed individuals, there may also be a slight increase in nonradiological fatalities due to factors such as extra pollution. Table 7.7 presents the average annual risk of nonradiological fatalities to the general public. As noted in Table 7.7, the increase in nonradiological fatalities range from approximately 2.0×10^{-5} (Dual-Purpose Canister) to 3.4×10^{-5} (Small Multi-Purpose Canister).

TABLE 7.7 Average Annual Risk of the Estimated Nonradiological Fatalities to the General Population Due to Incident Free Transportation Operations[a]

Alternative	Nonradiological Fatalities in the General Population[b]
Multi-Purpose Canister	2.1×10^{-5}
No-Action	2.8×10^{-5}
Current Technology/Rail	2.2×10^{-5}
Transportable Storage Cask	2.1×10^{-5}
Dual-Purpose Canister	2.0×10^{-5}
Small Multi-Purpose Canister	3.4×10^{-5}

[a] Numbers in this table are based on values from Table B.10, which includes shipments of naval spent nuclear fuel and special case waste.
[b] Values from Table B.10 divided by 25 years to estimate the average annual risk.

The average probability of a fatality in the United States associated with the national average pollutant factor for trains is 1.3×10^{-7} fatalities per kilometer. This factor is true for rural, suburban, and urban areas. This means that a fatality, based on train pollutants, may occur about once in 7,600,000 years. The risk factor, 1.3×10^{-7} was obtained from "Non-Radiological Impacts of Transporting Radiological Material" (Rao, et al. 1982).

The results presented in the tables are for the most direct route which passes through Salt Lake City, Utah as described in Section 7.2. If the eastern or western route is chosen, the number of fatalities for incident-free transportation increases, but the number of fatalities remains much smaller than one in the 25-year transportation period. The increase is mainly due to the additional length of the route.

7.3.4 Impacts on Socioeconomics

The regional socioeconomic impacts of the transport of the naval spent nuclear fuel are expected to be very small. A typical rail shipment involves only a few workers (typically, three train crew members and two government escorts). No more than 585 shipments of naval spent nuclear fuel and special case waste to a repository would be expected to occur over the period covered by this EIS. On the average, there would be fewer than three shipments per month. This would not create an appreciable number of new jobs, nor would it appreciably affect the business activity in any region.

7.3.5 Impacts on Environmental Justice

Because of the nature of naval spent nuclear fuel, rail shipment is the only method that will be used to transport from INEL to a repository under all of the alternatives considered. The only exception to this is that heavy-haul transport might be used to move loaded shipping containers from the source at INEL a few miles to the nearest rail siding or to a centralized interim storage site or a repository from its nearest rail siding. Rail shipment used for naval spent nuclear fuel tends to limit the exposure to members of the general public during transportation. The shipments pass through urban, suburban, and rural areas, using routes selected by the railroads in accordance with applicable regulations and the requirements of the load. The fractions of the distance traveled in urban, suburban, and rural areas are about 1.2% urban, 5.8% suburban, and 93% rural for the most direct representative route.

Each of the routes studied passes through the Shoshone-Bannock Tribes' Fort Hall Indian Reservation. The effects of radiation exposure from the total number of incident-free shipments, which includes naval spent nuclear fuel and special case waste, to the residents of Fort Hall are summarized as follows:

- Residents on the Fort Hall Indian Reservation will receive between 3 person-millirem (for the Current Technology/Rail Alternative) and 34 person-millirem (for the Small Multi-Purpose Canister Alternative) of radiation exposure over 25 years of shipments within the 40 years analyzed in this EIS. This is about the same as a single chest x-ray.

- Note that during the same time period, residents (the entire population) of Fort Hall will receive approximately 72 million person-millirem of radiation exposure from naturally occurring sources of radiation.

This analysis was performed in response to concern expressed by the Shoshone-Bannock Tribes; however, this example is also expected to be typical of the potential for human health effects for any minority, low-income, or Native American populations located along the actual route traveled for the alternatives considered in this EIS, and demonstrates the small magnitude of human health impacts.

The impacts on human health or the environment resulting from routine transport of naval spent nuclear fuel and hypothetical transportation accidents would be small for all of the alternatives considered. For example, it is unlikely that a single latent fatal cancer case or health detriment would occur as a result of the transportation of naval spent nuclear fuel under any alternative. Shipping accidents could occur at any location along the routes used, so it is not possible to identify the specific impact on the minority or low-income composition of the populations along the routes. However, the fact that the potential impacts due to an accident for any of the alternatives considered would present no significant risk and do not constitute a credible adverse impact on the population along the shipping routes makes it possible to state that no adverse effects from accidents associated with the transportation of naval spent nuclear fuel would be expected for any specific segment of the population, minorities and low-income groups included.

The results of the accident analyses are provided in Table 7.5 and in Tables B.11-B.13 in Appendix B, including the maximum consequences of a hypothetical accident in rural, urban, and suburban zones. The assumptions and parameters used in the accident analysis make these results applicable to all population groups along the routes, including Native American, minority, and low income populations.

To place the impacts on environmental justice in perspective, the risk from routine shipping activities or hypothetical accidents associated with transportation of naval spent nuclear fuel under any of the alternatives considered would amount to less than one fatality per year in the affected population along transportation routes. For comparison, in 1990 there were approximately 40,000 traffic fatalities in the U.S. population and there were about 7,400 deaths caused by traffic accidents in minority populations in the United States. Even if all of the cancer deaths associated with an accident for any of the alternatives considered for naval spent nuclear fuel management were assumed to occur only in minority populations, they would experience far less than one fatality per year. The same conclusion can be drawn for low-income populations.

7.3.6 Other Areas of Impact

Since the transport of the naval spent nuclear fuel to a repository would present essentially no observable increase in traffic activity and would primarily use existing transportation links, the impacts on other aspects of the environment along the transportation routes, such as aesthetics, geology, water resources, ecology, and cultural resources, would be negligible.

7.3.7 Cumulative Impacts

In addition to the transportation effects noted in this chapter, and detailed in Appendix B, there is one other foreseeable contributor to the health risks due to transportation: the shipment of commercial spent nuclear fuel.

In addition to the naval spent nuclear fuel, there will be many shipments of civilian and DOE spent nuclear fuel. It is estimated that there could be between 3,000 to 17,000 rail shipments and 5,000 to 37,000 truck shipments to move the civilian spent nuclear fuel. There will be only 345 to 585 total shipments of naval spent nuclear fuel and special case waste, thus the impact of the transportation of Navy waste would be approximately 1 to 4% of the total impact of spent nuclear fuel shipments to a centralized interim storage site or geologic repository.

Appendix I of Volume 1 of the Programmatic SNF and INEL EIS (DOE 1995) provided cumulative impacts of the shipment of all nuclear material in the United States, including Navy, DOE, civilian spent nuclear fuel, and medical waste. Appendix I also provided an estimate of transportation effects to a geologic repository. It was estimated that the total number of latent cancer fatalities from all shipments of nuclear material in the United States from 1943 to 2035 would be 130 for workers and 160 for the general population. These 290 fatalities would be approximately 0.0010 percent of the total number of latent cancer fatalities in the United States over that 92-year period.

The incident-free and non-radiological risks, as measured by the latent cancer fatalities of Table 7-4, are extremely small when compared to Appendix I results. The largest estimate of latent cancer fatalities for transporting naval spent nuclear fuel to a centralized interim storage site or a geologic repository is approximately 0.01 worker death and 0.01 death in the general population for the 25-year transportation period within the 40-year period analyzed for this EIS. These are less than 0.01% of the total Appendix I latent cancer fatalities.

7.3.8 Unavoidable Adverse Effects

The unavoidable adverse effects of the transportation activities would be inconsequential. Since the transport will generally be conducted with other routine commercial freight train shipments, the effect on air quality from the slight increase in locomotive emissions caused by the occasional shipment and the additional weight being pulled during the routine commercial shipments would be negligible.

The calculated impacts on the health and safety of the affected transportation waters and general population are small. No fatalities (either radiological or nonradiological related) are expected over the entire 25-year shipment period.

7.3.9 Irreversible and Irretrievable Commitment of Resources

Transportation of naval spent nuclear fuel from INEL to a centralized interim storage site or geologic repository would be conducted primarily by diesel-operated railcar. Since the naval spent nuclear fuel would be transported over existing rail lines, or new rail lines built for other projects, there would be no appreciable commitment of resources that would be irreversible or irretrievable.

7.3.10 Relationship between Short-Term Use of the Environment and the Maintenance and Enhancement of Long-Term Productivity

As discussed throughout this chapter, the normal operations associated with the transport of naval spent nuclear fuel will result in some very small increases in radiation exposure, traffic, and associated air emissions. This use of the environment and the associated impacts on the environment would not affect the long-term productivity of any area.

7.4 Impact Avoidance and Mitigative Measures

Radiological emissions from containers and casks used for the transport or storage of naval spent nuclear fuel are avoided by design. The containers and casks are air-tight and essentially leak-proof, even under adverse conditions. Nonradiological emissions are also avoided by the same design features. Impacts due to construction are avoided by utilizing existing transportation systems, thus eliminating the need to construct new rail lines. The effects of the radiation from the naval spent nuclear fuel are minimized through the use of shielding to reduce the radiation fields. The potential consequences of an accident are minimized by the rugged design of the shipping containers and casks. In the unlikely event that a serious accident should occur, existing resources can be activated to quickly and safely bring the situation under control.

SECTION 8.0
APPLICABLE LAWS AND REGULATIONS

TABLE OF CONTENTS

TABLES

8.0 APPLICABLE LAWS AND REGULATIONS

This chapter identifies the major laws, regulations and other requirements that would be applicable to the fabrication and deployment of any of the container systems for naval spent fuel considered in this EIS. Detailed summaries of many of these laws, regulations and other requirements can be found in the INEL Programmatic EIS (DOE 1995, Volume 1, Chapter 7) which is incorporated by reference in this section.

8.1 Federal Statutes and Regulations

8.1.1 Atomic Energy Act of 1954, as Amended (42 USC § 2011 et seq.)

The Atomic Energy Act, as amended, authorizes DOE, the Nuclear Regulatory Commission and the Environmental Protection Agency to issue regulations and establish standards for utilizing atomic energy for peaceful purposes consistent with public health and safety. Some associated regulations include:

- 10 CFR Part 20 - Standards for Protection Against Radiation
- 10 CFR Part 71 - Packaging and Transportation of Radioactive Material
- 10 CFR Part 835 - Occupational Radiation Exposure
- 40 CFR Part 190 - Environmental Radiation Protection Standards for Nuclear Power Operations
- 40 CFR Part 191 - Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High Level and Transuranic Radioactive Waste.

8.1.2 Clean Air Act, as Amended (42 USC §§ 7401-7671q)

The Clean Air Act, as amended, is intended to protect and enhance the quality of the nation's air resources. Implementing regulations are in 40 CFR Parts 50 through 99. Some regulations important to this EIS include:

- 40 CFR Part 61, Subpart H - National Emission Standards for Emissions of Radionuclides Other than Radon from DOE Facilities
- 40 CFR Part 86 - Control of Air Pollution from New and In-Use Motor Vehicles and New and In-Use Motor Vehicle Engines
- 40 CFR Part 93, Subpart B - Determining Conformity of General Federal Actions to State or Federal Implementation Plans.

8.1.3 Clean Water Act, as Amended (33 USC §§ 1251 - 1387)

The Clean Water Act, as amended, is intended to restore and maintain the chemical, physical and biological integrity of the nation's water. The most important implementing regulations are located in 40 CFR Part 122 et seq. - National Pollution Discharge Elimination System.

8.1.4 Emergency Planning and Community Right-to-Know Act of 1986

Under Subtitle A of this Act (also known as "SARA Title III"), federal facilities provide various information to state emergency response commissions and local emergency planning committees. Implementing regulations are found in 40 CFR Parts 350 through 372.

8.1.5 Federal Facility Compliance Act (42 USC § 6921 et seq.)

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, the effective date of the waiver has been delayed for three years for mixed waste storage prohibition violations, as long as the Federal facility is in compliance with all other applicable requirements of the Resource Conservation and Recovery Act. During this three-year period, DOE is required to prepare plans for developing the required treatment capacity for mixed wastes 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 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.

8.1.6 Hazardous Materials Transportation Act (49 USC § 5101 et seq.)

The purpose of the Hazardous Materials Transportation Act is to provide adequate protection against the risks inherent in the transportation of hazardous materials in commerce. Implementing regulations include:

- 49 CFR Parts 171 - 397 - Requirements for Marking, Labeling, Placarding and Emergency Response, etc.
- 49 CFR Part 173 - Radiation Level Limitations
- 49 CFR Part 174 - Requirements for Rail Transport
- 49 CFR Part 176 - Requirements for Waterborne Transport
- 49 CFR Part 397 - Truck Routing Requirements
- 10 CFR Part 71 - Packaging and Transportation of Radioactive Material

8.1.7 Low-Level Radioactive Waste Policy Act, as Amended (42 USC §§ 2021b-2021d)

The Low-Level Radioactive Waste Policy Act, as amended, sets forth the responsibilities of federal and state governments for disposal of low-level radioactive waste. Implementing regulations include:

- 10 CFR Part 20 - Standards for Protection Against Radiation
- 10 CFR Part 61 - Licensing Requirements for Land Disposal of Radioactive Waste.

8.1.8 National Environmental Policy Act, as Amended (42 USC § 4321 et seq.)

The National Environmental Policy Act, as amended, establishes a national policy of promoting awareness of the environmental impacts of activities by federal government agencies. Implementing regulations by the Council of Environmental Quality are found in 40 CFR Parts 1500 - 1508.

8.1.9 Noise Control Act of 1972, as Amended (42 USC § 4901 et seq.)

The Noise Control Act, as amended, promotes an environment free from noise that jeopardizes health and welfare.

8.1.10 Noise Pollution and Abatement Act of 1970 (42 USC § 7641 et seq.)

The Noise Pollution and Abatement Act provides for determination of methods to abate objectionable noise.

8.1.11 Nuclear Waste Policy Act of 1982, as Amended (42 USC § 10101 et seq.)

The Nuclear Waste Policy Act of 1982, as amended, provides for the management of spent nuclear fuel and high level waste and provides requirements for interim storage. Important implementing regulations include:

- 10 CFR Part 60 - Disposal of High-Level Radioactive Wastes in Geologic Repositories
- 10 CFR Part 72 - Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste.

8.1.12 Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 USC §5121 et seq.)

This Act provides for federal government assistance to state and local governments in the event of a disaster. The implementing regulations for the Federal Emergency Management Agency are in 44 CFR Chapter I.

8.1.13 Solid Waste Disposal Act as Amended by the Resource Conservation and Recovery Act (42 USC § 6901 et seq.)

The treatment, storage and 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 Environmental Protection Agency regulations implementing the Resource Conservation and Recovery Act are found in 40 CFR Parts 260-280. 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. The method of treatment, storage, and/or disposal also impacts the extent and complexity of the requirements.

8.2 Executive Orders

8.2.1 Executive Order 11514 - Protection and Enhancement of Environmental Quality

Executive Order 11514 requires federal agencies to monitor and control their activities to protect and enhance the quality of the environment.

8.2.2 Executive Order 12088 - Federal Compliance with Pollution Control Standards, as Amended by Executive Order 12580

This Executive Order assigns responsibility for ensuring the prevention, control, and abatement of environmental pollution by federal agencies.

8.2.3 Executive Order 12344 - Naval Nuclear Propulsion Program

This Executive Order, enacted as Public Law 98-525, (42 USC § 7158) establishes the responsibility and authority, in the Department of the Navy and in the Department of Energy, of the Director of the Naval Nuclear Propulsion Program for all matters involving naval nuclear fuel.

8.2.4 Executive Order 12856 - Right to Know and Pollution Prevention

This Executive Order provides requirements to federal agencies concerning toxic chemicals.

8.2.5 Executive Order 12898 - Environmental Justice

Executive Order 12898 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its programs on minority and low-income populations.

8.2.6 Executive Order 11593 - Protection and Enhancement of the Cultural Environment

This Executive Order directs Federal agencies to locate, inventory, and nominate properties under their jurisdiction or control to the *National Register of Historic Places* if those properties qualify. This process requires the Navy to provide the Advisory Council on Historic Preservation the opportunity to comment on the possible impacts of the proposed activity on any potential eligible or listed resources.

8.2.7 Executive Order 11988 - Floodplain Management

This Executive Order 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.

8.2.8 Executive Order 11990 - Protection of Wetlands

This Executive Order directs governmental agencies to avoid, to the extent practicable, any short- and long-term adverse impacts on wetlands wherever there is a practicable alternative.

8.2.9 Executive Order 12962 - Recreational Fisheries

This Executive Order directs Federal agencies, to the extent permitted by law and where practical, to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities. This includes evaluating the effects of Federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries and documenting those effects relative to the purpose of this order.

8.3 Other Laws and Regulations

- American Indian Religious Freedom Act of 1978 (42 USC § 1996)
- Archeological Resource Protection Act, as Amended (916 USC § 470 et seq.)
- Bald and Golden Eagle Protection Act (16 USC § 668)
- Endangered Species Act, as Amended (16 USC § 1531 et seq.)
- Migratory Bird Treaty Act, as Amended (16 USC §703 et seq.)
- National Historic Preservation Act, as Amended (16 USC § 470 et seq.)
- Native American Graves Protection and Repatriation Act of 1990 (25 USC § 3001)
- Pollution Prevention Act of 1990 (42 USC 13101 et seq.)
- Religious Freedom Restoration Act of 1993 (42 USC § 2000 et seq.)

- Idaho Hazardous Waste Management Act of 1983 (Idaho Code, Title 39, Chapter 44)
- Idaho Environmental Protection and Health Act (Idaho Code, Title 39, Chapter 101 et seq.)
- Idaho Water Pollution Control Act (Idaho Code, Title 39, Chapter 36)

8.4 DOE Orders

In addition to the above, the DOE Orders listed in Table 8.1 are considered. DOE Orders are in the process of being revised, replaced or consolidated. For clarity, the old order identification number is listed along with the tentative new number as available.

TABLE 8.1 DOE Orders[a]

DOE Order Numbers		
New	Old	Subject
O 252.1	1300.2A	DOE Technical Standards Program (May 19, 1992)
O 460.2	1540.2	Hazardous Material Packaging for Transport–Administrative Procedures (September 30, 1986; Chg. 1, December 19, 1988)
O 460.2	1540.3A	Base Technology for Radioactive Material Transportation Packaging Systems (July 8, 1992)
O 442.1	3790.1B	Federal Employee Occupational Safety and Health Program (January 7, 1993)
O 430.1	4330.4A	Maintenance Management Program (October 17, 1990)
O 430.1	4700.1	Project Management System (March 6, 1987)
-	5000.3B	Occurrence Reporting and Utilization of Operations Information (April 9, 1992)
-	5400.1	General Environmental Protection Program (November 9, 1988; Chg. 1, June 29, 1990)
P 450.2	5400.2A	Environmental Compliance Issue Coordination (January 31, 1989; Chg. 1, January 7, 1993)
O 441.1	5400.5	Radiation Protection of the Public and the Environment (February 8, 1990; Chg. 2, January 7, 1993)
N 441.1	N5400.13	Sealed Radioactive Source Accountability (December 22, 1994)
O 450.1	5440.1E	National Environmental Policy Act Compliance Program (November 10, 1992)

TABLE 8.1 - DOE Orders[a] (Cont.)

DOE Order Numbers		
New	Old	Subject
O 441.1	5480.1B	Environmental, Safety and Health Program for DOE Operations (September 23, 1986; Chg. 4, March 27, 1990)
O 441.1	5480.3	Environmental Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes (July 9, 1985)
O 440.3	5480.4	Environmental Protection, Safety and Health Protection Standards (May 15, 1984; Chg. 4, January 7, 1993)
O 440.1	5480.7A	Fire Protection (February 17, 1993)
O 440.1	5480.8A	Contractor Occupational Medical Program (June 26, 1992)
O 440.1	5480.10	Contractor Industrial Hygiene Program (June 26, 1985)
N 441.1	5480.11	Radiation Protection for Occupational Workers (December 21, 1988; Chg. 3, June 17, 1992)
O 225.1	5480.17	Site Safety Representatives (October 5, 1988)
-	5480.19	Conduct of Operations Requirements for DOE Facilities (July 9, 1990; Chg. 1, May 18, 1992)
O 424.1	5480.21	Unreviewed Safety Questions (December 24, 1991)
O 423.1	5480.22	Technical Safety Requirements (February 25, 1992; Chg. 1, September 15, 1992)
O 421.3	5480.23	Nuclear Safety Analysis Reports (April 10, 1992)
O 420.1	5480.24	Nuclear Criticality Safety (August 12, 1992)
-	5480.27	Equipment Qualification for Reactor and Nonreactor Nuclear Facilities (January 15, 1993)
P 420.1	5480.28	Natural Phenomena Hazards Mitigation (1-15-93)
O 421.3	5481.1B	Safety Analysis and Review System (September 23, 1986; Chg. 1, May 19, 1987)
O 224.3	5482.1B	Environment, Safety and Health Appraisal Program (September 23, 1986; Chg. 1, November 18, 1991)
O 440.1	5483.1A	Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned, Contractor-Operated Facilities (June 22, 1983)
O 231.2	5484.1	Environmental Protection, Safety and Health Protection Information Reporting Requirements (February 21, 1981; Chg. 7, October 17, 1990)
O 151.1	5500.1B	Emergency Management System (April 30, 1991; Chg. 1, February 27, 1992)

TABLE 8.1 - DOE Orders[a] (Cont.)

DOE Order Numbers		
New	Old	Subject
O 151.1	5500.2B	Emergency Categories, Classes, and Notification and Reporting Requirements (April 30, 1991; Chg. 1, February 27, 1992)
O 151.1	5500.3A	Planning and Preparedness for Operational Emergencies (April 30, 1991; Chg. 1, February 27, 1992)
O 151.1	5500.4A	Public Affairs Policy and Planning Requirements for Emergencies (June 8, 1992)
O 151.1	5500.7B	Emergency Operating Records Protection Program (October 23, 1991)
O 151.1	5500.9A	Emergency Planning, Preparedness, and Response to Continuity of Government Emergencies (July 8, 1992)
O 151.1	5500.10	Emergency Readiness Assurance Program (April 30, 1991; Chg. 1, February 27, 1992)
O 154.3	5530.3	Radiological Assistance Program (January 14, 1992; Chg. 1, April 10, 1992)
O 154.5	5530.5	Federal Radiological Monitoring and Assessment Center (July 10, 1992)
O 460.4	5610.14	Transportation Safeguards System Program Operations (May 12, 1993)
O 470.1	5630.11B	Safeguards and Security Program (August 2, 1994)
O 470.2	5630.12A	Safeguards and Security Inspection and Evaluation Program (June 23, 1992)
O 474.1	5633.3B	Control and Accountability of Nuclear Materials (September 7, 1994)
O 415.1	5660.1B	Management of Nuclear Materials (May 26, 1994)
O 416.1	5700.6C	Quality Assurance (August 21, 1991)
O 435.1	5820.2A	Radioactive Waste Management (September 26, 1988)
O 420.1	6430.1A	General Design Criteria (April 6, 1989)
O 440.1	5480.9	Construction Safety and Health Program (November 18, 1987)
O 362.2	5480.20	Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Nonreactor Nuclear Facilities (February 20, 1991)
O 414.1	5600.1	Management of Department of Energy Weapon Program and Weapon Complex (June 27, 1979)
O 471.2	5630.8A	Safeguarding of Naval Nuclear Propulsion Information (July 31, 1990)

[a]DOE currently is restructuring and consolidating its Order system. Therefore, some of the Orders listed in this table may be renumbered, consolidated, or eliminated in the future.

8.5 Other Legal Matters

8.5.1 Civil Actions in the United States District Court for the District of Idaho

On June 28, 1993 the U.S. District Court in Idaho enjoined DOE from transporting any spent nuclear fuel into the State of Idaho until DOE completed an environmental impact statement. The EIS was ordered to cover the impacts of the transportation, receipt, processing, and storage of any spent nuclear fuel at the INEL. This EIS was completed and issued in final form on April 30, 1995 and a Record of Decision was issued on June 1, 1995.

On October 16, 1995, the parties to the litigation reached a settlement of all issues related to the EIS. On October 17, 1995, the U.S. District Court in Idaho issued a Court Order vacating all prior injunctions in the cases and incorporating the settlement agreement as a Consent Order.

9.0 LIST OF PREPARERS

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11.0 COMMENTS AND RESPONSES

Chapter 11.0, which presents comments received following distribution of the Draft Environmental Impact Statement, is new in its entirety. Although no lines (sidebars) denoting revised text appear in the margins, no part of this chapter appeared in the Draft EIS.

On May 1, 1996 the Navy distributed the Draft EIS and the document's availability was announced in the Federal Register on May 14, 1996. The comment period on the EIS was originally scheduled for 45 days, but a 15-day extension was granted based on a request from the State of Nevada.

During the comment period, six public hearings were held and both written and oral comments were received. Comments are reprinted in this Final EIS and responses are provided.

A total of 51 parties commented orally or in written statements as follows:

- 2 commentors: Federal agencies and elected officials
- 13 commentors: State and tribal agencies and elected officials
- 5 commentors: Local agencies and elected officials
- 14 commentors: special interest groups
- 17 commentors: individuals

The Navy also received approximately 60 telephone calls during the public comment period. Most of the calls consisted of simple questions or requests for copies of the EIS. There were, however, three comments made during the course of these telephone conversations. Summaries of these three comments, along with responses, are presented at the end of this chapter.

11.1 Index to Commentors

Each oral comment and written comment letter has been assigned a document number, as indicated in the table below. In the following pages, each comment is reprinted in its entirety and is followed immediately by individual responses to each of the major points.

Document #	Author	Organization	State
1	Al Breaux		Nevada
2	Bernice C. Tom		Nevada
3	Julie Butler, Coordinator	Nevada State Clearinghouse/SPOC	Nevada
4	Bruce L. Schmalz		Idaho
5	Les W. Bradshaw, County Manager	Nye County, Nuclear Waste Repository Project Office	Nevada
6	John Geddie		New Mexico
7	Allyn Niles		Nevada
8	Sally Hamilton		Idaho

Document #	Author	Organization	State
9	James S. Hobbs	Sierra Nuclear Corp.	Georgia
10	Dennis Manning	State of California Department of Transportation	California
11	Jack Streeter		Idaho
12	Sam Baccambuso		Nevada
13	George Freund	Coalition 21	Idaho
14	Nancy E. Murillo	Shosone-Bannock Tribe Member	Idaho
15	Diana Yupe	Shoshone-Bannock Tribe Cultural Resources Representative	Idaho
16	Lucille Edmo	Shoshone-Bannock Tribe Member	Idaho
17	George Wood		Idaho
18	Zell Towersap	Shoshone-Bannock Tribe Member	Idaho
19	Hobby Hevewah	Shoshone-Bannock Tribe Member	Idaho
20	Robert Perry	Shoshone-Bannock Tribe Member	Idaho
21	Philip Batt	Governor of Idaho	Idaho
22	William Peterson		Utah
23	Genevieve Paroni		Idaho
24	Jeremy Harris	Mayor of Honolulu	Hawaii
25	Stan Hobson		Idaho
26	Richard L. Geddes		S. Carolina
27	Terence N. Martin	U.S. Dept. of the Interior/Office of Environmental Policy and Compliance	Wash., DC
28	Lois Bradshaw		Idaho
29	David B. McCoy		Idaho
30	Kenneth N. Drewes		Idaho
31	Herman Maestas		Idaho
32	George A. Freund	Coalition 21	Idaho
33	Paul C. Childress	B&W Nuclear Environmental Services, Inc.	Virginia
34	Robert R. Loux	State of Nevada, Agency for Nuclear Projects, Nuclear Waste Project Office	Nevada
35	Robert E. Fronczak	Association of American Railroads	Wash., DC

Document #	Author	Organization	State
36	L. Cheryl Runyon	National Conference of State Legislatures Energy, Science and Natural Resources Program	Colorado
37	Daniel Nix	Western Interstate Energy Board High-Level Radioactive Waste Committee	Colorado
38	Edward M. Davis	NAC International	Georgia
39	Robert N. Ferguson	INEL Oversight Program	Idaho
40	Richard E. Sanderson	US Environmental Protection Agency	Wash., DC
41	Robert F. Deegan	Sierra Club	Virginia
42	Brad Mettam	Inyo County Planning Department	California
43	Chuck Kamka		Idaho
44	Richard B. Holmes	Clark County/Department of Comprehensive Planning	Nevada
45	Sandy Green	Eureka County/Yucca Mountain Information Office	Nevada
46	William D. Peterson	P&A Engineers	Utah
47	John W. King	Ponca Industrial Corporation	Texas
48	Les Bradshaw	Nye County/County Manager	Nevada
49	Robert F. Deegan	Sierra Club	Virginia
50	Sonne Ward	Nova Plasma Technologies, Inc.	Idaho
51	Daniel Nix	Western Interstate Energy Board High-Level Radioactive Waste Committee	Colorado

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
2531 JEFFERSON DAVIS HWY
ARLINGTON, VA 22242-5160

IN REPLY REFER TO
May 1, 1996

Al Brian

Dear Sir/Madame

The Department of the Navy is pleased to provide for your review and comment the Draft Environmental Impact Statement (DEIS) for a Container System for the Management of Naval Spent Nuclear Fuel. The DEIS has been prepared in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations implementing NEPA (40 CFR 1500-1508) and the Chief of Naval Operations Environmental and Natural Resources Program Manual, OPNAV Instruction 5090.1B. Approximately 1300 copies of the DEIS are being mailed to individuals nationwide.

The Navy generates small amounts of spent nuclear fuel as a consequence of the operation of its nuclear powered submarines, aircraft carriers, and guided missile cruisers. The total amount projected to be generated by the year 2035 is 65 metric tons, less than 0.1% of the amount of commercial spent fuel expected by that date (approximately 85,000 metric tons).

The DEIS addresses the need, alternatives, and environmental impacts of manufacturing containers; loading containers; handling and dry storage of naval spent nuclear fuel at the Idaho National Engineering Laboratory; transportation of naval spent nuclear fuel loaded containers to a notional repository or centralized interim storage site; and the storage, handling, and transportation of certain radioactive waste associated with naval spent nuclear fuel management. Six alternative container systems for the management of naval spent nuclear fuel are evaluated: multi-purpose canisters; current technology; current technology supplemented by high capacity rail; dual-purpose canisters; transportable storage casks; and small multi-purpose canisters. The Navy has not identified a preferred alternative at this time. One will be identified in the Final EIS after consideration of public comments.

The Department of the Navy will hold hearings during the 45 day public comment period to inform the public of the DEIS contents and to facilitate the receipt of comments. A notice will appear in the Federal Register in May 1996 announcing dates, times and places for the hearings, but the tentative schedule is provided below:

Date	Time	Location
June 3, 1996	1 PM - 5 PM 7 PM - 11 PM	The Shoshone-Bannock Tribes' Tribal Business Center Pima Drive Fort Hall, Idaho
June 5, 1996	1 PM - 5 PM 7 PM - 11 PM	The Boise Centre on the Grove 850 W. Front Street Boise, Idaho
June 7, 1996	1 PM - 5 PM 7 PM - 11 PM	Best Western Olympus Hotel 161 West 600 South Salt Lake City, Utah

Federal, state and local agencies and interested parties are invited to attend or be represented at the hearing. Oral comments will be heard and transcribed by a stenographer. Written copies of comments are also welcome to help ensure the accuracy of the record. Persons who do not wish to or cannot attend a hearing may submit comments in writing by mail to Mr. William Knoll, Department of the Navy, Code NAVSEA 08U, 2531 Jefferson Davis Highway, Arlington, VA 22242-5160. All statements, both oral and written, will receive equal consideration and will become part of the public record on this matter.

For your information, enclosure (1) contains a list of libraries and reading rooms where copies of the DEIS have been placed to facilitate public review.

We appreciate your interest in this matter and look forward to receiving any comments you may have. Additional information may be obtained by contacting Mr. Knoll at (703) 602-8229.

Richard A. Guida

Richard A. Guida
Associate Director
for Regulatory Affairs
Naval Nuclear Propulsion Program

Enclosure

Hello there!

A Since we don't want to ship this crap into space on an isolated planet (which we could do. They should put it in Area 51 Groom Lake. The sight that they are wasting so much money on I feel is not good due to the 5 ext volcanoes. ———— Al Breau

Commenter: Al Breaux, Nevada

Response to Comment:

A. The location of a geologic repository is beyond the scope of this EIS. As discussed in Chapter 3, the Nuclear Waste Policy Amendments Act of 1987 designates Yucca Mountain at the Department of Energy's Nevada Test Site as the only site currently authorized by legislation to be characterized as a geologic repository, and its suitability has not yet been determined. The analysis in this EIS covers transportation from the Idaho National Engineering Laboratory to the Yucca Mountain location as a representative or notional destination to allow for a comparison of the container systems. This EIS does not make presumptions concerning the Yucca Mountain site's suitability for a geologic repository or designation for use as a centralized storage site. If the Yucca Mountain site is found suitable for a repository and Department of Energy recommends its development to the President, the Nuclear Waste Policy Act requires that development of the Yucca Mountain site as a geologic repository must be supported by an EIS. The scope of a repository EIS is discussed in a Notice of Intent that Department of Energy issued in the Federal Register on August 7, 1995.

Ely, Nevada
May 8, 1996

Mr. William Knoll
Dept. of The Navy
Code NAVSEA 084
2531 Jefferson Davis Highway
Arlington, VA. 22242-5160

2

Dear Sir:

My husband Edward Toor serial No. 799 37 35 U.S.S. McKinzey, Korean war — entered The navy Nov. 5, 1948, Honorable discharge on Oct. 27, 1952. a Korean War Veteran.

Edward died of Pulmenory Fibrosis on Feb. 8, 1993 at an early age, as he was born in 1928. The Federal register Date Friday April 10, 1992 will not reconige This death although it is written in Their register under "Proof of non-malignant respiratory desease". a death certificate signed by a medical Dr. from Las Vegas, Nev. was sent to The Justice Department but was returned To me. The lady said, he would not qualify because he did not have cancer. I would like to ask you "what is non-malignant Respirotory Desease really mean?" I sat by his bed-side from early morning To late at night and I had even stayed at the Humana Sunrise Hospital with Edward to the very end, it is not easy To see The only man in my life die a little by little each day.

I feel bad that The Federal Government had turned Their back on him, if it wasnt for people like him That enlisted in The U.S. NAVY where would we be? he told me one day that he and his buddy was standing on the deck of the ship and the next thing he knew was his buddy's head was shot off. he never talked about Korea, all he said, was I want To forget about it. but he had a terrible war shock.

My Brother, Alvin Kenneth Charles died of cancer but I am not able To get his records. U.S. Army veteran —

My Aunt, Daisy Delores Williams RN. also died of cancer she served 16½ years in Germany — U.S. Army Veteran

A

My-self, we lived in The path of The bombs which was set off ~~at~~ near Las Vegas, Nev. which Exposed us To Radiation.

One Doctor from Ely, Nev. told my Mother, Ina you should move away from here, we use to get up early just To see the huge light That would light up the sky, Then the huge dust cloud would follow That filled The valley, after hours of watching That after the dust finally settled we would catch the tiny parts of metal That fell like snow flakes.

I had seen little birds die near our well, we were kids Then, and my Dad took them away with a shovel. I had also seen our horses get down and couldnt get up from eating the alfalfa which The radiation had turned a dark green.

I have tiny scars on both arms from radiation - as it started To sprinkle as Dad and I were walking home from the field, it had eaten tiny holes in his shirts. it was like some thing was biting me on each arm Then it started To blister, Mother told me To wash it in vinegar water.

One Doctor here in Ely, Nev. told my Husband and I That I was starting an early stage of cancer & for me to go To Salt Lake City, Utah and have it removed, after surgery I felt the same way so I went back and had another surgery. I also had brain surgery in 1970 in Salt Lake City, as I had an absess on the brain the size of a Lemon. I know it was from the raidation as many of us have nerve problems some even have seizures.

B

Thank you Mr. Knoll for letting me know, but I am unable to go.

Very sincerely,
BERNICE C. TOM
Bernice C Tom
Box 385
Ely, Nev. 89301

Commenter: Bernice C. Tom, Nevada

Response to Comment:

A. While the Navy understands your concern about the suffering of your loved ones and extends its sympathy, this comment is outside the scope of this EIS.

B. Comment noted.

BOB MILLER
Governor

STATE OF NEVADA

JOHN P. COMEAUX
Director

DEPARTMENT OF ADMINISTRATION
Capitol Complex
Carson City, Nevada 89710
Fax (702) 687-3983
(702) 687-4065

May 9, 1996

Richard A. Guida
Associate Director for Regulatory Affairs
Naval Nuclear Propulsion Program
Department of the Navy
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Dear Mr. Guida:

I have just been informed by the Nevada Agency for Nuclear Projects that the Navy has released its Draft Environmental Impact Statement for a "Container System for the Management of Naval Spent Nuclear Fuel" for public review and comment. The purpose of this letter is threefold. First, my Office has not received copies of the draft EIS, although certain other State agencies were, apparently, on the original distribution list. As the official State of Nevada single point of contact, as per Presidential Executive Order 12372, the State Clearinghouse must receive copies of all federal environmental actions (i.e., Environmental Assessments, Environmental Impact Statements, etc.). The Clearinghouse is responsible for coordinating the State of Nevada's comments. Consequently, it is imperative that we receive review copies. I am requesting that you
A provide me with five (5) copies of the draft EIS by overnight as soon as possible.

Second, the State of Nevada is formally requesting that the comment period
B specified in the draft EIS be extended from 45 days to at least 60 days, and preferably to 90 days, if possible. As you know, the actions contemplated by the Navy's draft document have implications well beyond the limited scope of storing and transporting Naval spent nuclear fuel. The decision that is ultimately arrived at by the Navy could well influence the direction of the entire civilian spent fuel storage and transportation program, since the choice of a canister system by the Navy will be precedent-setting for spent fuel management, be it civilian or military. The potential scope and impact of the draft EIS requires that adequate time be afforded to states like Nevada, which will be significantly affected both by the Navy's spent fuel program and by the Department of Energy's civilian radioactive waste management activities.

Nevada, like many of the western states affected by the actions contemplated in the draft EIS, is a small state with limited resources available for reviewing complex EIS documents. We are currently dealing with several major, interrelated Department of Energy EIS's, including the Stockpile Stewardship PEIS, the Plutonium Disposition PEIS, the Nevada Test Site Sitewide EIS, and the Pantex EIS. We are also initiating scoping for the Nellis Air Force Base Land Withdrawal EIS. Given the work load and the need to address the many interconnected issues associated with the Navy's draft EIS and the other decision documents, the 45 day comment period is too restrictive and will not afford Nevada sufficient time to adequately review the draft and provide comments.

C The third issue involves the number and locations of public hearings on the draft EIS. Given the importance of the draft EIS for Nevada and other western states, it is not appropriate to hold only three hearings in two states (Idaho and Utah). I am formally requesting that the Navy plan at least four additional hearings, two of which should be in Nevada: one in Reno, and one in Las Vegas. Other additional hearings should be in held in western states potentially affected by Navy shipments of spent reactor fuel. These meetings should be scheduled in consultation with the Western Interstate Energy Board's Radioactive Waste Committee, which has been very active and effective in assisting western states in planning for safe and uneventful shipment of spent fuel and high-level waste.

After reviewing the draft EIS, we reserve the right to request a briefing by the Navy for State officials. This is a practice we have implemented with federal agencies over the years.

Thank you for your attention to these matters. Should you have questions or need additional information, please contact me at (702) 687-6367 or Mr. Joseph Strolin, Planning Division Administrator for the Nevada Agency for Nuclear Projects at (702) 687-3744.

Sincerely,

Julie Butler

Julie Butler, Coordinator
Nevada State Clearinghouse/SPOC

JB/js

cc: Sherri W. Goodman, Deputy Under Secretary of Defense Environmental Security
Governor Bob Miller
Senator Harry Reid
Senator Richard Bryan
Representative Barbara Vucanovich
Representative John Ensign
Robert Loux, Director, Nevada Agency for Nuclear Projects

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
2531 JEFFERSON DAVIS HWY
ARLINGTON, VA 22242-5160

IN REPLY REFER TO

May 29, 1996

Ms. Julie Butler
Coordinator, Nevada State Clearinghouse
Department of Administration
Carson City, Nevada 89710

Dear Ms. Butler:

Thank you for your letter of May 9, 1996, received on May 15, 1996, concerning the Navy's Draft Environmental Impact Statement covering container systems for the storage, transport and management of naval spent nuclear fuel (Container System EIS). Your letter identified three issues for which you desired a response. Each issue is addressed below.

Your letter asked that five additional copies of the draft Container System EIS be provided to your office to facilitate State review. Those copies have been sent by overnight mail under separate cover.

Your letter requested that the time available for the State of Nevada to comment on the draft Container System EIS be increased from 45 days to 60 or 90 days. We agree to extend the comment period to 60 days, and will publish a notice in the Federal Register to that effect. We would note that in order to facilitate State review of this matter, the Navy provided six complete copies of the draft Container System EIS by letter from Admiral DeMars dated April 2, 1996, in advance of the public mailing which began in early May after bulk printing by the Government Printing Office. A copy of that letter is enclosed. Under these circumstances, and recognizing that the Navy needs to complete the EIS and move forward with selection of a container system to meet commitments made in a federal court-ordered settlement with the State of Idaho, we cannot extend the public comment period beyond 60 days.

Your letter requested that in addition to the six public hearings at three locations (Boise, Idaho Falls area, and Salt Lake City) in Idaho and Utah, additional hearings be held in Reno, Las Vegas, and two other undesignated western sites. We do not believe that additional hearings are needed. The locations selected covered those regions where naval spent fuel will be loaded, stored, and possibly transported, consistent with the proposed action covered in the Container System EIS. The EIS does not cover long-term interim storage or disposal of the spent fuel, which are the responsibility of the Department of Energy rather than the Navy. The EIS does analyze shipment to Yucca Mountain, but for analysis purposes only, recognizing that location is the only one under the Nuclear Waste Policy Act being evaluated as a potential repository. The analysis does not presume, however, that Yucca Mountain will be found suitable as a repository.

Finally, your letter noted that the Navy's actions under this Container System EIS are particularly important because they may influence how commercial spent fuel is managed, stored and transported. In our view, naval spent fuel is very distinguishable from commercial spent fuel in several respects which ameliorate your concerns:

1. Amount: There are currently 12 metric tons (heavy metal) of naval spent fuel in existence, with a projection of 65 metric tons by the year 2035. By comparison, there are about 30,000 metric tons (heavy metal) of commercial spent fuel today, with projections of over 85,000 metric tons by the year 2035. Thus, naval spent fuel constitutes a very small percentage (less than 0.1%) of spent fuel inventories today and into the future.

2. Nature: Naval nuclear fuel is designed for combat conditions, making it different in design and function than commercial fuel. For example, naval fuel can withstand battle shock loads well in excess of 50 times the force of gravity without damage. Moreover, naval fuel fully retains fission products within the fuel itself, a necessary design requirement given the close proximity of the crew to the reactor aboard ship. Finally, naval fuel operates in excess of twenty years between refueling, requiring it to possess long term structural integrity.

3. Fuel Cycle: All naval spent fuel is shipped to the Idaho National Engineering Laboratory (INEL) for examination after service, which is why INEL is the only origination point evaluated in the Container System EIS for shipments to an interim storage facility or repository. Naval spent fuel is not stored at multiple locations under different conditions as is commercial spent fuel.

For these and other reasons, we do not expect the storage, transportation, or management of naval spent fuel to set precedents relevant to commercial spent fuel.

As is recognized in your letter, Admiral DeMars' letter offered a briefing by the Navy to Nevada officials on these matters. That offer remains available at your convenience.

Thank you for your consideration of this matter. If you have any questions, please contact me or Will Knoll of my staff at 703-602-8229.

Sincerely,

Richard A. Guida
Associate Director
for Regulatory Affairs
Naval Nuclear Propulsion Program

Enclosure

Copy to:
Ms. Sherri Goodman, DUSD(ES)
The Honorable Bob Miller, Governor
The Honorable Harry Reid, Senator
The Honorable Richard Bryan, Senator
The Honorable Barbara Vucanovich, Representative
The Honorable John Ensign, Representative

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, DC 20350-2000

IN REPLY REFER TO
April 2, 1996

The Honorable Robert Miller
Governor, State of Nevada
State Capitol
Carson City, Nevada 89703

Dear Governor Miller:

The Navy is pleased to provide you with advanced copies of the draft Environmental Impact Statement (EIS) covering the selection of a system of containers for the dry storage of naval spent nuclear fuel at the Idaho National Engineering Laboratory, and its ultimate transport to a repository or interim storage facility outside Idaho. The draft EIS analyzes shipment to Yucca Mountain as a notional destination for analytical purposes only. It should be noted that shipments to any geologic repository, or to any centralized interim storage facility, would only occur if authorized by law and regulation, analyzed in subsequent National Environmental Policy Act (NEPA) documentation, and approved by the NRC in licensing such a facility. The Department of Energy has participated in the preparation of this EIS as a cooperating agency under NEPA. Six copies of the draft are enclosed to facilitate State review.

The draft EIS will be provided to the public in May 1996, and public hearings are tentatively scheduled to be held in June 1996 at three locations: Boise, Idaho Falls area, and Salt Lake City. The public comment period will extend for 45 days.

The Navy would be pleased to meet with your representatives to review the contents of the draft EIS and answer any questions to facilitate preparation of State comments on the document. Your staff may contact Richard Guida of the Naval Nuclear Propulsion Program at 703-602-8229 to arrange for such a meeting.

We appreciate your interest in this matter and are grateful for your consideration.

Sincerely,

B. DeMars
~~Admiral, U.S.~~ Navy
Director, Naval Nuclear Propulsion

Enclosures

Commenter: Julie Butler, Coordinator - Nevada State Clearinghouse/SPOC, Nevada

Response to Comment:

A. Copies of the Draft EIS were sent by overnight mail.

B. The Department of the Navy extended the comment period to 60 days and published a notice in the Federal Register to that effect.

C. The Navy concluded that additional hearings were not needed; this was conveyed to the commenter by letter dated May 29, 1996. The letter explained that the locations selected covered those regions where naval spent nuclear fuel will be loaded and stored and representative regions where it might be transported, consistent with the proposed action covered in the Container System EIS. The EIS does not cover long-term interim storage or disposal of the spent nuclear fuel, which are the responsibility of the Department of Energy rather than the Navy. The EIS does use Yucca Mountain as a destination for purposes of analysis only, recognizing that location is the only one under the Nuclear Waste Policy Act being evaluated as a potential repository. The analysis does not presume, however, that Yucca Mountain will be found suitable as a repository or would be the site for a centralized interim storage facility.

Bruce L. Schmalz

4

6445 Sidehill Lane
~~Rt. No. 1, Box 76~~
Idaho Falls, Idaho 83401

Phone (208) 522-7176

05/10/96

Department of Navy
NAVSEA - 08U
2531 Jefferson Davis Hwy.
Arlington, VA 22242- 5160

Attention: William Knoll

Subject : DRAFT EIS- Naval Fuel Container System

Dear Sir :

This DEIS should dispel any concern held by informed rational people. The following comments are not intended to be critical or to provoke change:

A A dry storage facility at the INEL which would not be over the Snake Plain Aquifer does not seem relevant to container selection; however, the hydrologic systems west of the Plain and the locations discussed in Appendix F are originally separate but tributary to the Plain Aquifer and should be considered as being the same. The only locations which do not contribute significant recharge to the Aquifer are volcanic buttes. Constructing a storage facility on,or in, this type of geologic structure is not necessary or feasible.

Exponential growth of human needs and use of fossil fuel is commonly ignored in environmental documents. The life of U.S. petroleum reserves has been estimated using various rates of use and production. The result is in a time frame of less than 50 years as compared to 40 years used in the DEIS. This relates to container design and storage time should it become necessary or feasible to recover the contained expended fuel assemblies as a source of energy.

B Evaluation of radiological health effects results in small differences between the container options. Final selection will evidently be made on the basis of economic principles. A major consideration should then be the waste of existing facilities at the INEL if they were not utilized or duplicated elsewhere.

Respectfully

Bruce L. Schmalz

Bruce L. Schmalz

Commenter: Bruce L. Schmalz, Idaho

Response to Comment:

A. In Chapter 1 of the EIS, the proposed action states that the location of the dry storage facility at the Idaho National Engineering Laboratory is an action related to the container system choice. In addition, the technical feasibility of building a dry storage facility within the Idaho National Engineering Laboratory at a point not above the Snake River Plain Aquifer is being considered by the Department of Energy pursuant to the October 17, 1995 Court Order in Civil Case No. 91-00540-5-EJL (U.S. District Court, 1995) and the agreement among the State of Idaho, the Navy, and the Department of Energy. The potential impacts of choosing either of the two locations evaluated are discussed in Appendix F of the EIS.

B. This assessment is correct. Chapter 3, Section 3.9 of this EIS states that, ideally, the selected container system will economically allow naval spent nuclear fuel to be loaded and stored dry at the Idaho National Engineering Laboratory in the same container which will be used to ship the spent fuel outside the state of Idaho. In addition, the selection of an alternative, in the Record of Decision, will take into consideration the following factors: (1) public comments; (2) protection of human health and the environment; (3) cost; (4) technical feasibility; (5) operational efficiency; (6) regulatory impacts; and (7) storage or disposal criteria which may be established for a repository or centralized interim storage site outside the state of Idaho.

NYE COUNTY

5

May 16, 1996

Richard A. Guida,
Associate Director for Regulatory Affairs
Naval Nuclear Propulsion Program
Naval Sea Systems Command
2531 Jefferson Davis Highway
Arlington, Virginia 22242-5160

Re: Draft Environmental Impact Statement for Spent Nuclear Fuel Container System

Dear Mr. Guida:

Nye County has received the notice of the availability of the *Department of the Navy Draft*
Environmental Impact Statement for a Container System for the Management of Naval Spent
A *Nuclear Fuel* (DEIS). I am writing to request that a public hearing on the DEIS be held in Nye
B County, that the DEIS be placed in Nye County libraries for public review, and that the time
C for review and comment be extended beyond the current 45 day period.

Nye County is the host community for the nation's candidate sites for storage and disposal of spent nuclear fuel at the Nevada Test Site and Yucca Mountain, respectively. The canisters being evaluated for use by the Navy may, therefore, end up in Nye County if Congress and DOE continue on their current path. More importantly, the Navy design will likely become the prototype for the much greater volume of the civilian spent nuclear fuel to be shipped from reactor sites.

The task of performing the container environmental impact statement was taken on by the Navy after DOE cut its multipurpose canister program in FY96. DOE, however, is participating with the Navy as a cooperating agency. The Navy's DEIS addresses the need, alternatives, and environmental impacts of manufacturing the various containers, loading the containers, and the handling and dry storage of naval spent nuclear fuel at the Idaho National Engineering Laboratory. The DEIS also examines the transportation of naval spent nuclear fuel loaded containers to a conceptual repository or centralized interim storage site.

In this light, the Navy's responsibility to Nye County residents is no different than if DOE were to still be managing the project. At a minimum, we request that the Navy hold a DEIS public hearing in Nye County in either Pahrump or Amargosa Valley. In addition, we request a 30-day extension on the comment period due to resource constraints and the multitude of other federal actions to which we are also currently responding.

D Finally, Nye County has submitted scoping comments for DOE's original multipurpose canister EIS. I have included a copy with this letter. We hope the Navy, through DOE's role as a cooperating agency, has had an opportunity to address our scoping comments. Nye County will be using these comments to assess the DEIS.

Nye County looks forward to receiving a positive response to our requests for a hearing in the County, for copies of the DEIS for our libraries, and for an extension of the comment period. As you might imagine, all issues associated with the storage and disposal of nuclear waste in Nye County are of grave concern and demand our community's most conscientious attention.

Please call me with any questions at (703) 482-8183. Also feel free to contact Phillip Niedzielski-Eichner of Governmental Dynamics, Inc., in Arlington, Virginia, who will be assisting Nye County with this effort. He can be reached at (703) 818-2434.

Sincerely,

Les W Bradshaw /PNE

Les W. Bradshaw
County Manager

Enclosure

cc: Nye County Commissioners
Phillip Niedzielski-Eichner, GDI

NUCLEAR WASTE REPOSITORY PROJECT OFFICE
P.O. BOX 1767 • TONOPAH, NEVADA 89049
(702) 482-8183 • FAX (702) 482-9289

January 6, 1995

U.S. Department of Energy
c/o Argonne National Laboratory
EAD
Building 900, Mail Stop 1
9700 South Cass Avenue
Argonne, IL 60439

ATTN: MPC EIS Scoping Comments

Dear Sir or Madam:

Nye County appreciates the opportunity to participate in the scoping process for the multi-purpose canister environmental impact statement. As the situs jurisdiction of the Yucca Mountain Project, Nye County is concerned about all aspects of the civilian radioactive waste management program. We believe the proposed MPC system is a very significant development that has important impacts throughout the system that must be carefully evaluated.

Our comments address the following topics:

- Need for Programmatic EIS
- Use of generic sites
- Repository impacts
- Transportation impacts
- Cumulative risk
- Emergency response
- EIS Process issues

Need for Programmatic EIS

Nye County urges DOE to conduct a Programmatic Environmental Impact Statement for the entire civilian waste management system.

A decision by DOE to deploy the MPC will have profound consequences for the entire waste management system. For example, a decision to use MPCs will drive (1) requirments for at-reactor storage facilities and handling equipment, (2) key elements of the transportation system including modes, equipment and infrastructure requirements, and shipping casks design, and (3) fundamental features of repository design, such as thermal loading. The MPC EIS Notice of Intent under Purpose and Need for Agency Action indicates that "DOE needs to develop a program for handling, storing, transporting, and disposing spent nuclear fuel." This goal will be accomplished by the waste management *system* not by any individual component of the system, such as MPCs or even a geologic repository. DOE has not analyzed the totality of the impacts of the waste management system under NEPA, however, and none of the planned EISs under the NWPA, including the MPC EIS, will meet that need. For this reason, Nye County urges that DOE produce a Programmatic Environmental Impact Statement for the entire waste management system.

Use of Generic Sites

According to the Notice of Intent, the EIS will provide a generic analysis only of impacts at reactor sites, a hypothetical MRS, and of surface activities at a repository. Nye County recommends that the EIS use site specific analysis wherever possible in evaluating MPC impacts. Where site specific analyses are not possible, the EIS should make reasonable assumptions about what sites are likely to be chosen, especially for an interim storage facility.

With regard to reactor sites, the EIS should (1) identify which reactors can accommodate either the large MPC or small MPC and (2) identify linkages from reactors to the national transportation system.

Although there is indeed no MRS, the EIS should consider (1) impacts of the MPC on the private storage facility under development by the Mescalero Indian tribe and (2) impacts of the MPC on a federal interim storage facility. Given the potential for new legislation that would establish a federal facility in the West, most probably in Nevada or Idaho, the analysis should consider "generic" storage locations in both Nevada and Idaho. These analyses should pay special attention to transportation impacts, and should account for the most likely transportation routes and potential intermodal transfer points.

Given that Yucca Mountain is the only site under investigation for a geologic repository, it is not clear what a generic analysis of surface facility impacts even means. We therefore recommend that the EIS, at a minimum, address the site specific impacts of MPC surface facilities at Yucca Mountain. A generic analysis alone of surface impacts would deliberately ignore real data about the site that could substantially improve the analysis. If DOE believes a generic scenario is necessary it should be in addition to an analysis of impacts at Yucca Mountain.

Repository Impacts

The MPC will drive key aspects of repository design. For this reason, Nye County strongly urges that the EIS specifically address the impacts of deploying the MPC system on a repository at Yucca Mountain.

We are especially concerned about MPC impacts on thermal loading, retreivability, and long term criticality control. Clearly, use of MPCs will limit thermal loading options at Yucca Mountain, and may constrain the amount of spent fuel that can be accommodated at the repository. The Ghost Dance and Sun Dance Faults, as well as newiy discovered fractures at Yucca Mountain further reduce its potential capacity.

We are concerned that it would be impossible for all practical purposes to retrieve MPCs if the site is shown to be unsuitable after waste emplacement. Finally, it is likely to be more difficult to demonstrate long term criticality control for MPCs than smaller containers. We therefore believe the EIS must address the impacts of MPCs on thermal loading scenarios, retreivability, and long–term criticality control. In the absence of adequate data to perform a comprehensive analysis of these issues at this time, the EIS should use the best available data, supplemented by reasonable assumptions about bounding conditions. We note that the NRC has recently called on DOE to be as specific as possible in the repository design, even when data is not available to support a final design.

We further recommend that the EIS include a detailed analysis of the risks and impacts, including cost, of opening MPCs and repackaging spent fuel at the repository. Nye County is especially concerned about this scenario since repackaging spent fuel at the repository would likely be an unusually "dirty" operation that could subject workers who may be Nye County residents to significant radiological doses. Furthermore, the costs and risks of repackaging spent fuel at the repository may mean that the MPC system is not optimal in comparison to other alternatives.

In addition, Nye County recommends that the EIS consider the impacts of an MPC on a generic second repository. The volume of wastes requiring geologic disposal keep increasing, while the apparent capacity of Yucca Mountain is decreasing. As such, the EIS should assume that a second repository will be needed, probably in granitic or salt media.

Cumulative Risk

We urge that analysis of MPC risks consider the cumulative risks from MPCs to maximally exposed individuals along likely transportation corridors and in occupational settings. Many rural residents live in the same location for long periods of time, and it is not unrealistic that some individuals will be exposed to potentially significant radiation doses over long periods of time, even if each exposure is very small.

The EIS should analyze the cumulative radiological risks within Nevada, assuming that an interim storage facility is established at the Nevada Test Site and that Yucca Mountain is used for permanent disposal of MPCs. The analysis of cumulative exposures should account for off-site exposure from historical weapons testing at the Test Site, mixed waste and low-level radioactive waste management at the Test Site, and transportation of low-level and other radioactive wastes both to and from the Test Site. Estimated cumulative exposure risks to Nevada residents should be compared to those for persons located along other segments of likely transportation corridors.

Transportation Impacts

If a repository is ever built at Yucca Mountain, Nye County will be the ultimate destination for most of the nation's spent fuel and high-level waste. A decision to deploy the MPC system will have major implications for the nuclear waste transportation system. We urge that the EIS address transportation-related impacts as specifically as possible, especially in Nevada.

In particular, the EIS should evaluate the impacts of transporting MPCs to an interim storage facility located at the Nevada Test Site. This analysis should consider potential impacts of constructing a rail spur to the site. Since a specific route has not been chosen the analysis should account for the actual routes that are under consideration (i.e., the Caliente, Carlin, and Jean routes) as specifically as possible. Since it may well be necessary to transport MPCs to an interim storage facility before the rail spur can be constructed, the EIS should also consider impacts of transporting MPCs by heavy haul truck to the site. This analysis should identify potential intermodal transfer locations as well as potential truck routes to the site and consider impacts on infrastructure, local emergency response capabilities, and socioeconomic conditions.

Another key transportation issue is rail route selection at the national level. While we realize that the EIS cannot designate rail routes from reactors to Yucca Mountain, we urge that DOE use the most likely actual routes to analyze transportation risks and not simply rely on a generic analysis. The MPC will stress the capabilities of the nation's rail system, and we believe the risk analysis should be as specific as possible to give a true indication of how the railroads and corridor communities will be affected.

Emergency Response

Rural counties, including Nye County, are not equipped to respond to accidents or other emergencies involving MPCs, even though their personnel are likely to be the first responders to any incident. We recommend that the EIS evaluate the impacts of deploying the MPC system on rural emergency responders, especially with respect to training and equipment requirements.

Socioeconomic Impacts

A transportation accident involving an MPC could have significant impacts on affected communities even if no radiation is released. We recommend that the EIS evaluate the socioeconomic impacts to rural communities from a transportation accident involving an MPC. At a minimum, this analysis should address impacts of closing highways and railroads during recovery and/or clean-up operations, and the resulting disruption to communities.

Increasingly the nation's rural counties are becoming the dumping grounds for wastes generated in the nation's urban areas. Nye County believes the totality of impacts on its citizens must be considered in terms of environmental justice. We therefore recommend that the EIS specifically address potential disproportionate impacts on rural populations of MPC development in addition to impact on minority and disadvantaged populations.

Nye County also believes that fabrication of MPCs and maintenance of transportation casks could provide significant economic benefits. We therefore urge that the EIS provide a detailed evaluation of the number of jobs associated with MPC deployment, secondary business growth, and related economic activity. This analysis should consider the feasibility and impacts of establishing MPC fabrication facilities and associated operations in potential host communities for interim storage facilities and Yucca Mountain.

EIS Process Issues

Nye County requests that DOE extend the January 6 deadline for written comments. DOE has chosen the worst time of the year to ask members of the public for their input to the MPC EIS. Given the importance of the MPC issue and the fact that this is the first NEPA action undertaken under the Nuclear Waste Policy Act, we believe our residents should have the most generous possible opportunity to study the MPC issue and offer informed comments.

We also request that DOE provide the EIS implementation plan for public review. In view of the wide range of issues that need to be addressed in the MPC EIS, we believe that it is important for affected units of local government to be assured that DOE has adequately responded to the scoping issues they raise prior to issuing the draft EIS.

Nye County requests that DOE place relevant documents not only in DOE reading rooms but in the program offices of affected units of local government.

We also wish to acknowledge DOE's extensive efforts to provide alternative mechanisms for the public to comment, such as the toll free number and computer bulletin board. We request that these be maintained throughout the preparation of the EIS.

Nye County appreciates the opportunity to provide scoping comments for the MPC EIS, and we will look forward to reviewing the draft EIS when it is issued. Please call me at (702) 482-8183 if you have any questions.

Sincerely,

Les Bradshaw/ors

Les Bradshaw
Project Manager
Nye County Nuclear Waste Repository Project Office

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
2531 JEFFERSON DAVIS HWY
ARLINGTON, VA 22242-5160

IN REPLY REFER TO

May 31, 1996

Mr. Les W. Bradshaw
Nye County Manager
P.O. Box 153
Tonopah, Nevada 89049

Dear Mr. Bradshaw:

Thank you for your letter of May 16, 1996, received on May 22, 1996, concerning the Navy's Draft Environmental Impact Statement covering container systems for the storage, transport and management of naval spent nuclear fuel (Container System EIS). Your letter identified several issues, which were also shared with us by the Department of Energy's Office of Civilian Radioactive Waste Management. Each of these issues is addressed below.

Your letter asked that copies of the draft Container System EIS be placed in Nye County libraries for public review. Copies have been sent under separate cover to the three Nye County libraries per your request.

Your letter requested that the time available for Nye County to comment on the draft Container System EIS be extended 30 days beyond the current 45 day period, and that public hearings be held in Nye county. These requests are similar to those made by the State of Nevada in separate correspondence, to which we responded by letter dated May 29, 1996, copy attached. To summarize our response, the Navy has agreed to extend the comment period to 60 days, and will publish a notice in the Federal Register to that effect. However, no public hearings are planned in Nevada because the EIS does not cover long-term interim storage or disposal of the spent fuel, but rather its dry containerization and temporary storage at the Idaho National Engineering Laboratory, and ultimate transport to a repository or centralized interim storage site outside Idaho. In that vein, the EIS does evaluate shipment to Yucca Mountain, but for analysis purposes only, recognizing that location is the only one under the Nuclear Waste Policy Act being evaluated as a potential repository. The analysis does not presume, however, that Yucca Mountain will be found suitable as a repository.

As the enclosed letter indicates, the Navy has apprised Nevada of our willingness to brief State officials on the draft EIS and naval spent fuel matters. Depending upon when that is scheduled, or alternatively in conjunction with other visits made to conduct business with DOE officials in Las Vegas, we would be pleased to meet with Nye County officials at that time for the same purpose.

Thank you for your consideration of this matter. If you have any questions, please contact me or Will Knoll of my staff at 703-602-8229.

Sincerely,

Richard A. Guida

Richard A. Guida
Associate Director
for Regulatory Affairs
Naval Nuclear Propulsion Program

Enclosure

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
2531 JEFFERSON DAVIS HWY
ARLINGTON, VA 22242-5160

IN REPLY REFER TO

May 29, 1996

Ms. Julie Butler
Coordinator, Nevada State Clearinghouse
Department of Administration
Carson City, Nevada 89710

Dear Ms. Butler:

Thank you for your letter of May 9, 1996, received on May 15, 1996, concerning the Navy's Draft Environmental Impact Statement covering container systems for the storage, transport and management of naval spent nuclear fuel (Container System EIS). Your letter identified three issues for which you desired a response. Each issue is addressed below.

Your letter asked that five additional copies of the draft Container System EIS be provided to your office to facilitate State review. Those copies have been sent by overnight mail under separate cover.

Your letter requested that the time available for the State of Nevada to comment on the draft Container System EIS be increased from 45 days to 60 or 90 days. We agree to extend the comment period to 60 days, and will publish a notice in the Federal Register to that effect. We would note that in order to facilitate State review of this matter, the Navy provided six complete copies of the draft Container System EIS by letter from Admiral DeMars dated April 2, 1996, in advance of the public mailing which began in early May after bulk printing by the Government Printing Office. A copy of that letter is enclosed. Under these circumstances, and recognizing that the Navy needs to complete the EIS and move forward with selection of a container system to meet commitments made in a federal court-ordered settlement with the State of Idaho, we cannot extend the public comment period beyond 60 days.

Your letter requested that in addition to the six public hearings at three locations (Boise, Idaho Falls area, and Salt Lake City) in Idaho and Utah, additional hearings be held in Reno, Las Vegas, and two other undesignated western sites. We do not believe that additional hearings are needed. The locations selected covered those regions where naval spent fuel will be loaded, stored, and possibly transported, consistent with the proposed action covered in the Container System EIS. The EIS does not cover long-term interim storage or disposal of the spent fuel, which are the responsibility of the Department of Energy rather than the Navy. The EIS does analyze shipment to Yucca Mountain, but for analysis purposes only, recognizing that location is the only one under the Nuclear Waste Policy Act being evaluated as a potential repository. The analysis does not presume, however, that Yucca Mountain will be found suitable as a repository.

Finally, your letter noted that the Navy's actions under this Container System EIS are particularly important because they may influence how commercial spent fuel is managed, stored and transported. In our view, naval spent fuel is very distinguishable from commercial spent fuel in several respects which ameliorate your concerns:

1. Amount: There are currently 12 metric tons (heavy metal) of naval spent fuel in existence, with a projection of 65 metric tons by the year 2035. By comparison, there are about 30,000 metric tons (heavy metal) of commercial spent fuel today, with projections of over 85,000 metric tons by the year 2035. Thus, naval spent fuel constitutes a very small percentage (less than 0.1%) of spent fuel inventories today and into the future.

2. Nature: Naval nuclear fuel is designed for combat conditions, making it different in design and function than commercial fuel. For example, naval fuel can withstand battle shock loads well in excess of 50 times the force of gravity without damage. Moreover, naval fuel fully retains fission products within the fuel itself, a necessary design requirement given the close proximity of the crew to the reactor aboard ship. Finally, naval fuel operates in excess of twenty years between refueling, requiring it to possess long term structural integrity.

3. Fuel Cycle: All naval spent fuel is shipped to the Idaho National Engineering Laboratory (INEL) for examination after service, which is why INEL is the only origination point evaluated in the Container System EIS for shipments to an interim storage facility or repository. Naval spent fuel is not stored at multiple locations under different conditions as is commercial spent fuel.

For these and other reasons, we do not expect the storage, transportation, or management of naval spent fuel to set precedents relevant to commercial spent fuel.

As is recognized in your letter, Admiral DeMars' letter offered a briefing by the Navy to Nevada officials on these matters. That offer remains available at your convenience.

Thank you for your consideration of this matter. If you have any questions, please contact me or Will Knoll of my staff at 703-602-8229.

Sincerely,

Richard A. Guida
Associate Director
for Regulatory Affairs
Naval Nuclear Propulsion Program

Enclosure

Copy to:
Ms. Sherri Goodman, DUSD(ES)
The Honorable Bob Miller, Governor
The Honorable Harry Reid, Senator
The Honorable Richard Bryan, Senator
The Honorable Barbara Vucanovich, Representative
The Honorable John Ensign, Representative

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, DC 20350-2000

IN REPLY REFER TO
April 2, 1996

The Honorable Robert Miller
Governor, State of Nevada
State Capitol
Carson City, Nevada 89703

Dear Governor Miller:

The Navy is pleased to provide you with advanced copies of the draft Environmental Impact Statement (EIS) covering the selection of a system of containers for the dry storage of naval spent nuclear fuel at the Idaho National Engineering Laboratory, and its ultimate transport to a repository or interim storage facility outside Idaho. The draft EIS analyzes shipment to Yucca Mountain as a notional destination for analytical purposes only. It should be noted that shipments to any geologic repository, or to any centralized interim storage facility, would only occur if authorized by law and regulation, analyzed in subsequent National Environmental Policy Act (NEPA) documentation, and approved by the NRC in licensing such a facility. The Department of Energy has participated in the preparation of this EIS as a cooperating agency under NEPA. Six copies of the draft are enclosed to facilitate State review.

The draft EIS will be provided to the public in May 1996, and public hearings are tentatively scheduled to be held in June 1996 at three locations: Boise, Idaho Falls area, and Salt Lake City. The public comment period will extend for 45 days.

The Navy would be pleased to meet with your representatives to review the contents of the draft EIS and answer any questions to facilitate preparation of State comments on the document. Your staff may contact Richard Guida of the Naval Nuclear Propulsion Program at 703-602-8229 to arrange for such a meeting.

We appreciate your interest in this matter and are grateful for your consideration.

Sincerely,

B. DeMars
Admiral, U.S. Navy
Director, Naval Nuclear Propulsion

Enclosures

Commenter: Les W. Bradshaw, County Manager - Nye County, Nuclear Waste Repository Project Office, Nevada

Response to Comment:

A. The Navy concluded that additional hearings were not needed; this was conveyed to the commenter by letter dated May 31, 1996. The letter explained that the locations selected covered those regions where naval spent nuclear fuel will be loaded and stored and representative regions where it might be transported, consistent with the proposed action covered in the Container System EIS. The EIS does not cover long-term interim storage or disposal of the spent nuclear fuel, which are the responsibility of the Department of Energy rather than the Navy. The EIS does use Yucca Mountain as a destination for purposes of analysis only, recognizing that location is the only one under the Nuclear Waste Policy Act being evaluated as a potential repository. The analysis does not presume, however, that Yucca Mountain will be found suitable as a repository or would be the site for a centralized interim storage facility.

B. Copies of the Draft EIS were sent by overnight mail.

C. The Department of the Navy extended the comment period to 60 days and published a notice in the Federal Register to that effect.

D. The scoping comments provided by Nye County by letter dated January 6, 1995 to the Department of Energy on the Multi-Purpose Canister EIS were considered in establishing the scope of this Navy Container System EIS. In response to the Nye County scoping comment that the type of container selected by the Department of Energy for management of spent nuclear fuel will have substantial influences on the entire waste management system, the Navy believes that the container system EIS fully evaluates environmental impacts associated with container selection and use for naval spent fuel in a fashion which will not be affected by the Department of Energy’s ultimate decision for containerizing non-naval spent fuel. While the ultimate Department of Energy decision may affect the cost of containers or other such factors, the Navy must proceed at this time to select a container system in order to meet its obligations under the Idaho agreement and court order. Moreover, since the number of containers needed for naval spent fuel is very small compared to those required for commercial spent fuel, the DOE’s ultimate decision is not expected to have a substantial effect on the Navy. Thus, the Navy does not need to wait for the Department of Energy’s decision on containers for non-naval spent fuel to decide what is needed for naval spent fuel.

8040 Bellamah Ct. NE
Albuquerque, NM 87110
May 20, 1996

Mr. William Knoll
Naval Nuclear Propulsion Program
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Dear Mr. Knoll:

A Please place me copies of the reference material used in preparation of the DEIS for a Container System for the Management of Naval Spent Nuclear Fuel.

Thank you.

Sincerely,

John Geddie

John Geddie

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
2531 JEFFERSON DAVIS HWY
ARLINGTON, VA 22242-5160

IN REPLY REFER TO

June 24, 1996

Mr. John Geddie
8040 Bellamah Ct. NE
Albuquerque, NM 87110

Dear Mr. Geddie:

This letter is in response to your letter of May 20, 1996, concerning the availability of reference material used in preparation of the Draft Environmental Impact Statement (DEIS) for a Container System for the Management of Naval Spent Nuclear Fuel. References have been placed in the public reading rooms identified in the DEIS (see section J.10.). The closest public reading room to your vicinity is the Albuquerque Bernalillo County Library.

Thank you for interest in the DEIS.

Sincerely,

William Knoll
Nuclear Propulsion Directorate

Commenter: John Geddie, New Mexico

Response to Comment:

A. Mr. Geddie was referred to the Public Reading Room at the nearby Albuquerque Bernalillo County Library where copies of the references had previously been provided. This was conveyed to the Mr. Geddie by letter dated June 24, 1996.

5/20/96

Allyn Niles
Box 363
Ruth, NV 89319

Mr. William Knoll
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Hwy.
Arlington, VA 22242-5160

Dear Mr. Knoll,

Thank you for including me in the Draft Environmental Impact Statement process in deciding for a Container System for the Management of Naval Spent Nuclear Fuel.

After having read parts of the DEIS it would seem that the most acceptable methods for containment are the No-Action Alternative and the Current Technology/Rail although the fewer number of total shipments with the CTR may be advantageous in the long run over the NAA. I feel that these methods have proven themselves reliable through years of use and will in all likelihood continue to be a suitable containment program until a permanent storage facility is constructed. A

Sincerely,

Allyn Niles

Commenter: Allyn Niles, Nevada

Response to Comment:

A. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for dry storage and transportation (either by rail, heavy-haul truck, or a combination of both) must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably.

May 21, 1996

8

William Knoll
NAVSEA Code 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

I recently received very large paper-back book from you entitled

Department of the Navy
Draft Environmental Impact Statement
for a Container System for the
Management of Naval Spent Nuclear Fuel

Cooperating Federal Agency
U.S. Department of Energy

This book was mailed in a large tan envelope, first class, and cost $4.00 to mail!! That does not count the ink or paper used.

First of all, I do not know why I received this manual. I am concerned about our enviornment. But since I recently retired, and am a Senior Citizen I do not, at this time, have the time or energy to get involved in this very controversial subject.

A At a time when the American Citizen is being taxed over and beyond reason, it does not seem reasonable that you would spend this kind of taxpaper money on mailings, and also this manual had to be very expensive to print. The manual measures 8 1/2" x 11" and is 14/16" thick. There is a very pretty green cover on this manual with the United States Navy Insignia on it.

I am sending a copy of this letter to Idaho's Senators and Congressman for their information. I do appreciate the U.S. Navy and am much safer because of you, but cannot understand this expense.

Sincerely,
Mrs. Sally Hamilton

Mrs. Sally Hamilton
11631 W. Oneida Drive
Boise, ID 83709

cc: Idaho Senators & Congressman
Enclosure: Copy of front of mailing envelope

Commenter: Sally Hamilton, Idaho

Response to Comment:

A. Per her request, Ms. Hamilton has been removed from the mailing list.

SIERRA NUCLEAR CORP.

June 6, 1996
SNC-JSH-96-025

Mr. William Knoll
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

9

Dear Mr. Knoll:

A Sierra Nuclear Corporation (SNC) appreciates the opportunity to comment on the Draft Environmental Impact Statement (DEIS) prepared by the Department of the Navy and the Department of Energy (DOE). We found the DEIS to be thorough and well presented. The analyses in the DEIS clearly demonstrate that the Naval reactor fuels can be safety stored until there is a geologic repository constructed for the permanent disposal of spent nuclear fuel and high level waste.

B Based on our review of the DEIS, as well as our experience in supplying storage systems for commercial reactor spent fuel, we recommend that the Navy implement a storage program that is compatible with the DOE Civilian Radioactive Waste Management System (CRWMS). The Multi-Purpose Canister (MPC) and the Dual Purpose Canister are fully compatible with the DOE system (the Small Multi-Purpose Canister alternative is as well, but is not as economic due to the larger number of canisters and additional shipments required). There are at least five viable commercial storage systems for civilian power reactor fuels that are currently available or under development by private industry that meet the DOE Specifications for the MPC System. All of these storage systems are capable of storing Naval fuels. This existing technology and the large number of companies providing storage systems assures competitive supply sources and minimal, if any, development costs for the government.

We would appreciate being kept on your mailing list for subsequent information and for your request for proposals, when issued.

Very truly yours,

James S. Hobbs
Principal Engineer

620 Colonial Park Drive • Roswell, Georgia 30075 • (404) 518-7785 • Fax (404) 518-7883

Commenter: James S. Hobbs - Sierra Nuclear Corp., Georgia

Response to Comment:

A. Comment noted.

B. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for dry storage and transportation (either by rail, heavy-haul truck, or a combination of both) must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably.

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY PETE WILSON, *Governor*

DEPARTMENT OF TRANSPORTATION
500 SOUTH MAIN STREET
BISHOP, CA 93514

(619) 872-0658

10

June 3, 1996

File: Iny-Misc.-1

Mr. William Knoll
Department of the Navy
Code NAVSEA 08U
2581 Jefferson Davis Highway
Arlington, Virginia 22242-5160

DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR A CONTAINER SYSTEM FOR THE MANAGEMENT OF NAVAL SPENT NUCLEAR FUEL

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel. **A** Our only comment at this time is that the document seems to make a good case for shipment of Naval nuclear waste entirely by rail. If you have questions on this matter, please call me at (619) 872-0658.

Sincerely,

for Robert J. [signature]
DENNIS MANNING
Associate Transportation Planner

DM:mam

Commenter: Dennis Manning - State of California, Department of Transportation, California

Response to Comment:

A. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for dry storage and transportation (either by rail, heavy-haul truck, or a combination of both) must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably.

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William Knoll
Department of the Navy
NAVSEA Code 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

To Bell KNOLL Dept of the NAVY NAUSEA Code 08U 2531 Jefferson Davis Hiway Arlington VA 22425

6/6/96

A We concur with the report provided by the United States Navy. We the United States of America must keep up with the rest of the world in the field of Nuclear Power generation and the re-use of low yield Atomic Nuclear Rods in space. To Power under ground mining exploration on the moon and other semi-dead planets and or stars for our further exploration of our Universe to find other beings, other forms of life and etc.

p.s.
Sorry for your typo mistake, blame your secretary like I do.

The Expanded Jack Streeter Family

Commenter: Jack Streeter, Idaho

Response to Comment:

A. Support from the public is acknowledged as the Navy selects a container system for the management of naval spent nuclear fuel.

12

DEPARTMENT OF THE NAVY

NAVAL SEA SYSTEMS COMMAND
2531 JEFFERSON DAVIS HWY
ARLINGTON, VA 22242-5160

IN REPLY REFER TO

May 29, 1996

Dear Sir/Madam:

By separate letter dated May 1, 1996, the Navy provided you with a copy of the Department of the Navy Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel. That letter requested that any public comments be received prior to the completion of the 45-day public comment period. The formal comment period commenced on May 17, 1996 (61 FR 24933) and was scheduled to close on July 3, 1996. The Navy has now determined that the public comment period will be extended to July 18, 1996. A notice will be published in the Federal Register announcing this change, but we wanted to ensure you were apprised.

Additionally, subsequent to printing, some minor typographical errors (incorrect page references) were found in the index to the draft EIS. Attached is a revised copy of the index which corrects those errors. We are providing the corrected index to you now, to facilitate your review of the draft EIS. The final EIS will have the corrected index included in it.

Thank you for your consideration on this matter, and we look forward to receiving any comments you may have.

Sincerely,

Richard A. Guida

Richard A. Guida
Associate Director
for Regulatory Affairs
Naval Nuclear Propulsion Program

Enclosure

A Please Don't Send me any more letters. I have no idea what this is and do not know how you got my name.
Sam Baccambuso

Commenter: Sam Baccambuso, Nevada

Response to Comment:

A. Per his request, Mr. Baccambuso has been removed from the mailing list.

ORIGINAL

PUBLIC HEARING

13

DEPARTMENT OF THE NAVY

DRAFT ENVIRONMENTAL IMPACT STATEMENT

FOR THE CONTAINER SYSTEM FOR THE MANAGEMENT OF

NAVAL SPENT NUCLEAR FUEL

AT FORT HALL, IDAHO

JUNE 3, 1996

AFTERNOON SESSION

MODERATOR: Lieutenant Timothy Sullivan, USN

SPEAKERS: Mr. Elmer Naples
Mr. William Knoll

REPORTED BY:
LISA K. ERSTAD, C.S.R. No. 279
Notary Public
(and)
KATHY McCOY, C.S.R. No. T163
Notary Public

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wish to speak have an opportunity to do so. I have a watch with me that I will be using to monitor the time.

As you are speaking, if you get up to about four minutes, I will probably let you know that you have one minute left, and then if you would finish up within the next minute or so and we will move on to the next speaker.

The procedure for the comment period will be as follows: I will announce each registered speaker, I have a list of your names here. When you are called, please proceed to one of the microphones as we did before and state your name, your address and if you are representing an organization, the name of that organization. Please direct your comments also to me.

I request your cooperation and courtesy today while people are speaking and so far that has been good. So we appreciate that.

We are pleased today to have as our first speaker, Mr. George Freund.

MR. FREUND: My name is George Freund, the address I want you to use is P.O. Box 51232, Idaho Falls, Idaho, 83405.

This statement is being submitted on behalf of Coalition 21, a recently formed citizens group supporting tomorrow's technology with facts.

The preparation of this Draft Environmental Impact Statement indicates that the U.S. Navy takes seriously its commitments under the 1995 Nuclear Waste Agreement with the State of Idaho. It shows that the agreement is working. A

Overturning this agreement in favor of putting Idaho at the total mercy of political and bureaucratic action in Washington, D.C., would not achieve the common goal of getting nuclear waste and spent nuclear fuel out of Idaho in a timely manner.

Coalition 21 intends to monitor carefully the public meeting process for this DEIS and to make factual constructive comments by the July 18 submittal deadline. Thank you.

LIEUTENANT SULLIVAN: Thank you, Mr. Freund.

Are there any questions from the panel?

Thank you, Mr. Freund.

Commenter: George Freund, Coalition 21, Idaho

Response to Comment:

A. The Navy appreciates support expressed for its efforts. The Navy needs to ensure that naval spent nuclear fuel, after examination, is managed in a fashion which facilitates ultimate safe shipment to a permanent geologic repository or centralized interim storage site outside of the state of Idaho; is protective of the Idaho environment while being temporarily stored at the Idaho National Engineering Laboratory; and complies with the court ordered agreement among the State of Idaho, Department of Energy, and the Navy (U.S. District Court, 1995). As the commenter noted, this EIS includes proposed actions by the Navy that would commence placing naval spent nuclear fuel into dry storage on a schedule consistent with that required of the Department of Energy in the Idaho Agreement.

ORIGINAL

PUBLIC HEARING 14

DEPARTMENT OF THE NAVY

DRAFT ENVIRONMENTAL IMPACT STATEMENT

FOR THE CONTAINER SYSTEM FOR THE MANAGEMENT OF

NAVAL SPENT NUCLEAR FUEL

AT FORT HALL, IDAHO

JUNE 3, 1996

AFTERNOON SESSION

MODERATOR: Lieutenant Timothy Sullivan, USN

SPEAKERS: Mr. Elmer Naples
Mr. William Knoll

REPORTED BY:
LISA K. ERSTAD, C.S.R. No. 279
Notary Public
(and)
KATHY McCOY, C.S.R. No. T163
Notary Public

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Our next speaker will be Nancy Murillo.

MS. MURILLO: Nancy E. Murillo, P.O. Box 663, Fort Hall, Idaho, 83203. I am an individual member of the Shoshone-Bannock tribes, Fort Hall Indian Reservation.

I have a grave concern in reference to the radioactive waste spent fuel that is being stored at INEL and has been occurring since 1957.

As an American Indian and member of Shoshone-Bannock tribes, these tribes have been in existence since who knows when, for millions of years perhaps, not millions, but thousands and thousands of years in reference to their aboriginal lands here from Nevada to Canada, primarily set here on the Fort Hall Indian Reservation in 1868.

We roamed the entire areas for a nomadic tribe gathering and hunting. It seems A
that the federal agencies in '57 throughout have not really had great consultation or any consultation with the Shoshone-Bannock tribes that live here on the Fort Hall Indian Reservation. We are a little over a half-million

acres. INEL is just a little bit larger, they are a federal reserve. However, we are the stewards of this land.

As a member of the tribe I feel I want to express my concern about that fuel being there initially and as it goes through Fort Hall Indian Reservation and as it will leave. The sooner it leaves the better for our folks. The aquifer, it has felt that there has been some contaminants there. It seems to be within the realm of belief. B

Many technologies that have occurred in this new day and age affects the reservation life, reservation land and natural resources. INEL is just one of those affects that impacts our livelihood and our survival.

Many of our folks hunt and fish in that area and INEL is right in that sacred area that we have. People that have been buried, traveled towards the mountain area of the Challis and Salmon areas.

I believe it needs to be known that American Indian people are here in the United States, they are surviving, they have survived the wars of many years with the non-Indian. We have given up a lot.

This reservation has been built I would say on blood and we were placed here to protect the immigrants that were coming through. We are here now to protect our own people, Shoshone-Bannock Indian people and their children and great-grandchildren and so forth.

C

Insofar as the casks are concerned, the safer the better. Let's get them out as soon as we can. And I believe with the Shoshone-Bannock tribes that they need to be included in every aspect of what occurs at INEL, particularly with the transportation, what is occurring out there at the INEL.

D

E

The Shoshone-Bannock tribes' tribal governing body should be included on any discussions, we are a sovereign nation or I would say like a state within a state and our president, our Governor, is the chairman of the Fort Hall Business Counsel.

Indian people have offered too much and they need to go forth and speak and let it be known that we are here and we will be here for many, many, many, many, many years. Thank you.

LIEUTENANT SULLIVAN: Thank you,

Commenter: Nancy E. Murillo - Shoshone-Bannock Tribe Member, Idaho

Response to Comment:

A. The Navy is currently involved in negotiating an agreement with the tribes covering the transportation of naval spent nuclear fuel across the Fort Hall Reservation, including the current shipments that come from the shipyards and prototype sites. The Navy has also participated in other meetings and briefings for all members of the Tribes or the Tribal Business Council related to naval spent nuclear fuel. Concerns expressed and issues identified during those meetings assisted the Navy in formulating the Draft EIS.

B. The Navy has taken steps, including the process of selecting an appropriate container system as described in this EIS, to ensure that naval spent nuclear fuel is among the early shipments of spent fuel to the first repository or interim storage facility. In addition to evaluating container systems, this EIS covers modifications to facilities to support loading naval spent nuclear fuel into containers suitable for dry storage and the location and construction of dry storage facilities at Idaho National Engineering Laboratory.

C. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for dry storage and transportation (either by rail, heavy-haul truck, or a combination of both) must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably.

D.&E. The Navy is currently involved in negotiating an agreement with the tribes covering transportation of naval spent fuel across the Fort Hall Reservation, including the current shipments that come from the shipyards and prototype sites. Five federal laws prompt consultation between federal agencies and Indian tribes: The National Environmental Policy Act, the National Historic Preservation Act, the American Indian Religious Freedom Act, the Archeological Resources Protection Act, and the Native American Graves Protection and Repatriation Act (NAGPRA). In accordance with these directives and in consideration of its Native American Policy, Department of Energy is developing procedures at the Idaho National Engineering Laboratory for consultation and coordination with the Shoshone-Bannock Tribes of the Fort Hall Reservation. Department of Energy 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. In addition, the Cultural Resources Management Plan for the Idaho National Engineering Laboratory and curation agreement for permanent storage of archeological materials is expected to be completed shortly. 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.

ORIGINAL

PUBLIC HEARING

15

DEPARTMENT OF THE NAVY

DRAFT ENVIRONMENTAL IMPACT STATEMENT

FOR THE CONTAINER SYSTEM FOR THE MANAGEMENT OF

NAVAL SPENT NUCLEAR FUEL

AT FORT HALL, IDAHO

JUNE 3, 1996

AFTERNOON SESSION

MODERATOR: Lieutenant Timothy Sullivan, USN

SPEAKERS: Mr. Elmer Naples
Mr. William Knoll

REPORTED BY:
LISA K. ERSTAD, C.S.R. No. 279
Notary Public
(and)
KATHY McCOY, C.S.R. No. T163
Notary Public

Ms. Murillo.

After the last speaker, I asked the panel if they had any questions. The record will reflect that neither did and I would like the record to reflect that that is not something that is a part of this comment period. So if you do choose to speak, I will not be asking the panelists if they do have any questions.

Our next speaker is Diana Yupe.

MS. YUPE: My name is Diana Yupe, Y-U-P-E, and I have a tribe address that I gave to you. I am representing the Shoshone-Bannock tribes for the Cultural Resources under the tribes and the Department of Energy working agreement that is in place.

And I would like to refer to Section 5.4 of your DEIS if you would like to follow along. That is on page 5-9.

The comment I would like to make is we are the Cultural Resources section, there are A historic properties on the INEL which does not relate to the Native American history. They are as important to the history of the INEL as are the Native American concerns.

In the process of the D and D's or the

constructions on the buildings, it is very important that those be considered through the whole process of construction.

Additionally, the importance of the Native American interests are equally, should be considered. B

On your Section 5.4, land and cultural resources, you refer to I think it is on the next-to-the-last sentence, you said since there is a potential to impact cultural resources, it needs to be known that there is -- I cannot -- I looked at the maps for the INEL, I cannot see C where INEL does not affect the aquifer, whether it be in the Big Lost River Range or the Birch Creek.

The tribes believe at the utmost D importance of our cultural history is water. Mother Earth is generated by water. That is the blood of the earth, that is the way we see it. We see Mother Earth as a human, similar to a human. The water is what generates the power and the life of the earth.

So if there is development under by any hydro area, including the aquifer, it is going to be affecting the cultural resources of the tribal people of the Native American people.

On your section impacts, I have a concern on that first paragraph, you said the impacts were assessed qualitatively. What about quantitatively? For the cultural parts the quantitative assessments are as important as the qualitative. E

On the second paragraph in the impacts, you have, "Consequently Native American rights and interest would not be modified by construction or operations" and so on.

I am going to stress this point that you guys take this very seriously. It says that you are not going to modify the Native American concerns. F

I would like to ask the question without an answer, do you understand the Native American concerns and rights? The tribes are going to take you to stand on this. You are going to have to. We are going to take this statement very seriously and we will hold you to this statement.

On the next paragraph, you have with respect to prehistoric cultural resources, Native American cultural resources and paleontological resources in the Birch Creek and Lemhi area.

I would like for you guys to really assess qualitatively and quantitatively your comments there about the impacts that are going to be made if this be an alternative, not only to the Native Americans, which is a lot of resources. They are including traditional culture policies as defined by Bulletin 38, under the definition by National Park Service, but also impacts to the residents in how they may have a very serious concern into this area as well. G

LIEUTENANT SULLIVAN: Ms. Yupe, you have one more minute.

MS. YUPE: Under the socioeconomic section under 5.5, you stated here that there has been no significant socioeconomic impacts. Is that negative or positive to the community? I didn't really understand that. H

The tribes will be providing, at least from my office, I will be providing written comments prior to the deadline on other issues in this, but those are my main concerns within the document that I read. Thank you.

LIEUTENANT SULLIVAN: Thank you, Ms. Yupe.

Commenter: Diana Yupe - Shoshone-Bannock Tribe Cultural Resources Representative, Idaho

Response to Comment:

A. & B. The Navy also recognized this concern as discussed in Chapter 5, Section 5.4.1 of the EIS, which refers to a complete presentation on archeological sites, historic structures, and Native American interests in the Programmatic SNF and INEL EIS. In Section 5.4.2, the EIS states that the National Historic Preservation Act and the Cultural Resources Management Plan for the Idaho National Engineering Laboratory would be followed during planning stages of project development to minimize the impacts in these areas.

C. & D. The Navy reached this same conclusion. Appendix F of the EIS explains that the runoff of the Birch Creek and Lemhi Range areas recharges the Snake River Plain Aquifer.

E. The Draft EIS contains both qualitative and quantitative assessments of land use and cultural resource impacts. In Chapter 5 and Appendix F the areas of land impacted by the alternate dry storage locations are presented. In addition, the land impacted by constructing a rail line to the Birch Creek and Lehmi Range areas is listed.

The preferred alternative identified for this EIS would not disturb any land at the Idaho National Engineering Laboratory not previously affected by construction and operations or outside existing industrial areas. Thus no impact on cultural resources would be expected. In fact, the qualitative assessment was sufficient to exclude these areas from further consideration. If one of those areas had been chosen, then a quantitative analysis would have been appropriate. (See Chapter 3, Section 3.9) All excavation or construction would be conducted in accordance with applicable cultural agreements and regulations to minimize the potential for unforeseen impacts.

F. Native American concerns are considered with great care. The Navy is currently involved in negotiating an agreement with the tribes covering transportation of naval spent fuel across the Fort Hall Reservation, including the current shipments that come from the shipyards and prototype sites. Five federal laws prompt consultation between federal agencies and Indian tribes: The National Environmental Policy Act, the National Historic Preservation Act, the American Indian Religious Freedom Act, the Archeological Resources Protection Act, and the Native American Graves Protection and Repatriation Act (NAGPRA). In accordance with these directives and in consideration of its Native American Policy, Department of Energy is developing procedures at the Idaho National Engineering Laboratory for consultation and coordination with the Shoshone-Bannock Tribes of the Fort Hall Reservation. Department of Energy 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. In addition, the Cultural Resources Management Plan for the Idaho National Engineering Laboratory and curation agreement for permanent storage of archeological materials is expected to be completed shortly. 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.

G. The EIS recognizes the potential for impacts to prehistoric cultural resources, Native American cultural resources and paleontological resources in the Birch Creek and Lemhi Range areas, both in Chapter 5 and Appendix F. These areas were evaluated since they are the only locations on Idaho National Engineering Laboratory which are not directly above the Snake River Plain Aquifer. As stated in Chapter 5, Section 5.4.2, should either of these areas be selected for dry storage, procedures as required by the National Historic Preservation Act and the Cultural Resources Management Plan would be followed during the planning stages of project development to minimize the impacts on the use of this land. The preferred alternative

Commenter: Diana Yupe - Shoshone-Bannock Tribe Cultural Resources Representative, Idaho

for this EIS would not utilize the Birch Creek or Lemhi Range areas for dry storage of naval spent nuclear fuel, in part for this reason.

H. In Chapter 5, Section 5.5.2 of the EIS, the details of this evaluation are presented. The increased number of jobs for construction (about 50) and operations (about 10 to 20) has a positive impact on the community; however, when compared to thousands of workers at the Idaho National Engineering Laboratory, there is no discernible aggregate impact on the local workforce in the vicinity of the Idaho National Engineering Laboratory. In addition, there is very little difference among the alternatives.

DEPARTMENT OF THE NAVY

DRAFT ENVIRONMENTAL IMPACT STATEMENT

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NAVAL SPENT NUCLEAR FUEL

AT FORT HALL, IDAHO

JUNE 3, 1996

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MODERATOR: Lieutenant Timothy Sullivan, USN

SPEAKERS: Mr. Elmer Naples
Mr. William Knoll

REPORTED BY:
LISA K. ERSTAD, C.S.R. No. 279
Notary Public
(and)
KATHY McCOY, C.S.R. No. T163
Notary Public

Our next speaker is Lucille Edmo.

MS. EDMO: My name is Lucille Edmo and it is spelled L-U-C-I-L-L-E, E-D-M-O. I am a member of the Shoshone-Bannock tribe and I have a BA degree. My box number is Box 367, Fort Hall, Idaho, 83203.

A

And first of all, I just want to begin by saying that I am totally against any nuclear waste shipments at INEL or to the Idaho National Engineering Laboratory. And I do know that nuclear waste has seeped into the Columbia River system near the Hanford Nuclear Facility in Washington and it is a fact that large doses and exposure to radiation by human beings will cause cancer. And too many times the poor and the uneducated receive the bad deals.

The federal government bureaucrats and the Congressional representatives made the choice for the poor that these shipments would be placed at the INEL and knowing full well that the uneducated will not buck the system and some poor people, including poor whites who are also illiterate, will never speak out against such an atrocity.

B

The federal government in the early

1700s had an extermination and annihilation policy towards Indian people or Native Americans. Many Native Americans lost their lives because of viruses such as small pox were deliberately used to annihilate Native Americans. Government surplus blankets infected with small pox disease was distributed to Indian people.

The correlation or implication I may allude to is that there is the possibility of Native Americans being contaminated by nuclear waste, either while transportation of the waste or contamination of the aquifer by seepage of waste into the water. This could be termed another extermination policy and this is my own perspective.

No matter what paid federal government officials tell me, I will refuse to accept it at face value about the good aspects of nuclear waste shipments. And I am against the nuclear waste stored at the INEL site and the current transportation of the waste to the facility. C

I watched on television the effects of the Chernobyl accident and the devastating effects of the radiation exposure to the land and the people there, and I have read of the Three Mile Island accident.

I have read in the newspaper, the <u>Post Register</u> of Idaho Falls, about storage containers at the INEL site that have eroded. If I remember correctly, these storage containers apply to waste that has been stored at the site for years. Nevertheless, the possibility can occur again because of mismanagement and carelessness. D

And one last thing, when I referred to the Hanford site in Washington, there have been other tribes, including Yakima and Umatilla, who have spoken at Native American conferences about the nuclear waste and the contamination of the fish in the Columbia River system and the human effects of the waste haven't been determined.

Even at Chernobyl the effects of the nuclear accident upon the human population haven't been determined. Thank you.

LIEUTENANT SULLIVAN: Thank you, Ms. Edmo.

Mr. George Wood.

MR. WOOD: My name is George Wood and I want to make a couple of remarks because I was a former naval aviator serving aboard aircraft

Commenter: Lucille Edmo - Shoshone-Bannock Tribe Member, Idaho

Response to Comment:

A. & C. As discussed in the Container System EIS, naval spent nuclear fuel already exists and will require safe management. The Programmatic SNF and INEL EIS addresses shipment of naval spent nuclear fuel to Idaho National Engineering Laboratory. The Container System EIS addresses loading naval spent nuclear fuel into dry storage containers and transportation out of the state of Idaho. In both of these documents, analysis results are presented which show that naval spent nuclear fuel can be managed safely. All members of the public are able to comment on these documents regardless of their level of education or wealth. The National Environmental Policy Act established a national policy of promoting awareness of the environmental impacts of activities by federal government agencies.

B. The analysis results provided in this EIS show that naval spent nuclear fuel can be safely managed, stored, and transported with no significant impact on members of the public. The analysis methods used in this EIS are recognized throughout the United States and the world as the standard techniques for determining the risk to the public. In Chapter 3, a perspective is provided so the public can compare the analysis results to risks associated with other activities encountered in daily life. In addition, Chapter 7, Section 7.3.5 provides very specific information for Fort Hall Reservation residents which shows that over a 40 year period the entire aggregate radiation exposure to all residents of the reservation due to transportation of naval spent nuclear fuel is equal to that received during a single chest x-ray to a single individual.

The storage and shipping process for naval spent nuclear fuel has been designed to isolate radioactive waste from the environment. Further, there is no evidence that naval fuel has contaminated the aquifer.

C. See response for Comment A above.

D. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for dry storage and transportation (either by rail, heavy-haul truck, or a combination of both) must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably. As part of these licensing requirements, procedures must be in place to monitor the containers during storage and transportation to ensure that they do not deteriorate.

Railcars for Navy shipments are Government-owned boxcars, flatcars, depressed-center flatcars, and wellcars used exclusively by the Navy. These railcars are equipped with features like roller bearings, locking couplers, and end-of-car cushioning units which reduce the probability of accidents resulting from equipment failure and mitigate the potential for damage in the unlikely event of a collision or derailment. Navy railcars are thoroughly inspected prior to each use and confirmed to meet all requirements. Such inspections and on-going maintenance ensure that equipment remains in first-rate condition.

Written procedures are used by the Navy for the inspection and maintenance of shipping containers. Inspections and maintenance are performed at the shipyard before loading the shipping container with fuel modules and the loaded shipping container is thoroughly inspected before leaving the shipyard. Upon arrival at Idaho National Engineering Laboratory containers are again inspected thoroughly. Inspections and maintenance are performed on shipping containers after the fuel modules are unloaded at Idaho National Engineering Laboratory. These procedures meet the requirements listed in 10 CFR Part 71 Subpart G - Operating Controls and Procedures.

Naval spent fuel is packaged in shipping containers that meet the Type B rating as specified in the regulations of the U.S. Nuclear Regulatory Commision and the U.S. Department of Transportation. Tiedowns are specifically designed for each container/railcar combination to provide for retention of the container in place even during abnormal transport conditions. Boxcars are locked, externally and internally, and sealed.

Each shipment is accompanied by a Government-owned escort caboose occupied by Navy couriers who maintain constant surveillance of the shipment. The shipment contents are rugged and stable, the containers are robust, the railcars are well maintained, and trained Government escorts accompany each shipment. As a result, the probability of a serious accident is extremely remote.

ORIGINAL

PUBLIC HEARING

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DEPARTMENT OF THE NAVY

DRAFT ENVIRONMENTAL IMPACT STATEMENT

FOR THE CONTAINER SYSTEM FOR THE MANAGEMENT OF

NAVAL SPENT NUCLEAR FUEL

AT FORT HALL, IDAHO

JUNE 3, 1996

AFTERNOON SESSION

MODERATOR: Lieutenant Timothy Sullivan, USN

SPEAKERS: Mr. Elmer Naples
Mr. William Knoll

REPORTED BY:
LISA K. ERSTAD, C.S.R. No. 279
Notary Public
(and)
KATHY McCOY, C.S.R. No. T163
Notary Public

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the people there, and I have read of the Three Mile Island accident.

I have read in the newspaper, the Post Register of Idaho Falls, about storage containers at the INEL site that have eroded. If I remember correctly, these storage containers apply to waste that has been stored at the site for years. Nevertheless, the possibility can occur again because of mismanagement and carelessness.

And one last thing, when I referred to the Hanford site in Washington, there have been other tribes, including Yakima and Umatilla, who have spoken at Native American conferences about the nuclear waste and the contamination of the fish in the Columbia River system and the human effects of the waste haven't been determined.

Even at Chernobyl the effects of the nuclear accident upon the human population haven't been determined. Thank you.

LIEUTENANT SULLIVAN: Thank you, Ms. Edmo.

Mr. George Wood.

MR. WOOD: My name is George Wood and I want to make a couple of remarks because I was a former naval aviator serving aboard aircraft carriers during World War II and during the Korean War.

I know how dangerous it is to refuel an aircraft carrier at sea during wartime. I have seen the spilled oil and the big hoses and the ships sailing together and the extreme danger that was imposed upon us at that time.

I have also seen the oil spilled at times, accidents, and I know, I know full well that the saving of that type of injury from the ship's oil alone is a great step in advance by using nuclear power on our ships.

I believe the United States Navy should A have every ship that is large enough to do it powered by nuclear. It would be far safer, far more environmentally benign to do that.

I also believe that nuclear power, electricity, is by far the cleanest, the safest, most environmentally benign way of producing any meaningful amount of electricity.

There is no question in my mind that radiation has saved far more lives through medicine and incidentally, possibly through the production of energy, than it ever took at Hiroshima and Nagasaki combined. We are not even talking about the relatively minor loss at Chernobyl and no loss at all at Three Mile Island.

My former questions, by the way, were intended to bring out the factors of exposure, time and distance as a protection against radiation. As a protection against almost any other peril. If you are getting shot at, if somebody is throwing rocks at you, you get away from them, that is the distance. You do it as soon as you can, that is the timing. And you get behind a rock or something if they are shooting at you and that is the shielding.

But we use the same shielding in radiation that you talked about. But I want to explain, too, that the time and the distance are also factors and that the people this far away from the works of INEL are, indeed, quite safe because of the distance alone.

And if you should have an accident on a railroad here, back away from it as you would a poisonous gas, a bunch of explosives or anything else. It is not a mysterious thing that cannot be overcome. Thank you very much.

LIEUTENANT SULLIVAN: Thank you,

Mr. Wood.

Ladies and gentlemen, I have no further registrations. Has anyone registered to speak to whom I have not given the opportunity?

I want to thank you all on behalf of the United States Navy for taking the time to participate in this hearing this afternoon. We appreciated the opportunity to hear your comments and we will work to make sure they are addressed in the Final EIS. Thank you.

This meeting is adjourned.

(Whereupon, the hearing was concluded at 3:50 p.m.)

Commenter: George Wood, Idaho

Response to Comment:

A. The Navy appreciates support expressed for its efforts. The Navy needs to ensure that naval spent nuclear fuel, after examination, is managed in a fashion which facilitates ultimate safe shipment to a permanent geologic repository or centralized interim storage site outside of the state of Idaho; is protective of the Idaho environment while being temporarily stored at the Idaho National Engineering Laboratory; and complies with the court ordered agreement among the State of Idaho, Department of Energy, and the Navy (U.S. District Court, 1995). As the commenter noted, this EIS includes proposed actions by the Navy that would commence placing naval spent nuclear fuel into dry storage on a schedule consistent with that required of the Department of Energy in the Idaho Agreement.

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We didn't know, but now it's coming out in documentation. So I guess we did know. Thank you.

LT. SULLIVAN: Thank you, Mr. Perry. Does anybody else have a question? At this time we're going to take a recess. For those who would like to make a comment during the formal comment period, if you haven't signed in at the registration desk outside, we would ask that you do that. We'll stop for ten minutes. We'll reconvene just a little bit after 9:15. Thank you.

(Recess was taken.)

(Reconvened at 9:30 p.m.)

LT. SULLIVAN: Ladies and gentlemen, we would like to reconvene at this time. We've reached the comment period. We don't have anyone who is registered to make a comment. If you would like to -- is there anyone who does want to make a statement? You can make one here or there is also a court reporter out in the hallway, if you'd like to make your statement in private. Is there anyone who would like to speak at this time?

MS. TOWERSAP: I would.

LT. SULLIVAN: If you would, ma'am, let me lay a couple ground rules for this part of the meeting. You're welcome to stand there. This is the comment period. I request your cooperation in limiting your comments to five minutes. I have a watch. I'll be keeping time, and at about four minutes I will let you know that you have about one minute left to make a statement. And we'll let someone else make a statement, if they want to do that. If there is no one else, we'll let you speak for a little more reasonable period of time. When you make your comments, if you would please direct them to me.

Ma'am, if you would please come up to the podium again and please state your name and spell your last name for us.

MS. TOWERSAP: I'll wait.

LT. SULLIVAN: But you're the only person who wants to make a statement, so if you would please make your statement at this time.

MS. TOWERSAP: I'll just make it brief. You already have my name. And I'm concerned, like I was saying I'm concerned about the health of our Indian people. I'm speaking on behalf of the older people, my age, who doesn't know about these meetings, who doesn't know what's going on with the council, who are just out there. These people do not work. They can't work. And not only that they cannot be hired by our neighboring towns. So we have to exist the best way we know how. And that is through beading, through with our hands. That's the way we make a living.

At this time for the sake of our health, our well-being, for the sake of our children so that they can have a life, I would like to ask thirty million dollars for all of this nonsense that's going through because this is really -- it's a bad stuff. I dream about these things. In fact, I dream about the future, how are we going to look and it's not pretty. That's all I want to say. That's how much I'm asking for my health and my people's health. Thank you.

A

LT. SULLIVAN: Ma'am, could you please for Ms. McCoy's benefit state your name and spell your last name and give us your address.

MS. TOWERSAP: Zeli Towersap, P. O. Box 22, Fort Hall, Idaho 83203.

LT. SULLIVAN: Thank you very much.

MR. HEVEWAH: My name is Hobby Hevewah. I'm a Shoshone Bannock tribal member. I've spoken to -- oh, Post Office Box 8, Fort Hall, Idaho 83203.

LT. SULLIVAN: Sir, how to you spell your last name?

MR. HEVEWAH: Hevewah, H-e-v-e-w-a-h. I don't really have a problem with the containers or anything, but the document itself. You recognize the

Commenter: Zell Towersap, Shoshone-Bannock Tribe member, Idaho

Response to Comment:

A. The analysis results provided in this EIS show that naval spent nuclear fuel can be safely managed, stored, and transported with no significant impact on members of the public. The analysis methods used in this EIS are recognized throughout the U.S. and the world as the standard techniques for determining the risk to the public. In Chapter 3, a perspective is provided so the public can compare the analysis results to risks associated with other activities encountered in daily life. In addition, Chapter 7, Section 7.3.5 provides very specific information for Fort Hall Reservation residents which shows that over a 40 year period the entire aggregate radiation exposure to all residents of the reservation due to transportation of naval spent nuclear fuel is equal to that received during a single chest x-ray to a single individual.

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know how. And that is through beading, through with our hands. That's the way we make a living.

At this time for the sake of our health, our well-being, for the sake of our children so that they can have a life, I would like to ask thirty million dollars for all of this nonsense that's going through because this is really -- it's a bad stuff. I dream about these things. In fact, I dream about the future, how are we going to look and it's not pretty. That's all I want to say. That's how much I'm asking for my health and my people's health. Thank you.

LT. SULLIVAN: Ma'am, could you please for Ms. McCoy's benefit state your name and spell your last name and give us your address.

MS. TOWERSAP: Zeli Towersap, P. O. Box 22, Fort Hall, Idaho 83203.

LT. SULLIVAN: Thank you very much.

MR. HEVEWAH: My name is Hobby Hevewah. I'm a Shoshone Bannock tribal member. I've spoken to -- oh, Post Office Box 8, Fort Hall, Idaho 83203.

LT. SULLIVAN: Sir, how to you spell your last name?

MR. HEVEWAH: Hevewah, H-e-v-e-w-a-h. I don't really have a problem with the containers or anything, but the document itself. You recognize the tribe as a sovereign nation or you wouldn't be sitting down negotiating with them.

A

This document you look at .it as coming from the Indian perspective, the Indian tribe, Indian government, nothing in here pertains to that. Your EIS does not show me the impact to my treaty. The treaty here it has nothing in this document that addresses that. There is nothing in this document that shows that the INEL is the aboriginal territory of Shoshone Bannock tribes. It should be in this document. If you're dealing with the tribe as wholeheartedly as you say you are, you recognize what your just responsibilities are.

B

None of the impacts in here shows the impacts to my people, impacts to the wildlife out there on the transportation issue. It's not in here. You don't even see that today. You don't see the tradition. The cultures fall between the cracks of the EIS, and you're naval process. And you don't -- I been out there, looked at the new developments that happen out there. And we walked over medicine plants that the people, the archaeologists, the botanists, they don't even look at. These are the impacts that should be in this if you're going to deal with a sovereign nation like the Shoshone Bannock tribes. It's not in here.

And I brought this up probably six years ago when you first started coming to the table talking to the tribal government, and I was on the council. I was on the land use department making comments about why. Why isn't the treaty rights in the EIS here? They should be if you're dealing with us. It has to be in here. Some of your representatives here even from the DOE and from the Navy representatives, yes, next time we deal with your issues. They will be in this document, but today it's not there. C

I'm just mentioning this from a point of view of a public official. It's really needed because if this is going to be a legal document, it needs to be in here. Thank you.

LT. SULLIVAN: I have no other registrations. Does anyone else wish to make a comment?

I want to thank you all on behalf of the United States Navy for taking the time to participate in this hearing tonight. We appreciated the opportunity to hear your comments and will work to make sure they are addressed in the Final EIS. We would also like to thank the Shoshone Bannock tribes for the use of their facilities and their hospitality this afternoon and this evening. Thank you very much. This

Commenter: Hobby Hevewah - Shoshone-Bannock Tribe member, Idaho

Response to Comment:

A.&C. The impacts on treaty rights are addressed in the EIS by reference to the Programmatic SNF and INEL EIS. In Chapter 5, Section 5.4.1, reference is made to this EIS for a detailed discussion of land uses at Idaho National Engineering Laboratory. There it is stated that no on-site land use restrictions due to Native American treaty rights would exist for any of the alternatives. The Idaho National Engineering Laboratory site does not lie within any of the land boundaries established by the Fort Bridger Treaty. Furthermore, the entire Idaho National Engineering Laboratory site is land occupied by the Department of Energy, and therefore that provision in the Fort Bridger Treaty that allows the Shoshone and Bannock Indians the right to hunt on the unoccupied lands of the United States does not presently apply to any land upon which the Idaho National Engineering Laboratory is located. To clarify this issue, Section 5.4.2 will be revised to include these details rather than referencing another document.

The impacts on treaty rights due to hypothetical facility accidents are presented in the EIS in Table A.7 of Appendix A. There it states that some temporary restrictions on access may be required until cleanup is completed. No enduring impacts are expected.

B. Chapter 7, Sections 7.3.5 and 7.3.6 of the EIS address these impacts. The analysis results provided in this EIS show that naval spent nuclear fuel can be safely managed, stored, and transported with no significant impact on members of the public. The analysis methods used in this EIS are recognized throughout the United States and the world as the standard techniques for determining the risk to the public. In Chapter 3, a perspective is provided so the public can compare the analysis results to risks associated with other activities encountered in daily life. In addition, Section 7.3.5 provides very specific information for Fort Hall Reservation residents which shows that over a 40 year period the entire aggregate radiation exposure to all residents of the reservation due to transportation of naval spent nuclear fuel is equal to that received during a single chest x-ray to a single individual. In Section 7.3.6, the EIS states that the impacts on the ecology along the transportation routes would be negligible.

C. See the response to comment A above.

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ORIGINAL

PUBLIC HEARING

DEPARTMENT OF THE NAVY

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(and)
KATHY McCOY, C.S.R. No. T163
Notary Public

STATEMENT GIVEN IN PRIVATE

MR. PERRY: My name is Robert W. Perry, Jr. I am an enrolled member of the Shoshone-Bannock tribes. I am 36 years old and have lived on this reservation all my life.

To date I haven't witnessed or observed A
any sort of a nuclear agreement between the Navy and the Shoshone-Bannock tribes nor Westinghouse and the Shoshone-Bannock tribes, of which I know Westinghouse has been hauling nuclear waste across the reservation for the last four years and the tribes haven't been given anything for the waste moving across the reservation.

I am appalled that the State of Idaho B
receives $30 million and the Shoshone-Bannock tribes, the people of the Shoshone-Bannock tribes, are yet to receive any monetary funding from the Navy, DOE or DOD for the individual tribal members due to the fact that if there is a nuclear spill, the people will be the ones to suffer, not just the tribal government.

No one from the tribe has given us an alternative to this agreement, which I know under

CFR rules and regulations we do have an alternative. No one has exposed or related to C the tribes that within the last three months there has been canister leakage at the INEL that has caused damage or is leaching towards the groundwater. No one has made public comment on it of which I am appalled that the Navy, DOE, Lockheed are all covering up this disaster.

I have had contact with sources in Washington, D.C. that have affirmed what I have said about the leakage. As of last Monday Lockheed was to lay off a bunch of their employees that clean up spills. Instead, they kept the employees on full-time and hired more. The Army has been brought in to help.

I am appalled that the nuclear waste that has been coming across the reservation Westinghouse feels that they have really got something over on someone due to the fact that the Navy now is having to pay "X" amount of dollars to bring nuclear waste across the reservation by train. The Navy feels appalled that Westinghouse has to pay nothing or very little.

The Westinghouse agreement at one time

was signed by Kesley Edmo of which is not a chairman now. The agreement was for five years. If the agreement is to be renegotiated, all tribal members should have knowledge of the renegotiation and what the tribe shall receive because it is a tribe as a whole that will suffer.

D

I am appalled that as of this date I believe the Shoshone-Bannock tribes have already signed an agreement with the Navy. The reason being is the Shoshone-Bannock tribes are already receiving surplus goods from the Navy. It is common knowledge. You don't start paying for something unless an agreement is came to.

E

I am in question as to why in the agreement that the chairman sent out to each tribal member why the Navy agreed to give the tribe $400,000 for railroad upgrades due to the fact that the railroad is not our responsibility, it is Union Pacific's.

And in doing my research I found out that Union Pacific Railroad right-of-way across the Shoshone-Bannock Indian Reservation is illegal, null and void. In 1856, a train came to the reservation boundary, could not find anyone to sign a right-of-way agreement. Union Pacific pushed the agreement through of which it was Oregon Shortline at that time.

Washington, D.C. offered to pay $6,000 for the tribe to permit Oregon Shortline to come across the reservation. $6,000 hasn't been paid to the State because it is an illegal right-of-way of which I think the Navy knows. This is why they have given the tribe $400,000 for upgrades instead of giving it directly to Union Pacific Railroad.

F

The canisters we are talking about today are for the rail. I would like to know what type of canisters are used in the trucks that Westinghouse brings through the reservation. If they are as safe as the ones on the rail or supposably, and I would like to know

G

since this reservation is within malitia country, what the United States Navy plans on doing if a malitia destroys our railroad track and we have a pile up in the middle of Fort Hall.

Under the EIS system, I was told and I read that there would be an emergency response system set up in the Fort Hall area before any shipments went through this location. It is a boldface lie and it libels the United States Navy. There is no system in place and there is no funding for any type of a system right now in Fort Hall, Idaho or the Shoshone-Bannock Indian Reservation. H

I believe that the negotiations on the nuclear waste for transferring nuclear waste across the reservation are already done. I am appalled that tribal attorney Janette Woofley negotiated with the Navy on the nuclear shipments and as of May 6, resigned from the Shoshone-Bannock tribes and went to work for the DOE, which is a direct conflict of interest, DOE conflict of interest, Litco conflict of interest, and, of course, the United States Navy. I

I am appalled that in 1992 Marvin Osbourne, chairman of Shoshone-Bannock tribes, signed the transatlantic agreement, Westinghouse let nuclear waste come across our reservation by truck and that Mr. Marvin Osbourne has a petroleum company called American Shoshone Petroleum and has been hauling petroleum to Westinghouse ever since he signed the agreement in '93.

I feel there is a lot of underhanded,

corrupt negotiations going on at the present time. I do have a letter to William Perry, Secretary of Defense, along with other tribal members in response to the nuclear waste coming across the reservation.

We believe that since the nuclear waste has already come across the reservation, we cannot stop it, but we believe we are equal to the people of the State of Idaho and should be given the same respect and the same amount of money that State of Idaho was given so that if our people want to move off this reservation, they will have the money to do so.

We believe that if Mr. William Perry does not answer our response within two weeks, that we will file in United States District of Columbia a class-action against the Department of Navy and the Bureau of Indian Affairs who holds the trust fiduciary responsibility of protecting Native American tribes within trust status. That they are in violation of their fiduciary responsibility.

Also, a defendant in the case would be the president of the United States, Bill Clinton. Under sovereign immunity and the

K

treaties that establish the Shoshone-Bannock tribes and all tribes within the United States, we are to have a government-to-government relationship and not let the State of Idaho negotiate nuclear waste shipments through our reservation.

I have sat in 15 minutes of your public hearing and all I have heard Mr. Knoll speak about is the State of Idaho, the State of Idaho agreement, we have agreed with the State of Idaho. He fails to realize that the Shoshone-Bannock tribes is a sovereign nation within a nation, and that the Shoshone-Bannock tribes should be dealt with just as the State of Idaho and be given equal respect. That is all I guess.

L

I would like to know if there is any way I can get a copy of my testimony.

In reference to pesticides on the reservation, President William Clinton sent a delegation of people from Washington, D.C. to the Fort Hall Indian Reservation to investigate pesticides and toxic effects of pesticides on the Indian Reservation.

At that time we requested that

everything that we put on record would be sent back to our addresses so we would have proof that the United States Government utilized our testimony instead of throwing it in the trash can.

To this date we have yet to receive any documentation that our testimony made it into Congress or the legislature. To this date I have called different people from that delegation and requested assistance and requested them to send our testimony, a copy of our testimony, to us and we have yet to receive anything or phone calls back.

If this public hearing is like the last, I would think it is a smoke screen to pacify and appease the people of the Shoshone-Bannock tribes and the United States Navy and DOE have already made up their mind as to what they are going to do and this testimony is worthless.

In 1980 there was a pesticide fire, a chemical company burned up on this reservation. I find out to this date that it was one of the United States' most dangerous chemical fires and had been studied by Atlanta, Georgia for quite

M

sometime, for ten years, 1980 to 1990. It is one of the worse chemical fires in the United States.

But it was downplayed by a smoke screen. Investigators said that they researched this case and the 26 firefighters for ten years and studied health affects and what it did to them. They spent hundreds of thousands of dollars on this research.

To this date, 1996, I, Robert W. Perry, my father, Robert W. Perry, Sr., two of the initial attack firefighters on that chemical fire, to this date we have never been questioned, interviewed, or anything from Atlanta, Georgia. We believe the study was a waste of money and one of the biggest cover-ups the United States Government has ever had.

Out of the 26 initial attack firefighters that were on the scene, many of us have gotten really sick, respiratory problems, heart failure and some have died. The team from Atlanta, Georgia that studied this chemical fire failed to study two of the worst causes of heart disease, respiratory problems on this reservation, which was pointed out to be the FMC

Corporation, J.R. Simplot Corporation and the pesticides used on this reservation.

We would like an epidemiology study done on the Fort Hall Indian Reservation that is true and correct. It will expose the groundwater contamination that we have had for the past two years that constituted a national disaster. We had to have water shipped in here. But nothing has been done to this date to clean up the water. Our people are drinking cancer-causing carcinogens, ethylene dybromide, methosodium, DDT, strychnine, which have all been found in our water table. And to this date nothing has been done for our people.

The United States Government has a fiduciary responsibility to act to save the Shoshone-Bannock Indian Reservation because the Shoshone-Bannock tribes were not the ones who contaminate the water.

But as I said earlier, if I don't receive a copy of this and a response from Mr. Knoll, I will know for a fact that this is just another smoke screen by the United States Government to pacify and appease members of the Shoshone-Bannock tribes.

Thank you. Robert W. Perry, Jr., P.O. Box 5537, Chubbuck, C-H-U-B-B-U-C-K, Idaho, 83202.

(Whereupon, the statement was concluded.)

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
2531 JEFFERSON DAVIS HWY
ARLINGTON, VA 22242-5160

IN REPLY REFER TO

June 24, 1996

Mr. Robert W. Perry
P.O. Box 5537
Chubbuck, ID 83202

Dear Mr. Perry:

This letter is in response to your request, made at the Fort Hall Public Hearing on June 3, 1996, to receive a copy of the transcript of the comments you provided during the public hearing on the Department of the Navy's Draft Environmental Impact Statement (EIS) for a Container System for the Management of Naval Spent Nuclear Fuel.

The complete transcripts of the public hearings, including the public comments, slides and pictures used for the presentation, will be placed in the public reading rooms identified in the draft EIS (see section J.10.). The locations in the vicinity of Fort Hall include the Department of Energy Reading Room in Idaho Falls, ID; the Idaho Falls Public Library in Idaho Falls, ID; the Pocatello Public Library in Pocatello, ID; and the Shoshone-Bannock Library in Fort Hall, ID. It is expected that the proceedings from the public hearings will be available in these libraries by July 8, 1996.

Thank you for your interest in the draft EIS.

Sincerely,

William S. Knoll
Nuclear Propulsion Directorate

Commenter: Robert Perry - Shoshone-Bannock Tribe member, Idaho

Response to Comment:

A.B. &E. The Navy is currently negotiating an agreement with the tribes covering transportation of naval spent fuel across the Fort Hall reservation to the Idaho National Engineering Laboratory. The Navy has also participated in other meetings and briefings for all members of the Tribes or the Tribal Business Council related to naval spent nuclear fuel. Specific issues related to the ongoing negotiations between the Navy or Department of Energy and the tribes are outside the scope of this EIS.

C. This comment is incorrect. On May 7, 1996, Department of Energy issued a press release describing the discovery of 317, 55-gallon containers of transuranic waste which were found to have pin-sized holes. This press release stated that “No contamination has been detected on the external surfaces of any containers with the rust spots nor has any radioactive material been released to the environment.” These canisters did not contain and are not related to management of naval spent nuclear fuel.

D. As a show of good faith during the negotiations with the Shoshone-Bannock Tribes, the Navy has provided some excess items in support of the Tribe's emergency planning and training effort; however, an agreement has not yet been reached.

E. See the response to comment A above.

F. The shipping containers that the commenter mentioned are used for transporting irradiated test specimens (fuel and non-fuel) between the Expended Core Facility and off-site laboratories and test facilities. The details concerning the use and design of these containers are provided in the Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory EIS (Volume 1, Appendix D, Sections A.4.4 and A.4.5). The environmental impacts due to transporting these test specimens were covered in that EIS. These shipments are beyond the scope of this EIS.

G. The analysis provided in the EIS indicates that, in all likelihood, there will be no impact. In most accidents involving naval spent nuclear fuel on railcars, it is very likely that no radioactive material would be released from the container because of their robust design. As discussed in Appendix B, Section B.2.2, these containers meet 10 CFR 71 regulations which require the container to meet specific criteria under normal transport and accident conditions. Tests are conducted to demonstrate that the containers meet the criteria, including a 30-foot drop test onto an unyielding surface (equivalent to 60 foot onto a reinforced concrete surface) and a puncture test which produce forces greater than those expected during a derailment.

As indicated in Chapter 3, Table 3.3 of the EIS, for the Multi-Purpose Canister Alternative, there is an increase of about 1.1 ten millionths in the usual risk of a latent cancer per year due to hypothetical transportation accidents. This is about one latent cancer fatality in the entire population if the operation were continued for about 9 million years.

H. The Department of Energy has provided both resources and training to the Shoshone-Bannock Tribes to ensure that local response to a transportation accident is handled properly. If an accident did occur, federal, state, local, and tribal authorities are trained in emergency response. The Shoshone-Bannock Tribes have been actively participating in comprehensive, cooperative transportation accident exercises held in Idaho.

I. The employment status of private citizens and the competitive bid process involving placements of contracts at the Idaho National Engineering Laboratory are beyond the scope of this EIS, since neither is associated with naval spent nuclear fuel.

Commenter: Robert Perry - Shoshone-Bannock Tribe member, Idaho

J.&K. The Navy is currently involved in negotiating an agreement with the tribes covering transportation of naval spent fuel across the Fort Hall reservation to the Idaho National Engineering Laboratory. Five federal laws prompt consultation between federal agencies and Indian tribes: The National Environmental Policy Act, the National Historic Preservation Act, the American Indian Religious Freedom Act, the Archeological Resources Protection Act, and the Native American Graves Protection and Repatriation Act (NAGPRA).

In accordance with these directives and in consideration of its native American Policy, the Department of Energy is developing procedures at the Idaho National Engineering Laboratory for consultation and coordination with the Shoshone-Bannock Tribes of the Fort Hall Reservation. Department of Energy 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. In addition, the Cultural Resources Management Plan for the Idaho National Engineering Laboratory and curation agreement for permanent storage of archeological materials is expected to be completed shortly. 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.

L. Mr. Perry was informed by letter dated June 24, 1996 that a copy of his testimony can be found with all of the public hearing transcripts in the library on the Fort Hall Reservation.

M. In accordance with the National Environmental Policy Act, no decision on the alternative to be implemented has been made or will be made until after the Final EIS is issued and no actions are being taken which would prejudice that decision. The final decision and the basis for it will be documented in the Record of Decision which will be published in the Federal Register in December 1996.

N. While the Navy appreciates concern about health effects to firefighters during the 1980 pesticide fire on the reservation, this comment is outside the scope of this EIS. It is unrelated to activities associated with naval spent nuclear fuel.

O. Recent groundwater contamination involving cancer-causing carcinogens on the Fort Hall Indian Reservation is outside the scope of this EIS because it is unrelated to activities associated with naval spent nuclear fuel. The impacts on water resources due to the alternatives evaluated in this EIS are presented in Chapter 5, Section 5.6.2.

The Programmatic SNF and INEL EIS contains detailed information concerning detected contaminant concentrations within the Idaho National Engineering Laboratory site and at the site boundary (Volume 2, Section 4.8 and Appendix F). Trends in ground water quality are also reported in that EIS (Volume 2, Section 5.8).

ORIGINAL

21

PUBLIC HEARING

DEPARTMENT OF THE NAVY

DRAFT ENVIRONMENTAL IMPACT STATEMENT

FOR THE CONTAINER SYSTEM FOR THE MANAGEMENT OF

NAVAL SPENT NUCLEAR FUEL

AT BOISE, IDAHO

JUNE 5, 1996

MODERATOR: Lieutenant Timothy Sullivan, USN

SPEAKERS: Mr. Elmer Naples
Mr. William Knoll

REPORTED BY:

SHERI D. LUDIKER, C.S.R., R.P.R.
Notary Public
(and)
ANGELA M. CODER, C.S.R. #635
Notary Public

//2

2:40.

(Whereupon, a recess was taken from
2:30 p.m. to 2:50 p.m.)

LT. SULLIVAN: Ladies and gentlemen, we would like to reconvene at this time. We've reached the formal comment period. Nobody has signed up to register to speak, but is there anyone who does wish to speak at this time?

(No response.)

We've heard there's going to be a speaker at about 4:00 today, at least one. So, what we're going to do is we're going to recess now and we're going to meet again at 3:50 and go back on the record again and wait and see if the speaker shows up. So, right now we're in recess.

(Whereupon, a recess was taken from
2:51 p.m. to 3:53 p.m.)

LT. SULLIVAN: Ladies and gentlemen if we could, we would like to reconvene at this time. We're pleased to have with us the Honorable Philip Batt, the Governor of the State of Idaho. Mr. Batt is going to make a comment during our formal comment period this afternoon.

GOVERNOR BATT: Well, Lieutenant

Sullivan and distinguished visitors, we're very happy that you chose to have these hearings. We believe they are very valuable.

As Governor of the State, I want you to know that I appreciate the Navy's effort in holding this hearing here in Boise today. I extend my sincere gratitude for the effort you have made, both in preparing this document and traveling throughout the state to hold public hearings.

Two days ago you held a similar hearing in Fort Hall, Idaho, on the Sho-Ban Indian Reservation. I appreciate that effort to listen to the concerns of those important citizens. In a few more days you'll travel to Salt Lake City to hold another hearing.

Undoubtedly, one of the main reasons you are holding these hearings is directly due to the settlement agreement I reached with the U. S. Navy and other federal officials last year.

Until that agreement was reached, there was no plan to ship spent Navy fuel out of Idaho. Now, quoting from the settlement agreement, "the naval spent fuel stored at INEL on the date of the opening of a permanent repository or interim storage facility shall be among the early shipments of spent fuel to the first permanent or interim repository."

To help facilitate the shipment of the Navy's fuel out of Idaho, the agreement further requires that the U. S. Department of Energy, DOE, and the Navy shall employ multi-purpose canisters, or MPC's, or comparable systems to prepare spent fuel located at INEL for shipment and ultimate disposal of such fuel outside Idaho.

A

In order to determine what kind of canisters should be used to get spent nuclear fuel out of Idaho, the Navy must prepare an Environmental Impact Statement. Part of that EIS process requires the soliciting of comments from the public. And that's why we're here today.

B

I am hopeful that those shipments out of Idaho will begin well before the 2010 date outlined in the EIS. Indeed, the Navy should be looking at a deadline closer to the year 2000.

I say this because there is legislation currently before Congress that would open an interim repository for spent nuclear fuel by 1999. That legislation allows enough room at the interim facility to accommodate all of the Navy fuel now in Idaho. And as I've noted, the settlement agreement requires Navy fuel to be among the first spent fuel to enter such a repository.

Therefore, I urge the Navy to quickly move in selecting a canister system. By so doing, the Navy will be able to meet its agreement obligation to get its spent nuclear fuel road-ready to ship out of Idaho as soon as the interim or permanent repository opens. C

That is why this hearing today in Boise is so important. This hearing is another step in the right direction for my state, an important first step to get nuclear waste out of Idaho.

I believe that the hearing here today is a clear indication of the tremendous value of the agreement I reached last year. This hearing is also a clear indication of the federal government's commitment to live up to its legally binding obligations to get spent nuclear fuel out of Idaho.

I must say that it is encouraging to see the Navy making progress to meet the terms of the agreement that we worked so hard to solidify last year.

Frankly, the only reason Idaho was able to reach such an agreement was due to the federal government's effort to accommodate the needs of the U. S. Navy. The Navy has always needed Idaho. And Idaho needed the Navy to get an agreement.

Unfortunately, as many of you in the Navy are aware, there are those who are trying to undo the agreement by getting the "Stop the Shipments" initiative on the ballot in Idaho.

Those signature gatherers, who I've been told are being paid a handsome sum, have failed to appreciate the difficult situation the state faced. Federal courts have consistently ruled that states and localities can't stop the shipment of radioactive materials. That's on the record.

Indeed, in his legal opinion on the "Stop the Shipments" initiative, Idaho Attorney General Al Lance noted that federal courts have uniformly interpreted federal statutes and the U. S. Constitution as preventing state legislatures or citizens' initiatives from enacting legislation to prohibit the shipment of radioactive waste into a particular state. Therefore, he concluded that the initiative is very likely to be ruled unconstitutional if it passes.

Given that reality, it is no wonder that the settlement agreement between Idaho and the federal government is the envy of other states. Not only does the agreement reduce the number of spent nuclear fuel shipments into Idaho, but it also specifies specific dates by which the waste must leave. And these are only two of the major highlights of the agreement.

Other important achievements include the legally binding commitments that the federal government will accelerate cleanup of radioactive wastes already at INEL, in some cases by as much as 40 years ahead of previously established targets.

Transuranic waste must begin leaving in the next three years, starting April 31, 1999. And no commercial spent nuclear fuel will ever again be brought into Idaho for storage.

And despite what the critics say, there are teeth in this agreement. If INEL does not clean up as established in the agreement, U. S.

Department of Energy shipments into Idaho will cease. If the U. S. Navy fails to meet its commitments, the Navy shipments into Idaho will stop. And if spent nuclear fuel is not removed from our state on schedule, the agreement allows for fines up to about $22,000,000 a year.

In addition, the Court can award additional financial damages to the state and even request that federal officials be thrown into jail for their failure to comply with the terms of the agreement.

With all of these facts, I must reiterate that the people who are gathering signatures to stop the shipments are in my opinion completely misguided in their efforts.

If the initiative passes, and in the unlikely event that the Court would allow the initiative to stand, the agreement I reached will then come before a vote of the citizens.

If the citizens overturn the agreement, Idaho would have no ability to limit any shipments or stop any waste from coming into this state. There will be no legal requirement to remove spent naval fuel from Idaho. There will be no legal requirement for any waste to leave.

In the end, the so-called effort to "Stop the Shipments" will mean, quote, "increase the shipments and Idaho keeps the nuclear waste." That would truly be a sad day for Idaho.

That, in essence, is again why this hearing today is so important. I hope the citizens of Idaho take note of this hearing. Again, this hearing is a clear indication of the federal government's commitment to remove nuclear waste from Idaho.

Now, when it comes to the containers that are being considered, I understand that the Navy is evaluating six container alternatives in the Environmental Impact Statement. Of those six, only four meet the stated objective outlined in the executive summary of EIS calling for, to quote, "a container system which allows naval spent nuclear fuel to be loaded and stored dry at the INEL in the same container that would be used to ship the naval spent nuclear fuel outside the State of Idaho could be advantageous in meeting the Navy's current and future needs." D

Of the six canisters under consideration, the four that meet the objective of the executive summary are: No. 1, the multi-purpose canister, MPC; No. 2, the dual-purpose canister; No. 3, the transportable storage cask; and No. 4, the small multi-purpose canister alternative.

It is my understanding that of those four, the preliminary economic estimates indicate that no single container is a clear cost leader. It is also my understanding that the minimal radiation exposure from each of the casks are essentially the same.

That being the case, I suggest that the Navy choose a container system that will accommodate the Navy's needs while minimizing the total number of shipments required to move all Navy spent fuel from Idaho. Such a decision would eliminate at least the small multi-purpose canister.

The State of Idaho will have more to say about this Environmental Impact Statement. I have directed the State's INEL Oversight Program to evaluate the document in detail. They will provide a technical review as well as a check on the adequacy from a NEPA perspective.

As you can tell from testimony, it is important to Idaho that this document be prepared properly so that the Navy can proceed expeditiously to carry out its end of the settlement agreement to remove its fuel from Idaho.

Thanks once again for holding this hearing. I hope the citizens will take note of it and I hope you will take note of my concerns. Thank you, sir.

LT. SULLIVAN: Thank you, Governor Batt.

Ladies and gentlemen, I have no further registrants. Is there anyone else who would like to make a comment during the formal comment period?

(No response.)

On behalf of the United States Navy, I want to thank Governor Batt for his hospitality in Boise. And I would also like to thank you for taking the time to participate in this hearing. We appreciate the opportunity to hear your comments and we will work to make sure that they are all addressed in the final EIS.

Thank you. This meeting is adjourned.

(Whereupon, the hearing was adjourned at 4:05 p.m.)

Commenter: Philip Batt - Governor of Idaho

Response to Comment:

A.&E. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for use must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, the Navy expects the reliable use of other containers can also be accomplished.

B.&C. The Navy has taken steps including the process of selecting an appropriate container system as described in this EIS, to ensure that naval spent nuclear fuel is among the early shipments of spent fuel to the first repository or interim storage facility. In addition to evaluating container systems, this EIS covers modifications to facilities to support loading naval spent nuclear fuel into containers suitable for dry storage and the location and construction of dry storage facilities at Idaho National Engineering Laboratory.

D. National Environmental Policy Act regulations (40 CFR 1502.4) require that a reasonable range of alternatives, including the alternative of no action be included. As defined in the EIS, the No-Action Alternative is based on using existing technology to handle, store, and subsequently transport naval spent nuclear fuel to a repository or centralized interim storage site. All of the alternatives evaluated are suitable for use as a container system for naval spent nuclear fuel. The Navy's preferred alternative is the dual-purpose canister system, which is one of the alternatives that the State of Idaho supports.

E. See the response to Comment A above.

ORIGINAL

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PUBLIC HEARING OF THE DEPARTMENT OF THE NAVY DRAFT ENVIRONMENTAL STATEMENT FOR THE SELECTION OF A CONTAINER SYSTEM FOR THE MANAGEMENT OF NAVAL SPENT NUCLEAR FUEL

-oOo-

Friday, June 7, 1996; 1:30 p.m.

Moderator: Lieutenant Timothy M. Sullivan
Speakers: Mr. Elmer Naples, Mr. William Knoll
Reported by: Ariel Mumma, CSR/RPR

Olympus Hotel Conference Center
161 West Sixth South
Salt Lake City, Utah 84101

asking questions; and if you'd like to make a comment, please wait until the formal comment period to do that.

So having said that, does anybody have a question?

Okay. It looks like no questions.

So at this point we'll take our recess. We don't have to worry about waiting an hour, and we'll come back in about 10 minutes. Let's come back at 3:15 and we'll have the formal comment period.

Thank you.

(There was a short break taken.)

LT. SULLIVAN: Ladies and gentlemen, we'd like to reconvene at this time.

We've reached the formal comment period. You're welcome at this time to make any statement that you would like to make, and since there aren't too many people here we're going to be pretty liberal with the time requirements. We have one registered speaker, Mr. William D. Peterson representing P&A Engineers.

And we welcome Mr. Peterson. If you would, sir, come up to the microphone, please state and spell your name, give us your address, and state the organization you're with.

MR. PETERSON: Thank you. William Donald Peterson, and I go by Bill. Address is 2127 Lincoln Lane; it's in Holladay, Utah 04124.

I first of all want to applaud you guys getting back on the MPC line. I received copies of this (indicating) a couple of years ago from the Department of Energy when I along -- the things that I've asked when they were telling me that this was going to be how they were going to do it.

And to me the MPC makes a lot of sense, and I think it's a good way to go, the reason being is A that when you ship it, you are restricted to weight, but when you store it away you can use the economy of storing it in concrete, which is a lot cheaper than stainless steel fabricated shielding system.

So I think economy-wise, weight-wise, logistic-wise, all together this MPC makes much more sense over a canister that is the shield system itself, that starts from the source to go to -- over the railroad or trucking and then goes into the storage. So I want to say I'm glad you're getting back into this thing and I endorse this.

Now, I've come here and shown a system that I've been working on to try and convince people that an MRS is a good, safe way of storing nuclear spent fuel, and I haven't -- as we've discussed, my display out in the hall -- and I've given you drawings and B write-ups of that, and I'd like to include that as -- as part of my comment as for the record.

I would like to say that the safety of the system is evident, if it can be shown to the people and the people will see it, if they can see it and understand it, then they will accept it, but until we get past the political part of this thing, just we've got to get beyond the word "nuclear" and get to the -- to the nitty-gritty of it and the full understanding of what this thing is, then people will understand and accept it. And I think after it gets going, in a few years it will be -- just become commonplace.

I believe that Utah itself has a major C responsibility to take these wastes, because Utah has the mines which most of this material -- or much of this material came from. Utah has the mills where this material was processed and refined, and Utah has places where this material is stored now, where wastes from this process is stored.

Utah is a generator and Utah must accept its responsibility. Utah is again opening its mines, Utah is again producing uranium; Utah needs this technology for the people who are working in those mines.

Those mines in the past have not operated safely. This technology in Utah can complement the technology in those mines used to mine this uranium. There needs to be a real effort put forth by Utah in Utah to -- to work with this technology and -- and improve upon what's going on in Utah.

I don't think it's right to force generator status upon Nevada, Idaho, Wyoming, and I don't know about New Mexico or Colorado. I think there may be some mines in those states, but I think the states that have had generator status need to stand up and say we're willing to do something and take care of this problem.

My effort is to show how this problem can be taken care of, and my effort as an engineer is to try to make this happen from private enterprise with anyone that is willing to work with me or that I can work with.

I appreciate this opportunity to meet you people -- and meet with you and show you my efforts, and I appreciate seeing your efforts. I've worked with state and local people all the way up to the writers of the bill for Nevada, Troy Timmons and Karen Hunsaker; there's a senator, Bennett Johnson's office, and Dan Kane and the Department of Energy.

I worked with -- contacted with these people every few days, and I want to make this thing happen.

I appreciate this chance to make this comment. Thank you very much.

LT. SULLIVAN: Thank you, Mr. Peterson.

I don't have anyone else registered to speak. Is there anyone who would like to make a statement at this time?

On behalf of the United States Navy I'd like to thank you all for participating in this hearing this afternoon. We appreciated the opportunity to hear your comments, and we'll work to make sure that they are all addressed in the final EIS.

Thank you again.

This meeting is adjourned.

(The meeting was adjourned at 3:25 p.m.)

* * *

Commenter: William Peterson, Utah

Response to Comment:

A. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for use must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably.

B. These materials have been included with the public hearing transcripts in all of the libraries and reading rooms listed in the EIS.

C. The location of a geologic repository or centralized interim storage facility is beyond the scope of this EIS.

P.O. Box 229
Wallace, ID 83873-0229
June 17, 1996

Richard A. Guida
Associate Director for Regulatory Affairs
Naval Nuclear Propulsion Program
Department of the Navy--Naval Sea Systems Command
2531 Jefferson Davis Hwy.
Arlington, VA 22242-5160

Dear Mr. Guida:

With reference to the Navy Draft EIS for a Container System for the Management of Naval Spent Nuclear Fuel and the formal comment period (61 FR 24933), I would like to make several comments.

A 1 - The Multi-Purpose Cannister seems to be the best idea if the research and development have been adequate and the cannister will be available.

a. There seems to be less handling after being "canned"

b. The cancer rate at the ICPP might be a bit higher, but essentially there is little risk.

c. There might be increased employment with this option, but jobs would be minimal because of the decrease of total INEL staffing.

d. Option would make rail shipment most feasible, but what of Sho-Ban activities.

B 2 - Mentioning rail brings to mind the plan to build an extensive rail system through Nevada. This seems such a waste. The regional disposal of waste at existing sites has seemed to me to be more efficient.

C 3 - Discussion of the Lemhi and Birch Creek areas seemed to show that because of faulting, etc., they were really not good, even though they are "off" the Snake River Aquifer. It has always amazed me as I read more about the INEL that they picked quite a seismically stable site, as well as one where the seepage over the last 50 years has not affected the aquifer. This is true in spite of all the bally-hoo.

I really enjoyed my participation on the EM Site Specific Advisory Board for INEL. It was a tremendous learning experience and although I rotated off the Board in May, I remain interested. Thank you for asking for my comments.

Genevieve M. Paroni

Genevieve M. Paroni, Member 1994-1996
EM Site Specific Advisory Board - INEL

Commenter: Genevieve Paroni, Idaho

Response to Comment:

A. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for dry storage and transportation (either by rail, heavy-haul truck, or a combination of both) must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably.

B. The location of a geological repository or centralized interim storage facility is beyond the scope of this EIS.

C. The Navy evaluated these two areas in an attempt to identify a technically feasible location for dry storage of spent nuclear fuel at the Idaho National Engineering Laboratory, which would not be above the Snake River Plain Aquifer, as required in the agreement with the state of Idaho. A complete discussion of this evaluation is presented in Appendix F of the EIS. This EIS shows that there is no technically feasible area at Idaho National Engineering Laboratory which does not contribute water to the Snake River Plain Aquifer. The preferred alternative would not make use of the Lemhi Range or Birch Creek areas.

OFFICE OF THE MAYOR

CITY AND COUNTY OF HONOLULU

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JEREMY HARRIS

MAYOR

24

June 20, 1996

Mr. Richard A. Guida, Associate Director
Department of the Navy
Naval Sea Systems Command
2531 Jefferson Davis Highway
Arlington, Virginia 22242-5160

Dear Mr. Guida:

A Thank you for providing the City and County of Honolulu the opportunity to comment on the Department of the Navy Draft Environmental Impact Statement (EIS) for a Container System for the Management of Naval Spent Nuclear Fuel.

This draft EIS addresses the storage and handling of naval spent nuclear material after inspection at the Idaho National Engineering Laboratory with primary transportation to a storage site by rail. The City and County of Honolulu does not have any personnel with expertise in this subject nor does it have any rail system. Therefore, I do not feel this City can make any substantive comment on the EIS.

Thank you for keeping the City of Honolulu informed about this sensitive issue.

Sincerely,

JEREMY HARRIS
Mayor

JH:jk

Commenter: Jeremy Harris - Mayor of Honolulu, Hawaii

Response to Comment:

A. Comment noted.

COMMENT FORM - Boise, Idaho

June 5,1996

25

NAME: STAN HOBSON

ADDRESS: 4951 BAYWOOD

CITY, STATE, ZIP: BOISE, ID. 83703

PHONE: 208 336-1878

ORGANIZATION: EM-SSAB-INEL

COMMENTS: Combine the concept one storage/transportable container, described in the Transportable Storage Cask System (TSC Alt) with the MPC, Multi-Purpose Canister Alternative. A

That is to say, use one overpack for both storage and transportation that contains a canister (MPC) to contain the fuel assemblies.

This would eliminate one handling of the canister shown in the current MPC alternative.

Cost of a single storage/transport

For further information contact:

William Knoll
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160
(703) 602-8229

COMMENT FORM - Cont'd

NAME: STAN HOBSON

cask may be a deterent

Commenter: Stan Hobson, Idaho

Response to Comment:

A. The alternative suggested by the commenter is essentially a variation of the Multi-Purpose Canister Alternative. The Navy does not anticipate that requirements or specifications will prohibit using a single overpack design as part of a multi-purpose canister system. If a container vendor designed a single overpack system which meets the requirements of both 10 CFR 71 and 10 CFR 72, handling of the canister could potentially be simplified. A vendor with such a design will have an opportunity to bid when the Navy solicits quotations for container procurement after the Record of Decision.

June 22, 1996

Mr. William Knoll
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

COMMENTS ON DRAFT EIS
CONTAINER SYSTEM FOR MANAGEMENT OF NAVAL FUELS

In my review of the referenced Draft EIS I have found a number of areas that I believe require additional explanation or basis prior to this document becoming an acceptable Final EIS. In particular I have the following comments:

A • The use of a "universal" cask was eliminated because there is no NRC approved version. Yet, the document examines the use of a "multipurpose" cask, for which there is also no NRC approved version. In fact, I believe that DOE has terminated the contract it had with firms proposing to develop such a cask. Therefore there is no basis for the evaluation of the proposed multi-purpose cask.

B • The EIS purports to represent bounding situations, since a definitive packaging and repository acceptance certification is so nebulous, indeed uncertain. Yet, there are a number of very credible scenarios where the Draft fails to examine a bounding case. For instance -

> The proposed fissile loading of the burial cask (of any kind examined in the report) is more than an order of magnitude greater than that proposed for commercial spent fuel. If this is not acceptable, then some kind of "treatment" or small quantity packaging will be required. Either compensatory action will significantly increase the environmental impact over any case shown in the draft EIS.
>
> It is now being widely discussed that the repository package for commercial fuel may have to be titanium or another highly corrosion resistant material, rather than the stainless steel of current storage casks. While it is widely known that Naval fuel itself is highly corrosion resistant, it may still require a package quite different than currently envisioned. Again, a future action to repackage into an approved container is a major effort, no potential impact is shown, yet there is no basis for assuming any container envisioned in the Draft, made from stainless steel, with high fissile loading, and containing long lived isotopes, will meet some future repository acceptance criteria.

C • The Court settlement involving DOE, the Navy, and the State of Idaho (10/16/95) expressly states the Naval fuel is to be packaged in "multi-purpose" casks. Therefore why are other container systems being examined, and who is developing this "multi-purpose" cask?

D • The Court settlement also requires Naval Fuels to be among the "early" shipments to the repository. With the high degree of uncertainty regarding casks and repository acceptance, and with DOE-RW focused on commercial fuels, what is the impact of a failure to comply with the Court settlement?

E Thank you for consideration of my comments. My basic issue is that the Draft purports to examine various methods of achieving a repository acceptance, yet it overlooks, and hence underestimates, the potential environmental impact from being held to the same standards for burial as commercial fuel or vitrified high level waste.

F Therefore I propose that the EIS should include an evaluation of processing/treatment cases necessary to transform the Naval fuel to a repository form similar to commercial fuel or vitrified high level waste. In addition, the EIS should include the potential environmental impact of having to perform these treatments at a later date as a possible adder for each of the cask/canister options currently evaluated.

Yours truly,

[signature]

Richard L. Geddes
807 Big Pine Road
North Augusta, SC 29841

Commenter: Richard L. Geddes, South Carolina

Response to Comment:

A. The statement in Chapter 3, Section 3.7 of the Draft EIS has been revised in the Final EIS to read: "Because the two systems are functionally similar, and because no feasible universal cask design currently exists that would be capable of receiving Nuclear Regulatory Commission certification, the universal cask was not considered further."

As stated in Section 3.7, it is expected that future canister and cask designs which might be developed will have environmental impacts bounded by those of the six alternatives in this EIS. For example, if a vendor designed a universal cask system which meets the requirements of 10 CFR Part 60, 10 CFR Part 71, 10 CFR Part 72, and other waste package disposal requirements, it would be functionally similar to the multi-purpose canister alternative evaluated in this EIS. Likewise, if a dual-purpose canister design meets the 10 CFR Part 60 and waste package disposal requirements, it too would be functionally similar to the multi-purpose canister.

B. The commenter states that the proposed fissile loading for naval spent nuclear fuel is more than an order of magnitude greater than that proposed for commercial spent fuel. This is not correct. Chapter 2, Section 2.3 of the EIS states that "Naval nuclear fuel is highly enriched (93 percent to 97 percent) in the isotope U-235 as compared with civilian reactor fuel (about 4 percent). However, to ensure the design will be capable of withstanding battle shock loads, the naval fuel material is surrounded by large amounts of structural material made of an alloy of zirconium called Zircaloy. Naval spent nuclear fuel assemblies will fit dimensionally into the same container systems designed for civilian spent nuclear fuel. Because of the large amount of Zircaloy structure and the limit on total loaded weight of the container, the amount of fissionable material in a loaded container is similar for naval and civilian fuel in spite of the different enrichments (in each case, about 440 to 660 lb, or 200 to 300 kg, of U-235)."

The scenario described is covered in the facility and transportation analyses for both normal operations and accidents. In Section A.2.4, Loading Operations, the analysis results for the No-Action and Current Technology/Rail Alternatives include the impact of repackaging naval spent nuclear fuel at Idaho National Engineering Laboratory. If this were required for one of the other alternatives, the larger values in Appendix A, Table A.10 would apply. Similarly, under the Unloading Operations discussion, the impact of repackaging naval spent nuclear fuel at a repository surface facility is presented in Table A.12. If this action were required for the two Multi-Purpose Canister Alternatives, the reported annual health effects would be applicable.

For the transportation analyses, sufficient information is provided to allow the reader and decision makers to estimate the impact of transporting more, smaller packages. In Appendix B, Section B.6.1, incident-free risks are presented in Table B.9 for one shipment of one container for each alternative. This section explains that risks for the total number of shipments, presented in Table B.10, are obtained by multiplying the Table B.9 results by the total number of containers. Similarly, in Section B.6.2, accident risks are presented in a similar format. These discussions were expanded in the Final EIS to explain that if the number of shipments would change, revised conservative total risks could easily be calculated by using the same method.

For facility and transportation accidents, the analysis results presented in the EIS are bounding since the larger the container, the more spent nuclear fuel would be inside. Any reduction in container size would result in a smaller source term, and thus, lower consequences and lower risk.

Commenter: Richard L. Geddes, South Carolina

C. This statement is incorrect. Appendix F, Section F.4 of the settlement agreement states: "Department of Energy and the Navy shall employ Multi-Purpose Canisters ("MPCs") or comparable systems (emphasis added) to prepare spent fuel located at Idaho National Engineering Laboratory for shipment and ultimate disposal of such fuel outside Idaho."

The Navy needs to ensure that naval spent nuclear fuel, after examination, is managed in a fashion which facilitates ultimate safe shipment to a permanent geologic repository or centralized interim storage site outside of the state of Idaho; is protective of the Idaho environment while being temporarily stored at the Idaho National Engineering Laboratory; and complies with the court ordered agreement among the State of Idaho, Department of Energy and the Navy. The six container system alternatives evaluated in this EIS meet these objectives. In addition, National Environmental Policy Act regulations require that a reasonable range of alternatives be considered. The criteria used to select the alternatives for this EIS are presented in Chapter 3, Section 3.0.

D. Section D.1.e of the settlement states: "The naval spent nuclear fuel stored at Idaho National Engineering Laboratory on the date of the opening of a permanent repository or interim storage facility shall be among the early shipments of spent fuel to the first permanent repository or interim storage facility." The penalty for failing to meet this requirement is stated in Section D.1.f of the settlement which states: "The sole remedy for the Navy's failure to meet any of the deadlines or requirements set forth in this section shall be suspension of naval spent fuel shipments to Idaho National Engineering Laboratory as set forth in Section K.1." Section K.1.b states: "If the Navy or the Naval Nuclear Propulsion Program fails to satisfy the substantive obligations or requirements it has agreed to in this Agreement or fails to meet deadlines for satisfying such substantive obligations or requirements, shipments of Navy spent fuel to Idaho National Engineering Laboratory shall be suspended unless and until the parties agree or the Court determines that such substantive obligations or requirements have been satisfied." Finally, in addition to these remedies are any other penalties a court may impose under the Federal Rules of Civil Procedure. The Navy plans to comply fully with the agreement.

E. This claim is incorrect. In Chapter 1, Section 1.0 of the EIS, the proposed action is stated as: "The proposed action of this Environmental Impact Statement is to select a container system for the management of naval spent nuclear fuel after it has been examined at the Idaho National Engineering Laboratory. In addition, this EIS includes several actions which are related to the container system choice:

* Manufacturing the container system,
* Handling and transportation associated with the container system,
* Modifications at the Expended Core Facility and the Idaho Chemical Processing Plant to support loading naval spent nuclear fuel into containers for dry storage,
* The location of the dry storage at the Idaho National Engineering Laboratory and
* The storage, handling and transportation of special case waste associated with naval spent nuclear fuel."

Chapter 3, Section 3.0 of the EIS states that "Designs shall meet the technical requirements found in regulations, specifically 10 CFR Part 72, 10 CFR Part 71, or 10 CFR Part 60 for storage, transportation, or disposal, respectively. If necessary, spent nuclear fuel may be reloaded at a repository surface facility (or centralized interim storage site) into disposal containers that comply with 10 CFR Part 60."

The naval spent nuclear fuel will meet the same standards and requirements for disposal as commercial spent nuclear fuel.

Commenter: Richard L. Geddes, South Carolina

F. Naval spent nuclear fuel will be in a solid form, just as commercial fuel, when it is packaged as described in this EIS. No further processing for disposal in the same manner or form as commercial spent fuel will be needed.

The analytical results for loading operations, dry storage, and unloading operations are presented in Appendix A, Section A.2.4 of the EIS. There are no additional processing or treatment operations required for naval spent nuclear fuel. As stated in Chapter 3, Section 3.0 of the EIS, "Designs shall meet the technical requirements found in regulations, specifically 10 CFR Part 72, 10 CFR Part 71, or 10 CFR Part 60 for storage, transportation, or disposal, respectively. If necessary, spent nuclear fuel may be re-loaded at a repository surface (or centralized interim storage site) into disposal containers that comply with 10 CFR Part 60."

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

27

In Reply Refer To:
ER 96/410

JUN 27 1996

Mr. William Knoll
Naval Nuclear Propulsion Program
Department of the Navy, Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Dear Mr. Knoll:

This is in regard to the request for the Department of the Interior's comments on the draft environmental impact statement concerning Proposed Container System for the Management of Naval Spent Nuclear Fuel.

A This is to inform you that the Department may have comments, but will be unable to reply within the allotted time as we have just received your transmittal of sufficient copies to satisfy our intradepartmental needs. Please consider this letter as a request for an extension of time in which to comment on the draft statement.

Our comments should be available by mid August, 1996.

Sincerely,

Terence N. Martin

Terence N. Martin
Team Leader, Natural Resources Management
Office of Environmental Policy and Compliance

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
500 NE Multnomah Street, Suite 600
Portland, Oregon 97232-2036

IN REPLY REFER TO:

August 15, 1996

ER 96/410

William Knoll
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, Virginia 22242-5160

Dear Mr. Knoll:

The Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement for the Container System for the Management of Naval Spent Nuclear Fuel, Idaho. The Department does not have any comments to offer.

We appreciate the opportunity to comment.

Sincerely,

Preston Sleeger
Acting Regional Environmental Officer

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
2531 JEFFERSON DAVIS HWY
ARLINGTON VA 22242-5160

IN REPLY REFER TO

11 July 1996

Mr. Terence N. Martin
Team Leader, Natural Resources Management
Office of Environmental Policy
and Compliance
Office of the Secretary
United States Department of the Interior
Washington, D.C. 20240

Dear Mr. Martin:

Thank you for your letter of June 27, 1996 received on July 3, 1996 concerning the Navy's draft Environmental Impact Statement (EIS) for a Container System for the Management of Naval Spent Nuclear Fuel. Your letter stated that the Department of the Interior (DOI) would be unable to respond to the Navy's request for comments within the allotted comment period because the DOI had just received sufficient copies (18) to satisfy interdepartmental needs. Your letter requested that the comment period for the draft EIS be extended and noted that comments should be available by mid-August 1996.

As you may be aware, to facilitate DOI review, the Navy had supplied five copies of the draft EIS to five different DOI offices in early May as part of the initial distribution of the document; attached is a list of those offices and individuals from page J-2 of the draft EIS. We supplied 18 additional copies in mid-June upon oral request by your office.

As Will Knoll of my staff previously apprised Ms. Stone of your staff, the Navy has already extended the comment period from 45 days to 60 days (ending July 18, 1996) in response to requests from the State of Nevada. We cannot provide a further extension because of the need to complete the EIS to support actions required under a court ordered agreement among the DOE, Navy and State of Idaho covering spent fuel management at the Idaho National Engineering Laboratory. Thus, recognizing this time frame, we appreciate and welcome any comments you may have, and will do what we can to include them in the final EIS depending upon when they arrive.

We appreciate your interest in this matter. Please contact me at 703-602-8229 if there are any questions.

Sincerely,

Richard A. Guida
Associate Director
for Regulatory Affairs
Naval Nuclear Propulsion Program

Enclosure

J. DISTRIBUTION (Cont.)

Elaine Chan
Federal Emergency Management Agency
Washington, DC

Steven Long Chase
Westinghouse WIPP
Carlsbad, NM

The Honorable Helen Chenoweth
House of Representatives
Washington, DC

Raymond Clark
Council on Environmental Quality
Washington, DC

The Honorable William S. Cohen
U.S. Senate
Augusta, ME

Ben F. Collins
EM Site Specific Advisory Board
Buhl, ID

Commandant
U.S. Coast Guard Headquarters
Washington, DC

The Honorable Lawrence E. Craig
U.S. Senate
Washington, DC

The Honorable Michael Crapo
House of Representatives
Washington, DC

Ada Deer
Assistant Secretary for Indian Affairs
U.S. Department of the Interior
Washington, DC

C. Ray Dickson
U.S Department of Commerce
Idaho Falls, ID

The Honorable John Ensign
House of Representatives
Las Vegas, NV

The Honorable Slade Gorton
U.S. Senate
Seattle, WA

Ellie Hamilton
EM Site Specific Advisory Board
Idaho Falls, ID

Joel R. Hamilton
EM Site Specific Advisory Board
Moscow, ID

The Honorable James Hansen
House of Representatives
Ogden, UT

The Honorable Orrin G. Hatch
U.S. Senate
Salt Lake City, UT

D. Marc Haws
Asst. U.S Attorney
Boise, ID

Stanley Hobson
EM Site Specific Advisory Board
Idaho Falls, ID

INEL Boise Office
Boise, ID

The Honorable Daniel K. Inouye
U.S. Senate
Honolulu, HI

Douglas J. James
U.S. Department of the Interior
Boise, ID

Jonathon Jarvis
U.S. Department of the Interior
Arco, ID

The Honorable Dirk Kempthorne
U.S. Senate
Washington, DC

Dieter Knecht
EM Site Specific Advisory Board
Idaho Falls, ID

Daniel Kotansky
U.S Department of the Interior
Idaho Falls, ID

John Krause
Bureau Of Indian Affairs
Phoenix, AZ

Jerome Leitch
U.S Environmental Protection Agency
Region 10
Seattle, WA

The Honorable James B. Longley, Jr.
House of Representatives
Portland, ME

Robert R. Loux
Agency for Nuclear Projects
Nuclear Waste Project Office
Carson City, NV

Meg Lusardi
U.S. Nuclear Regulatory Commission
Washington, DC

Dean Mahoney
EM Site Specific Advisory Board
Lewiston, ID

Linda Milam
EM Site Specific Advisory Board
Idaho Falls, ID

Leland Roy Mink
EM Site Specific Advisory Board
Idaho Falls, ID

The Honorable Patricia Murray
U.S. Senate
Seattle, WA

The Honorable William Orton
House of Representatives
Provo, UT

Terry L. Perez
EM Site Specific Advisory Board
Idaho Falls, ID

Maxwell Powell
Office of Public Affairs
Yucca Mountain Site
Characterization Office
Las Vegas, NV

E.W. Pritchard
U.S. Department of Transportation
Federal Railroad Administration
Washington, DC

The Honorable Harry Reid
U.S. Senate
Las Vegas, NV

Charles Rice
EM Site Specific Advisory Board
Idaho Falls, ID

The Honorable Charles Robb
U.S. Senate
Richmond, VA

Richard E. Sanderson
Office of Federal Activities
United States Environmental Protection
Agency
Washington, DC

Joel Siegel
Housing And Urban Development
Washington, DC

E. J. Smith
EM Site Specific Advisory Board
Boise, ID

Vicki Snitzler
U.S. Department of the Interior
Arco, ID

The Honorable Olympia J. Snowe
U.S Senate
Bangor, ME

Richard Suckel
EM Site Specific Advisory Board
Fort Hall, ID

U.S. Army Corps of Engineers
Idaho Falls, ID

U.S. Department of Agriculture
Idaho Falls, ID

U.S. Department of Commerce
Boise, ID

U.S. Department of Veterans Affairs
Boise, ID

George L. Vivian
U.S. Bureau of Mines
Idaho Falls, ID

The Honorable Barbara Vucanovich
House of Representatives
Reno, NV

Commenter: Terence N. Martin - U.S. Department of the Interior/Office of Environmental Policy and Compliance, Washington, D.C.

Response to Comment:

A. To facilitate Department of the Interior review, the Navy had supplied five copies of the Draft Environmental Impact Statement to five different Department of the Interior offices in early May 1996 as part of the initial distribution of the document. The Navy supplied 18 additional copies in mid-June upon oral request by the Department of the Interior.

As discussed in a Navy letter to the Department of the Interior dated July 11, 1996, the Navy had already extended the comment period from 45 days to 60 days (ending July 18, 1996) in response to requests from the State of Nevada. A further extension could not be provided because of the need to complete the EIS to support actions required under a court order agreement among the Department of Energy, Navy, and State of Idaho covering spent fuel management at the Idaho National Engineering Laboratory.

In a subsequent letter dated August 15, 1996, the Department of the Interior advised that they had completed their review and had no comments.

28

7/3/96
3070 TAFT
Boise, Ida
83703

Dear Richard Guida,

I have read (scanned) the copies of your Naval Draft - Impact Statement for a Container System for the ~~Department~~ Management of Naval Spent Nuclear Fuel, including your latest epic: "INDEX".

The one thing that is crystal clear is that
A unbelievable amounts of money have been and are being (and will continue to be -) spent to convince the American people of the absolute necessity for atomic fuel for submarines, weapon and atomic energy, etc..

And very little money or effort is being used to try phase out this behemoth whose wastes are so toxic that no one wants them in their own "back yard."

Richard, I thank you for asking very kindly what my opinion is, but you and I both know very well that mine and the opinions of those
B powerless ones like me mean nothing.

Sincerely,

Lois Bradshaw

Commenter: Lois Bradshaw, Idaho

Response to Comment:

A. This EIS explains the need for management of naval spent nuclear fuel which already exists and will require safe management, even if all nuclear energy programs ended immediately. However, the EIS does not discuss the advantages and disadvantages of changing or maintaining the number of nuclear powered warships in operation or to be built. Such matters are directed by Congress and the President fulfilling their responsibilities under the Constitution in providing for the common defense. It would be inappropriate for this EIS to consider what the military force structure of the United States should be. Rather, the EIS analysis supports accomplishment of the Navy's fundamental mission as established by the President and Congress.

B. The National Environmental Policy Act established a national policy of promoting awareness of the environmental impacts by federal government agencies. All members of the public are able to comment on this EIS. The Navy has provided a large amount of information on the shipment of naval spent nuclear fuel and the types and amounts of radiation or radioactive material involved in releases from normal operations and postulated accidents. The Navy has attempted to provide enough information on the radiation, radioactivity, and other aspects of normal operations or hypothetical accidents to allow independent calculation of environmental impacts. All of this information is intended to permit independent analysis and verification of the estimated impacts calculated by the Navy.

   The comments from the public were taken into consideration prior to developing the preferred alternative in the EIS. This is consistent with the Draft EIS, Chapter 3, Section 3.9, which states: "The identification of a preferred alternative in the Final EIS, and the selection of an alternative in the Record of Decision, will take into consideration the following factors: (1) public comments; (2) protection of human health and the environment; (3) cost; (4) technical feasibility; (5) operational efficiency; (6) regulatory impacts; and (7) storage or disposal criteria which may be established for a repository or centralized interim storage site outside the State of Idaho."

7/16/96

Department of the Navy
Mr. William Knoll
Code NAVSEA 08U NC2
2531 Jefferson Davis Highway
Arlington, VA 22242

LETTER SENT BY FAX

Comment of Dr. David B. McCoy re: Naval Spent Nuclear Fuel, INEL, IDAHO. Draft EIS

A The Draft EIS is based on the false premise that there can be "disposal" of nuclear waste. This continues the five decades long fraud upon the public that there can be a disposal system or repository. The shell game includes the concepts of salt mine repositories, rocket ships, deep level geologic deposit, deposit at the discontinuity of oceanic + continental plates. The longevity + hazards associated with the transuranics argue against all alternatives suggested to date.

B For example, the geologic repository suitability was criticized by the General Accounting Office as early as 1979 because, even if the perfect underground site could be located, the entry into that site by drilling & emplacement of nuclear waste, would breach the integrity of the site. One need only look at the example of travertine deposits in Yellowstone National Park to realize how ground water can reach a hot source (such as nuclear waste or volcanic heat) and then resurface bearing the underlying strata to the surface of the earth.

C The EIS fails to examine the possibility that all wastes at INEL may remain in place, despite existing court orders to the contrary. Container technology for dry storage beyond the 40-year period is not analyzed.

D The EIS fails to give the cladding failure rate of SNF prior to its shipping to INEL for examination. The potential for accidents involving SNF prior to INEL delivery has not been adequately analyzed, nor alternatives presented.

E The EIS fails to consider the rail routes for SNF shipments and the number of trestles or bridges which may exceed the 30 foot drop design of the containers used + the maximum credible accidents which could occur at those locations.

F The EIS has inadequate discussion of the radioactivity increase of the containers themselves over their period of use & the plans for disposal of the containers themselves.

G The draft EIS fails to discuss possibilities of accidents & public exposure for possible terrorist caused events, which certainly have an increasing rate of occurrence in the U.S.A.

H The EIS discussion of tribal resources to deal with possible accidents is laughable in its brevity.

I The EIS fails to examine total breach of the different canisters in the midst of the most heavily populated regions through which transportation will take place.

J The EIS fails to consider what actions will be necessary in the event SNF remains at INEL past the 40-year period & which container systems would offer the most integrity. Corrosion of containers in light of cladding failure and/or other factors has not been discussed with respect to storage for periods past 40 years or even for less than 40 years.

K The EIS makes no mention of what the current levels of radioactive contamination are at the INEL site, including land and facilities. There is no opportunity for the public thus to determine whether any additional contamination of the INEL site would be acceptable.

L While the potential for releases of radiation to air and water are mentioned as potential, the nature of those releases are not described with any particularity nor are the specifics described as to how these releases could be prevented or minimized.

M Overall, the draft EIS is vague and does not discuss risks in a fashion which the public can evaluate & make determinations as to whether proposals are reasonable or safe for the most toxic products on the earth.

David B. McCoy
56 Deer Dr.
Victor, IDAHO

POB 224
83455

iiid

Response to Comment:

A.&B. The location and feasibility of a geologic repository is beyond the scope of this EIS. As discussed in Chapter 3, the Nuclear Waste Policy Amendments Act of 1987 designates Yucca Mountian at the Department of Energy's Nevada Test Site as the only site currently authorized by legislation to be characterized as a geologic repository, and its suitability has not yet been determined. The analysis in this EIS covers transportation from Idaho National Engineering Laboratory to the Yucca Mountain location as a representative or notional destination to allow comparison of the container systems. This EIS does not make presumptions concerning the Yucca Mountain site's suitability for a geologic repository or designation for use as a centralized storage site. If the Yucca Mountain site is found suitable for a repository and Department of Energy recommends its development to the President, the Nuclear Waste Policy Act requires that development of the Yucca Mountain site as a geologic repository must be supported by an EIS. The scope of a repository EIS is discussed in a Notice of Intent that Department of Energy issued in the Federal Register on August 7, 1995.

Naval spent nuclear fuel already exists at Idaho National Engineering Laboratory and must be managed safely. In Chapter 1, Section 1.0 of the EIS, the proposed action is stated as: "The proposed action of this Environmental Impact Statement is to select a container system for the management of naval spent nuclear fuel after it has been examined at the Idaho National Engineering Laboratory. In addition, this EIS includes several actions which are related to the container system choice:

- manufacturing the container system,
- handling and transportation associated with the container system,
- modifications at the Expended Core Facility and the Idaho Chemical Processing Plant to support loading naval spent nuclear fuel into containers for dry storage,
- the location of the dry storage at the Idaho National Engineering Laboratory, and
- the storage, handling and transportation of special case waste associated with naval spent nuclear fuel."

C.&J. As stated in the EIS, the Navy is committed to removing all naval spent nuclear fuel from Idaho by Calendar Year 2035, consistent with the agreement with the state of Idaho. This time period is also consistent with that used for the Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory EIS. Volume 1, page 2, of that EIS, states that the year 2035 was selected since "This amount of time may be required to make and implement a decision on the ultimate disposition of spent nuclear fuel." Therefore, the cumulative impacts presented in this EIS are considered to be reasonable and bounding for the actions currently foreseeable.

Council on Environmental Quality regulations, (40 CFR 1502.9(c)) require agencies to prepare supplements to environmental impact statements if the agency makes substantial changes in the proposed action that are relevant to environmental concerns or there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. Dry storage beyond 40 years would fall into this category and would require a supplemental EIS which would also include an evaluation of the dry storage container system.

D. This statement is incorrect. Chapter 2, Section 2.3 of the EIS provides a complete discussion of the characteristics of naval spent nuclear fuel. Results of measurements and testing have shown that naval fuel fully meets design requirements for containing fission products within the fuel precluding fission product release from the fuel in normal operation or when the fuel is removed, transported, or stored.

Transportation accidents during shipping to the Idaho National Engineering Laboratory are beyond the scope of this EIS. The Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory EIS presented the environmental impacts of transporting naval spent nuclear fuel to Idaho National Engineering Laboratory.

E. The Draft EIS presents the regulatory design requirements for Type B shipping containers in Appendix B, Section B.2.2. The 30-foot drop tests are part of the design criteria for the certification of shipping containers for spent nuclear fuel, and other high level radiological materials. The tests are not performed for specific route conditions.

The casks are tested in accordance with applicable regulations, including a 30-foot drop onto an unyielding surface (which is equivalent to a 60 foot drop onto reinforced concrete), in order to provide assurance that they will adequately perform their function of containment in reasonably foreseeable accidents of the type envisioned by the commenter.

For the analyses in this EIS, general routes were selected from the Idaho National Engineering Laboratory to a notional repository. The specific routes are not known at this time. However, the INTERLINE computer program and routing analysis are presented in Appendix B, Section B.4 of the EIS. INTERLINE simulates the route selection used by railroad companies and includes the current track conditions for shipments of this classification of radiological hazardous materials.

In the comparison of alternative container systems, the conditions are the same for all alternatives. The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses.

F. This statement is incorrect. Chapter 4, Section 4.5.2 of the EIS presents the results of an evaluation concerning recycling and management of end-of-life equipment. In addition, Chapter 4, Section 4.6 of the EIS presents the impacts on waste generation.

Container system components not disposed of with the naval spent nuclear fuel, including the storage and transportation containers, overpacks or casks and dual-purpose canisters would be reused and, after service, would be recycled. Some pieces of equipment may need to be decontaminated prior to recycling. It is possible that some low-level radioactive waste may result but it is not expected that large pieces of equipment would need to be disposed of as radioactive waste.

G. As stated in Appendix A, Section A.2.2 of the EIS, human-induced events such as terrorism were considered in selecting accidents to include in the detailed analyses. Acts of terrorism are expected to result in consequences which are bounded by the results of accidents which are evaluated. Naval spent nuclear fuel is not considered to be attractive to terrorists due to the bulk of the fuel containers and due to high radiation fields involved with unshielded spent nuclear fuel. However, terrorist attacks on naval fuel during shipment were evaluated. The massive structure of the containers used for naval spent nuclear fuel makes them an unlikely target of a terrorist attack. No such attacks have occurred in the nearly 40 years of rail shipments which have now traveled about 2 million container kilometers. Thus, the probability of a terrorist attack on a shipment is no higher than the probability of a rail accident which is listed in Appendix B, Section B.5.2 of this EIS. Even if an attack were to occur, the likelihood of it causing a breach in a container is not high owing to the rugged nature of the containers (high explosives by themselves would be insufficient to breach a container). The consequences of a terrorist attack are also no more severe than those listed for the transportation accidents for reasons explained below. Therefore, the same conclusions reached for transportation accidents apply to the risk to the extremely rugged shipping containers from terrorist attack during a shipment. In addition, during shipment, all naval spent nuclear fuel containers are accompanied by escorts who remain in contact with headquarters, such that a failure to regularly check in with headquarters due to their incapacitation would result in a response. In the event of an emergency, state and federal resources would be quickly summoned. The issue of acts of terrorism was also addressed in the Programmatic SNF and INEL EIS and the same conclusions were reached.

For an act of war, sabotage, or terrorist attack, it is likely the risk would be lower than calculated for an airplane crash because it should be less probable that a force would exist to disperse radioactive products into the atmosphere from a weapon as compared to the motive force of the fire assumed in the case of an airplane crash. For example, attacks on containers using anti-tank weapons would be less severe than the accidents analyzed because: (a) anti-tank weapons would cause a self-sealing penetration in the metal of a container, unlike that which is assumed from the airplane crash (impact from a 50-inch diameter engine rotor); (b) there is no explosive material inside the container, so it will not "blow-up" as a tank would if hit by such a weapon (in an attack on a tank, the tank shells inside the turret detonate); and, (c) there would be no fire to disperse the radioactivity that is released when the container is breached, unlike an aircraft crash where the jet fuel will burn creating such a fire. The rugged design of containers reduces the effects of other types of explosive charges. It is not credible that a terrorist attack would result in a criticality or meltdown of spent nuclear fuel; however, in Appendix A, Section A.2.5, the consequences of a hypothetical criticality accident are presented. The risks associated with an accidental criticality are less than those associated with a drained water pool or an airplane crash into dry storage containers.

The effect of a terrorist attack or an act of sabotage is expected to be conservatively bounded by the limiting accident discussed at each facility under each alternative. For example, the most limiting accident involving naval spent nuclear fuel is described in this EIS to be an airplane crash into a 125 ton multi-purpose canister at the Idaho Chemical Processing Plant. This accident could lead to 2.6 latent fatal cancers over the next 50 years in the population within 50 miles of the site. Since the probability of the event is one chance in 2,500,000 per year, the risk would be 0.00000104 latent fatal cancer fatalities per year or, in other words, about one chance in 960,000 of a single fatal cancer fatality over a year. This risk is shared among the approximately 120,000 people residing within 50 miles of the site, who would be expected to have over 300 cancer fatalities from all other causes every year. For an act of war, sabotage, or terrorist attack, it is likely the risk would be lower than calculated because it should be less probable that a force would exist to disperse radioactive products into the atmosphere from a weapon as compared to the motive force of the fire assumed in the case of an airplane crash.

This information has been added to Appendix A, Section A.2.2 of the EIS.

H. The Department of Energy has provided both resources and training to the Shoshone-Bannock Tribes to ensure that local response to a transportation accident is handled properly. If an accident did occur, federal, state, local, and tribal authorities are trained in emergency response. The Shoshone-Bannock Tribes have been actively participating in comprehensive, cooperative transportation accident exercises held in Idaho.

I. Appendix B information provides the details of the transportation analysis used in the EIS including the analytical codes (Section B.3) and the input parameters (Section B.5) that determine the results presented in the document. The EIS looks at design basis and beyond design basis accidents to compare the alternative container types. These accidents are not examined in this EIS for the purpose of evaluating transportation routes. However, low probability events, including those with a probability greater than 10^{-7} per year, i.e., greater than one chance in ten million per year, are included. The EIS provides in Appendix B the detailed description of input values used in the RISKIND analysis requested by the commenter. Uncertainties associated with the analysis of impacts of accidents are discussed in Section B.3.4. Appendix B provides in Table B.13 the maximum health consequences of a severe accident in a rural area and in a major urban area. The urban scenarios analyzed include population densities which are large enough to encompass rush hour traffic and major events.

J. See the response to Comment C above.

K. Throughout Chapter 5 of the EIS, references are made to the Programmatic SNF and INEL EIS (Volume 2, Part A, Chapter 4, various sections). This chapter provides the detailed descriptions of the existing environment at Idaho National Engineering Laboratory that the commenter is looking for. This action is consistent with the Council on Environmental Quality regulations (40 CFR 1502.21) which state that agencies shall incorporate material into an environmental impact statement by reference when the effect will be to cut down on bulk without impeding agency and public review of the action.

L. For the facility analyses, this information is contained in Appendix A, Section A.2.4 for normal operations and in Section A.2.5 for hypothetical accident scenarios. In Section A.2.4, the development of the source terms for loading, storage, and unloading are presented. In Section A.2.5, the source terms for each hypothetical accident scenario are provided prior to the presentation of the analysis results.

For the transportation analyses, this information is contained in Appendix B, Section B.5.1 for incident-free transportation analyses and Section B.5.2 for accident analyses.

M. The level of information in the Container System EIS is sufficient. Although the detailed design of Navy fuel is classified, the EIS contains significant information concerning its performance characteristics and the contents of the loaded container systems such that the environmental impacts from its shipment, storage, and management can be assessed and independent analyses can be performed to verify the results presented in this EIS. A similar level of detail was used successfully in the Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory EIS. Chapter 2, Section 2.3 of the EIS presents the general characteristics of naval nuclear fuel, including design description, U-235 enrichment range, the amount of U-235 in a loaded container, criticality control measures, and the results of decay heat calculations. Appendices A and B contain detailed numerical data on the source terms and on corrosion product and fission product releases expected for each container system for each hypothetical accident scenario analyzed. The Appendices also identify the computer programs which were used, along with the specific assumptions for each accident scenario. For facility and transportation accidents, the analysis results presented in the EIS are bounding since the larger the container, the more spent nuclear fuel would be inside. Any reduction in container size would result in a smaller source term, and thus, lower consequences and lower risk.

For example, Table B.8 provides a list of the radioactive nuclides which might be released in a shipping accident involving naval spent nuclear fuel. The data on the amount of radioactivity are divided into the amounts released from the fission products in the fuel and the amount in the activated corrosion products attached to the surface of the fuel. The data are provided for typical spent fuel in nuclear-powered submarine and surface ship fuel assemblies to demonstrate the range of radioactivity. Using the information in this table, along with the other detailed information on the calculations provided in Appendix B, allows independent reviewers to evaluate the adequacy of the calculation of impacts of a hypothetical accident on human health and the environment. It also permits an independent reviewer to perform analyses using alternate methods, such as other computer programs, or utilizing other conditions, such as different weather or accident conditions. The information in Appendix A, including the amount of radioactivity released and the fraction of the total activity in naval spent nuclear fuel it represents, is provided in similar detail to permit independent analyses for normal and accident conditions.

For facility and transportation accidents, the analysis results presented in the EIS are bounding since the larger the container, the more spent nuclear fuel would be inside. Any reduction in container size would result in a smaller source term, and thus, lower consequences and lower risk.

The Navy has provided in this EIS, and in documents referenced in the EIS, a substantial amount of information on the handling, storage, and shipment of naval spent nuclear fuel and the types and amounts of radiation or radioactive material involved in releases from normal operations and postulated accidents in this EIS. The Navy has attempted to provide enough information on radiation, radioactivity, and other aspects of operations or hypothetical accidents to allow independent calculation and verification of all estimates of environmental impacts.

KENNETH N. DREWES
840 Eleventh Street
Idaho Falls, ID 83404-5058

July 7, 1996

Mr. William Knoll
Department of the Navy
Code NAVSEA 08U,
2531 Jefferson Davis Highway,
Arlington, VA 22242-5160

Subject: Department of the Navy Draft Environmental Impact Statement for the Container System for the Management of Spent Nuclear Fuel; Comments on

Discussion:

1. This letter provides personal comments based on my review of the Draft Environmental Impact Statement (DEIS) addressing the need, alternatives, and environmental impacts of manufacturing, loading, storing, handling and the transport of naval nuclear fuel containers in support of currently projected needs in support of the U. S. Navy Nuclear Power Program.

A First, I would like to express thanks to those having prepared the DEIS into a complete, comprehensive, and well presented document. A significant amount of research, and organization of facts/data, and computations were needed to support the DEIS. While only a minute portion of the general population takes time to involve themselves in the public processes involving such documents, those of us that do read them, appreciate a well presented volume.

2. While no specific system choice was made as a result of the findings of facts presented in the DEIS it would appear that when all of the various options are presented with regard to the amount of hardware that will be needed, the exposures and latent cancers, transportation risks, ultimate disposal activities, numbers of required

shipments etc. that the Multi-Purpose Canister [MPC] system is the logical system of choice as it minimizes the risk and impact factors in nearly all areas, while appearing to be technically acceptable.

While specific construction details were not warranted or included in the DEIS, the verbal discussions provided of the canisters and overpacks describe common straightforward manufacturing capabilities. Likewise, due to the MPC system having a nominal number of required containers and over packs it also appears to be a fiscally responsible approach.

B In view of the materials presented in the DEIS and my evaluation of the provided information I would like to provide my endorsement of the Multi-Purpose Canister system.

3. Appendix F discussed the feasibility of locating a spent nuclear fuel dry storage on the INEL at a site removed from above the Snake River Plain Aquifer. Section F.4 discusses the hydrology of the Eastern Snake River Plain [ESRP].

This section appears some what limited in its view of the total view of the ESRP as it appears to only discuss the subterranean boundaries of the aquifer basin itself. The aquifer of course is simply a sump full of gravel and lava which provides storage and passage of water. The highly porous soils and sediments of the ESRP actually receive water from a much larger area than shown on pages F-2 and F-3. For example precipitation falling on either side of the Teton Mountains or portions of Yellowstone Park (located off the right side of Figure F.1) transit the area and serve to recharge the aquifer through infiltration losses of the river and the many miles of canals and ditches used for irrigation. In the past the Army Corps of Engineers has provided dispersion and spreading areas to the north east of the site to accommodate large spring run offs, and as a result of aquifer transmissivity, flooded areas such as Mud Lake. Consequently, water tables in the area of the ESRP have risen and fallen dramatically due to periods of drought, heavy irrigation demands and higher than normal water years such as currently being experienced in Idaho.

C The aquifer is simply a sump in a complex fluid system. To be shown accurately, its context and relationship to the entire fluid system should be presented. It is therefore suggested that the final Environmental Impact Statement include a figure [map] that shows the total drainage area which serves to recharge the aquifer.

D Likewise a schematic showing the relative proportions of the various flows would be meaningful. Such information should be readily available from the Idaho Water Resources Department [phone (208)525-7161]. The Bonneville County, ID Emergency Planning and Management Command Center [phone (208) 529-1220] may also be a source of such information as they maintain a status board of river flows on a continuing basis.

Thank you for your attention to these comments and allowing public involvement.

Name	Education/Expertise
Kenneth N. Drewes Commander- U.S. Navy (Ret.)	A.S. Nuclear Technology B.S. Liberal Arts ASEL-Com.,Inst., CFI 30 years nuclear operations. Previous member of INEL Natural Phenomena Committee (10 years).

Sincerely,

K. N. Drewes

Response to Comments:

A. Comment noted.

B. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for dry storage and transportation (either by rail, heavy-haul truck, or a combination of both) must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably.

C. The Navy agrees with the commenter that the Snake River Plain is the low spot in the Snake River Basin that collects water like a "sump", and a figure of the Snake River Basin would clearly demonstrate this fact. Appendix F, Figure F.1 originally showed the entire Snake River Basin; however, the scale was so small that it was not possible to see the Lemhi Range Area or the Birch Creek Area which are the primary focus of Appendix F. It was necessary to delete sections of the eastern and southern sections of the Snake River Basin in order to make the necessary details in the western and northern sections readable. The complete figure of the Snake River Basin is found in the reference (Rizzo Associates 1996) which is available in the reading rooms.

D. As suggested by the commenter, the Idaho Water Resources Department and the Bonneville County Emergency Planning and Management Command Center were contacted. It was determined that a simplified schematic of the sort recommended by the commenter showing the relative proportions of the various flows in the Lemhi Area and Birch Creek Area is not readily available. The best information currently available relative to ground water flow in the Lemhi Area and Birch Creek Area is contained in “Hydrology and Digital Simulation of the Regional Aquifer System, Eastern Snake River Plain, Idaho” (USGS 1992), which was used by Rizzo Associates 1996, and the hydrology section of Appendix F is based on Rizzo Associates 1996. There is ample information to conclude that the Lemhi Range Area and the Birch Creek Area are not hydrologically removed from above the Snake River Plain Aquifer and that because of their proximity to faults they are not desirable sites. These factors combined with other environmental impacts and disadvantages associated with these areas are sufficient to eliminate them from further consideration.

Herman Maestas

2304 Bodily Street • Idaho Falls, ID 83401

July 13,1996

Mr. William Knoll
Department of the Navy
NAVSEA Code 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Dear Mr. Knoll:

Thank you for sending me a copy of the Navy Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel. I have read the document and have the following comments.

I support the temporary dry storage of Naval spent nuclear fuel in Idaho. As a Westinghouse employee who works at the Naval Reactors Facility Expended Core Facility, I feel that we have the correct expertise and facilities to correctly package the
A naval fuel for dry storage. I feel that this should be done in either the dual-purpose or multi-purpose canisters. To minimize the cost of shipments between the Expended Core
B Facility and other areas, I feel that the temporary dry storage of the loaded canisters should be at the Naval Reactors Facility until they are transferred to the National Repository for final disposition..

C I do not think that plans to build a separate storage facility which is not located over the Snake River Plain aquifer should be pursued. I feel that all this option will do is create another facility that will need to be remediated in the future. I also feel that this facility will also incur more expense to the tax payers as its infrastructure (roads, security requirements, utilities, radiological monitoring requirements) will duplicate those already in place at the Naval Reactors Facility. In addition, building a storage facility which is not located over the aquifer will place the facility closer to the earthquake faults in the area which would appear to incur more risk than dry storage within the current Naval Reactors Facility perimeter.

D I also support the use of either the dual-purpose or multi-purpose canisters to package special case wastes (greater than Class C wastes) for temporary dry storage the Naval Reactors Facility until transferred to the National Repository for final disposition.

As a Westinghouse employee, I would like to state that the above comments are written to express my personnel opinion.

Thank you for the opportunity to comment on this pressing and very important issue.

Sincerely yours,

Herman J. Maestas

Maestas
2304 Boddily ST
Idaho Falls, ID 83401

POCATELLO ID 832
PM
13 JUL
1996

William Knoll
Department of the Navy
NAVSEA Code 084
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Commenter: Herman Maestas, Idaho

Response to Comments:

A.&D. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for dry storage and transportation (either by rail, heavy-haul truck, or a combination of both) must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably.

B.&C. In Appendix A, Section A.2.4, Analysis Results: Normal Operations, the EIS shows that the radiological impacts for dry storage are small at all of the locations evaluated. The commenter is correct that costs will be greater if shipments between the Expended Core Facility and other areas are required. In addition, Chapter 5 and Appendix F of the EIS discuss the increased environmental impacts, including seismic concerns, associated with placing a dry storage facility at undeveloped locations. The preferred alternative, described in Chapter 3, Section 3.9 does not include construction of a dry storage area at the locations originally thought to be removed from above the Snake River Plain Aquifer, partly because the hydrologic connection of these locations to the Aquifer removes any advantage they might have presented.

D. See the response to Comment A above.

COALITION 21 Supporting Tomorrow's Technologies With Facts, Not Fears

Date: July, 17, 1996

P.O. Box 51232
Idaho Falls, ID
83405

Comments on Draft Environmental Impact Statement (EIS) for A Container System for the Management of Naval Spent Nuclear Fuel

A Members of Coalition 21, a citizens' group promoting beneficial application of technology, have reviewed the subject Container System as it was presented by the Department of Navy in the public hearing at Fort Hall on June 3, 1996 and as it was presented in the Draft EIS. All six alternative approaches to the handling, storage, and transportation of Naval spent nuclear fuel appear to be fully safe and workable. However, the Multi-Purpose Canister (MPC) has advantages over the others that make it the superior approach. Packaging the fuel in a sealed (by welding) canister at the outset of handling the fuel minimizes any further decontamination labor required during transportation, temporary storage, additional transportation, and final storage of the fuel. Furthermore, the sealed canister would minimize the radiation to which workers handling the packaged fuel are exposed.

The Small MPC would have a similar advantage over the other four alternatives. However, use of the Large MPC alternative probably would result in lower total handling costs. Although the EIS is not required to assess operating costs (and the impact of a program on taxpayer dollars), Coalition 21 recognizes this concern.

B We recognize that selecting the MPC approach requires Waste Acceptance Criteria (WAC) for the Yucca Mountain repository. We encourage the Department of Energy to freeze the WAC before fuel actually is packaged.

C Coalition 21 compliments the Navy personnel who made the clear, forthright presentation at Fort Hall. The preparation of this Draft EIS indicates that the U.S. Navy takes seriously its commitments under the 1995 Settlement Agreement with the State of Idaho. The Draft EIS shows that the agreement is working.

George A. Freund

George A. Freund, Secretary

Phone: 208-528-2161

Commenter: George A. Freund - Coalition 21, Idaho

Response to Comments:

A. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for dry storage and transportation (either by rail, heavy-haul truck, or a combination of both) must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably.

B. In Chapter 3, Section 3.0, Description and Comparison of Alternatives, the EIS states that container system designs shall meet the technical requirements found in 10 CFR Part 72, 10 CFR Part 71, and 10 CFR Part 60 for storage, transportation, or disposal, respectively. The Navy agrees with the commenter that it is preferable for the waste acceptance criteria for repository disposal to be finalized before naval spent nuclear fuel is packaged. The Navy is actively participating with the Department of Energy in the process to finalize these and many other technical issues related to a geologic repository. In parallel with this effort, the Navy must move forward to meet its commitments made in the agreement with the State of Idaho, including removal of fuel from water pool storage. Thus, a container system must be selected, taking into consideration the waste acceptance and disposal requirements as they currently exist. Because there is a chance that any one of the container systems may require reloading prior to repository acceptance, the radiological releases due to unloading operations were evaluated as part of this EIS at both the Idaho National Engineering Laboratory and a repository. The results presented in Appendix A, Section A.2.4 show that the impacts on the environment are small for such operations.

C. Comment noted.

B&W Nuclear Environmental Services, Inc.
a McDermott company

P.O. Box 10548
Lynchburg, VA 24506-0548
(804) 948-4600
Fax: (804) 948-4846

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July 17, 1996

Mr. William Knoll
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Ref: Draft EIS for a Container System for the Management of Naval Spent Nuclear Fuel

Dear Mr. Knoll:

B&W Nuclear Environmental Services, Inc. (B&W NESI) is an affiliate of Babcock & Wilcox, the supplier of nuclear fuel and nuclear propulsion systems to the US Navy. B&W also fabricates the M-140 spent fuel shipping container, manages a facility for the US government in Idaho that supplies products utilizing depleted uranium, and operates its own hot cell facilities that examine spent fuel and other radioactive material. We have designed and fabricated several spent fuel shipping containers and most recently had a contract with the US DOE to design, license and fabricate two prototypes of a 100-ton container (the BR-100) to ship commercial spent fuel to the national repository or interim storage facility. The 100-ton container contract was prematurely stopped in 1994 due to project budget redirection, but accomplished many design objectives.

We have reviewed the reference EIS to determine if any of the lessons learned from our design or fabrication experience could help in its evaluation and to see if the proposed system could complement the overall environmental situation now existing at DOE sites with which we are familiar, particularly in Idaho. We also factored in the desire to (1) maximize safety for workers and the public, (2) minimize the opportunity for radioactive material release, and (3) minimize cost. Our comments are as follows:

A 1. Packaging the spent fuel into canisters at the INEL would prevent extraneous handling of exposed fuel and always provide a layer of containment during repository operations. The canisters should have handling interfaces identical to other canisters that the repository will manage. The canisters should be an acceptable waste form that could be placed directly into disposal overpacks.

B 2. Utilization of the canisters in transportable storage casks instead of vaults or systems that require their removal prior to shipment would minimize the direct handling of the canisters, thereby minimizing exposures and maximizing safety.

C 3. Priority should be given to utilization of surplus depleted uranium (DU) stock in storage in Idaho and at other government sites. DU is an excellent gamma shield and its use for spent fuel containers is a proven application previously licensed. This would provide a positive use for the DU instead of having to package it as a waste material and pay for its disposal in special facilities.

D 4. Priority should be given to utilization of recycled metal from DOE's contaminated metal stores. The canister shell and container walls could be made from metal with low levels of volumetric contamination. The additional dose rate of radiation from the use of such material would be insignificant and easily accounted for in safety analyses.

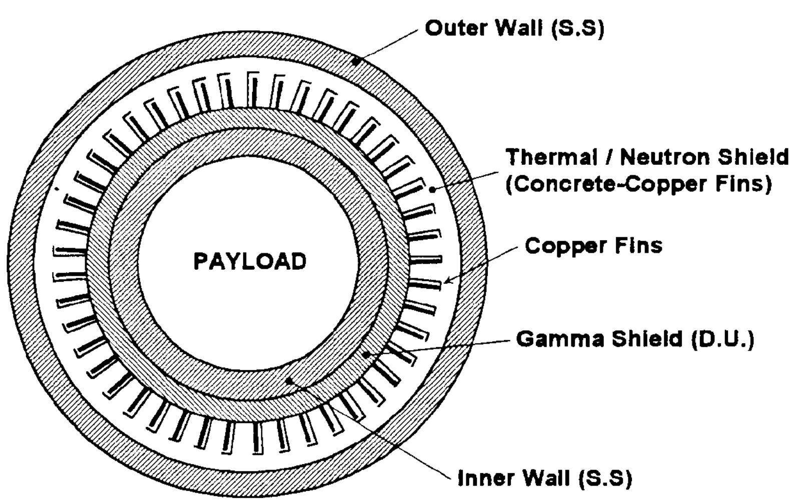
E 5. The use of a multi-layered construction for the containers, similar to the cross-section shown below, will provide the maximum safety and loading efficiency for a transportable storage container. The inner and outer walls are made of a recycled low-carbon 300-series stainless steel, the gamma shield from DU, and the neutron/thermal shield from a patented concrete-copper fin array utilized in the BR-100. Tests conducted for the DOE confirmed that such an arrangement would have the ability to withstand impacts and fires well beyond current regulatory limits. Section S.2.4 refers to the use of existing commercially available containers, but no such product exists for naval spent fuel, either individually in a basket or in a canister. The redesign of the transportable storage container should incorporate the use of DU, recycled metal and the concrete-copper fin array.

I hope these comments have been helpful. If you have any questions, please contact me at 804-948-4845 (fax 804-948-4635).

Sincerely Yours,

Paul C. Childress

Paul C. Childress
Vice President, Business Development



SF CONTAINER CROSS-SECTION

Commenter: Paul C. Childress - B&W Nuclear Environmental Services, Inc., Virginia

Response to Comments:

A. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for dry storage and transportation (either by rail, heavy-haul truck, or a combination of both) must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably.

B. The alternative suggested is essentially a variation of the Multi-Purpose Canister Alternative. The Navy does not expect to impose requirements or specifications which would prohibit using a single overpack design as part of a Multi-Purpose Canister System. If a container vendor designed a single overpack system which meets the requirements of both 10 CFR 71 and 10 CFR 72, handling of the canister could potentially be simplified.

C. Depleted uranium is recognized as an excellent gamma shield and as a licensed application for use in spent fuel containers. For example, the conceptual designs of the transportation overpacks for the Multi-Purpose Canister equipment are based on existing and demonstrated technology. They consist of concentric shells of stainless steel with layers of lead and depleted uranium in between for gamma radiation shielding (Appendix D, Section D.2.1). Since it is intended that the container system will be procured through the government competitive bidding process, it is not possible to identify at this time the actual materials which will be incorporated in the winning design.

D. The final type of material used in the container will be a detail of the design chosen by the vendor and the Navy to meet the regulatory licensing requirements and will take into consideration the following factors: public comments such as these; protection of human health and the environment; cost; technical feasibility; operational efficiency; regulatory impacts; and storage or disposal criteria which may be established for a repository or centralized interim storage site outside the State of Idaho (Chapter 3, Section 3.9).

E. The comment provides design and construction details for a transportable storage cask. For analytical purposes, the transportable storage cask designed by Nuclear Assurance Corporation International has been evaluated in this EIS as an existing representative design for the transportable storage cask type meeting the standards of the Nuclear Regulatory Commission. The design of the NAC-STC cask has been used in this EIS to represent this type of container; such use, however, does not mean that it is the design which would be chosen. Rather, the final choice will be made through a competitive bidding process. Similar, licensed transportable storage casks are likely to become available in the future and any one of the available designs might be selected (Chapter 3, Section 3.4). The identification of a preferred alternative and the selection of an alternative will take into consideration numerous factors, including public comments such as these: protection of human health and the environment; cost; technical feasibility; operational efficiency; regulatory impacts; and storage or disposal criteria which may be established for a repository or centralized interim storage site outside the State of Idaho (Chapter 3, Section 3.9).

BOB MILLER
Governor

STATE OF NEVADA

ROBERT R. LOUX
Executive Director

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AGENCY FOR NUCLEAR PROJECTS
NUCLEAR WASTE PROJECT OFFICE
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July 18, 1996

Richard A. Guida, Associate Director for Regulatory Affairs
Department of the Navy (Code NAVSEA 08U)
Naval Nuclear Propulsion Program
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

RE: State of Nevada's Comments: Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel

Dear Mr. Guida:

Enclosed is the State of Nevada's comment on the Department of Navy's *Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel.* The comments are intended to assist the Navy in preparing the final EIS and record of decision.

A The draft EIS evaluates six alternative container systems for spent fuel storage, transport, and disposal as well as impacts from manufacturing, handling and transportation; yet a preferred alternative was not presented in the document. While the document indicates the Navy intends to select a container system that will meet "multiple" storage, transportation, and disposal needs, there are numerous programmatic, regulatory and technical issues which dictate that the proposed action should be limited to the selection of a container system to meet the exclusive need for on-site transportation and interim storage of naval fuel at the Idaho Engineering Laboratory (INEL). The enclosed comments provide regulatory and technical analysis to support this conclusion.

Because no repository or central interim storage location has been identified - and may not be for many years, it is inappropriate for the Navy to use the current EIS as the vehicle for evaluating transport, storage, or disposal impacts or for supporting future decisions with regard to such activities. The analysis of transport, interim storage, and/or disposal impacts and alternatives should be done as part of the broader environmental impact statement process DOE is required to carry out under the Nuclear Waste Policy Act of 1982, as amended. By the same token, DOE, as a cooperating agency in the Navy's DEIS process, cannot use the extremely limited Navy document to support *any* future decisions regarding canister systems for storage or disposal of commercial spent nuclear fuel or defense high-level radioactive waste at an interim storage facility or a repository or for transport of such materials to these facilities.

Should you have questions regarding the attached comments, please feel free to contact me.

Sincerely,

Robert R. Loux
Executive Director

RRL/cs
Enclosure
cc: Governor Bob Miller
Nevada Congressional Delegation
Frankie Sue Del Pappa, Attorney General
Julie Butler, State Clearinghouse
Leo Penne, State of Nevada, Washington Office
Local Governments/Tribes
Sherri W. Goodman, DOD
Daniel Dreyfus, OCRWM
Wesley Barnes OCRWM
Terry Vaeth, DOE/NV
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State of Nevada

Nuclear Waste Project Office

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Fax sent 7/18/96

Facsimile Transmission

To: WILLIAM KNOLL. NAVAL NUCLEAR PROPULSION PROGRAM

From: ROBERT LOUX

Date: 7/18/96 Time: 10:10 AM Total Pages: 29

Comments: ATTACHED ARE THE STATE OF NEVADA COMMENTS ON THE NAVY"S DRAFT EIS FOR A CONTAINER SYSTEM FOR THE MANAGEMENT OF NAVAL SPENT NUCLEAR FUEL. THE ORIGINALS OF THE COMMENTS AND COVER LETTER ARE IN THE MAIL.

STATE OF NEVADA COMMENTS ON THE DEPARTMENT OF THE NAVY'S DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR A CONTAINER SYSTEM FOR THE MANAGEMENT OF NAVAL SPENT NUCLEAR FUEL

Prepared by
The Nevada Agency for Nuclear Projects

The State of Nevada's comments on the Department of the Navy's Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel (draft EIS) reflect 13 principal areas of concern. These include the Navy's public participation process, the lack of a preferred alternative, the overall level of information in the draft EIS, the analyses of worse case accidents, the overall transportation analyses, environmental justice, waste characteristics, waste acceptance, environmental impacts and analyses, and the relationship between Navy activities contemplated under the draft EIS and other closely related activities (i.e., the U.S. Department of Energy's (DOE) civilian high-level radioactive waste program, Nevada Test Site (NTS) activities, Idaho National Engineering Laboratory (INEL) activities, etc.).

A The comments which follow were prepared in response to the information and alternatives presented in the draft EIS and address the entire range of issues and actions suggested by the draft document as it was released for comment. It should be pointed out, however, that, while we have made comments with respect to transportation, storage, and disposal issues covered by the draft EIS, the State of Nevada contends that the proposed action to be included in the final EIS must be limited to the selection of a canister system and related support facilities for the interim storage of Naval spent nuclear fuel and Special Case Waste at the Idaho National Engineering Laboratory. Because no repository or central interim storage location has been identified, and may not be for some time, it is inappropriate for the Navy to use this EIS as the vehicle for the evaluation of transport, storage, or disposal impacts or to support future decisions with regard to such activities. The analysis of transport, interim storage, and/or disposal impacts and alternatives should be done as part of the broader environmental impact statement process DOE is required to carry out under the Nuclear Waste Policy Act of 1982, as amended.

By the same token, DOE, as a cooperating agency in the Navy's EIS process, cannot use this extremely limited Navy document to support any future decisions regarding canister systems for storage or disposal of commercial spent nuclear fuel or defense high-level radioactive waste at an interim storage facility or a repository or for transport of such materials to these facilities.

B

1.0 Preferred Action Alternative

As currently written, the draft EIS evaluates six alternative container systems for spent fuel storage, transport, and disposal. The document also evaluates impacts from the manufacturing, handling, and transportation of these container systems, as well as the modification of existing facilities for spent fuel loading. Additionally, the document evaluates various sites and facilities at INEL that could be used for above ground dry storage. However, the draft EIS does not contain a preferred alternative for the overall management of Naval spent nuclear fuel (SNF) and Special Case Waste (SCW). Nevertheless, statements in the document specifically suggest that a single preferred alternative is needed to allow the Navy to load and store spent nuclear fuel at INEL in containers which will be used to ship the spent nuclear fuel outside the state of Idaho. The document also states that the "Multi-Purposed Canister, Dual-Purpose Canister, Transportable Storage Cask, and Small Multi-Purpose Canister could effectively meet [this need]."[1]

While Nevada's review of the draft EIS does not contain a detailed analysis of the merits of each of these container systems, it does examine certain technical, programmatic, and regulatory compliance issues that must be considered in the selection of a proposed action (preferred alternative) for the final EIS. Foremost of these are issues related to off-site transportation of Navy SNF and SCW, as well as issues related to waste disposal/waste acceptance. In fact, examination of these fundamental issues in the draft EIS is so deficient that Nevada officials contend that the Navy will be unable to complete a final EIS and Record of Decision that can adequately support any decisions regarding off-site transportation and waste disposal issues.

For example, the implementing regulations of the National Environmental Policy Act (NEPA) are very specific concerning limitations on actions during the NEPA process, consideration of actions that are connected, deliberation of actions that flow from a program plan or policy to a lesser scope, and consideration of actions that are "ripe" for discussion. These regulations[2] purposely restrict actions that would impact the environment while an agency is in the process of preparing either a site-specific or a programmatic EIS, if such actions "prejudice pending decisions" or otherwise "determine subsequent developments" or "limit alternatives." This is notable since certain actions contemplated in the Navy's draft EIS are directly connected to a larger programmatic action encompassed by the EIS required for the Yucca Mountain

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[1] See draft EIS, page 3-26

[2] 40 CFR 1501.6
40 CFR 1508.18(b)(3)
40 CFR 1508.28

Repository.[3] In preparing the Repository EIS, the Department of Energy must consider, in detail, the total spectrum of transportation and disposal issues as "systematic and connected agency decisions [which] allocate agency resources to implement a specific statutory program . . . "[2] Because the existing NEPA requirements contained under the Nuclear Waste Policy Act have not been concluded, preparation of a site-specific EIS such as the Navy's draft EIS is inappropriate and, in fact, violates the referenced NEPA implementing regulations (at least as it relates to transportation and disposal issues).

Consequently, State officials strongly suggest that the proposed action in the final EIS be limited strictly to the selection of a container system(s) and related support facilities that serve the exclusive need for on-site transportation and interim storage of Navy spent nuclear fuel and SCW at INEL.

As already noted, the draft EIS does not specify a proposed action or preferred alternative. Without an articulated proposed action or preferred alternative, it is difficult to evaluate the document and determine if the information presented is adequate. If one of the two Multi-Purpose Canister (MPC) alternatives is selected as the preferred action, for example, much more information would be needed on the relationship between MPC performance, fuel characteristics, and implications for ultimate disposal in a repository (since the MPC, by definition, would be designed to also serve as a disposal canister). The final EIS must include sufficient information so that the appropriateness of the preferred alternative that is identified can be adequately evaluated.

C

2.0 Public Participation

Limiting public hearings on the draft EIS to two in Idaho and one in Utah calls into question the adequacy of the Navy's public involvement/participation process for the EIS. The contention that, since a definitive repository or interim storage location is not known, public hearings need not be held in Nevada or in potential transportation corridor states, is flawed. Nevada is used in the EIS as the reference destination for Naval SNF and SCW, and routes between Idaho and Yucca Mountain/NTS are identified. Public hearings should have been scheduled to provide opportunities for public involvement in Nevada and in states/communities along the referenced shipping routes. At least four additional hearings should be held in Nevada and in western states potentially affected by Navy shipments of spent reactor fuel. These meetings should be scheduled in consultation with the Western Interstate Energy Board's

[3] See U.S. Department of Energy, Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada. (Federal Register, Volume 60, No.151, August 7, 1995, pp. 40164-40170).

Radioactive Waste Committee, which has been very active and effective in assisting western states in planning for the safe and uneventful shipment of spent fuel and high-level waste.

D 3.0 Overall Level of Information

The overall level of information in the draft EIS is inadequate. There is no information on the characteristics of Naval spent nuclear fuel or how such fuel is different from commercial spent fuel. There is also no information on the characteristics of the Special Case Waste referred to in the draft EIS. Without this information, issues such as criticality, thermal impacts, and compatibility with other waste forms cannot be assessed. The lack of sufficient information limits reviewers from assessing the adequacy of risk and performance assessments. Likewise, the comparative health risks analyses contained in the draft EIS are unsupported because of the lack of technical data. If the Navy is contending that such information in unavailable because it is classified, there should be a classified appendix as part of the final EIS that can be reviewed by State or local experts with appropriate clearances.

E 4.0 Worse Case Accidents

The analysis of worse case accidents is inadequate in the draft EIS. The argument that the Navy is not required to evaluate risks and impacts from low probability/high consequence events is inappropriate. Credible worst case accidents both at INEL during loading and storage and subsequently during shipment off-site should be analyzed. The claim that the Naval SNF waste form is rugged and therefore presents little risk during transport or storage is unsupported, especially in the absence of adequate information on waste form characteristics.

F 5.0 Overall Transportation Analyses

5.1 Background Information on the Current and Projected Inventory of Naval Spent Nuclear Fuel

The final EIS must provide sufficient information on the amount of naval spent nuclear fuel to be shipped to a repository or interim storage facility so that reviewers can verify the hardware requirements and number of shipments required under each alternative. Neither the draft EIS nor the DOE Programmatic Spent Nuclear Fuel Management Final EIS (DOE/EIS-0203-F) provide sufficient information to allow independent verification of the hardware requirements stated in Table S.1 and Table 3.1 and the shipment numbers stated in Tables S.7, 7.1, 7.2, B.2, B.3, and B.4. For each of the Naval SNF types referenced on Pp. 2-1 to 2-2, the final EIS must provide the following information: the current and projected amount of SNF (in Metric Tons of Initial Heavy Metal); the current and projected number of cores or assemblies;

the physical dimensions and weight of each representative fuel type; and the assumed capacity (in cores or assemblies) of each alternative container system described in Appendix D.

The final EIS must provide sufficient information on the radiological characteristics of Naval spent nuclear fuel to be shipped to a repository or interim storage facility so that reviewers can verify the purported public health impacts, worker health impacts, environmental impacts, and socioeconomic impacts under each alternative. Neither the draft EIS nor the DOE Programmatic Spent Nuclear Fuel Management Final EIS provide sufficient information to allow independent verification of the radiological risks stated in Tables S.2 through S.8, Tables 3.2 through 3.4, Tables 3.7 through 3.9, Tables 7.3 through 7.6, and Appendix B. The final EIS must provide radiological characteristics for each of the Naval SNF types referenced on Pp. 2-1 to 2-2, including radionuclide composition, total radioactivity, surface dose rate, thermal output, and projected change over time for each of these characteristics.

G 5.2 Heavy Haul Truck Transportation

The final EIS must address a broad range of impacts associated with potential heavy haul truck (HHT) transportation of Naval spent nuclear fuel containers to the repository or interim storage facility. There is no direct rail access to Yucca Mountain or the Nevada Test Site at the present time. The nearest main railroad is almost 100 miles distant. DOE is currently studying four corridors (ranging in length from 98 to 363 miles) for possible construction of a new rail spur to the repository site. The potential for direct rail access is uncertain because of high costs (estimated as high as $1 - 1.5 billion), anticipated difficulties in obtaining environmental approvals and acquiring rights-of-way, and pending congressional legislation that would require DOE to ship rail casks by HHT from an intermodal transfer facility at Caliente. The final EIS cannot assume that direct rail access will be available for delivery of Naval spent nuclear fuel containers to the repository or interim storage facility.

The final EIS must extend the route-specific transportation risk and impact analyses contained in Appendix B and presented in Chapter 7.0 and the Executive Summary, to incorporate the three potential HHT routes identified by DOE in the Nevada Potential Repository Preliminary Transportation Strategy Study 2 (February 1996). These potential routes are listed below:

(1) Apex Route: Interstate 15 - U.S. Route 95 - Jackass Flats Road (104 miles);

(2) Arden Route: State Route 160 - U.S. Route 95 - Lathrop Wells Road (111 miles); and

(3) Caliente Route: U.S. Route 93 - State Route 375 - U.S. Route 6 - U.S. Route 95 - Lathrop Wells Road (321 miles).

The route-specific transportation risk and impact analyses contained in Appendix B must also consider the so-called "Chalk Mountain Heavy Haul Route" from the Caliente intermodal transfer facility specified in Senate Bills S.1271 and S.1936. This route covers U.S. Route 93 - State Route 93 - Local roads from Rachel to Nevada Test Site Guard Station 700 - Mercury Highway - Cane Spring Road (approximately 160 miles).

In light of the potential requirement for long-distance HHT transportation from a Nevada rail siding to the repository or interim storage facility (100 to 320 miles), the final EIS must reevaluate the feasibility of the various container system alternatives described in Chapter 3.0 and Appendix D. In particular, use of the M-140 transportation cask may be incompatible with HHT transport because of its loaded weight, height (16 ft.), and vertical shipping configuration. The M-140 transportation cask is usually transported in a specially designed well-type railcar. The draft EIS provides no evidence that M-140 transportation casks have ever been, or can potentially be, shipped by HHT for distances of 100 to 320 miles. Indeed, there in no evidence in the draft EIS that the other proposed container systems can be safely and economically shipped by HHT for distances of 100 to 320 miles.

The final EIS must demonstrate that each of the proposed container system alternatives is compatible with long distance HHT transport. The final EIS must specifically consider: (1) the need to obtain special HHT shipping permits from the Nevada Department of Transportation, (2) existing seasonal prohibitions on HHT use of certain route segments, and (3) potential additional state or local regulations such as time-of-day restrictions or escort requirements. Furthermore, the transportation cost analysis must specifically include the backhaul (return shipment) of empty transport-only casks and MPC transportation overpacks. Based on our analysis of the specific HHT routes likely to be used for shipments to Yucca Mountain or the Nevada Test Site, we believe that the small MPC is the only container system identified in the draft EIS that could possibly be feasible if there is no rail access. However, there will be so many difficulties involved in HHT transport of the small MPC that, absent rail access, legal-weight truck casks may the preferred or only feasible method of shipping Naval spent nuclear fuel from INEL to Yucca Mountain or the Nevada Test Site.

The final EIS must include revised transportation risk and impact analyses which specifically consider HHT transportation of Naval spent nuclear fuel on likely Nevada highway routes. For example, the analysis of routine radiological emissions from large MPCs on HHTs must consider the relatively slow HHT operating speeds (averaging 15 - 40 miles per hour) and limited passing opportunities for other vehicles traveling behind or alongside HHTs on long uphill grades or on heavily congested route segments. Given existing Nevada highway route characteristics, passengers of other vehicles (particularly elevated vehicles such as school buses, passenger vans, recreational vehicles, or pickup trucks) could regularly travel within 2 - 4 meters of the MPC surface for periods of an hour or more.

Similarly, the definition of the maximally exposed individual (MEI) must consider the exposures resulting from incidents involving large MPCs or other shipping containers on HHTs. The discussion on page B-6 of maximum possible radiological doses for MEIs during incident-free transportation is seriously deficient in this regard. The draft EIS assumes an MEI in the general population as "a person stopped next to a loaded transportation cask on a railcar at a distance of 19.8ft. (6 m) for one hour." In a credible gridlock incident, as described by DOE in response to questions by the Nuclear Waste Technical Review Board, one or more occupants of an elevated vehicle could be trapped within 2 meters of the surface of a spent fuel cask shipped by truck for a period of 3 - 4 hours, resulting in a dose of 30 - 40 millirems to each MEI. Moreover, if a multiple-occupant vehicle such as a school bus or passenger van is involved in such an incident, or if many single-occupant vehicles are involved in a gridlock incident at a congested urban intersection during evening rush hour, as many as ten or more individuals could receive the maximum radiological dose (30 - 40 millirems) and many other individuals could receive lesser but measurable doses.

Section B.3.2, "Technical Approach for Transportation Accidents", Section B.3.4, "Analysis of Uncertainties", Section B.4, "Routing Analysis", and Section B.5.2, "Accident Risk", must all be revised to address the probabilities and consequences of accidents involving large MPCs and other alternative shipping containers on HHTs while traveling likely highway routes in Nevada. In particular, the final EIS must specifically address the consequences of a maximum credible severe accident involving a release of radioactive materials from a large MPC or other large shipping container during HHT transport. In order to accurately assess the maximum credible accident impacts, the final EIS should evaluate the consequences of such an accident at worst case locations along likely Nevada shipment routes. For the urban HHT routes currently under consideration, the final EIS should evaluate a maximum severe accident at the intersection of I-15 and U.S. 95 in Las Vegas on a weekday during evening rush hour. For the rural HHT routes currently under consideration, the final EIS should consider a maximum severe accident at the intersection of State Routes 375 and 318 at Crystal Spring.

H 5.4 Reliance Upon the Modal Study

The transportation radiological risk estimates presented in Chapter 7.0 and Appendix B of the draft EIS rely excessively, and uncritically, upon one reference - the so-called Modal Study (U.S. Nuclear Regulatory Commission, 1987, Shipping Container Response to Severe Highway and Railway Accident Conditions, NUREG/CR-4829, prepared by Lawrence Livermore National Laboratory, for the U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory

Research, Washington, D.C.). The final EIS must correct this deficiency by responding to the detailed technical critiques of the Modal Study prepared by the Western Interstate Energy Board and the State of Nevada.

The State of Nevada submits for the record of this EIS the following report (see Attachment I to these comments): Lindsay Audin, Nuclear Waste Shipping Container Response to Severe Accident Conditions: A Brief Critique of the Modal Study, NWPO-TN-005-90 (December, 1990). This report documents five major deficiencies in the Modal Study: limited peer review and inadequate response to technical criticism by the peer reviewers; excessive reliance on an analysis of data created solely for the purpose of the study and inappropriate surrogate data; accident scenarios which do not capture the full range of real world conditions; inappropriate cask design assumptions and cask accident response assumptions; and non-representative spent fuel characteristics and undocumented spent fuel accident response assumptions. As a result of these deficiencies, the Modal Study is of limited value for assessing the risks and impacts of spent nuclear fuel shipments to a repository or interim storage facility. Moreover, specific aspects of the proposed shipments of Naval spent nuclear fuel are inconsistent with assumptions used in the Modal Study. The draft EIS assumes shipments in large rail casks using depleted uranium for gamma shielding, which limits the applicability of the Modal Study's focus on cask outer shell strain as a primary failure mode. The draft EIS assumes the use of casks with much greater capacities, which is inconsistent with the cask-payload weight ratios assumed in the Modal Study, and the physical and radiological characteristics of Naval spent fuel (and the resulting isotope concentrations) are so different from those assumed in the Modal Study that the Study's conclusions regarding the percentage of severe accidents involving releases may be inapplicable to the shipping campaign addressed in the draft EIS.

5.5 Consequences of Severe Transportation Accidents

The transportation radiological risk estimates presented in Chapter 7.0 and Appendix B of the draft EIS refer to a maximum severe transportation accident resulting in a release of radioactive materials. The information provided in the draft EIS is insufficient for the independent verification of the results presented in Tables 7.4, 7.5, 7.6, B.7, B.8, B.11, B.12, and B.13. The final EIS must provide a detailed scenario description of the maximum hypothetical transportation accident, a detailed list of major input values (for example, specific values for wind speed at the time of the accident) used in the RISKIND analysis, and a sensitivity analysis demonstrating the significance of key assumptions based on expert judgement rather than on empirical data (for example, assumptions about cask response to extra-regulatory thermal events when no full-scale fire tests have been conducted on the proposed MPC design or the other alternative container systems).

Moreover, the draft EIS focuses only on the public health effects of a hypothetical severe accident involving a release, and completely ignores other important impacts. The final EIS must correct these deficiencies by evaluating the full range of impacts resulting from a release of radioactive materials from: (a) a rail accident in a representative rural area with a local economy based on agriculture and tourism; and, (b) a rail accident in one of the two major urban areas along the likely rail route between INEL and Yucca Mountain (either Salt Lake City or Las Vegas). At a minimum, the consequence analysis must consider the extent of the area contaminated under worst case weather conditions and the level of cleanup required under several varying regulatory scenarios. In addition to health effects, the consequence analysis must address the economic cost of cleanup including opportunity costs, time and personnel requirements for cleanup, and the full range of social impacts, such as the potential for permanent out-migration.

J 5.6 Use of Dedicated Trains

The draft EIS repeatedly states that Naval spent nuclear fuel containers may be shipped in general freight trains. Shipment of spent nuclear fuel in general freight trains is unacceptable for the following reasons:

1) It unacceptably increases the complexity of rail operations. Even if DOE builds a rail spur to the repository or storage site, spent fuel casks in general freight trains would not be delivered directly to these facilities, but would have to be switched out of mixed freight trains at a rail yard or on a siding, raising concerns about safety and physical security until the cask cars were shipped to their ultimate destination;

2) It makes State point-of-entry safety inspections more difficult and more dangerous for railroad personnel and State safety inspectors;

3) It increases the probability of train derailments because mixing large, heavy rail casks in general freight trains could adversely affect train dynamics; and

4) It potentially increases the consequences of any severe accidents that occur, since Naval spent nuclear fuel casks could be shipped on the same trains with a variety of explosive, combustible, toxic, or otherwise hazardous materials.

All shipments to a repository or interim storage facility should be made in dedicated trains, and the final EIS should redo the entire risk and impact analyses in Chapter 7 and Appendix B and assume that all shipments will be made by dedicated train.

K 5.7 Consequences of A Successful Terrorist Attack

The draft EIS ignores the potential consequences of a successful terrorist attack on a shipment of Naval spent nuclear fuel. The final EIS cannot rely upon the inadequate terrorism consequence analyses prepared for DOE and the NRC in the mid-1980s. The final EIS must evaluate a credible range of terrorist attack methods, attack locations/environments, and attack outcomes based on currently proposed shipping container designs and currently available weapons capabilities.

NRC has evaluated and re-evaluated the consequences of terrorist attacks several times during 1970s and 1980s. In 1984, NRC concluded that the consequences of terrorist attack with explosives would not be significant in terms of the amount of release (relative to cask contents) or resulting health effects, and subsequently proposed lessened security requirements. Based on experiments sponsored by DOE and NRC, the NRC summarized its findings regarding the estimated release of radioactive materials following a successful terrorist attack using a shaped explosive against a spent fuel shipping cask: "A shipping cask has been subjected to attack by explosive to evaluate cask and spent fuel response to a device 30 times larger in explosive weight than a typical anti-tank weapon. This device would carve an approximately 3-inch-diameter hole through the cask wall and contained spent fuel and is estimated to cause the release of 2/100,000 of the total fuel weight (~10 grams of fuel) in an inhalable form." (U.S. Nuclear Regulatory Commission, Transporting Spent Fuel: Protection Provided Against Severe Highway and Railroad Accidents(March, 1987)).

The NRC's consequence analysis focused on the projected human health effects of such a release of respirable particles of spent fuel. In NRC-sponsored studies, assuming an attack on a truck cask carrying a single PWR fuel assembly, "researchers found that the average radiological consequence of a release in a heavily populated urban area such as New York City would be no early fatalities and less than one (0.4) latent cancer fatality." When more unfavorable circumstances were considered, for example assuming the attack occurred at evening rush hour on a business day in the most unfavorable location for a release, the peak consequence was found to be "no early fatalities and less than three (2.9) latent cancer fatalities." For larger casks containing more fuel, the NRC found that "the upper bound of release would likely increase roughly in proportion to the square root of the total number of assemblies contained in a cask." (For example, the release -and the expected peak consequence- from an attack on an MPC containing 21 civilian PWR assemblies would be about 13 latent cancer fatalities). The NRC concluded: "On the basis of energy release from the explosive, it is expected that the number of fatalities from a sabotage explosion would be greater than the number of radiologically induced fatalities."

The DOE sponsored studies, which included one full-scale and several small-scale experiments, produced similar results. The explosive attack on the full-scale cask containing one fuel assembly was calculated to release a maximum of 17 grams of spent fuel. Researchers calculated peak consequences of a 17 gram release to be "no early fatalities and about 7 latent cancer fatalities." (NRC," Modification of Protection Requirements for Spent Fuel Shipments: Proposed Rule," Federal Register, Vol. 49, No. 112 (June 8, 1984), Pp.23868-23869).

Many comments on the NRC's 1984 proposed rule attacked the NRC methodology and conclusions:

- NRC underestimated the potential damage to cask and spent fuel as result of an attack with explosives;

- NRC underestimated the potential health effects of a release; and

- NRC did not adequately evaluate the economic impacts of an attack resulting in a release of contents.

The final EIS must avoid the inadequacies of the NRC's previous analyses. The final EIS must consider a range of attack methods, such as:

1. Attack cask without capture using one or more rocket-propelled armor piercing weapons;

2. Attack cask after capture using one or more high-energy explosive devices (e.g., military or civilian shaped charges, massive truck bomb);

3. Damage infrastructure to cause accident subjecting cask to catastrophic impacts (e.g., destroy bridge causing truck or train to fall, destroy tunnel causing truck or train to be-crushed, damage track or signals to cause high-speed derailment, blow up fuel storage near tracks or roadway as shipment is passing, etc.).

The final EIS must consider a range of terrorist attack locations, such as:

1. Rural areas near sensitive activities and resources such as farms, ranches, water supplies;

2. Suburban areas near difficult to evacuate activities such as residences, schools, industrial facilities, sports stadiums, etc.;

3. Urban areas, downtown office districts, highway or subway junctions, tourist areas like the Las Vegas Strip;

4. Locations of special events (e.g., the Olympics, major international trade show or convention, national political party convention).

The final EIS must consider a range of terrorist attack outcomes, such as:

1. Cask is breached, contents damaged, radioactive materials released, radiation from loss of shielding;

2. Cask is damaged, no release of radioactive materials, radiation from loss of shielding;

3. Cask is damaged, no release, no loss of shielding;

4. Cask is undamaged (attack fails completely).

The final EIS must consider two aspects of cask design important for a vulnerability assessment:

1. Cask wall materials and thickness : the large MPC transport cask walls are comprised of 4.25" of stainless steel, 1.5 " of depleted uranium, and 0.5" of lead; the MPC canister shell inside the transport cask adds 1.0" of stainless steel; the NACS/T (Nuclear Assurance Corporation Storage/Transportation cask) walls are comprised of 4.1" of stainless steel and 3.7" of lead;

2. Diameter of the cask cavity and overall cask thickness : The large MPC cask cavity is 61.0" in diameter, and the overall cask thickness is about 85"; the NACS/T cask cavity is about 71" in diameter, and the overall thickness is about 96";

The final EIS must consider the armor penetration capability of currently available weapons that could be used to attack a shipping cask. Military weapons guides are readily available in most big city libraries or book stores and provide detailed information on numerous anti-tank missiles and other munitions that could be used against spent fuel shipping casks. One of the best known anti-tank weapons, the Milan missile, illustrates several general characteristics[4] that should be considered in a terrorism risk assessment, including:

- Armor penetration capability : >1000 mm;
- Man-portability: total system weight about 33 kg;
- Long range capability: maximum effective range of 2,000 meters (travel time 12.5 seconds);
- Relative ease of use: sight-on-target, semi-automatic, wire guidance; and
- Relative availability: several tens of thousands have been produced, and it is used by a number of European, Middle Eastern, and Asian armies.

A weapon such as a Milan missile could conceivably penetrate or even perforate a rail cask containing Naval spent nuclear fuel. It therefore represents the type of weapon that should be evaluated in a terrorism risk assessment for Naval spent nuclear fuel transportation to Yucca Mountain.

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6.0 Environmental Justice

The issue of environmental justice is inadequately addressed in the draft EIS. Apart from a cursory evaluation of effects on the Ft. Hall Indian Reservation in Idaho, no other analyses are provided to examine the impacts of Naval SNF and SCW on Native American communities in Nevada (and elsewhere) along shipping routes. Likewise, the potential for disproportionate impacts to rural communities should be addressed. The final EIS must address environmental justice impacts more fully, and the Record of Decision must specify mitigation measures the Navy is committed to implementing.

The draft EIS makes a number of problematic and/or inaccurate assertions with respect to environmental justice, including "The environmental consequences and impacts on health and safety for the actions described in this EIS would be small for all population groups and therefore, it would be expected that there would be no disproportionately high or adverse impacts to any minority or low-income population" (S.7 - Page S-18), and "Shipping accidents could

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[4] Source: Ian V. Hogg, Infantry Support Weapons: Mortars, Missiles and Machine Guns (Greenhill Military Manuals, No. 5), Mechanicsburg, PA: Stackpole Books, 1.

occur at any location along the routes used, so it is not possible to identify the specific impact on the minority or low-income composition of the populations along the routes" (7.3.5 - Page 7-10).

Since the draft EIS notes that, for the most direct representative rail transportation route to Yucca Mountain, 93% of the distance is rural, and 5.8% is suburban, (and equivalent information is provided in Table B.15 for two alternate routes), it is possible to analyze the populations along the routes as to their minority or low-income status. This should be done as it was for potential cask fabrication locations.

Probabilities of accidents at locations in which minorities or low-income populations occur can be calculated from location-specific (rather than national average) experience records to evaluate if there are disproportionate accident risks involved. Several hypothetical accident scenarios (involving a range of meteorological conditions because of the locations of the 3 routes) can be evaluated and compared to other locations along the rail lines as to their potential impact (both radiological and non-radiological), given that traffic safety facilities and emergency preparedness and management capabilities are generally less developed in rural areas, especially those populated by minority or low-income communities. Evaluations such as these, especially focused on Native American lands and sparely populated rural counties and communities, should be carried out in order to support any conclusions in the final EIS regarding whether disproportionate impacts are present or not, and whether mitigation actions would be appropriate.

The conclusions of the draft EIS, as quoted above, are insufficiently supported in the draft EIS to satisfy either the information needs of the EIS or the requirements of an Environmental Justice evaluation.

M 7.0 Socioeconomic Analyses

The treatment of possible socioeconomic effects of Naval spent nuclear fuel for all of the alternatives evaluated in the draft EIS involving handling, storage, transport, and disposal of nuclear materials is inadequate (ref. Sections 5.5, 6.0, 7.3). When any analysis is done, it focuses solely on those impacts that are driven by employment and population increases resulting from various alternatives, and then does so only with respect to their potentially positive contributions to local economics. What the draft EIS fails to assess, and what should be included in the final EIS if economic and other impacts to affected jurisdictions are to be adequately evaluated, are the implications of the potential stigmatizing effects of various nuclear-related activities (i.e., handling and storage at INEL; transportation of spent fuel through states and communities; and handling and storage/disposal at a repository or interim storage facility).

Research conducted by the State of Nevada has demonstrated convincingly that nuclear-related activities (i.e., storage facilities, radioactive materials transportation, etc.) have the potential to result in significant socioeconomic impacts at all levels within the state, from the local communities to the state government. These effects originate in intense negative perceptions and avoidance behaviors by the public in response to nuclear facilities/activities which could produce large negative impacts. While such impacts would likely be most pronounced and more likely to occur in Idaho and Nevada (the "representative or notional" location used for the repository and interim storage site), they could occur within any state or community along potential shipping routes.[5] Such impacts could occur in the course of routine operations if public reaction to the facilities or to the transportation of nuclear materials is such that significant negative attention is brought to such operations. In the event of accidents involving spent nuclear fuel or other nuclear materials, the potential for significant impacts would be much greater. This can be the case even if no radiological materials are released, when the accident draws wide media attention. In the case of an accident involving a release, the occurrence of stigmatizing impacts is almost a certainty - the only question being the extent of the negative effects and their duration.

In Nevada, the potential for stigma-related impacts is magnified by the state's unique vulnerability to any change in its public image.[6] The great public and media interest in things nuclear makes it almost certain that any association with negative "nuclear" perceptions could adversely affect Nevada's attempts to attract tourists, conventions, migrants, and new business investments to some degree. This could be especially troublesome in the event of a nuclear waste accident in or near Las Vegas, one of the world's major tourist destinations and the dominant contributor to Nevada's economy and tax revenues. While there is considerable uncertainty about the federal government's ability to manage radioactive materials safely and about future public responses to accidents and events, it is clear that over the last half century the public has developed a very strong negative aversion to such wastes and the facilities associated with them. The conclusion of the Nevada researchers who have studied the issue is that, under certain circumstances, stigma impacts could be very negative and very large.

The existing research on stigma effects and potential impacts provides a viable theoretical and methodological base so that the Navy should be able to provide an assessment of these types

[5] The Winter Olympics will be held in Salt Lake City in 2002 at a time when, under provisions of legislation now before Congress, spent fuel shipments to an interim storage facility could be occurring. Under such circumstances, Salt Lake City and Utah could be especially vulnerable to stigmatizing effects of Naval spent fuel transportation accidents.

[6] Nevada is unique among all of the states because of its extraordinary reliance on tourism as the source of revenue for all aspects of state and local government operations. As such, Nevada's public image as an attractive tourist destination is crucial to the state's economic well-being. Changes in that image will have direct economic and other consequences.

of impacts on the economy, public revenues, public services, and community quality of life for Idaho, Nevada, and states/communities located along likely transportation corridors.[7] It is very possible that, through the social amplification of risk process, even relatively minor events or accidents could have serious economic consequences that, in the case of Idaho and Nevada, could dwarf any expected benefits to be derived from employment and spending associated with Naval spent fuel activities.

The fact that Naval spent fuel and Special Case Waste represent a small percentage of the total volume of spent fuel and high-level radioactive wastes that would be transported to and stored/disposed of at an interim storage facility or repository does not absolve the Navy from the responsibility to adequately assess potential socioeconomic and other impacts. It is inappropriate and unacceptable to state, as the draft EIS does in several places, that impacts will be small because the Navy's contribution to the overall spent fuel/waste stream is so small. There will be instances where Naval spent fuel and SCW will be the principal contributors to impacts (i.e., in Idaho and along the likely shipping route from Idaho to Utah). In addition, the fact that DOE has chosen to piecemeal the EIS process by not preparing a programmatic EIS for the range of activities contemplated under the Nuclear Waste Policy Act means that the Navy must prepare an EIS for its activities that adequately evaluates the potential for impacts resulting from the types of materials and operations contemplated. The analysis of cumulative impacts should then examine the contribution of the Navy's activities to DOE's larger program. It is possible that the Navy's activities could significantly increase the overall risks and impacts in certain geographic areas.[8]

N 8.0 Waste Acceptance

The draft EIS makes some questionable assumptions about the fundamental issue of disposal of Naval spent fuel and Special Case Waste in a repository, including the assumption that, "The Nuclear Waste Policy Act authorizes disposal of spent nuclear fuel, including naval spent nuclear fuel, in a geologic repository"(S.1 on Page S-1) and the related assumption that, "The Yucca Mountain site is the only site currently authorized by legislation, specifically the

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[7] A detailed summary of the State of Nevada research can be found in the publication, "State of Nevada Socioeconomic Studies of Yucca Mountain 1986 - 1992: An Annotated Guide and Research Summary," NWPO-SE-056-93 (June, 1993). See also "State of Nevada Socioeconomic Studies Biannual Report, 1993-1995," by James Flynn, et. al. (July, 1995).

[8] In Salt Lake City, for example, Naval spent fuel shipments could add significantly to the volume of total spent fuel shipments and expand the number of shipping routes with which the city and surrounding communities will have to contend.

Nuclear Waste Policy Act, for site characterization as a geologic repository for spent nuclear fuel, including naval spent nuclear fuel" (1.0 on Page 1-1).

It is not clear that the Nuclear Waste Policy Act authorizes the disposal of Naval spent nuclear fuel in the proposed geologic repository. Rather, it appears that the Act does not contemplate the need for disposal of spent nuclear fuel from atomic energy defense activities. The authority for disposal in a repository of spent nuclear fuel from atomic energy defense activities, including Naval spent nuclear fuel, should be provided either in future legislation, or preferably, by rule of the Nuclear Regulatory Commission, as provided in Sec. 2, Paragraph (12)(B) [42 USC 10101] of the Nuclear Waste Policy Act.

Notwithstanding the definition of "spent nuclear fuel" in Section 2 [42 USC 10101] of the Nuclear Waste Policy Act, Sec. 8 [42 USC 10107] contemplates that all relevant nuclear waste from atomic energy defense activities will be "high-level radioactive waste" for purposes of a Presidential decision regarding co-mingling of civilian and defense wastes in a repository.

The question of authority regarding disposal of Naval spent nuclear fuel is an important one since, as will be discussed later in these comments, Naval spent nuclear fuel has significantly different characteristics from commercial spent nuclear fuel. And, if the Naval spent fuel is intended to be disposed in a repository along with commercial spent fuel under license from the Nuclear Regulatory Commission, it could be important to safety to have regulatory authorization for this activity that is responsive not only to the differing characteristics of the Naval spent fuel, but also to the likelihood that some details of these characteristics will be classified for national security purposes and not available to all participants in the repository licensing proceeding.

O 9.0 Waste Characteristics

There will be specific waste acceptance criteria for receipt of all spent nuclear fuel, and potentially Special Case and Greater-Than-Class-C Waste at a repository or interim storage site. These criteria will be established by the Office of Civilian Radioactive Waste Management prior to operation of the facilities. While the criteria have not yet been set, it is clear that meeting any waste acceptance criteria will rely heavily on acceptable records and verification of the characteristics of the waste in each container received. The records required for acceptance will vary not only with the range of waste characteristics, but with the alternative containers because of their differing capacities.

The draft EIS, in its discussion of spent fuel and Special Case Waste characteristics (Section 2.3 on Pages 2-3, 2-4 and Appendix E), should describe the range of waste characteristics that exists in the inventory that will be placed in any of the alternative containers, e.g., physical dimensions, physical condition, radiological characteristics, thermal output, radiological output, burn-up, initial enrichment, age out of reactor, etc. The draft EIS should describe the records kept of these characteristics, and the means and procedures that will be used to validate these records at the time of container loading, for purposes of waste acceptance.

It is not enough for the draft EIS to defer this matter to the Nuclear Regulatory Commission's container certification process, as suggested on page 2-4. The issue is of much greater dimension, if the Naval nuclear waste is to be accepted into a storage and disposal system regulated by the requirements of the Nuclear Regulatory Commission and open to public scrutiny. The final EIS must include this crucial waste acceptance issue and all its requirements as currently understood in its considerations, rather than assume that the wastes will be accepted as presented.

If the specifics of the waste characteristics cannot be fully revealed in a public final EIS for national security reasons, this information should be included in a classified appendix for review by appropriately cleared reviewers.

Strict adherence to waste acceptance criteria is important to Nevada, in that it is a fundamental component of repository performance assessment and safety. It describes the source term for the repository. Therefore, it is imperative that the characteristics of the contents of each container be known through validated records, to which the acceptance criteria can be applied. It is not sufficient nor acceptable for the draft EIS to say, and imply, that the Naval nuclear wastes exist in such small amounts that the impacts of waste management and disposal, when compared with the impacts from all spent nuclear fuel in the waste management system, are insignificant. Instead, the extent of their significance must first be determined though the analysis of validated documentation of the waste characteristics.

For example, the final EIS must evaluate specifically the implications of Naval spent fuel characteristics within the context of the explosive autocatalytic criticality theory put forth by scientists at Los Alamos National Laboratory [Ref. C.D. Bowman and F. Venneri, "Underground Autocatalytic Criticality From Plutonium and Other Fissile Material," (LA-UR-94-4022)]. The Bowman-Venneri theory postulates a situation at a Yucca Mountain repository where subcritical fissile material could reach criticality that is self-enhancing, resulting in a potentially explosive breach of repository integrity. The draft EIS should evaluate the likelihood that the unique characteristics of Naval spent fuel could contribute to the risks of such an occurrence subsequent to disposal in a repository.

10.0 Environmental Impacts and Analyses

P

10.1 Programmatic Environmental Impact Analysis

Nowhere in the Navy's draft EIS for spent nuclear fuel is there mention of how programmatic impacts for all the nuclear waste in a geologic repository will be addressed. This raises the combined issues of cumulative impacts, connected actions, and segmented, piecemeal analysis where an integrated programmatic analysis and assessment is called for. For example, 40 CFR 1508.25 states that an agency should analyze "connected actions" in one EIS. The Council on Environmental Quality (CEQ)regulations are directed at avoiding improper segmentation, wherein the significance of the environmental impacts of an action as a whole would not be evident if the action were to be broken into component parts and the impacts of those parts analyzed separately.

The Navy's final EIS must address this matter with respect to the disconnected impact assessments between the Navy spent nuclear fuel, a geologic repository, and the disposal of all additional nuclear waste as proposed by the Department of Energy. How the Navy's nuclear waste will be integrated into the whole process is especially important with respect to such issues as groundwater, past testing of nuclear weapons, and other relevant programs such as environmental restoration programs that doubtlessly will apply to any final repository site.

While it is true that a final site for a repository has not been formally designated, the Navy is beholden to NEPA and the public to address the full spectrum of potential environmental and health consequences arising from the Navy's spent nuclear fuel. Because a repository site has not been selected does not mean that the Navy is free of the responsibility for preparing a comprehensive EIS in a programmatic manner [cf. CEQ's 40 CFR 1508(b)(3) and DOE's 10 CFR 1021.330]. Therefore, instead of proceeding with the current draft EIS, the Navy should join with DOE to prepare a programmatic EIS for all the spent nuclear fuel to be disposed of in a geologic repository. From that document, specific actions should be tiered pursuant to the NEPA regulations.

Q 10.2 Environmental Life Cycle Assessment

Environmental life cycle assessment is an approach that analyzes the entire system around waste disposal. Applied to Navy spent nuclear fuel, it would encompass raw materials used for manufacturing nuclear waste canisters and transporting the waste to a repository, as well as repository construction, operation, closure, and future outcome. All the downstream and upstream effects of the operation of waste disposal would be factored into the environmental impact assessment to provide a comprehensive view of the full spectrum of environmental consequences associated with the proposed action.

In Sections S.3 and 3.8, the draft EIS addresses canister manufacturing impacts in partial terms of the life cycle assessment process. However, the words "life cycle assessment" are never used and the concept itself is not articulated. As a consequence, the concept of life cycle assessment appears inadequately understood and applied in the draft EIS. Especially for Tables S.1 and 3.5 and the associated text, the concept of raw material extraction and ultimate disposal of all wastes, including the long-term fate of the canisters, needs to be clearly expressed. Then, the concept should be woven throughout the document.

To achieve this, there are two U.S. Environmental Protection Agency documents that should be used. These were issued to encourage waste management activities to apply life cycle assessment to environmental protection:

- Life Cycle Design Guidance Manual, EPA/600/R-92/226, January 1993.

- Life-Cycle Assessment: Guidelines and Principles, EPA/600/R-92/245, February 1993.

The documents should guide the Navy's application of the life cycle assessment process. In so doing, a departure away from the present piecemeal, compartmentalized approach to the NEPA process can be reflected in the final EIS.

Such a procedure should be accomplished by integrating impact assessment into a systems engineering program for the canisters and ultimate waste disposal. This would permit a systems engineering analysis to address alternatives within the project that would allow the best environmental decisions to be made to the benefit of the comprehensive repository program. To this end, the EIS should be based on a framework for environmental life-cycle assessment that would assure environmental decision making in the full long-term context implied by the Navy spent nuclear fuel program.

Environmental life cycle assessment is consistent with the tenants of ecosystem management which the White House has instructed federal agencies to adopt as the basis for protecting public interest regarding natural resources. The Navy has joined the Army, the Air Force, the Department of Defense, the Department of Energy, and other federal agencies in this approach to resource stewardship, and this should be reflected in the final EIS. (See, for example, White House Office of Environmental Policy Interagency Ecosystem Management Task Force, ***The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies***, Vols. I-III, June 1995, and Department of Energy, ***Stewards of a National Resource***, DOE/FM-0002, 1995.)

R 10.3 Impact Assessment

While Sections S.4 through S.8 and Chapters 1 through 7 of the draft EIS discuss various aspects of impact assessment, the document does not identify accepted methods for assessing environmental impacts. An appendix that discusses the impact assessment methods, assumptions, and steps in the process as well as the results of each step should be added to the document. In other words, an accepted environmental assessment methodology and approach should be adopted and documented for the EIS. An example that could be used is:

Jain, R., L. Urban, G. Stacey, and H. Balbach. 1993. ***Environmental Assessment.*** McGraw-Hill, Inc., New York, 526 pp.

S 10.3.1 Environmental Risk Analysis

Central to NEPA is the ability to make predictions about environmental outcomes resulting from alternative courses of action such as those presented in the draft EIS. The soundness of decision making is dependent on this predictive capability. In turn, the fitness of the very long-term predictions, such as the ones posed by nuclear spent fuel, depends on the inclusiveness, representativeness, and explanatory power of simulation models derived from sound empirical information. Gaps in knowledge and uncertainties should be eliminated wherever possible. Decision making, on the other hand, like that under NEPA, should be based on best practicable methodology, i.e., environmental risk analysis. The extent of uncertainty that can be tolerated in risk assessment for disposing of spent nuclear fuel and that is unlikely to be resolved must be made clear in the Navy's final EIS (**cf. *The Environmental Professional* 15: 1-160, 1993** and ***The Environmental Professional* 18: 1-235, 1996**).

The steps in such a risk-based approach are for the Navy to (a) define the end point conditions that must be protected, (b) characterize the long-term environment that might exist, and (c) assess the full spectrum of environmental hazards that could result from spent nuclear fuel to the long-term health of future generations and their environment. The extensive uncertainty that presently exists in all three steps can be reduced only by empirical scientific studies. Any effort to resolve the uncertainties by subjective opinion, as is frequently resorted to, will be unsatisfactory.

T 10.3.2 Cumulative Impact Analysis

References should be included in the final EIS regarding the methods used for analyzing cumulative impacts. Otherwise, the analyses will appear not to be empirically based. It is likely in the Navy's routine NEPA compliance process that cumulative impacts (40 CFR 1508.7) typically are ignored or brushed aside with cursory personal opinion that such effects will not occur. In this case, the potential for long-term radiation health impacts from spent nuclear fuel means that the Navy's final EIS must address cumulative effects supported at least by generic or programmatic scientific data and analysis.

U 10.3.3 Human Health Risks and Safety Impacts Study

The Navy's final EIS should include a detailed appendix that provides the approach used for estimating human health consequences, both near term and long term. The risk assessment process should follow identified contaminants from the point of origin along various pathways to humans. Transport mechanisms to humans should include air, water, soil, and food. There is no acknowledgment of the fact that transport of nuclear waste contaminants eventually will occur in ecosystems and that understanding the transport mechanisms ultimately must occur. This is a conceptual deficiency that the Navy's final EIS must resolve. The inability of the EIS to address realistic environmental scenarios and contaminant pathways to humans constitutes a significant flaw in the Navy's NEPA compliance process.

Care should be taken in the final EIS to assure that readers comprehend the uncertainty associated with the findings and conclusions that lack logically supported and credible scientific bases. Thus, it is necessary that the final EIS be grounded in sound approaches to environmental health risk assessment and should, for example, be based on methodologies such as:

Kolluru, R., S. Bartell, R. Pitblado, and S. Stricoff. 1996. ***Risk Assessment and Management Handbook for Environmental, Health, and Safety Professionals***, McGraw-Hill, Inc. New York. 641 pp., and

Calabrese, E. and L. Baldwin. 1993. ***Performing Ecological Risk Assessments***. Lewis Publishers, Boca Raton, FL.

V 10.3.4 Succeeding (Future) Generations

The Navy's draft EIS reflects little attention to measures for protecting the environment for future generations where, aside from such concerns as transportation accidents, most of the threat posed by geologic disposal of spent nuclear fuel lies. Long-term cumulative impacts to the environment and therefore to humans pose a serious threat and are a "truly significant" issue that the Navy's NEPA compliance process must address. The undeniable knowledge that such consequences will someday materialize poses a conflict with NEPA's mandate that each generation be a trustee of the environment for succeeding generations. The Navy must confront this issue and set forth the means for resolving it in the final EIS.

W 10.3.5 Truly Significant, Reasonably Foreseeable Long-Term Impacts

With respect to NEPA, potential adverse environmental and health consequences are associated with the "truly significant" issue (40 CFR 1500.1) of "reasonably foreseeable" long-term (10^6 years) impacts (40 CFR 1502.22) of nuclear waste canisters and the Navy spent nuclear fuel. This concern arises regarding environmental resources like groundwater for future generations. Thus, in keeping with NEPA's mandate for creating environmental and ecological knowledge, the Navy is challenged to show how environmental analysis and assessment procedures can address such concerns as long-term repository performance. The information needed to meet the challenge of scientific integrity (40 CFR 1502.24) and to assess significance (40 CFR 1508.27) will have to be empirical, quantitative, and available within the period to be allocated for comprehensive, integrated environmental impact assessment for nuclear waste disposal that includes the Navy spent nuclear fuel. The challenge cannot be met with the traditional application of subjective expert judgement to environmental impact assessment in cases of unavailable information (40 CFR 1508.22). Plans for resolving this issue in a manner that withstands independent expert peer review should be presented in the final EIS.

X 10.4 Post-project Monitoring

The Navy spent nuclear fuel program must demonstrate how environmental monitoring meant to detect significant adverse impacts will be performed. Monitoring must be initiated in sufficient time for a pre-disturbance baseline of data to be established for comparison with post-project monitoring data. Thus, the final EIS should describe how environmental monitoring will provide the opportunity to address long-term issues of nuclear waste repository performance. Additionally, the document should explain how the environmental simulation modeling necessary for predicting long-term impacts will be carried out.

Y 10.5 Policy and Guidance for NEPA and Regulatory Compliance

The final EIS must list and discuss the policies and guidance followed to achieve NEPA compliance. For compliance with routine media-based environmental regulatory requirements, a statement in the EIS that the proposed action would be in compliance with applicable regulations and DOE Orders will not substitute for a presentation of impacts regarding the materials and the environmental media involved. In this respect, the whole is greater than the sum of the parts with respect to how ecosystem-based environmental assessment should be conducted. Thus, credible and responsible NEPA compliance requires a holistic approach whereas media-based environmental regulations address only restricted components of the environment.

Z 11.0 Relationship Between the Navy Activities and Other Related Activities/Commitments

The draft EIS relies heavily on the agreement between DOE, the Navy, and the State of Idaho in establishing the planning framework upon which the EIS is based. The final EIS must address the potential conflicts between DOE's agreement with Idaho and its agreements with utility companies regarding waste acceptance. If DOE's utility agreements take precedent, the Navy could be required to store SNF and SCW at INEL for a much longer period, and this, in turn, could have implications for a preferred alternative (i.e., the suitability of the canister system as a longer term on-site storage system).

Since DOE is a cooperating agency in the development of the Navy EIS, and since the decision made via the Navy EIS process will impact waste disposal or storage at Yucca Mountain (if that program goes forward), the final EIS should discuss how the Navy's EIS can be "tiered" to DOE's Yucca Mountain EIS so that the impacts of Naval reactor spent fuel on Yucca Mountain can be integrated and assessed.

A A 12.0 Special Case Waste (SCW)

The NEPA compliance strategy for the management and disposition of both Navy and non-Navy Special Case Waste should be discussed or otherwise clarified in the Navy's final EIS. While officials in Nevada are aware that DOE-generated SCW has been disposed of at the Nevada Test Site and that similar wastes classified as Greater-Than-Class-C (GTCC) are being stored at the Idaho Engineering Laboratory, DOE has never conducted either a programmatic or a site-specific NEPA analysis for the management and disposition of these waste types.

This is significant, since DOE has indicated that it will initiate a programmatic analysis at the weapons complex level that will focus on alternative storage and disposition strategies for DOE-generated SCW as well as commercial waste classified as GTCC. Nevada officials understand that alternatives for storage and disposal of DOE's SCW, along with GTCC waste, will be evaluated in a forthcoming Supplemental Environmental Impact Statement tiered from DOE's Waste Management Programmatic EIS.[9] If this, indeed, is the case, DOE has appropriately committed to a program evaluation for the management and disposition of these wastes, and by doing so, the agency will be in compliance with requisite Council of Environmental Quality and DOE Departmental NEPA implementing regulations.[10]

As the Navy is aware, SCW is not currently authorized for disposal in a federal repository. Therefore, conducting an analysis which proposes transporting Navy-generated SCW to Yucca Mountain for either interim storage or disposal is contrary to the spirit and intent of the National Environmental Policy Act, even if such an analysis is "strictly for purposes of evaluation." In fact, there is no need to conduct this analysis in advance of a forthcoming programmatic NEPA evaluation, and by doing so, the Navy could prejudice pending decisions or

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[9] See Notice of Inquiry: Strategy for Management and Disposal of Greater-Than-Class-C Low-Level Radioactive Waste, Federal Register Notice, Vol. 60, No. 48, Monday, March 13, 1995; and DOE Draft Waste Management PEIS [DOE/EIS0200d] Volume I. Page 1-16 and 1-17.

[10] 10 CFR 1020.330 and 40 CFR 1508.18(b)(3)

otherwise predetermine subsequent developments which could limit future alternative considerations for the disposition of this waste.[11]

With regard to storage of Navy-generated SCW, State officials believe the EIS should not only evaluate a long-term dry storage system (e.g., MPC), but also a co-located storage program for both Navy-generated SCW and DOE-managed GTCC waste at INEL. This is important since INEL is now charged with management responsibilities for commercially-generated GTCC waste.[12] Accordingly, the Navy should insist that DOE conduct a supplemental analysis of the Idaho Programmatic EIS (DOE/EIS-0203-F) to address co-location and storage of these waste types at a single facility, pending a final disposition strategy. After all, these wastes types are the federal government's responsibility[13] and, because of their similarities[14], they should be managed accordingly.

A B 13.0 Off-Site Generated Radioactive Wastes

A review of the existing public land orders that established the NTS clearly show that the site was not established to serve as a waste disposal facility for off-site generated radioactive wastes. In fact, the State's long standing position is that "the only action appropriately described as no action [e.g., currently permitted activities] at the NTS includes only national defense and nuclear weapons testing activities defined under the public land orders as consented to by the State of Nevada for the NTS withdrawal."[15] Accordingly, any proposed action in a NEPA document developed by a federal agency that is in conflict with the stated purposes and

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[11] 40 CFR 1506.1(a); 1506.1©

[12] See U.S. Department of Energy, Record of Decision. Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs, May 30, 1995, Section 3.2.2.5.

[13] Atomic Energy Act (PL 83-703), and the Low-Level Radioactive Waste Policy Amendments Act of 1985 (PL 99-240)

[14] Generally speaking, both GTCC waste and SCW are long-lived and contain significant concentrations of radionuclides. They represent a significant threat to human health and the environment and have been determined to be unsuitable for shallow land burial.. As such, these wastes like the Navy's non-fuel bearing zirconium metal structures (SCW) must be isolated from the biosphere for thousands of years.

[15] Nevada Department of Administration, May 3, 1996. State of Nevada Comments on The Department of Energy's Draft Environmental Impact Statement for the Nevada Test Site and Off-Site Locations Comment Summary.

limitation of the NTS withdrawal must address the "environmental consequences" of such conflicts.[16]

[16] See 40 CFR 1502.16(c)

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
Nuclear Waste Project Office, Nevada

Response to Comments:

A. **Cover Letter**

The commenter expresses the position that the EIS should be limited to the selection of a container system to meet the exclusive need for on-site transportation and interim storage of naval fuel at the Idaho National Engineering Laboratory.

The proposed action of this EIS does not entail actual shipment to a repository or a centralized interim storage site. Rather such a shipment to a notional repository or centralized interim storage site is evaluated to help distinguish among the six container alternatives. As stated in the EIS, the proposed action is the selection of a container system for the management of post-examination naval spent nuclear fuel and Navy-generated special case waste. The proposed action also includes:

- Manufacturing the container system.
- Loading, handling and storage of the container system at Idaho National Engineering Laboratory.
- Modifications to the Expended Core Facility and the Idaho Chemical Processing Plant at Idaho National Engineering Laboratory to support loading the containers at Idaho National Engineering Laboratory.
- Selection of the location of the dry storage area at Idaho National Engineering Laboratory.
- Evaluating the impacts of transporting the container system to a representative or notional interim storage facility or repository and unloading the container system at that hypothetical location.

In evaluating alternatives for such a system, it is incumbent upon the Navy under the National Environmental Policy Act to evaluate how the system affects ultimate transport to an interim storage facility or repository, since such action is reasonably foreseeable. Including the impacts of transporting the container system to, and unloading at, a representative or notional interim storage facility or repository ensures that the container system selected is compatible with these operations at the facilities to the extent they are understood at this time. The location of the facilities is not known at this time and waste acceptance criteria have not yet been established. The site for a geologic repository or centralized interim storage facility is neither a decision which the Navy will make nor a matter covered under this EIS. Likewise, the routes for transporting loaded containers to that specific location are not selected by the Navy. For the former, further National Environmental Policy Act evaluation will be needed in site-specific environmental documentation for an interim storage facility or repository when the specific location is established. A possible location (Yucca Mountain) has been included in this EIS only for transportation analysis purposes, since it is the only location identified for characterization in the Nuclear Waste Policy Act. Routes to Yucca Mountain, as examples, were chosen with different distances and through areas having different population densities to identify whether different routes or different population densities would have a significant impact on the container system selection. They did not. Since the impacts of transporting to and unloading at this representative or notional location are shown to be small, and little difference exists among the alternate containers evaluated, this enables the Navy to select a container system now, taking these factors into account in the most reasonable and appropriate fashion.

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
Nuclear Waste Project Office, Nevada

B. **1.0 Preferred Action Alternative**

The commenter observed that the Draft EIS does not contain a preferred alternative. He is correct. However, National Environmental Policy Act regulations (40 CFR 1502.14(e)) only state that the Draft EIS should include a preferred alternative if one exists. None is identified since the Navy did not have a preferred alternative at the time the Draft EIS was issued. The regulations further require that a preferred alternative be included in the Final EIS; one is identified in Chapter 3, Section 3.9 of the Final EIS.

The Draft EIS contains six alternate container systems. Each of the six systems has been evaluated for loading at Idaho National Engineering Laboratory, dry storage at Idaho National Engineering Laboratory, loading for shipment, and shipment outside the state of Idaho to a representative or notional repository and unloading at that hypothetical location consistent with the proposed action as it is described in Chapter 1. The systems have some similarities, but many differences.

All six of the container systems are practical for use in managing naval spent nuclear fuel and special case waste. The differences in environmental impacts among the six systems are small.

The commenter stated that the EIS is not adequate to support decisions regarding off-site transportation and waste disposal. This EIS is not intended to make decisions regarding off-site transportation or waste disposal. Thus this comment is beyond the scope of this EIS. Evaluation of the impacts of off-site transportation and unloading at a representative or notional interim storage facility or repository are included only to determine if off-site transportation or unloading operations could significantly affect the selection of the container system. In view of the small magnitude of the impacts and the small differences among the alternatives due to off-site transportation and unloading, the EIS adequately supports a decision regarding the selection of a container system.

Until an interim storage facility or repository is identified, the container system selected will be used only on-site at Idaho National Engineering Laboratory. However, the National Environmental Policy Act requires that the EIS estimate whether impacts from other operations, which are not yet ripe for decision, but are reasonably foreseeable, may significantly influence the selection of a container system. Before the container system would actually be used for off-site transportation to, and unloading at, an interim storage facility or repository, the location of these facilities must be identified and appropriate environmental documentation completed as discussed in the Executive Summary, Section S.1 of the EIS. This documentation would include transportation to these facilities and unloading and management of container systems at these facilities.

It is desirable, but not essential, that canister designs, such as a multi-purpose canister, be put into disposal "overpacks" when they arrive at the repository without needing to unload the contents. When an overpack is used, the combination of the overpack, the canister and the waste package contents then would be required to meet the repository requirements. Alternately, the contents of the canister may be unloaded at the repository and the contents placed into a disposal container. Both operations were evaluated in the EIS to see if there are any significant differences that may affect the selection of the container system. No significant differences were identified. Thus, there is no need to delay selection of the container system pending further information on the interim storage site or repository location, and indeed such a delay is unacceptable owing to the Navy's obligations under the court-ordered Idaho agreement to proceed with dry containerization and storage of naval spent nuclear fuel.

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
Nuclear Waste Project Office, Nevada

C. **2.0 Public Participation**

The commenter claimed that since no public hearings were held in Nevada, the Navy's public involvement/participation process for the EIS was not adequate to provide opportunities for public involvement in Nevada and in states/communities along the referenced shipping routes.

The public involvement/participation process for this EIS meets applicable requirements. Over 1,600 copies of the Draft EIS and EIS Executive Summary were mailed to interested members of the public as well as federal, state, tribal, and local agencies. The Draft EIS was placed in 43 public reading rooms and libraries spread throughout the western states and numerous advertisements were placed in local newspapers announcing the availability of the Draft EIS for public review and comment. In addition, six public hearings were held at three locations (Boise, Idaho Falls area, and Salt Lake City) in Idaho and Utah. The locations selected covered those regions where naval spent nuclear fuel will be loaded and stored, and a large urban area along a possible transportation route. These locations are consistent with the proposed action covered in the Container System EIS. The EIS does not lead to selection of a centralized interim storage site or a site for ultimate disposal of spent fuel, since those matters are under the cognizance of the Department of Energy. The EIS does analyze shipment to Yucca Mountain, but for analytical purposes of comparing alternate container systems only, recognizing that location as the only one authorized under the Nuclear Waste Policy Act for evaluation as a potential repository. The analysis does not presume, however, that Yucca Mountain will be found suitable as a repository.

The actual routes to be used for shipment of naval spent nuclear fuel to a repository will be evaluated along with other routes to be used for a geologic repository or centralized interim storage facility in the site specific EIS for such a facility. The evaluation of the environmental impacts due to transportation of naval spent nuclear fuel in this EIS was performed in part to determine whether or not there were any differences among the six container system alternatives. In order to perform the analysis, a notional destination had to be selected. In addition, three routes were evaluated to identify a range of potential impacts to see if that would produce differences among the alternate container systems. As the summary in Chapter 7, Section 7.3 states, the environmental impacts are very small in each case and the differences among the container system alternatives are negligible. The analysis suggests that a similar conclusion would be reached for any destination located away from populated areas. The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses.

D. **3.0 Overall Level of Information**

The level of information in the Container System EIS is sufficient; a classified appendix is not necessary. Although the detailed design of Navy fuel is classified, the EIS contains significant information concerning its performance characteristics and the contents of the loaded container systems such that the environmental impacts from its shipment, storage, and management can be assessed and independent analyses can be performed to verify the results presented in this EIS. Chapter 2, Section 2.3 of the EIS presents the general characteristics of naval nuclear fuel, including design description, U-235 enrichment range, the amount of U-235 in a loaded container, criticality control measures, and the results of decay heat calculations. Appendices A and B contain detailed numerical data on the source terms and on corrosion product and fission product releases expected for each container system for each hypothetical accident scenario analyzed. The Appendices also identify the computer programs which were used, along with the specific assumptions for each accident scenario.

For example, Appendix B, Table B.8 provides a list of the radioactive nuclides which might be released in a shipping accident involving naval spent nuclear fuel. The data on the amount of radioactivity are divided into the amounts released from the fission products in the fuel and the amount in the activated corrosion products attached to the surface of the fuel. The data are provided for typical spent fuel in nuclear-powered submarine and surface ship fuel assemblies to demonstrate the range of radioactivity. Using the information in this table, along with the other detailed information on the calculations provided in Appendix B, allows independent reviewers to evaluate the adequacy of the calculation of impacts of a hypothetical accident on human health and the environment. It also permits an independent reviewer to perform analyses using alternate methods, such as other computer programs, or utilizing other conditions, such as different weather or accident conditions. The information in Appendix A, including the amount of radioactivity released and the fraction of the total activity in naval spent nuclear fuel it represents, is provided in similar detail to permit independent analyses for normal and accident conditions.

The Navy has provided in this EIS, and in documents referenced in the EIS, a substantial amount of information on the handling, storage, and shipment of naval spent nuclear fuel and the types and amounts of radiation or radioactive material involved in releases from normal operations and postulated accidents in this EIS. The Navy has attempted to provide enough information on radiation, radioactivity, and other aspects of operations or hypothetical accidents to allow independent calculation and verification of all estimates of environmental impacts.

E. **4.0 Worse Case Accidents**

Accident analyses performed for this EIS meet applicable requirements. Appendices A and B, Section A.2.5 and Sections B.5 and B.6 provide detailed descriptions of analysis for the most severe reasonably foreseeable accidents which might occur during handling, storage or shipment of naval spent nuclear fuel. The analyses described in this EIS include the risks and impacts from low probability events. Accidents with a probability of occurring greater than 10^{-7} per year, i.e., with a chance of one in ten million per year, are described and analyzed in Appendices A and B and the results are included in the discussions in the Executive Summary and Chapters 5, 6, and 7. Section A.2.2, Screening/Selection of Accidents for Detailed Examination, and the discussion on Categorization of Accidents (in Section A.2.3) present the details of the approach taken for facility accidents. Accidents which are less likely than 10^{-7} per year are considered to be incredible (i.e. not reasonably foreseeable) and typically are not discussed since they are not expected to contribute in any substantial way to the risk. This is consistent with guidance developed by other federal agencies, including the DOE, for facility accident analysis.

Detailed descriptions and tabulations of the amount of radioactivity which might be released by hypothetical accidents are provided in Appendices A and B. The data in these Appendices provide numerical values for the sources of radiation and radioactivity which allow an independent calculation of the effects on human health and the environment using the same or different conditions.

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
Nuclear Waste Project Office, Nevada

Sections A.2.7 and B.3.4 state that an analysis of uncertainties concludes that the estimates of risk provided in the EIS are unlikely to be exceeded during either normal operations or in the event of an accident. The models used have attempted to provide estimates of the probabilities, source terms, pathways for dispersion and exposure, and the effects on human health and the environment which are as accurate as possible. However, in many cases, the Navy has used models or values for input which produce estimates of consequences and risks which are higher than would actually occur because of the desire to provide results which will not be exceeded. In summary, the risks presented in this EIS are believed to be at least 10 to 100 times larger than would actually occur.

The use of conservative analyses does not bias the analysis in the EIS since all of the alternatives have been evaluated using the same methods and data, allowing a fair comparison of all of the alternatives on the same basis. Furthermore, even using these conservative analytical methods, the risks for all of the alternatives are very small.

F. **5.0 Overall Transportation Analysis**

A range of routes to a repository or centralized interim storage site is used for the transportation analysis in order to determine whether different routing characteristics, such as distance or differences in population distribution, would affect the comparison of the alternative container types. Since no repository or centralized interim storage site has yet been selected, the transportation routing in this EIS uses a site being evaluated by the Department of Energy pursuant to the Nuclear Waste Policy Act as the destination point for naval spent nuclear fuel shipments.

The Navy recognizes that the legal and regulatory climate is changing on nuclear waste transportation matters and is keeping abreast of the requirements. From the historical perspective, naval spent nuclear fuel has been shipped safely by rail for almost 40 years (over 660 container shipments) without release of radioactivity to the environment. Federal, state and local regulations have been fully met in the past. This EIS addresses issues in the light of the existing laws and regulations and the best information available on the future conditions. The Navy's shipment history demonstrates that the Navy is committed to ensuring the safety of spent nuclear fuel transportation. This commitment to safety will continue in the future as the new laws and regulations affecting transportation of spent nuclear fuel and high-level radioactive waste are implemented. For the sake of comparing a reasonable range of alternatives the current regulations have been applied conservatively in the EIS transportation analysis.

Specific transportation routes have not been evaluated for shipment of naval spent nuclear fuel to a repository or centralized interim storage site because that will be the subject of the site-specific EIS for the particular facility. Transportation of naval spent nuclear fuel to a repository or centralized interim storage site will be addressed in the repository EIS analysis. The Navy will participate and contribute to that EIS, as appropriate. This participation will include, at a minimum, the contribution of naval spent nuclear fuel to the cumulative impact for all of the spent nuclear fuel shipments to the designated repository.

Additional discussion to clarify these points has been added to the EIS in Chapter 7, Section 7.1 and Appendix B, Section B.1.

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
Nuclear Waste Project Office, Nevada

5.1 Background Information on the Current and Projected Inventory of Naval Spent Nuclear Fuel

The information in Appendix B provides the details of the transportation analysis used in this EIS including the analytical codes (Section B.3) and the input parameters (Section B.5) used to estimate the impacts presented in the document. Appendix B provides enough information on the sources of radioactivity, including data for each radioactive nuclide, to permit an independent reviewer to perform analyses of the impacts of normal operations and hypothetical accidents for a wide range of conditions similar to or differing from those analyzed.

Information provided in the EIS enables the reader to determine that the average amount of naval spent nuclear fuel in each container shipped from the Idaho National Engineering Laboratory to a repository over the period covered by the EIS will be:

Alternate	# of Containers	MTHM per Container
Multi-Purpose Canister	300	0.22
No-Action	425	0.15
Current Technology/Rail	325	0.20
Transportable Storage Cask	325	0.20
Dual-Purpose Canister	300	0.22
Multi-Purpose Canister	500	0.13

This table has been added to the EIS (Chapter 7, Section 7.3) to facilitate reader understanding.

A typical detailed shipping schedule by year is presented in Appendix B, Table B.4 of the EIS.

The above quantities of metric tons of heavy metal (MTHM) per container are consistent with the total amount (65 MTHM) expected to be in existence by 2035 documented in the *Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory Environmental Restoration and Waste Management EIS* (DOE 1995). It can be determined in DOE 1995 that each shipping container being transported from shipyards to the Idaho National Engineering Laboratory on the average contains 0.11 MTHM of naval spent nuclear fuel. The increased amount in each container being shipped from the Idaho National Engineering Laboratory takes into account the fact that excess non-fuel structural material is removed from each fuel assembly during the examination process at the Idaho National Engineering Laboratory, thus, making more space available in the containers.

Additional specific information in the EIS on MTHM is provided in Chapter 1, Section 1.0 of the EIS. Characteristics of naval spent nuclear fuel are described in Chapter 2, Section 2.3, and the planned reductions in the number of nuclear-powered naval vessels is described in Section 2.7, along with a graph provided as Figure 2.4. Appendix B, Table B.1 provides relative container capacities for the cargo and Table B.2 shows the number of shipping containers for each alternative.

G. **5.2 Heavy-Haul Truck Transportation**

The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses. Comparison of heavy-haul transportation routes is pertinent to this EIS to the extent that it helps to discriminate among the alternatives considered.

All of the alternative container systems would be suitable for heavy-haul transportation, as illustrated by prior use of the M-140 containers in heavy-haul transport. However, it is accurate to state that the M-140 based alternatives would be less suitable due to size, height, and weight. This statement has been added to Chapter 3, Section 3.2 of the EIS.

The Navy is aware that no rail link to the Yucca Mountain site currently exists, and that if it were to become the site of a repository or centralized interim storage facility, heavy-haul transport might be used in place of a rail connection. However, the resolution of that issue will depend on the site eventually selected and the evaluation of the environmental impacts and other factors specific to that site. The routes, distances, and potentially affected populations would be the same for all of the alternative container systems considered for naval spent fuel because the shipments will use the same route--the route selected for shipment of commercial spent nuclear fuel and high-level radiological waste to the repository or centralized interim storage site. Similarly, all container systems considered would have the same design dose rate, a maximum of 10 millirem per hour at 2 meters, as required by the Department of Transportation regulations (49 CFR 100 et seq.). Therefore, the key difference in the alternatives for the purposes of comparing the impacts associated with heavy-haul transport for naval spent nuclear fuel using the alternative container systems is the number of shipments. Text which explains this matter has been added to Appendix B, Section B.4.

The radiological risks of shipping naval spent nuclear fuel have been conservatively analyzed in this EIS and are described in Appendix B, Section B.5.1. The analyses use a train speed of 15 miles per hour. This is slower than the actual expected average transport speed. Using the slower train speeds is more conservative because that results in higher calculated radiation exposure to the public (trains spend more time proximate to the public). This conservatively slow train speed means that the exposure associated with the transport speeds for possible heavy-haul transport would be similar to the results for rail shipments of the same length over similar routes (e.g., Caliente to Yucca Mountain).

It is unlikely that passengers in recreational vehicles and buses (elevated vehicles) traveling in the vicinity of an oversized load on a heavy-haul transport vehicle would be as close as the 2 meter distance of the regulatory package maximum external exposure of 10 millirem per hour. First, the length of the tractor and the overlap of the trailer on the sides and at the rear would prevent any vehicle approaching as close as 2 meters (about 6.5 feet) to the exterior surface of the container. Second, the routine safety precautions for shipping would involve at least one escort vehicle accompanying the tractor-trailer rig due to its size and speed per Nevada transportation regulations. The escort vehicle would add several meters to the distance from the spent nuclear fuel shipping cask. In the EIS a maximally exposed individual for shipments has been described in Appendix B, Section B.3.1, and the results in Table B.10 are evidence of small impact for such a person.

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Containers used for legal-weight truck transfer would also be designed to produce a maximum exposure rate of 10 millirem per hour at 2 meters in accordance with the DOT regulations and their use would present the same opportunity for the elevated vehicles to be in traffic with them as would occur for heavy-haul transport. Further, many more legal-weight truck shipments would be required to move all spent fuel. Text has been added to Chapter 3, Section 3.7 which summarizes the evaluation of legal-weight truck use.

The range of accidents analyzed in the EIS Appendix B, Section B.5.2 would bound the impacts from a hypothetical heavy-haul transportation accident at an intersection in Las Vegas, such as at the intersection of I-15 and U.S. Route 95 on a week day during rush hour. Such an event would be expected to produce impacts which would be within the scope of the accidents analyzed in Section B.5.2, using an urban population density of 3,861 people per square kilometer. These severe hypothetical accidents have also been analyzed for the rural population density of six people per square kilometer and would produce estimates of effects similar to those which might result from the scenario postulating an accident at the intersection of Nevada State Routes 375 and 318 at Crystal Springs.

Text has been added to Chapter 7, Section 7.3.3 and to Appendix B, Section B.5.2 to specifically cover these points.

5.3 No section was provided by the State of Nevada.

H. **5.4 Reliance upon the Modal Study**

Sections B.4 through B.5 of Appendix B describe the use of two separate analytical approaches to evaluate the impacts to human health and the environment associated with transportation of naval spent nuclear fuel, a probabilistic assessment of risks based on methodology described in *Shipping Container Response to Severe Highway and Railway Accident Conditions* (NRC 1987--the Modal Study) and a deterministic estimate of maximum consequences of a transportation accident. The commenter's assertions focus only on the probabilistic approach to estimating risks and the commenter makes no criticism of the deterministic estimates of the maximum consequences used as an alternate method for assessing the impacts that might result from an accident. Estimates of impacts were derived using two independent methodologies and presented in the EIS intentionally to avoid relying solely on a single method to compare impacts among alternatives.

The Navy included in the Draft EIS a deterministic analysis of a transportation accident which would result from very severe damage to a shipping container, even though the Modal Study utilized by the probabilistic approach predicts such an accident would happen in less than one out of more than ten million accidents. This accident is identified as the “Maximum Consequences Accident” and is described in Section B.3.2. This analysis postulates that a shipping container transporting naval spent nuclear fuel might be breached so that it could leak radioactive material to the environment and that the fuel inside might have been damaged enough to release fission products.

The detailed results of the analysis of this maximum consequences accident are presented in Table B.13. This table shows the human health impacts which might occur if the event were to occur in a rural, urban, or suburban area. This accident analysis is conservative in that it would produce impacts unlikely to be exceeded by the most severe accident that might reasonably be foreseen during shipping.

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Text has been added to Section B.3.2 of the EIS to explain more fully that the Navy has used both a probabilistic and deterministic approach to analysis of transportation accidents for the comparison of alternatives and has not placed sole reliance on the study criticized by the commenter. Text has also been added to Chapter 7, Section 7.3.3 to direct the attention of the reader to this assessment and the dual approach.

The assertion by the commenter that the EIS relies excessively on the Modal Study is not correct. The analyses presented in this EIS use the Modal Study in only one portion of the development of the probabilistic estimate of the risks associated with accidents which might occur during shipment of naval spent nuclear fuel. Other key data required to perform the assessment were developed from the best available information. The estimate of risk is based on potential routes through representative population areas over a range of distances (see Section B.4). The national average probabilities of accidents are used (see Section B.3.2). The population densities and the fraction of each route in rural, urban, and suburban areas were input to the analysis (see Section B.3.2). Pasquill D and F meteorological conditions were used to represent the 50 percent and 95 percent conditions, as shown to be appropriate by the National Oceanic and Atmospheric Administration. The amounts of radioactive material which might be released for accidents of specified severity were determined specifically for naval spent nuclear fuel, using the characteristics of naval fuel and the amounts of fission and activated corrosion products present in both typical submarine and surface ship fuel (see Section B.5.2 and Table B.8).

The Modal Study was used to provide only one parameter in the equation in Section B.3.2 used to estimate accident risk: the probability that, if an accident were to occur, the severity of the accident might exceed a given level. That is, the Modal Study was used only for the purpose of estimating that if an accident were to occur what the probability might be that the temperatures and strains produced by the accident would exceed certain levels. The accident risk calculations were performed especially for naval spent nuclear fuel using the widely accepted RADTRAN and RISKIND computer programs.

The Modal Study offers the best available data for estimating the probability that a given level of severity might be exceeded if an accident occurs during shipping. The commenter does not suggest a better source for such data. The Modal Study has become the standard source for estimating such probabilities in probabilistic analyses of risks for shipping spent nuclear fuel and radioactive waste, as documented in 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), the *Environmental Impact Statement on a Proposed Nuclear Weapons Non-Proliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel* (DOE/EIS-0218-F), and in the *Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel* (DOE/EA-0912).

Reassessment of a shipping cask using more detailed structural and thermal analyses was performed subsequent to the original Modal Study, and the results were comparable to the original results. This reassessment is discussed in the Packaging and Transportation of Radioactive Materials (PATRAM ‘95) conference abstract entitled “Transportation Accident Response of a High-Capacity Spent Fuel Truck Cask” (W. O’Connell, LLNL; E. McGuinn, B&W Fuel Co.; W. Lake, Department of Energy).

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Some observations are merited relative to the comments concerning the application of the Modal Study in the analyses in this EIS. First, the analysis in this EIS used the specific fuel characteristics of naval spent nuclear fuel and did not rely upon the characteristics or response of the spent fuel examined in the Modal Study. Therefore, the commenter's criticisms of the Modal Study relative to the characteristics and response of spent fuel and differences between the characteristics and response of naval and commercial spent nuclear fuel do not apply.

Second, the commenter states that the Modal Study failed to consider the range of real world scenarios. The report referenced by the commenter uses the omission of criticality and immersion in water as one basis for the contention that the full range of scenarios was not evaluated (see page 24 of the report). The naval spent nuclear fuel to be shipped to a repository or centralized interim storage facility will include neutron absorbers mechanically fixed in the fuel assemblies in such a manner that they could not be dislodged in an accident, eliminating the chance of criticality, even if the container or the fuel were completely or partially immersed in water. Immersion in water would extinguish any fire and increase heat capacity, ameliorating and reducing the effects of a hypothetical accident and causing it to be less severe. Therefore, this contention in the report referenced by the commenter does not apply.

Third, the report referenced by the commenter also cites as another reason for contending that the full range of scenarios was not evaluated the fact that tests of containers for the Modal Study used the conditions specified in federal regulations (10 CFR 71) (see pages 24 and 25 of the report). The report admits that the tests specified in 10 CFR 71 were designed to represent the worst conditions that could prevail in almost any accident and that impacts with any real objects, such as bridge abutments, would absorb some impact energy and that such collisions are less limiting than those with the unyielding surface used in the impact testing required by 10 CFR 71. Thus, the arguments concerning the range of scenarios advanced in the report seem to rest on the contradictory contentions that the Modal Study scenarios included only accident conditions which are more severe than would be expected to actually prevail but the requirements of 10 CFR 71, which specify these tests, might somehow fail to include real world conditions which might be more demanding.

Finally, the commenter criticizes the Modal Study for failing to incorporate the design features of current generation shipping containers, such as the method of securing the container closure and the use of solid neutron shielding in place of water (see pages 17 and 18 of the report). The EIS evaluates six broad categories of container systems, some of which are still in development. For example, the accident analysis in this EIS is not restricted to shipping containers using depleted uranium for shielding, as the commenter implies, or lead, as discussed in the report cited by the commenter, but also covers shipping containers covering designs using other shielding materials, such as steel. Systems employing bolted, welded, and other types of closures are included in the alternatives. Further, the container systems currently being developed make use of solid neutron shielding material and provide appropriate heat transfer methods. Thus, the EIS analysis has properly considered a reasonable range of current and planned container system designs.

The preceding observations address the criticisms leveled by the commenter at the validity of the application of the Modal Study to the analyses in this EIS. The facts that the probabilities of transportation accidents are determined from the mileage traveled in each state and the individual accident probability for that state, the consequences are evaluated using the widely accepted RADTRAN and RISKIND computer programs and the characteristics of naval spent nuclear fuel and the population densities for the routes considered, and that maximum consequences accidents are presented independent of any probabilities based on the Modal

Study shows that the EIS does not place sole or excessive reliance on the data criticized by the commenter.

I. **5.5 Consequences of Severe Transportation Accidents**

Appendix B information provides the details of the transportation analysis used in the EIS including the analytical codes (Section B.3) and the input parameters (Section B.5) that determine the results presented in the document. The EIS looks at design basis and beyond design basis accidents to compare the alternative container types and not for the purpose of evaluating specific transportation routes. Low probability events, including those with a probability greater than 10^{-7} per year, i.e., greater than one chance in ten million per year, are included. The EIS provides in Appendix B and in the Department of Energy reference document, (e.g.,the *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* of April 1995), the detailed description of input values used in the RISKIND analysis requested by the commenter. For example, DOE 1995 identifies that the wind speed used for the Pasquill D (normal meteorological conditions) was 4 meters/second, while the wind speed for Pasquill F (stable meteorological conditions) was 1 meter/second. Uncertainties associated with the analysis of impacts of accidents are discussed in Section B.3.4. Appendix B provides in Table B.13 the maximum health consequences of a severe accident in a rural area and in a major urban area. Thus, the Navy considers there is enough information on radiation, radioactivity, and other aspects of operations or hypothetical accidents to allow independent calculation and verification of all estimates of environmental impacts.

Chapter 5, Section 5.9 of the EIS provides an analysis of the possible effects other than on human health for hypothetical accidents which might result in a release of radioactivity from containers of naval spent nuclear fuel at the Idaho National Engineering Laboratory. The analysis shows that for the most severe accidents, an area of less than 630 acres extending about 2.2 miles downwind might be contaminated to the point that exposures could exceed 100 millirem per year. This maximum affected area and associated impacts would likely bound the impacts that would result from the most severe transportation accident. The analysis in Section 5.9 discussed impacts such as preventing people from going to their jobs, short-term limits on access, land use and the local ecology.

Since the actual environmental impacts associated with all of the alternative container systems considered in the EIS would be small, there is no reason to believe that shipment of naval spent nuclear fuel at any of the locations evaluated would have any significant effect on tourism, an observation supported by almost 40 years of naval spent nuclear fuel management and shipments including populated areas around naval and private shipyards in Hawaii, California, Washington, Virginia, South Carolina, Connecticut, Maine, and New Hampshire. Even the impacts of hypothetical accidents are limited in extent and small enough that there should be no long-term impacts.

The possible environmental impacts of hypothetical accidents during shipment of naval spent nuclear fuel are very similar for all of the container systems evaluated and no single alternative shows a markedly better or poorer performance than the others. Therefore, the effects of the analysis suggested by the commenter would not provide a basis for selecting one system over the others. A discussion of the impacts other than on human health for transportation accidents has been added to Chapter 7 of the EIS in order to make it easier for the reader to evaluate impacts of the nature outlined by the commenter.

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J. **5.6 Use of Dedicated Trains**

The shipment of naval spent nuclear fuel containers in general commerce, i.e., as part of freight trains carrying other cargo to many destinations has proven to be acceptable and practical in almost 40 years of experience, during which over 660 container shipments of naval spent nuclear fuel have been done safely. This practice is not especially complex and has been proven not to increase the difficulty or hazards of point-of-entry inspections for railroad or other personnel. It has not contributed to any derailments and the railroads have provided clearance for the shipments and associated railcars, frequently being involved in the design process for the systems. The shipping containers are designed to meet the requirements for shipping in general commerce, including withstanding high temperature fires. Safety precautions, such as using buffer cars, have worked well over time.

Although future spent nuclear fuel shipping practices for transportation to a repository or centralized interim storage site have not been defined, the Navy will ensure that applicable regulatory requirements will be fully met as they have been in the past. The transportation analyses performed in this EIS are conservative and are based on the best data available to determine current and future impacts to human health and the environment.

The issue of whether dedicated trains will be used to ship naval spent nuclear fuel to a geologic repository or a centralized interim storage facility has not been decided and does not affect the analyses in the EIS since conservative assumptions were made concerning transport speed and other factors. The safety and practicality of making the shipments in general commerce have been established. The number of containers of naval spent nuclear fuel is the same for any of the alternative systems considered and this is the primary factor in determining the environmental impacts associated with the decision supported by this EIS. Therefore, the analyses in Chapter 7 and Appendix B sufficiently evaluate the alternative containers.

K. **5.7 Consequences of a Successful Terrorist Attack**

The consequences of naval spent nuclear fuel storage facilities being struck by projectiles from weapons were specifically considered in the Department of Energy *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* of April 1995, Appendix D to Volume 1. Attacks using anti-tank weapons or other specialized weapons, as well as conventional explosives, were evaluated. This evaluation was performed as part of the analysis of possible terrorist or military attack. The effects of such an attack were shown to be less than the limiting accidents analyzed in the EIS, specifically the crash of a large jet or an earthquake (Appendix D, Attachment F, Section F.1.2).

The reasons that the effects of a projectile from an anti-tank weapon striking one of the storage containers would be less severe than the accidents analyzed are: (a) anti-tank weapons would be likely to cause a self-sealing penetration in the metal of a container, unlike that which is assumed from the airplane crash (impact from a 50 inch diameter engine rotor); (b) there is no explosive material inside the container, so it will not "blow up" as a tank would if hit by such a weapon (in an attack on a tank, the ordnance inside the turret detonates from the energy injected into the turret by the anti-tank shell causing the turret to “blow up”); (c) there would be no fire to disperse the radioactivity that is released when the container is breached, unlike an aircraft crash where the jet fuel might pool, ignite, and create such a fire. The rugged design of containers and the thick walls of water pools, combined with the shock-absorbing nature of water with a free surface, reduce the effects of other types of explosive charges.

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The fraction of the total amount of radioactive material in a shipping container of naval spent nuclear fuel which might be released by the severe hypothetical accident is analyzed and described in detail in Appendix B, Section B.5.2. The release of radioactive fission products and the results are comparable to the release described in the extreme test cited in the Nuclear Regulatory Commission report and outlined by the commenter. Therefore, for the events cited by the commenter the conclusion is that the accident analyses in Appendices A and B include events with consequences comparable to the most severe terrorist attack scenarios specified by the commenter.

The number of fatalities estimated would be lower for naval spent nuclear fuel than for the commercial spent nuclear fuel in the event of a terrorist attack with explosives or similar weapons because of the design of naval nuclear fuel for use in combat. This design places a high premium on surviving explosions and kinetic shock and produces fuel that is much stronger than commercial nuclear fuel assemblies (e.g. naval fuel can withstand shock loads well in excess of 50 times the force of gravity). Section B.5.2 and the information in Table B.8 provide a detailed description of the percentages and absolute amounts of naval spent nuclear fuel that might be released in the event of a severe accident, or an extremely severe terrorist attack, similar to the three scenarios identified by the commenter.

Similarly, the population densities and other conditions used in the severe hypothetical accident analyses performed for this EIS encompass the range of severity of the effects of terrorist attack at locations mentioned by the commenter. For example, the population assumed for urban areas is greater than 3326 people per square mile. The analysis results described in Table B.13 of the EIS include impacts on rural areas and urban areas like Las Vegas during rush hour or during a major special event as mentioned by the commenter. Accidents in suburban areas have also been analyzed.

The case of a terrorist attack involving the capture of a cask and its subsequent destruction by the use of high-energy explosive devices is an event which would not be credible (having a probability much lower than the 10^{-7} criterion) for National Environmental Policy Act EIS analyses. However, the consequences of such an event could be estimated by using the information provided in Appendix B, Section B.5.2 and in Table B.13. Since the Table B.13 consequences mostly consist of impacts due to the release of fission products, these results could be multiplied by a factor of 1 to 100 (where 100 represents a full release of contents), depending on the damage assumed in any other type of incredible hypothetical accident scenario. Moreover, to determine the risk of such an event, the probability of the event must then be multiplied by the newly estimated consequences. The probability of the capture attack event would be much less than the 10^{-7} probability used in the EIS maximum consequences analysis because even if this attack would occur it is even more unlikely that it would happen in an urban area (an assumption used in the maximum consequences analysis). The probability would most likely be several orders of magnitude lower; therefore, the risk (probability times consequences) would be less than the risk for the maximum consequences analysis presented in this EIS. As stated in Section B.3.4, Analysis of Uncertainties, the results in Appendix B are believed to be 10 to 100 times larger than what would actually occur. The use of conservative analyses is not an important problem or disadvantage in this EIS since all of the alternatives have been evaluated using the same methods and data, allowing a fair comparison of all of the alternatives on the same basis. Furthermore, even using these conservative analytical methods, the risks for all of the alternatives are small, which greatly reduces the significance of any uncertainty analysis parameters.

The range of analyses performed in Appendix B of this EIS uses assumptions which include: the cask is breached, the contents are damaged and the radioactive materials have been released, and the cask has been damaged with no radiological release. However, the scenario resulting in an undamaged cask has not been described specifically since there is no risk to the public associated with release of radioactive material. The cask design and materials used have been factored into the evaluations described in the EIS and presented in Chapter 7 and Appendix B.

In summary, the terrorist attack scenarios described by the commenter fall within the bounded range of accident analyses performed for this EIS and appropriate text has been added to Chapter 7 and Appendix B to help the reader better understand the range of transportation analyses performed for this EIS.

L. **6.0 Environmental Justice**

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires federal agencies to identify and address, as appropriate, disproportionately high and adverse effects on human health or the environment of its programs, policies, or activities on minority populations or low-income populations. This EIS addresses environmental justice for minority, low-income, and Native American populations in sections related to manufacturing (Chapter 4, Section 4.8), loading and storage (Chapter 5, Section 5.8), and shipment over public transportation routes (Chapter 7, Section 7.3.5), and in the Executive Summary.

Analyses of the potential impacts associated with all of the container systems considered for management of naval spent nuclear fuel are presented in this EIS for manufacturing, loading and storage, and shipment over public transportation routes. These analyses show that any effects on human health or the environment would be small for all of the alternatives considered. The potential impacts due to normal operations or hypothetical accident conditions associated with the alternative container systems evaluated present little or no significant risk to public health or the environment and do not constitute an adverse impact to any population in the vicinity of the activities involved, including Native American, minority and low-income populations.

This EIS includes specific demonstrations that the impacts resulting from any of the alternatives considered would not be high and adverse for any group. For example, Chapter 7, Section 7.3.5 includes an analysis of the impacts of shipments on minority and low-income populations. This analysis assumed that all of the latent cancer fatalities which might occur as the result of a severe accident during transportation of naval spent nuclear fuel using any of the container systems considered were members of minority populations and demonstrated that they would experience far less than one additional fatality per year. Section 7.3.5 also includes a comparison of this less than one potential additional accidental death per year among members of minority populations to the approximately 7400 deaths in minority populations due to traffic accidents in 1994 to provide perspective.

Similarly, the radiation exposure from incident-free shipment for the total number of shipments for almost 40 years is presented in Section 7.3.5 for the Fort Hall Reservation as a concrete example of the very small risk to a minority population or low-income population who might be exposed to every shipment. The Shoshone-Bannock Reservation at Fort Hall was used to illustrate the absence of high and adverse impact because every shipment of naval spent nuclear fuel would pass through those Native American lands on the way from the Idaho

National Engineering Laboratory to any repository. Other minority or low income populations would not be exposed to human health or environmental effects which would differ greatly from those estimated for Fort Hall. Similarly, the accident risks in Chapter 7, Table 7.4 and the maximum consequences of a severe hypothetical accident in Appendix B, Table B.13 were determined for urban, suburban, and rural populations and the input to the analyses make these results applicable to any population group in those categories. The discussion of environmental justice in this EIS is sufficient and in compliance with the Council on Environmental Quality regulations in 40 CFR 1502.2(b).

As pointed out by the commenter and described in Section B.4 of the EIS, specific routes, including the fraction of the total distance of each route that would be through rural, urban, or suburban localities, were used to compare the possible impacts of the alternatives. Also as identified in Sections B.4 and B.5, the analyses used estimates of the population density in the rural, urban, and suburban areas which are unlikely to be exceeded. The probabilities of accidents for the transportation used in the analyses were specific to each state along the route to correctly represent variations in accident rates, as described in Section B.5.2 of the EIS. Table B.13 provides a summary of the maximum consequences of a severe hypothetical accident broken down by rural, urban, and suburban areas.

As shown by the analyses in this EIS, including the analyses for minority, Native American, or low-income populations presented, there are no high and adverse impacts associated with the alternatives considered. Even if all of the impacts were assumed to occur only among minority or low-income populations, the impacts for any of the container systems for naval spent nuclear fuel management would not constitute a disproportionately high and adverse impact to any particular segment of the population, minorities and low-income groups included. Since there are no disproportionately high and adverse human health or environmental effects for any population, no mitigating measures beyond the normal practices for shipment of spent nuclear fuel will be necessary.

The text of Chapter 7, Section 7.3.5 of the EIS has been modified to enhance the reader's ability to use the results of the analyses to evaluate the possibility that any of the alternatives might have a disproportionately high and adverse impact on minority populations or low-income populations.

M. **7.0 Socioeconomic Analyses**

Although selected research conducted in Nevada indicates that certain “nuclear related activities” have the potential to generate negative socioeconomic impacts, the results of this research have not been borne out by empirical studies of actual events. In locations where nuclear-related activities occur, such as Idaho National Engineering Laboratory and the Savannah River and Hanford sites, the socioeconomic environment does not appear to have experienced negative impacts of the type or magnitude that the Nevada research would predict based on the nuclear-related activities conducted at these locations. Indeed, despite its proximity to the Nevada Test Site and the decades of nuclear-related activities that have occurred there, including over 600 detonations of nuclear weapons above or below ground, Las Vegas has been one of the fastest growing major metropolitan areas with one of the fastest growing economies in the United States since 1980. Similarly, the area around the Idaho National Engineering Laboratory, including the Craters of the Moon National Monument, has not exhibited the sort of negative socioeconomic effect predicted by the Nevada studies.

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The evaluation of socioeconomic consequences in the Navy EIS explores issues for which there is basis for concern. The nature of socioeconomic impacts considered in the EIS can be positive or negative. Analysis was conducted in as much depth as practical given the absence of defined manufacturing sites, an interim storage site, or a repository. The absence of specific locations, coupled with what appears to be non-universal empirical implications of nuclear-related activities regarding a stigma, removes the utility of exploring that issue in this EIS. Should either of the last two facilities be proposed for development at a particular place, a site-specific National Environmental Policy Act document would be prepared to support that proposed action at the proper time. The Department of Energy has already announced its intention to prepare an EIS for a geologic repository at Yucca Mountain.

The purpose of this EIS is to evaluate the differences in impacts which might be produced by the alternative container systems considered for storage and shipment of naval spent nuclear fuel. Since all of the alternatives involve the shipment of spent nuclear fuel, speculation concerning impacts like those theorized by the commenter does not assist in the comparison of alternatives.

N. **8.0 Waste Acceptance**

The EIS is correct in stating that the Yucca Mountain Site is the only site currently authorized by legislation for site characterization as a geologic repository for spent nuclear fuel. The Nuclear Waste Policy Act, as amended in 1987, (refer to 42 USC 10133) directs the Secretary of Energy to carry out appropriate site characterization activities at the Yucca Mountain Site necessary to submit an application to the Nuclear Regulatory Commission for a construction authorization for a geologic repository for spent nuclear fuel and high-level radiological waste at that site. The Yucca Mountain Site is the only site so authorized in 42 USC Chapter 108.

The commenter states that it is not clear that the Nuclear Waste Policy Act authorizes the disposal of naval spent nuclear fuel in the geologic repository proposed under the Act. However, as pointed out by the commenter, naval spent nuclear fuel conforms with the definition of spent nuclear fuel in 42 USC 10101 and naval spent nuclear fuel is specifically included in the statement of applicability in 42 USC 10107 (a) and (c). Taken together, these sections indicate that disposal of naval spent fuel in the repository is authorized by the Act.

In the final analysis, nothing in the Act or elsewhere in law precludes using Yucca Mountain as the terminus in the analysis covering shipment of naval spent nuclear fuel. The Department of Energy believes that disposal of naval spent nuclear fuel is authorized under the current wording of the Act and has adopted the policy that naval spent nuclear fuel will not be reprocessed to recover the uranium-235, but instead will be buried in a geologic repository. The issue of authority for disposal will be fully resolved prior to shipment of any naval spent nuclear fuel to a geologic repository. The resolution of this issue will fully consider the safety of the repository, the appropriate level of protection for classified information, and the other issues cited by the commenter. It should be noted that the Nuclear Regulatory Commission, the Environmental Protection Agency, and others already have the capability, experience, and knowledge to deal with the classified characteristics of naval spent nuclear fuel.

Notwithstanding any questions of authority, it is necessary to select a container system for dry storage of naval spent nuclear fuel at the Idaho National Engineering Laboratory, shipment to the location selected for its ultimate disposition, and possibly for disposal in a geologic repository. Therefore, this EIS has been prepared in compliance with the requirements of the National Environmental Policy Act to address the human health and environmental impacts associated the necessary activities, including evaluation of the impacts of manufacturing and employing various alternative systems for storage and delivery to a geologic repository for naval spent nuclear fuel.

O. **9.0 Waste Characteristics**

As the commenter points out, the waste acceptance criteria for a geologic repository have not yet been established. The Navy is familiar with the developments in this area and is following this work to ensure compatibility with the requirements when they are specified. The Navy fully intends to comply strictly with the waste acceptance criteria for any repository or centralized interim storage facility.

The collection of naval spent nuclear fuel records and other data will be accomplished in accordance with the guidelines established by the Office of Civilian Radioactive Waste Management, as stated by the commenter. Pertinent records and data will be collected or qualified for use under a program in conformance and compliance with DOE/RW-0333P, "Office of Civilian Radioactive Waste Management Quality Assurance Requirements and Description."

This EIS does not state or imply at any point that naval spent nuclear fuel or any other waste will not have to adhere to applicable requirements or acceptance criteria. This EIS presents analyses of the impacts associated with the use of the alternative container systems considered for storage and shipment naval spent nuclear fuel and special case waste to a repository or centralized interim storage facility. It also goes further and provides the source terms and similar information used in the analyses of impacts to enable an independent reviewer to estimate the impacts using the same or different methods and conditions. The analysis of impacts for a geologic repository or centralized interim storage facility will be included in a site-specific EIS prepared for such a facility by the Department of Energy. The impacts of disposal of naval spent nuclear fuel at such a facility will be included in that EIS as part of the Department of Energy-owned fuel identified in the Notice of Intent to prepare an EIS for a geologic repository (Federal Register of August 7, 1995, 60 FR 40164).

All data on the characteristics of naval spent nuclear fuel required to evaluate impacts associated with selection of a container system for the management of naval spent nuclear fuel are presented in Appendices A & B of this EIS. Naval spent fuel characteristics necessary for evaluations of disposal will be provided in the required geologic repository EIS. The repository EIS will address the stability of all spent nuclear fuel, including naval spent nuclear fuel, in a repository and potential impacts on human health and the environment.

The theory advanced by C. D. Bowman and F. Venneri in the referenced paper has been criticized by numerous reviewers as having no validity. Papers discussing the fallacies in the Bowman and Venneri theory were presented in a recent technical society conference (Transactions of the American Nuclear Society 1996 Annual Meeting, Reno, NV, June 16-20, 1996, Proceedings of the Embedded Topical Meeting on Department of Energy Spent Nuclear Fuel & Fissile Material Management; 1. *Event Tree for Autocatalytic Criticality in Geologic Repositorie*s; 2. *Release, Transport and Deposition of PU and HEU in Geologic Media*; 3. *Transport of fissile and Poison Materials Through Fractured Geologic Media*; 4. *Minimum Critical Mass of* ^{239}*Pu-Rock-Water Systems*; 5. *Neutronic Parametric Study Of Critical Configurations of Plutonium Deposited In Rock Fractures*; and 6. *Dynamic Response of Heterogeneous Deposits Of TFM in Moist Rock*). Additionally, an article published in Nuclear Technology, September 1995 (W. E. Kastenberg, et al.) debunks this theory too. Therefore, naval spent nuclear fuel would not contribute to the risk of concern to the commenter. Moreover, their theory focuses on

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Pu-239 transport; unlike commercial spent nuclear fuel, naval spent nuclear fuel has negligible amounts of Pu-239.

10.0 Environmental Impact and Analysis

P. **10.1 Programmatic Environmental Impact Analysis**

In regard to the state of Nevada's request that the Navy stop work on this EIS and divert work to a programmatic EIS, the Navy considers this is not appropriate. Congress has determined that, with respect to the requirements imposed by the National Environmental Policy Act of 1969 (42 U. S.C. 4321), compliance with the procedures and requirements of the Nuclear Waste Policy Act (42 U.S.C. 10101, et seq, as amended) shall be deemed adequate consideration of the "...need for a repository, the time of initial availability of a repository, and all alternates to the isolation of high-level radioactive waste and spent nuclear fuel in a repository..." and that "...alternate sites to Yucca Mountain..." and "...nongeologic alternatives to such site..." need not be considered as alternates. (42 U.S.C. 4321, Article 114(f)).

On August 7, 1995 Department of Energy announced (60 FR 40164) its intent to prepare an EIS in accordance with Nuclear Waste Policy Act for a geologic repository at Yucca Mountain. The environmental issues to be examined in the Department of Energy EIS were identified as including "...the potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and Department of Energy facilities to the Yucca Mountain site ...including impacts of constructing and operating a rail spur, a heavy-haul route and/or a transfer facility..." Following a 90-day scoping period which ended December 5, 1995, Department of Energy deferred action on the EIS until Fiscal Year 1997 for budget reasons. Thus, the programmatic impacts of all the nuclear waste in a repository are properly the subject of the EIS ultimately to be prepared by the Department of Energy and are beyond the scope of this EIS.

Q. **10.2 Environmental Life Cycle Assessment**

The life assessment approach is followed in the EIS in those areas where it is within the scope of the EIS and impacts can be identified or estimated. In particular, the EIS covers the concept of raw material extraction in relationship to the manufacture of the container system. Table 4.4 in Chapter 4 lists the total tons of each type of raw material used over a 40 year period in the manufacture of each of the six alternate container systems. Table 4.5 then expresses these amounts in terms of the percentage of the annual U.S. domestic production. It is observed that the amounts of materials used are small when compared to the available production. The EIS then covers in Chapter 4, Section 4.5.2 those components of the container systems which are either recycled or disposed of as nongeologic waste. When the location of the repository is known, the disposal of spent nuclear fuel and high-level waste will be covered in the repository EIS that will be prepared by the Department of Energy in accordance with the Nuclear Waste Policy Act.

The material in Chapters 4, 5, 6, and 7 provides analyses and comparisons of the impacts of all aspects of the manufacture of the alternate systems considered and their use in storing or shipping operations, including waste generation, throughout the life cycle of the systems. This is consistent with the approach recommended by the commenter.

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R. **10.3 Impact Assessment**

The Navy has used models which describe the environmental impacts to an accuracy consistent with the significance of the impacts, and has described these models and their use and the EIS. The models and the resulting estimates of impacts are presented in accordance with established practice for documenting scientific work, including use of references. Thus the Navy disagrees with the contention of Nevada that the EIS does not identify accepted models for assessing environmental impacts.

The EIS adequately describes the specific methodology and computer codes used to analyze the impacts. In many cases, this is done by leading the reader through a specific trail to more and more detailed explanations of the methodology. For example, with respect to impacts from airborne releases, the first paragraph of Chapter 5, Section 5.2.2 contains the sentence "...The specific methodology and computer codes used for these analyses are presented in Appendix A, Section A.2.3..." Examination of Section A.2.3 reveals a section that is nine pages long and this Appendix, in turn, refers to many other published documents. For example, the paragraph on the computer codes used contains the sentence "...These codes are discussed in detail in the Programmatic SNF and INEL EIS (DOE 1995 Volume 1, Appendix D, Attachment F, Section F.1.3.6)". This reference in turn provides a one page long summary with descriptions of each computer code and in each description there are references to more detailed descriptions. This use of references to help document the methodology is consistent with the guidance of the Council of Environmental Quality on reducing excessive paperwork and providing analytic vice encyclopedic environmental impact statements (40 CFR 1500.4).

S. **10.3.1 Environmental Risk Assessment**

The commenter's statement that the long-term predictions for disposal require use of the best practicable methodology in this EIS is outside the scope of this environmental impact statement. The Navy Container System EIS does not discuss or evaluate the disposal of spent nuclear fuel or high-level radiological waste. The Navy believes the methodology used in the EIS is sufficient for the intended purpose, which is to select among the alternate container systems. This methodology is described in detail in the EIS and in referenced documents. This methodology was selected by the Navy's experts and is appropriate for its intended purpose. This is substantiated by the small impacts. The EIS contains an analysis of uncertainties in Appendix A, Section A.2.7 which in turn refers to more detailed discussions in reference documents.

The EIS applies the approach recommended by the commenter, including the use of the best practicable methodology, to assess the full spectrum of effects on human health and the environment in the comparison of alternatives for storing and shipping naval spent nuclear fuel.

T. **10.3.2 Cumulative Impact Analysis**

The basic methods used to evaluate the environmental impacts in the EIS were also used to calculate the individual components of the cumulative impacts. These methods are fully documented in the EIS and in traceable references as described above. Additional discussion of which individual impact components are added together to create the cumulative impacts are then identified in each of the cumulative impact sections of body of the EIS; for example, in Executive Summary Section S.8.1, in Chapter 3, Section 3.8.5 (Summary of Cumulative Impacts), in Chapter 4, Section 4.10 (Cumulative Impacts of Manufacturing), in Chapter 5, Section 5.10 (Cumulative Impacts of Loading and Storage at Idaho National Engineering Laboratory Facilities), in Chapter 6, Section 6.5 (Cumulative Impacts of Unloading at a Repository or Interim

Storage Facility), and in Chapter 7, Section 7.3.7 (Cumulative Impacts of Transportation). The Navy believes that the methods used to evaluate cumulative impacts are properly documented.

U. **10.3.3 Human Health Risks and Safety Impacts Study**

The EIS has fully described the approach used to estimate human health consequences. For example, the basic analytical methods used for the calculation of radiation exposure at Idaho National Engineering Laboratory is described in detail in the EIS in Appendix A, and in particular in Section A.2.3 which, in turn, references other more detailed descriptions. As a specific example, the section provides the following discussion:

> "...Exposure is calculated to result from direct radiation from the facility and exposure to contamination released to the air. The exposure pathways are described in detail in the Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory EIS (DOE 1995, Volume 1, Appendix D, Attachment F, Section F.1.3.2) and include all internal and external pathways for exposures, including food and water.
>
> "... Health effects are calculated from the exposure results. The risk factors used for calculations of health effects are taken from Publication 60 of the International Commission on Radiological Protection (ICRP 1991)."

Therefore, the Navy has included the requested description of the approach used to estimate human health effects, both near term and long term. The documents which are the sources of the methods, such as ICRP 1991, provide logical scientific bases and detailed discussions of the uncertainties in the estimation of risks to human health.

V. **10.3.4 Succeeding (Future) Generations**

The threat to future generations from geologic disposal will be addressed by DOE in its repository EIS; such an analysis is outside the scope of the Navy Container System EIS. For evaluations which are within the scope of the EIS, such as human health effects from radiological exposure at Idaho National Engineering Laboratory, the EIS presents the results in terms of latent fatal cancers. By using a simple multiplier of 1.46 the results presented can be converted to total health effects, including genetic effects. This is described on Appendix A, Section A.2.3 by the following paragraph:

> "...Cancer fatalities were used to summarize and compare the results in this EIS since this effect was viewed to be of the greatest interest to most people. The number of total health effects (deaths, nonfatal cancers, genetic effects, and other impacts on human health) may be easily obtained by multiplying the latent cancer fatalities by the factor of 1.46, which is the ratio of 7.3×10^{-4} divided by 5.0×10^{-4} from Table A.5 above..."

A straightforward extension of this method would reveal that genetic effects can be obtained by multiplying the latent cancer fatalities by the factor of 0.26, which is the ratio of 1.3×10^{-4} divided by 5.0×10^{-4} from Table A.5.

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W. **10.3.5 Truly Significant, Reasonably Foreseeable Long-Term Impacts**

The commenter's concerns about long-term repository performance are outside the scope of the Navy Container System EIS. Evaluation of the environmental impacts of long term repository performance will be included in the geologic repository EIS being prepared by Department of Energy in accordance with the Nuclear Waste Policy Act. Department of Energy announced its intent to prepare this EIS on August 7, 1995 (60 FR 40164).

X. **10.4 Post-project Monitoring**

The commenter's concerns about long-term monitoring of the repository are outside the scope of the Navy Container System EIS.

Y. **10.5 Policy and Guidance for National Environmental Policy Act and Regulatory Compliance**

A holistic approach related to the disposal of naval spent nuclear fuel in a geologic repository is beyond the scope of this EIS. Such concerns related to a geologic repository are properly the subject of the EIS to be prepared by the Department of Energy in accordance with the Nuclear Waste Policy Act (see the Notice of Intent to prepare this EIS in the Federal Register of August 7, 1995, 60 FR 40164.)

The primary policies and guidance followed by this EIS to achieve National Environmental Policy Act compliance included the National Environmental Policy Act (42 U.S.C. 4321 et seq), the Council of Environmental Quality regulations (40 CFR 1500 et seq), implementing regulations issued by Department of Energy (10 CFR 1021) and the Navy (32 CFR 775) and a document entitled "Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements" issued May 1993 by the Office of National Environmental Policy Act Oversight, Department of Energy. Other federal statutes and regulations, executive orders, other laws and regulations and Department of Energy Order are listed in Chapter 8 of the EIS.

As described throughout the EIS, the impacts are presented based on calculations of the estimated releases to various media (air, water, soil) for normal operations and for accidents. The results are based on following all applicable pathways of these releases to determine their impact on man and on the environment. The significance of the impacts is based on the actual calculated results rather than on comparisons to regulations governing the release of potential contaminants or pollutants to the air, water, soil, or other medium. The Navy has applied the holistic approach recommended by the commenter, as demonstrated by the discussions in Chapters 3, 4, 5, 6, and 7 and in the detailed descriptions of analyses in Appendices A, B, C, and E.

Z. **11.0 Relationship Between the Navy Activities and Other Related Activities/Commitments**

The planning framework upon which the EIS is based does not depend on the Department of Energy's agreement with the state of Idaho potentially being in competition with utility companies regarding waste acceptance. The standard contract between Department of Energy and utility companies (10 CFR Part 961) identifies that Department of Energy will take title, transport, and dispose of spent nuclear fuel from civilian nuclear power reactor plant owners or generators. The standard contract allows Department of Energy, after it takes title, to transport this spent nuclear fuel to a Department of Energy facility prior to its transportation to a disposal facility.

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The Idaho agreement merely excludes the Department of Energy facility at Idaho National Engineering Laboratory as a potential destination.

Appendix B, Table B.3 provides a notional schedule for shipment of naval spent nuclear fuel from Idaho to a geologic repository or centralized interim storage facility that incorporates the requirements of the Nuclear Waste Policy Act and the agreement between the state of Idaho and the federal government. As shown in Table B.3, there would be a small number of shipments to the repository beginning in the year it becomes operational, causing naval spent nuclear fuel to be among the first shipments to such a facility. The number of shipments of naval spent nuclear fuel would increase as the capability of the repository to accommodate commercial spent nuclear fuel builds up to meet the demand. Within ten years or so, naval spent fuel shipments would reach a steady level which could be handled within the expected 300 or so commercial spent nuclear fuel shipments currently used as the steady-state planning rate for the repository. This schedule, or similar schedules, would result in all naval spent nuclear fuel being removed from Idaho by January 1, 2035, as specified in the agreement between the State of Idaho and the federal government.

The container systems considered would be suitable for storage for the period specified by the Idaho agreement with appropriate maintenance and monitoring. This is consistent with the current requirements for licensing and renewal of the license under the Nuclear Regulatory Commission regulations (10 CFR 72) for commercial spent nuclear fuel storage containers of the same type considered for naval fuel.

The Department of Energy has announced its intention to prepare an EIS for a geologic repository for spent nuclear fuel and high-level radioactive waste (see the Federal Register of August 7, 1995, 60 FR 40164). The geologic repository EIS will include a discussion of impacts associated with naval spent nuclear fuel, including appropriate reference to this Container System EIS since the two would be related. It is appropriate to evaluate these geologic repository and container system issues separately, as separate stages of development, as permitted under National Environmental Policy Act regulations (40 CFR 1502.4(c)). The National Environmental Policy Act regulations encourage environmental assessments and environmental impact statements to be tiered to what has been done before and what is planned or anticipated for the future (40 CFR 1502.20) and this is the procedure being followed.

AA. **12.0 Special Case Waste (SCW)**

The commenter recommends that the National Environmental Policy Act compliance strategy for the management and disposition of both Navy and non-Navy Special Case Waste (SCW) should be discussed or otherwise clarified in the Navy's Final Environmental Impact Statement. The commenter points out, the Department of Energy has not yet determined its strategy. The analysis of transportation to, and unloading at, a representative repository of Navy-generated special case waste has been included in this EIS to determine whether it may have an impact on selection of a container system because it is reasonably foreseeable that such waste might be disposed of in the same geologic repository as spent nuclear fuel. There is no intention to imply that such a decision has already been made or will be made as a result of this EIS, but it is a factor that the EIS rightfully evaluates in assessing the container system alternatives.

The commenter further states the position that "conducting an analysis which proposes transporting Navy-generated SCW to Yucca Mountain for interim storage or disposal is contrary to the spirit and intent of the National Environmental Policy Act..." and, further "could prejudice pending decisions...." This is not correct. The Navy is not proposing the transport of SCW or naval spent nuclear fuel to Yucca Mountain. The Navy's EIS analyzed the environmental impacts of Navy-generated SCW with regard to facility operations, manufacturing, and transportation in order to see if selection of a container system could be significantly influenced by SCW. The EIS clearly states in the Executive Summary, Section S.1 that it does not presume that SCW would be shipped to Yucca Mountain, but rather this location is used purely for analytical purposes. Chapter 7, Section 7.2, provides the reader with a clear understanding that the suitability of Yucca Mountain has not yet been determined nor has it yet been authorized by law as a location for a centralized interim storage site. Yucca Mountain is used in the EIS as a representative or notional location to ensure the completeness of the calculations.

With regard to the final point in Comment 12, this EIS evaluates container systems for the management of naval spent nuclear fuel which could also be suitable for management of Navy-generated SCW. As stated in Appendix E, Section E.3, it is assumed for the purpose of this EIS that the special case waste could be stored in the same alternative locations selected for storage of naval spent nuclear fuel using the same alternative storage system. Selection of a container system does not preclude use of a co-located storage program, if one were to be established, for both Navy-generated SCW and Department of Energy-managed Greater than Class C waste at the Idaho National Engineering Laboratory. Section E.3 of the EIS addresses this issue as well, noting that although the Department of Energy has identified a project to handle Greater than Class C low-level waste from commercial sources, another aspect is to consider the possibility of using that facility for storage of naval program special case low-level waste until shipment to a centralized interim storage site or a repository for permanent disposal.

The text of the Executive Summary, Section S.1 has been changed to provide additional clarification that this EIS does not presume that Navy-generated special case waste will be shipped to the same repository or centralized interim storage facility as spent nuclear fuel and the EIS does not lead to such a decision.

AB. **13.0 Off-Site Generated Radioactive Wastes**

This EIS has been prepared to compare the human health and environmental impacts associated with alternate container systems which might be used for storage of naval spent nuclear fuel at the Idaho National Engineering Laboratory and subsequent delivery to a geologic repository or centralized interim storage facility. Because the location of the repository or interim storage facility does not help to distinguish among the alternative storage systems, the location is a peripheral issue for this EIS. The Nuclear Waste Policy Act (42 USC 10133) specifies that the Department of Energy is to characterize the Yucca Mountain Site as a potential site for a geological repository for spent nuclear fuel and high-level radiological waste. Therefore, the Yucca Mountain Site was used in this EIS as the destination for evaluation of impacts which might be produced by transportation to a repository or centralized interim storage facility.

The comment that the public land orders that established the Nevada Test Site did not establish the site to serve as a waste disposal facility for off-site generated radioactive wastes is correct. However, this does not preclude its use as a geologic repository. The Nuclear Waste Policy Act, as amended in 1987, (42 USC 10172) states that:

> "Property clause provided sufficient textual basis for Congress' authority to enact amendments to the Nuclear Waste Policy Act designating location in Nevada as sole site to be characterized for possible development as high-level radioactive waste repository, where the Nevada location was federally owned land, and thus subject to Congress' plenary power to regulate its use."

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Nuclear Waste Project Office, Nevada

Because the Nevada Test Site is federally-owned land, its use is determined by Congress. The issue of authority for use of the site will be resolved prior to shipment of any naval spent nuclear fuel to a geologic repository, but is not germane to the comparison of alternative container systems for naval spent fuel that is the subject of this EIS. Therefore, this issue is beyond the scope of the actions being considered in this EIS. The resolution of the matter of authority for using of the Nevada Test Site as a geologic repository for the disposal of naval spent nuclear fuel will fully consider the environmental consequences.

Robert E. Fronczak, P.E.
Executive Director
of Environmental Affairs

ASSOCIATION OF AMERICAN RAILROADS

18 July 1996

Mr. William Knoll
Department of Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Subject: Comments of the Association of American Railroads (AAR) on the "Department of Navy Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel"

Dear Mr. Knoll:

On behalf of its member railroads, the Association of American Railroads (AAR) submits the following comments or the Department of Navy Draft Environmental Impact Statement (EIS) for a Container System for the Management of Naval Spent Nuclear Fuel. AAR's member railroads are transporters of radioactive materials and hence have a significant interest in the container system.

General

A The railroads believe that in the interests of public health, safety, environment, and property, the risks of transporting radioactive waste must be identified. A plan for managing those risks in the rail transportation environment must be developed that is consistent with the rail industry's goal of operating trains carrying radioactive waste at prevailing track speeds. The best available technology should be used to provide safe and seamless transportation over the life of the Department's Naval Spent Nuclear Fuel (NSNF) shipping campaign.

Dedicated Trains

B The Draft EIS states in several locations that "dedicated trains may be used if appropriate." The railroads believe that a dedicated train system would provide the greatest degree of safety and operating flexibility. The train should be short to permit braking over a short distance and avoid unduly slow acceleration and low operating speeds. A dedicated train would not have to make time-consuming stops in rail classification yards and could be given high priority.

The government should own all of the rail equipment, including buffer cars, cask cars, and escort cars. The Navy should use the most technologically advanced equipment, such as electro-pneumatic braking systems, AAR's 1-B wheel profile, an onboard defect detection system, the best available suspension, and passenger car (tightlock) or tank car (double shelf) couplers

All cars in a train should use the same suspension and braking equipment and be a consistent weight car to ensure safe dynamic operation. A prototype of an entire train should be thoroughly tested to ensure consistent performance in a variety of railroad operating environments. Thorough and frequent maintenance should be required to ensure long-term peak performance.

Buffer cars should be low-sided to permit unobstructed visibility by security escorts at all times. Design of the buffer car should not impair the crash worthiness of the cask. Ordinary freight cars would be inappropriate since they would not necessarily be equipped with innovative features and would not be specifically designed for spent fuel transportation. Similarly, cabooses would not be suitable cars for security escorts because of the cabooses' light weight, lack of creature comforts, and lack of onboard monitoring equipment.

Performance Monitoring

C Automatic Equipment Identification (AEI) or satellite tracking technology should be used by the Navy to track the location of its trains. Industry-developed AEI technology would be adequate to monitor periodically changes in the location of trains. However, satellite tracking would permit real-time monitoring.

The Navy should consider the development of defect detection systems providing real-time monitoring of train system performance. Such systems would minimize the likelihood of accidents caused, for example, by overheated wheels and wheel bearings, brake failure, and coupler failure.

Devices that monitor the contents of a cask car, such as Sandia Labs' "green box," should be employed to provide real-time information to the Navy. This technology, coupled with communication equipment, would alert the Navy to any problems that require attention. Onboard Navy technical experts, in addition to security escorts, should be available to provide initial technical assistance.

Train Speed

Concern over the crash worthiness of casks has led AAR to recommend that trains containing NSNF be restricted to 35 mph and that when a train containing NSNF meets another train, one train should stop while the other passes. These operating restrictions interfere with normal railroad operations, hindering the railroads' ability to provide their customers with fast, efficient service. Passenger trains and freight operate at speeds as high as 90 and 70 mph, respectively. With increasing demands for efficient rail service, it is likely that train speeds will further increase over the next several decades. FRA, in fact, authorizes freight trains to operate at 80 m.p.h.

D The NSNF transportation system should preclude the need for risk management techniques such as special speed limits for NSNF or stopping NSNF trains while opposing traffic passes by on another track. In addition to facilitating rail transportation, a transportation system permitting the operation of NSNF trains just like other freight rains would minimize the number of shipping canisters and other rail transportation equipment the Navy will need to purchase.

Routing

E The railroad industry believes that regulatory control over rail routing to avoid population centers would be counterproductive from a safety perspective. Routing to avoid populated areas would increase transit times and the potential for an incident to occur because of the circuitous route the trains would take. Not only would routes avoiding urban areas be significantly longer, but train speeds over such routes would be slower. Main line tracks are the tracks maintained for the fastest service, and such routes typically pass through urban areas.

Accident Prevention

F Regardless of the crash worthiness of casks, steps must be taken to minimize derailments of trains containing NSNF. Research and testing should be conducted on the dynamics of NSNF train operation at various speeds. Alerting systems and the best possible braking systems should be employed to help prevent accidents. Thus, a short dedicated train capable of stopping in a short distance is of critical importance.

G The Navy also must take appropriate steps to avoid harm to railroad employees through long-term exposure to NSNF. Since NSNF trains will be used for perhaps 30 years, there may be a potential for buildup of radiation.

Emergency Response

H Should an incident occur, emergency response roles must be clearly defined. The Navy should assume the responsibility for any and all consequences of an accident that is related to NSNF. The Navy should arrive at an accident scene promptly, prepared to manage radiological threats, real or perceived. Local officials should be provided with the appropriate training and be prepared to work cooperatively with the railroad officials in restoring rail service as soon as possible. Training on the potential risks associated with the transportation of NSNF should also be available to railroad supervisors and employees. Railroad officials should be trained on what to expect and how to interface with public officials in the event of an incident involving NSNF.

Emergency recovery of casks should be planned in advance for all possible situations. It may be extremely difficult to recover a cask by traditional railroad methods. DOE should shoulder the responsibility for ensuring emergency response personnel and equipment are available for all conceivable types of accidents.

The railroad industry has long been concerned about the potential economic impact of an incident occurring on its property. The Navy should be financially responsible for any event that occurs on railroad property, including evacuation, human casualties, environmental contamination, and loss of revenue from delays in reopening rail service. The indemnification provided by the Price-Anderson Act does not cover private property damage, such as the loss of track and equipment involved in a derailment.

It is our understanding that Price-Anderson indemnification does cover consequential damages, including liability for evacuations and the cost of rerouting traffic. However, there is little experience with Price-Anderson's provisions and further clarification of its scope would be appropriate.

Cask Crash Worthiness

I The Nuclear Regulatory Commission standards for cask design and testing should be reevaluated in light of the current railroad operating environment and anticipated changes. Trains are longer, heavier, and faster than they were when the standards were first developed. There are many more new car designs today and more to come. The weight of rail vehicles has increased from the 70-ton load typical of the 1960's and 70's, when the regulations were developed, to 100-125 tons today. The gross weight of future rail cars may be even greater. Train speed is expected to increase further in many parts of the country.

The railroad industry understands that an NRC-certified cask is capable of withstanding a 30-mph impact onto an unyielding surface. What we don't understand is how the NRC standards translate to the railroad environment. What is the maximum impact speed against a bridge abutment, mountainside, or some other unyielding surface that an NSNF canister can withstand without leaking radiation? What would happen if several NSNF canisters piled up in such an accident (piling up is not unusual in railroad accidents)? How long can an NSNF canister withstand a flame impingement on its side or head? How long can an NSNF canister be submerged in water before it poses a radiological hazard? How does the scale-model testing compare to real-world situations that can occur in the railroad environment? We need a much better understanding of the whole testing process that the Navy will use.

<u>Cask Weight</u>

In comments submitted in response to the Department of Energy (DOE) concerning the Multipurpose Canister (MPC) EIS in December of 1994, the AAR expressed concerns about the weight of the proposed large MPC cask. AAR noted that:

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> Current DOT hazardous materials regulations limit tank car gross rail load (GRL) to 263,000 pounds for four axle cars. Six axle cars have a weight restriction of 394,000 pounds for unrestricted interchange. The gross rail load (GRL) of a loaded cask car would be about 400,000 pounds. Presently, AAR standards require that any four axle tank car weighing in excess of 263,000 pounds and six axle car in excess of 394,000 pounds must move under a special exception.

Weight is a critical factor because of track and bridge weight limits. Cars over the normal weight limits may require more than the normal number of axles in order to distribute the weight safely. Such cars must be specially designed and tested extensively.

The weight of the latest series of DODX cask cars is 513,000 pounds. The overall weight of the cask and car raises the question of whether the cask should be an integral part of the car, as is the case with the DODX cask, or a breakaway design, as proposed in DOE's preliminary engineering plans. The NSNF canister cannot be cut up to aid in wreck recovery so keeping it an integral part of the rail car has the advantage of more to hook onto should hoisting be necessary. On the other hand, a 400,000 pound MPC car would be difficult to recover in a wreck.

The weight of NSNF cars provide further support for the use of dedicated trains. Cars this heavy present special train handling problems. Mixing cars this heavy into regular freight service would compound train handling difficulties.

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Cask weight also needs to be considered from a multi-modal perspective. The proposed repository site at Yucca Mountain is not served by rail and studies indicate significant obstacles to rail line construction to the site. Motor carrier transportation of casks from a rail siding to the repository might be more economical. It is not apparent that planners have taken this into account.

Summary

In summary, the AAR believes that a new NSNF transportation system should be designed and built. Such a system should minimally disrupt the rail transportation system and employ the best available technology, to minimize the chance for an incident involving this material.

Sincerely,

Robert E. Fronczak/rct

cc. Nuclear Waste Transportation Task Force
Chuck Dettmann
Al Reinschmidt

Commenter: Robert E. Fronczak - Association of American Railroads, Washington, D.C.

Response to Comment:

A. Two environmental impact statements (EIS) have been prepared during the last two years which provide details on various analyses conducted on the storage, handling, and transportation of naval spent nuclear fuel. These documents are this EIS and the Department of Energy *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental restoration and Waste Management Programs Final Environmental Impact Statement* of April 1995 (DOE 1995), referenced in this EIS. In both of these documents the risks related to naval spent nuclear fuel are described for routine facility and transportation operations, as well as the accident risks for reasonably foreseeable design and beyond design events. The risks are described for workers, members of the general population, and for the hypothetical individuals who are considered to be maximally exposed to releases from all potential sources.

The management of transportation risks is provided for in the various laws and regulations which apply to the design of Type B shipping containers for high-level radiological materials and their safe transportation (Appendix B, Section B.2.2 of this EIS). The Nuclear Regulatory Commission, the Department of Energy, and the Department of Transportation require certification or licensing of shipping containers. The containers must meet stringent design and testing criteria including a series of 30-foot drop tests to unyielding surfaces, puncture tests, the open-fire tests which must sustain 1475 degree Fahrenheit temperatures for 30 minutes, and the water submersion tests to assure water-tight, pressure-resistant Type B packages.

Just as it has for almost 40 years, moving naval spent fuel shipments from shipyards and land-based prototype sites to Idaho (Chapter 2, Section 2.5 of this EIS), the Naval Nuclear Propulsion Program will work with the Association of American Railroads and the individual railroads to provide for safe, efficient, cost-effective transportation of naval spent nuclear fuel from Idaho to the geologic repository or centralized interim storage site when they are available for use.

B. The use of general freight trains has been proven safe during the almost 40 years of shipping over 660 container shipments of naval spent nuclear fuel. These shipments have been made with no release of radioactivity to the environment. Dedicated trains have been used only when the need for urgent delivery or other considerations justified the increased cost.

From the mid-1970s to the early 1990s the U.S. Department of Energy and U.S. Department of Defense argued before the Interstate Commerce Commission and civil courts in multiple proceedings against the railroads imposition of special (dedicated) train service on radioactive shipments. In every case, including exhaustive reviews of safety and railroad and train operations, the Interstate Commerce Commission and courts determined and upheld that special train service for radioactive shipments, including spent nuclear fuel, was unnecessary, wasteful and unlawful. In 1993, the railroad industry refunded to the federal government $8 million it had collected, plus interest, for imposed special train service.

The Navy remains of the view that any additional safety resulting from dedicated train service is insignificant and when compared to the substantial increase in cost associated with dedicated trains simply cannot be justified. A dedicated train may be used in a particular instance if schedule or other considerations dictate that it is necessary but not as a matter of policy or routine and clearly not to increase safety.

The safety of naval spent nuclear fuel shipments rests squarely on the robust shipping containers and the rugged nature of the contents as discussed below in the response to comment I. Generally speaking, naval spent nuclear fuel shipments do not need to be treated or handled any differently than any other hazardous materials handled by the railroads in interchange service. Certainly unnecessary or lengthy delays and layovers in railyards and at interchanges should be avoided; but the normal times required for train switching and makeup, train crew reliefs, and connections between railroads are not a concern during movement of naval spent nuclear fuel just as they are not a concern during movement of any other hazardous material. Expedited movement beyond what the Code of Federal Regulations, Title 49, Section 174.14 requires for any hazardous material is not necessary for naval spent nuclear fuel shipments for safety.

The Government will own the escort and container cars to be used in the future for shipping naval spent nuclear fuel to a geologic repository or centralized interim storage site just as it has for almost 40 years of naval spent nuclear fuel movements. This equipment is unique to the purpose and cargo and must be dedicated to naval spent nuclear fuel shipments without availability for other railroad customers, therefore it is appropriate for it to be government, not railroad owned. Current practice is and future practice will be to ensure in careful fashion that the equipment meets all railroad industry standards of railcar construction and operation, including Association of American Railroads review of the railcar design prior to construction and testing of new equipment at the Transportation Test Center in Pueblo, Colorado for dynamic handling. Association of American Railroads requirements for railcars used to transport radioactive material, for example as set forth in Field Manual Of Interchange Rule 88.A.15.c.(2), will be met.

If onboard defect detection equipment is required under Department of Transportation regulations, it will be used for naval spent nuclear fuel shipments.

Naval spent nuclear fuel shipments are intended to move in regular interchange freight service. Since specially designed buffer cars are not necessary for any other hazardous material which moves in regular interchange freight service in order to achieve 49 CFR separation and segregation requirements, then they should not be necessary for naval spent nuclear fuel shipments.

The current fleet of six escort cabooses has been used successfully, without any significant operational problems, in regular and dedicated interchange freight service in conjunction with naval spent nuclear fuel and other Naval Nuclear Propulsion Program shipments for approximately 20 years. Scrapping this equipment in favor of newer equipment before the existing equipment's useful life of 40 years, as defined by railroad industry standards, is not considered warranted. Navy equipment would be replaced after the year 2010. When the time comes to replace the existing escort cabooses, the Naval Nuclear Propulsion Program will work closely with the Association of American Railroads, as it does for container cars, to ensure the new equipment meets railroad industry standards.

C. Current naval spent nuclear fuel shipments are tracked via the same satellite tracking/monitoring system managed by the Department of Energy's Albuquerque Operations Office, Transportation Safeguards Division used for nuclear weapons shipments. Naval spent nuclear fuel shipments using the new container system will be tracked and monitored in the same or an equivalent manner. The equipment and monitoring of fuel shipments is beyond the scope of this EIS. This EIS includes discussions of transportation of naval spent nuclear fuel in order to provide a general basis for the comparison of alternative container systems which will meet the requirements as they are defined at this time.

Container contents do not require additional monitoring due to the robust nature of naval reactor fuel (see Chapter 2, Section 2.3) which is manufactured to withstand severe battle conditions and reactor operation transients. Similarly, on-board technical experts are not justified because the escorts are trained and prepared to implement immediate emergency actions and have communications equipment which allows them to establish contact with the full range of technical expertise of the Naval Nuclear Propulsion Program wherever the train may be located.

D. The crash worthiness of casks used for high-level radiological materials shipments, such as naval spent nuclear fuel, is part of the design of the Type B containers which must meet technical requirements of the Code of Federal Regulations for the Departments of Energy and Transportation.

The shipping regulations require spent nuclear fuel shipping containers to be among the most robust hazardous material packaging in existence. Each container costs millions of dollars to design, test, and manufacture. Hundreds of millions of dollars are invested in the handling equipment and facilities to properly load and unload the containers. Crash tests of radioactive material packages, conducted by Sandia National Laboratories and in the United Kingdom, have already demonstrated that the regulatory design requirements, state-of-the-art engineering technologies, vigorous quality assurance, and detailed manufacturing applicable to spent nuclear fuel containers ensure that the containers would perform as advertised even in the most severe accidents. The result is that when naval spent nuclear fuel is offered to the railroads for transport it can be moved and handled in the same manner as any other freight, and certainly in the same manner as any other hazardous material.

The Naval Nuclear Propulsion Program's 35 mile per hour speed limitation is not a requirement for safety purposes or railcar stability; nor is it imposed because of a concern over the ability of the container to maintain its integrity in an accident. There is utmost confidence in the containers. The railcars have been tested and have demonstrated satisfactory performance. The speed restriction is imposed to minimize the financial and schedule risk of exterior damage requiring refurbishment to a scarce, multi-million dollar asset. The ability to get a container back in service quickly at minimal refurbishment cost is the overriding concern. The Navy does note that based on our extensive public interface, we have also found the fact that the speed of these shipments is restricted has been reassuring to many members of the general public.

E. The results of the analysis of the three possible routing scenarios presented in the EIS in Appendix B indicate the most direct route has the lowest risks. The Navy agrees that routing of spent nuclear fuel rail shipments to avoid population centers is unwarranted. The three routes selected for this EIS were evaluated in order to portray a range of routes so the alternative container systems could be compared and these routes do not include any attempt to avoid populations centers. They represent the normal routing for the localities involved.

The requirements for railroad track inspections and the standards for track condition and safety are established by the Federal Railroad Administration, a part of the Department of Transportation, and are set forth in federal regulations (49 CFR 213). In advance of each shipment of naval spent nuclear fuel, the Navy provides railroad companies who will move the naval spent nuclear fuel with the number of railcars and the weight of each railcar. The railroad companies ensure that locomotives, tracks, and bridges are capable of accommodating the shipment and completing it safely.

F.&G. The minimization of derailments is a subject which is not within the scope of this EIS. The accident analyses assume derailments and other accidents occur at the typical rate found historically. Thus, while the Navy agrees with minimizing the likelihood of such an event, this does not result in higher risks to the public or the environment. Discussion is provided above in response D which describes the use of Type B shipping containers and transportation systems which meet the applicable railroad industry safety standards that exist at this time. The Navy has proved its commitment to safe shipping practices and will continue to do so in the future in accordance with changing safety regulations. The Navy also supports all reasonable steps to prevent accidents and ensure safety, as applied to all hazardous material shipments and commensurate with the small risks involved.

All Type B shipping containers regardless of the amount of high-level radiological materials contained within must meet the maximum external exposure rate of 10 millirem per hour at 2 meters from the container. In reality the shipping containers, such as the M-140 used by the Navy, have actual external exposure rates of about 1 millirem per hour at 2 meters or less. In this EIS (Appendix B) evaluations of the exposure risks to workers and members of the general population have been provided in Table B.10.

H. Naval spent nuclear fuel itself is rugged and stable, the containers are robust (see Chapter 2, Section 2.3), and the railcars are and will continue to be well maintained. As a result, the probability of an accident resulting in release of radioactive contents or significant radiological exposure, or requiring unique response capability on the part of the first responder emergency services personnel is extremely remote. The risks associated with the complete range of accidents which might occur during these shipments are analyzed in detail and discussed in the DOE 1995 reference in Attachment A of Appendix D to Volume 1 and were shown to be very small. Accordingly, special precautions or preparations by state or local agencies are not warranted.

Emergency response roles have been defined by regulation and Federal Emergency Management Administration procedures, and the organizations already exist to cope with emergencies involving radioactive materials. The responsible agencies of the federal and state governments and local jurisdictions have received funding, conducted training, and where appropriate have tested the response. The Navy acknowledges the need to work more closely with railroad emergency response/accident recovery personnel to ensure that plans and current thinking about accident recovery and response are accurate. The Navy has and will continue to work with the railroad industry along these lines.

Naval spent nuclear fuel shipments are and will be shipped under Government Bills of Lading in accordance with prevailing or negotiated discount rates establishing the railroads as common carriers of the shipment. Price Anderson Nuclear Hazards Indemnity provides relief to the railroads for accident response and recovery costs related to highly unlikely nuclear consequences resulting from an accident. Non-nuclear consequences such as railroad property damage and lost revenue from line shutdown would be born by the railroad just as it is now for any type of accident/derailment. Accident consequences related to the hazardous nature of the cargo will be far less for a naval spent nuclear fuel shipment than for many other hazardous materials handled by railroads.

The Navy will meet all applicable Nuclear Regulatory Commission and Department of Transportation regulations governing shipment of spent nuclear fuel to a repository under the Nuclear Waste Policy Act and may impose on itself additional requirements as well, but the analysis in the EIS is correct and accurate assuming compliance with Nuclear Regulatory Commission and DOT requirements.

I. The management of transportation risks is provided for in the various laws and regulations which apply to the design of Type B shipping containers for high-level radiological materials and their safe transportation (Appendix B, Section B.2.2 of the Draft EIS) and reflect the assessment of risks presented by current conditions for shipping. The Nuclear Regulatory

Commission, the Department of Energy and the Department of Transportation require certification or licensing of shipping containers. The containers must meet stringent design and testing criteria including the series of 30-foot drop tests to unyielding surfaces, puncture tests, the open-fire tests which must sustain 1475 degree Fahrenheit temperatures for 30 minutes, and the water submersion tests to assure water-tight, pressure-resistant Type B packages. Additional crash testing of casks has been conducted at the Sandia National Laboratory where simulations using trains and trucks carrying Type B containers traveling at speeds of approximately 60-80 miles per hour have been crashed into concrete barriers and at railroad crossings. The results of such crash tests have shown that the casks would not release their radiological contents.

J.&K. As was done for the latest series of DODX spent nuclear fuel cask cars, the Navy would review the proposed design, including size and weight, of the container system containers and associated railcars with the railroads that will handle the containers. Any necessary clearances, both from a size and weight perspective, will be obtained. Any special handling requirements owing to the size and weight will be discussed. It is important to recognize though that the larger and heavier containers require a smaller number of shipments to be made. Since containers of all sizes and weights are designed to produce similar maximum radiation exposure levels, fewer shipments can be expected to produce a lower total radiation exposure to the public and workers associated with the transport of the shipments. Accordingly, a design goal will be to make the containers as large as practical and still be able to move them in regular interchange freight service.

The requirements for railroad track inspections and the standards for track condition and safety are established by the Federal Railroad Administration, a part of the Department of Transportation, and are set forth in federal regulations (49 CFR 213). In advance of each shipment of naval spent nuclear fuel, the Navy provides railroad companies who will move the naval spent nuclear fuel with the number of railcars and the weight of each railcar. The railroad companies ensure that locomotives, tracks, and bridges are capable of accommodating the shipment and completing it safely.

Naval spent nuclear fuel has been shipped from the various Navy sites by rail using such heavy containers for almost 40 years without any release of radioactive material. Nevertheless, as described in Section A.4.1.4 of Appendix D to Volume 1 of the DOE 1995 EIS and in this EIS Chapter 2, Section 2.5, each shipment of naval spent nuclear fuel is accompanied by escorts who remain in contact with the communications or monitoring center. In the event of an emergency, state and federal resources would be quickly summoned to stabilize the situation. Moreover, naval spent nuclear fuel is shipped in large, rugged, certified shipping containers which are designed to withstand accidents which might occur during shipment. DOE 1995 Section A.4.1 of Appendix D and Appendix B, Section B.2 of this EIS provide descriptions and photographs of the shipping containers used for naval spent nuclear fuel.

All Type B shipping containers regardless of the amount of high-level radiological materials contained within must meet the maximum external exposure rate of 10 millirem per hour at 2 meters from the container. In reality the shipping containers, such as the M-140 used by the Navy, have actual external exposure rates of about 1 millirem per hour at 2 meters or less. In the EIS (Appendix B) evaluations of the exposure risks to workers and members of the general population have been provided in Table B.10.

Commenter: Robert E. Fronczak - Association of American Railroads, Washington, D.C.

The Navy has successfully completed many shipments using the M-140 shipping container in general interchange. This container and its car weigh approximately 390,000 pounds and are representative of the weights for all of the alternatives considered. These shipments have not resulted in safety or train handling difficulties.

As discussed in Section B.4 of the EIS, all of the container systems considered will be compatible with heavy-haul truck transport. If a rail connection to a centralized interim storage site or geologic repository were not available, this mode of transportation would be utilized. The impacts associated with transportation of shipments by this mode have been considered in this EIS.

NATIONAL CONFERENCE OF STATE LEGISLATURES

1560 BROADWAY SUITE 700 DENVER, COLORADO 80202
303-830-2200 FAX 303-863-8003

July 18, 1996

Mr. William Knoll
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, Virginia 22242-5160

Dear Mr. Knoll:

I am submitting the attached comments on the "Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel." These comments are based upon the Radioactive Waste Management policy approved by the National Conference of State Legislatures and upon my personal expertise and opinions developed during my work on the NCSL High-Level Radioactive Waste Project.

The National Conference of State Legislatures has supported a high-level radioactive waste project for nearly 12 years. During that time, NCSL staff have shared information with state policymakers and staff and consulted with the states in order to share information with the Department of Energy regarding the concerns and interests of the states and the public. NCSL would be willing and able to work with the Navy to share information with state policymakers concerning the storage and transport of naval spent fuel.

If you have any questions regarding my comments, please contact me at 303/830-2200.

Sincerely,

Cheryl Runyon

L. Cheryl Runyon
Project Manager
Energy, Science and Natural Resources Program

Enclosure

WASHINGTON OFFICE 444 NORTH CAPITOL STREET, N.W. SUITE 515 WASHINGTON, D.C. 20001 202-624-5400 FAX 202-737-1069

COMMENTS ON THE DEPARTMENT OF THE NAVY DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR A CONTAINER SYSTEM FOR THE MANAGEMENT OF NAVAL SPENT NUCLEAR FUEL

Cheryl Runyon
National Conference of State Legislatures
1560 Broadway, Suite 700
Denver, Colorado 80202
303/830-2200

July 18, 1996

Thank you for the opportunity to provide written comments on the above draft environmental impact statement. My comments will focus primarily on the issues of:

- The cumulative impacts from the production and shipping of the canister/cask system selected by the Navy and most probably the system selected by the private sector for the storage and transport of commercial spent fuel to either a centralized interim storage facility or a deep geologic repository.
- The need for uniformity in the shipping and storage container between the Navy and the commercial sector.
- The recycling and reuse of the canister/cask components after the naval and commercial spent fuel have been emplaced for disposal in the geologic repository, particularly in regard to the receipt and transfer of spent fuel at either an interim storage facility or the repository.
- The number of shipments (preferably rail) required to transport the naval spent fuel either to a centralized interim storage facility and/or a deep geologic repository.
- The reduction of worker exposure to radiation during the loading of the canister/cask system and the storage and transport of the system.

Cumulative Impacts

A Although the percentage of canisters/casks required for the storage and transport of Navy spent fuel is very small in comparison to commercial spent fuel needs, I believe the Navy needs to take into consideration the cumulative impact of shipments, especially when calculating the accident potential during shipment, the potential level of exposure ~~to residents along rail lines, and during~~ the back transport of the casks or overpacks, depending on the shielding alternative selected. The Navy discusses the minor impacts of its shipments, but the general public will view all shipments as components of one class and will not differentiate between naval and commercial shipments. This is especially true for communities near rail lines that are used by both the Navy and the private sector for shipment of spent fuel. The Navy will need to work in consultation with state policymakers and stakeholders to share information regarding both its shipments and storage plans.

Uniformity in Containers

B The Navy and the private sector need to coordinate on the selection of the canister/cask system selected for storage and shipment of spent fuel. I realize that the internal basket and configuration will be different for naval fuel in comparison with commercial fuel, but by selecting a uniform external system, the Navy will ensure that the handling and acceptance of spent fuel does not require different equipment at either the centralized interim storage facility or the repository. Such action will reduce the cost to ratepayers and taxpayers for the cost of the storage facility and the repository.

Recycling and Reuse

C Whichever alternative the Navy selects for the storage and transport of spent fuel, the factor of reusing the external components and recycling the materials at the conclusion of the shipping and storage campaign must be taken into consideration. As we have seen during the history of commercial nuclear power, the original decision to proceed with the Atoms for Peace program did not fully address the waste issue, resulting in difficult policy choices for the current generation.

Transportation

D Whichever alternative is selected, the Navy must give a strong value to the system that requires the fewest number of shipments of spent fuel. Although the Navy has never experienced an accident in shipping fuel since the late 1950s, heightened scrutiny of all spent fuel shipments will occur during the coming years. State policymakers, residents and interested parties will have concerns regarding the health and safety of the public and the rail workers; emergency response to an accident will require coordination among the Navy, the Department of Energy, the states and affected Indian nations.

Worker Exposure

E Whichever alternative is selected, worker exposure to radiation from the spent fuel must be kept to a minimum during the transfer of spent fuel from the pool, during storage, and while the fuel is transported either to an interim storage facility or the repository. Although it is expected that a "hot cell" will be available at either a storage facility or the repository, public perception of the safety of the storage and transport system will be significantly greater if the workers (and ultimately the public) are not exposed to bare fuel rods.

Additional Clarifications

F I think the Navy should include a comment on the need to ensure that the system selected and used will be reviewed and licensed by the Nuclear Regulatory Commission. I know this has been the past practice of the naval reactor program, but to ensure public confidence in the storage and transport process, the Navy must continue to use a canister/cask system that has been reviewed and licensed by the appropriate regulatory agency.

G One point that I believe requires further discussion in the final environmental impact statement is the temperature fluctuations discussed on page 2-7 of the draft EIS. The section discusses the lack of temperature fluctuation in naval spent fuel as long as the fuel remains in a cool spent fuel pool. I believe the Nave needs to expand upon this section, either here or in later discussions, regarding the measures the Navy will undertake when using dry storage to ensure that the temperature of the fuel does not fluctuate outside the spent fuel pool. It is my understanding that the inert gases injected between the interior and exterior walls of a canister/cask system will alleviate temperature fluctuations. I would suggest that you provide a discussion of this action in close proximity to the initial discussion of the fuel temperature.

With all of this is mind, the greatest unknown, both to the Navy and the private sector, is the criteria the Nuclear Regulatory Commission will develop for a disposal overpack for a multi-purpose canister system. If the Navy can financially support private research and development of a disposal overpack for the multi-purpose canister system, and if the NRC can license such an overpack in the near term, both the country and the public will benefit.

Respectfully submitted,
L. Cheryl Runyon
Project Manager
Energy, Science and Natural Resources Program
National Conference of State Legislatures

Commenter: L. Cheryl Runyon - National Conference of State Legislatures Energy Science and Natural Resources Program, Colorado

Response to Comment:

A. Transportation impacts are discussed and summarized in Chapter 3, Sections 3.8.4 and 3.8.5. Transportation impacts in absolute terms are provided in Tables 3.8 and 3.9. Further information on transportation is provided in Chapter 7. Relative impacts, expressed as percentages of the total cumulative impacts which are due to naval spent nuclear fuel and special case waste, are also included to provide a convenient perspective. In Section 7.3.7 estimated cumulative impacts for transportation of all spent nuclear fuel to a geologic repository are described and naval spent nuclear fuel shipments to a geologic repository make up from one to four percent of the total impact of all shipments to a repository or centralized interim storage site. These impacts are further described in the Department of Energy *Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Final Environmental Impact Statement* of April 1995 in Appendix I of Volume 1.

The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses.

Additional discussion to clarify these points has been added to the EIS in Chapter 7, Sections 7.1 and Appendix B, B.1.

B. While the Navy appreciates this concern, the cost to ratepayers and taxpayers would be substantially affected if the Navy and private sectors attempted to coordinate the selection of container systems. Chapter 1, Section 1.0 of the EIS states that the Navy was participating in the Department of Energy's Multi-Purpose Canister System EIS when the Department of Energy suddenly ceased preparation of the EIS. However, the Navy must move forward to meet its commitments made in the agreement with the state of Idaho, including removal of fuel from water pool storage. Therefore, a container system must be selected for the management of naval spent nuclear fuel. Moreover, once a system is selected, the Navy must comply with federal acquisition requirements obliging competitive bidding which would make it difficult or impossible to coordinate procurement of such containers for naval use with separate procurements for other uses. The Navy is participating with the Department of Energy in finalizing waste acceptance criteria and disposal requirements such that naval spent nuclear fuel will not require different equipment at either a centralized interim storage facility or a geologic repository. It is noted in the Executive Summary Section S.8.1 of the EIS that the number of containers needed for naval spent nuclear fuel represent about 1 to 4 percent of the total number of containers needed for both naval and civilian spent nuclear fuel which would be shipped to a repository or centralized interim storage site.

C. Recycling and management of end-of-life equipment is discussed in Chapter 4, Section 4.5.2 of the EIS. It is expected that all container system components not disposed of with the naval spent nuclear fuel, including the storage and transportation containers, overpacks or casks and dual-purpose canister would be reused and, at the end of their useful life, recycled. Some pieces of equipment may need to be decontaminated prior to recycling.

Commenter: L. Cheryl Runyon - National Conference of State Legislatures Energy Science and Natural Resources Program, Colorado

D. In the selection of an alternative in the Record of Decision several factors will be considered including protection of human health and the environment, as stated in the Executive Summary, Sections S.1 and Chapter 3, Section 3.9 of the EIS. The normal transportation risks and the accidents risks for transportation are described in Appendix B, Tables B.10 and B.12. In all cases the risks are very small.

The extremely rugged design of naval spent nuclear fuel and the design and testing of shipping containers, which fully meet Department of Transportation and Nuclear Regulatory Commission requirements, makes it unnecessary for emergency response to maintain an extraordinary alert for shipments. The risks for these shipments are small. Every shipment is accompanied at all times by escorts who can immediately contact the emergency control center and Naval Nuclear Propulsion Program experts, if necessary. Federal or local emergency response personnel will be reached immediately, if necessary, in the event of a problem. When notified, emergency response personnel would utilize existing emergency response plans and capabilities, as needed.

The risks associated with the complete range of accidents which might occur during these shipments are analyzed in detail and discussed in the Department of Energy *Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Final Environmental Impact Statement* of April 1995 in Attachment A of Appendix D to Volume 1 and were shown to be small.

E. The Navy agrees that worker and public radiation exposure must be minimized. The results of an evaluation of occupational safety and health over a 40-year period are presented in Chapter 5, Section 5.3.2.1 of the EIS. These results conclude that no latent cancer fatalities are expected to occur in the worker populaton involved in naval spent nuclear fuel operations.

The Navy has safely managed and shipped spent nuclear fuel since 1957. Chapter 2, Sections 2.5 and 2.6 of the EIS describe naval spent nuclear fuel operations and facilities at Idaho National Engineering Laboratory. The design of the loading facility and container system will incorporate this experience to minimize worker and public exposure as low as reasonably achievable.

F. Section 2.4 of the EIS, Regulatory Framework, addresses this comment. Consistent with long-standing practice by the Naval Nuclear Propulsion Program, any container system selected for post-examination naval spent nuclear fuel transportation will receive Nuclear Regulatory Commission review and will be certified for transport by the Department of Energy in full compliance with all applicable federal regulations.

G. Section 2.3 of the EIS, Characteristics of Naval Nuclear Fuel, addresses the results of decay heat calculations for naval spent nuclear fuel. As discussed in the EIS, the design of the selected container system will meet the technical requirements of 10 CFR Part 72 and 10 CFR Part 71 for storage and transportation, respectively. The thermal performance of naval spent nuclear fuel will be addressed as part of the process of obtaining a Certificate of Compliance for transportation once the container system is selected.

Western Interstate Energy Board/ WINB

37

June 28, 1996

Richard A. Guida
Associate Director for Regulatory Affairs
Naval Nuclear Propulsion Program
Department of the Navy
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Dear Mr. Guida:

On behalf of the Western Interstate Energy Board's (WIEB) High-Level Radioactive Waste Committee, we formally request an extension of the comment period for the *Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel*. We also request that the locations suggested below be added to the list of sites where the Navy will hold public hearings concerning this Draft EIS.

A The High-Level Waste Committee, which is made up of 11 western states, has provided the federal government with western states' views on nuclear waste transportation issues for almost fifteen years. However, due to the fact that federal support for the Committee's work has been drastically reduced, Committee resources for analyzing and commenting upon the Navy's current Draft EIS are extremely limited. To allow for the appropriate level of review and analysis of this lengthy and important document, the Committee requests that the comment period be extended from 45 days to 90 days.

B In addition, past experience has demonstrated the critical importance of adequately involving the public in transportation decisions, especially in those states which could potentially be traversed by radioactive waste shipments. According to page B-31 of the Draft EIS, such states include: Oregon, California, Wyoming, New Mexico, Arizona, Colorado, and Nevada. The Committee therefore requests that, during the comment period, the Navy plan additional public hearings in La Grande, Oregon; Reno, Nevada; Las Vegas, Nevada; Denver, Colorado and Albuquerque, New Mexico.

Thank you for your consideration of these requests. If you have any questions, please call Doug Larson at (303) 573-8910.

Sincerely,

Daniel Nix, Co-Chair
High-Level Radioactive Waste Committee

Richard Moore, Co-Chair
High-Level Radioactive Waste Committee

600 17th Street, Suite 1704 South Tower, Denver, CO 80202-5447
Phone 303/573-8910 Fax 303/573-9107

233X

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
2531 JEFFERSON DAVIS HWY
ARLINGTON, VA 22242-5160

IN REPLY REFER TO

July 8, 1996

Mr. Daniel Nix
Mr. Richard Moore
Co-Chairs, High Level Radioactive
Waste Committee
Western Interstate Energy Board
600 17th Street
Suite 1704 South Tower
Denver, Colorado 80202-5447

Dear Sirs:

Thank you for your letter of June 28, 1996, received in our office on July 5, 1996 requesting that the period for public comment on the Navy's draft Container System Environmental Impact Statement (EIS) on naval spent fuel storage and shipping containers be extended from 45 days to 90 days, and public hearings be held at five locations in addition to the six hearings held in early June at three locations in Idaho and Utah.

In response to previous requests, the Navy has agreed to extend the comment period to 60 days, ending July 18, 1996. A notice to this effect was published in the Federal Register on June 6, 1996, copy enclosed. An extension beyond that date cannot be provided since completion of the EIS supports decisions on naval spent fuel dry storage at the Idaho National Engineering Laboratory (INEL) required under a court-ordered settlement agreement among the Navy, Department of Energy and State of Idaho. Thus, comments received after July 18, 1996 will only be considered to the extent practical.

In regard to additional hearings, we do not believe additional hearings are needed because the locations selected adequately covered those regions where naval spent fuel will be loaded, stored, and possibly transported, consistent with the proposed action of the draft EIS.

To facilitate your Committee's review of this matter, however, let me call to your attention some of the key facts which place naval spent fuel shipments and storage into context:

1. History: Since 1957, there have been 655 container shipments of naval spent fuel made to INEL, without any accidents causing release of radioactivity. The DOE published in April 1995 a comprehensive programmatic EIS on spent fuel management in which the Navy was cooperating agency. In that EIS, detailed calculations were made covering incident-free and accident conditions involving naval spent fuel shipments; those calculations showed that for the approximately 600 container

shipments made as of that date, the total radiation exposure to the public was extremely small - causing less than one chance in 1000 of a single latent cancer fatality among the millions of people living along the transportation corridors from almost 40 years of shipments. (Thus, the annual average per-person risk was well below one chance in one billion.)

2. Amount: There are currently 12 metric tons (heavy metal) of naval spent fuel in existence, with a projection of 65 metric tons by the year 2035. By comparison, there are about 30,000 metric tons (heavy metal) of commercial spent fuel today, with projections of over 85,000 metric tons by the year 2035. Thus, naval spent fuel constitutes a very small fraction of the spent fuel inventories today and into the future which may be transported.

3. Nature: Naval nuclear fuel is designed for combat conditions, making it different in design and function than commercial or other nuclear fuel. For example, naval fuel can withstand battle shock loads well in excess of 50 times the force of gravity without damage. Moreover, naval fuel fully retains fission products within the fuel itself, a necessary design requirement given the close proximity of the crew to the reactor aboard ship. Finally, naval fuel operates in excess of twenty years between refueling, requiring it to possess long term structural integrity. All of these factors make naval spent fuel especially safe for storage and shipment.

4. Fuel Cycle: All naval spent fuel is shipped to the Idaho National Engineering Laboratory (INEL) for examination after service, which is why INEL is the only origination point evaluated in the Container System EIS for shipments to an interim storage facility or repository. Naval spent fuel is not stored at multiple locations under different conditions as is commercial spent fuel.

I trust that this information will be helpful to you in your evaluation of the draft EIS. If you have any questions, please contact me or Will Knoll of my staff at 703-602-8229.

Sincerely,

Richard A. Guida

Richard A. Guida
Associate Director
for Regulatory Affairs
Naval Nuclear Propulsion Program

Enclosure

Patent and Trademark Office

Agency Information Collection Activities; Proposed Collection

DOC has submitted to the Office of Management and Budget (OMB) for clearance the following proposal for collection of information under the provisions of the Paperwork Reduction Act (44 USC 35).

Agency: Patent and Trademark Office (PTO).

Title: Post Allowance and Refiling.

Agency Approval Number: 0651-0033.

Form Numbers: PTO/SB13, 14, 44, 50, 51, 52, 53, 54, 55, 56, 57, and PTO-85B.

Type of Request: Revision of a currently approved collection.

Burden: 63,400 hours.

Number of Respondents: 165,900 submissions.

Avg. Hours Per Response: Varies for each form from .2 to 5 hours.

Needs and uses: This collection of information is required to administer the patent laws pursuant to Title 35 of the U.S. Code concerning the issuance of patents and related actions. The affected public includes any individual or institution whose application for a patent has been allowed or who takes action as covered by the applicable rules. The information is collected when an application for a patent is allowed by PTO or if the grantee or others request reexamination or wishes to correct information contained in the patent.

Affected Public: Individuals or Households, Businesses or other for-profit institutions, Farms, State, Local or Tribal Government, Federal Government and Not-for-profit institutions.

Frequency: When an application for patent is allowed or at discretion of the individual.

Respondent's Obligation: Required to obtain Benefit.

OMB Desk Officer: Maya A. Bernstein, (202) 395-3785.

Copies of the above information collection proposal can be obtained by calling or writing Linda Engelmeier, Acting Departmental Forms Clearance Officer, Department of Commerce, Room 5327, 14th and Constitution Avenue, N.W., Washington, DC 20230.

Written comments and recommendation for the proposed information collection should be sent to Maya Bernstein, OMB Desk Officer, room 10236, New Executive Office Building, Washington, DC 20503.

Dated: May 30, 1996.

Linda Engelmeier,

Acting Departmental Forms Clearance Officer, Office of Management and Organization.

[FR Doc. 96-14215 Filed 6-5-96; 8:45 am]

BILLING CODE 3510-16-P

DEPARTMENT OF DEFENSE

Office of the Secretary

Defense Science Board Task Force on Information Warfare Defense; Notice of Advisory Committee Meeting

SUMMARY: The Defense Science Board Task Force on Information Warfare Defense will meet in closed session on June 18-19, July 30-31, and August 29-30, 1996 at Science Applications International Corporation, McLean, Virginia.

The mission of the Defense Science Board is to advise the Secretary of Defense through the Under Secretary of Defense for Acquisition and Technology on scientific and technical matters as they affect the perceived needs of the Department of Defense. At these meetings the Task Force will focus on protection of information interests of national importance through establishment and maintenance of a credible information warfare defensive capability in several areas, including deterrence. This study will be used to assist in analysis of information warfare procedures, processes, and mechanisms and illuminate future options in defensive information warfare technology and policy.

In accordance with Section 10(d) of the Federal Advisory Committee Act, P.L. No. 92-463, as amended (5 U.S.C. App. II, (1994)), it has been determined that these DSB Task Force meetings concern matters listed in 5 U.S.C. § 552b(c)(1)(1994), and that accordingly these meetings will be closed to the public.

Dated: May 31, 1996.

Patricia L. Toppings,

Alternate OSD Federal Register Liaison Officer, Department of Defense.

[FR Doc. 96-14133 Filed 6-5-96; 8:45 am]

BILLING CODE 5000-04-M

Department of the Army

Cargo Liability of Motor Carriers

AGENCY: Military Traffic Management Command (MTMC).

ACTION: Request for Carrier Industry Comments.

SUMMARY: This notice supplements the notice published on March 14, 1996 (FR, Vol. 61, No. 51, page number 10566). The effective date of July 1, 1996 is postponed to allow consideration of comments on the proposed motor carrier liability for shipments of non-Guaranteed Traffic (GT) Freight All Kinds (FAK) shipments, described in the MTMC Freight Traffic Rules Publication No. 1A, Items 112, 113, 115, and 116.

DATES: Comments concerning the proposed motor carrier liability for shipments of non-GTFAK must reach Headquarters, Military Traffic Management Command, ATTN: MTOP-T-SR, 629 NASSIF Building, 5611 Columbia Pike, Falls Church, VA 22041-5050, by August 5, 1996.

FOR FURTHER INFORMATION CONTACT: Mr. Julian Jolkovsky, MTOP-T-SR, (703) 681-3440, or Mr. James Murphy, MTOP-T-S, (703) 681-3443.

SUPPLEMENTARY INFORMATION: The proposed liability, described on 61 FR 10566, is the same liability already in effect for GT shipments, in MTMC Guaranteed Traffic Rules Publication No. 50, Item 350.

Gregory D. Showalter,

Army Federal Register Liaison Officer.

[FR Doc. 96-14270 Filed 6-5-96; 8:45 am]

BILLING CODE 3710-08-M

Department of the Navy

Notice of Extension of the Public Comment Period for the Department of the Navy Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel

SUMMARY: The Department of the Navy (Navy) gave notice of the availability of the Draft Environmental Impact Statement (EIS) for a Container System for the Management of Naval Spent Nuclear Fuel in the May 14, 1996 **Federal Register** (61 FR 24293). The formal comment period commenced on May 17, 1996 (61 FR 24933) and was scheduled to close on July 3, 1996. The Navy has now determined that the public comment period will be extended to July 18, 1996.

The draft EIS was prepared in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA); Council on Environmental Quality regulations implementing NEPA, 40 CFR Parts 1500-1508; and the Chief of Naval Operations Environmental and Natural Resources Program Manual, OPNAV Instruction 5090.1B. As identified in the May 14, 1996 **Federal Register** notice, the Navy will conduct public hearings and receive comments on the draft EIS which addresses the need, alternatives, and environmental impacts of manufacturing containers; loading containers; handling, and storage of naval spent nuclear fuel at the Idaho National Engineering Laboratory (INEL); transportation of naval spent nuclear fuel loaded containers to a notional repository or centralized interim storage site; and the storage, handling, and transportation of certain radioactive waste associated with naval spent nuclear fuel management. The Department of Energy is a cooperating agency for this draft EIS. The draft EIS is available to the public in reading rooms and designated information locations, as identified in the May 14, 1996 **Federal Register** notice.

DATES: The Navy invites interested agencies, organizations, and the general public to provide comments on the draft EIS. The original 45 day formal comment period commenced on May 17, 1996 and was scheduled to close on July 3, 1996. The Navy is now providing a 60 day public comment period and all comments on the draft EIS are due by July 18, 1996. Oral comments will be accepted at the public hearings to be held at the Times and locations listed in the May 14, 1996 **Federal Register** notice. The final EIS is scheduled to be available no later than November 30, 1996.

FOR FURTHER INFORMATION CONTACT: Comments should be sent to: Mr. William Knoll of the Naval Nuclear Propulsion Program of the Department of the Navy, Code NAVSEA 08U, 2531 Jefferson Davis Highway, Arlington, VA 22242–5160, Telephone: 703–602–8229.

Dated: May 31, 1996.

M.A. Waters,

LCDR, JAGC, USN, Federal Register Liaison Officer.

[FR Doc. 96–14305 Filed 6–5–96; 8:45 am]

BILLING CODE 3810–FF–P

DEPARTMENT OF EDUCATION

Research Priorities Plan; Invitation for Public Comment and Notice of Availability of the Proposed Research Priorities Plan: "Building on What We've Learned: Developing Priorities for Education Research"

SUMMARY: The Assistant Secretary for Educational Research and Improvement is developing a research priorities plan which shall recommend priorities for the investment of the resources of the Office of Educational Research and Improvement over the next five-, ten-, and fifteen-year periods. The development of this plan is required by the Office of Educational Research and Improvement's authorizing legislation, the "Educational Research, Development, Dissemination, and Improvement Act of 1994." In accordance with 20 U.S.C. 6011(f)(2)(B), the Assistant Secretary has issued a proposed research priorities plan and seeks public comment on the content of the proposed plan.

DATES: All comments concerning this proposed plan must be received on or before August 5, 1996.

ADDRESSES: All comments concerning this proposed plan should be addressed to Judith I. Anderson, U.S. Department of Education, Office of Educational Research and Improvement, 555 New Jersey Avenue, NW., Room 510, Washington, DC 20208–5573. Comments may also be sent through Internet to (Judith_Anderson@ed.gov).

TO RECEIVE A COPY OF THIS PROPOSED PLAN AND FOR FURTHER INFORMATION CONTACT: Tammra Gill. Telephone (202) 219–1556. Internet electronic mail address (research_plan@inet.ed.gov). Individuals who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1–800–877–8339 between 8 a.m. and 8 p.m., Eastern time, Monday through Friday.

SUPPLEMENTARY INFORMATION:

Background

On March 31, 1994, President Clinton signed Public Law 103–227, which includes Title IX—the "Educational Research, Development, Dissemination, and Improvement Act of 1994" (the "Act") (20 U.S.C. 6001 et seq.). The Act restructured the Office of Educational Research and Improvement (OERI) and endowed it with a broad mandate to conduct an array of research, development, dissemination, and improvement activities aimed at strengthening the education of all students. The Act established the following five national research institutes within OERI:

(1) The National Institute on Student Achievement, Curriculum, and Assessment;

(2) The National Institute on the Education of At-Risk Students;

(3) The National Institute on Educational Governance, Finance, Policymaking, and Management;

(4) The National Institute on Early Childhood Development and Education; and

(5) The National Institute on Postsecondary Education, Libraries, and Lifelong Learning.

The Act authorized the Assistant Secretary to conduct research, development, demonstration, and evaluation activities to carry out the purposes for which these Institutes were established.

The Act also required the establishment of a National Educational Research Policy and Priorities Board (the "Board") to work collaboratively with the Assistant Secretary to identify priorities to guide the work of OERI.

Statutory Requirements

The legislation directed the Assistant Secretary to work collaboratively with the Board to develop a research priorities plan that will recommend priorities for the investment of resources over the next five-, ten-, and fifteen-year periods, including as priorities those areas of inquiry in which further research, development and dissemination—

(a) is necessary to attain the National Education Goals;

(b) promises to yield the greatest practical benefits to teachers and other educators in terms of improving education; and

(c) will not be undertaken in sufficient scope or intensity by the other Federal and non-Federal entities engaged in Education research and development.

Invitation To Comment

Interested persons are invited to submit comments including suggestions on how to strengthen this document. The Department is especially interested in hearing what commenters believe to be the most important and promising educational research opportunities for the next five, ten and fifteen years.

All comments submitted in response to this proposed plan will be available for public inspection, during and after the comment period, in Room 510, 555 New Jersey Avenue, NW., Washington, DC, between the hours of 8:30 a.m. and 4 p.m., Monday through Friday of each week except Federal holidays.

Dated: May 30, 1996.

(Catalog of Federal Domestic Assistance Number does not apply)

Sharon P. Robinson,

Assistant Secretary for Educational Research and Improvement.

[FR Doc. 96–14164 Filed 6–5–96; 8:45 am]

BILLING CODE 4000–01–P

Commenter: Daniel Nix - Western Interstate Energy Board, Colorado

Response to Comment:

A. The Department of the Navy extended the comment period to 60 days and published a notice in the Federal Register to that effect.

B. The Navy concluded that additional hearings were not needed; this was conveyed to the commenter by letter dated July 8, 1996. The letter explained that the locations selected covered those regions where naval spent nuclear fuel will be loaded and stored and representative regions where it might be transported, consistent with the proposed action covered in the Container System EIS. The EIS does not cover long-term interim storage or disposal of the spent nuclear fuel, which are the responsibility of the Department of Energy rather than the Navy. The EIS does use Yucca Mountain as a destination for purposes of analysis only, recognizing that location is the only one under the Nuclear Waste Policy Act being evaluated as a potential repository. The analysis does not presume, however, that Yucca Mountain will be found suitable as a repository or would be the site for a centralized interim storage facility.

NAC INTERNATIONAL

Atlanta Corporate Headquarters
655 Engineering Drive
Norcross, Georgia 30092
770/447-1144
770/447-0344 Fax

Edward M. Davis
President & CEO

July 18, 1996

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Mr. William Knoll
United States Department of the Navy
Code NAVSEA 08U NC2
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Subject: Comments by NAC International on the Draft EIS for a Container System for the Management of Naval Spent Nuclear Fuel

Dear Mr. Knoll:

NAC International (NAC) is pleased to submit the attached comments on the U.S. Department of the Navy's draft Environmental Impact Statement (EIS) for a Container System for the Management of Naval Spent Fuel. NAC, founded in 1968, is the leading U.S. nuclear spent fuel technology, transportation services and fuel cycle information company.

A NAC's nuclear fuel storage and transportation cask experience and understanding of spent fuel cask design bases -- and our appreciation for regulatory and public policy realities -- all support the choice of the transportable storage cask as the "preferred alternative" for the final EIS.

As stated in the EIS, dual-purpose systems offer obvious advantages to the Navy as compared to single-purpose systems. Cost, efficiency and environmental benefits would be realized through utilization of systems that enable spent fuel to be both transported and stored dry in the same container. Four of the six alternatives evaluated in the EIS provide this dual-purpose capability. We support your conclusion, subject to the attached comments, that the costs and environmental impacts associated with implementing any of these alternatives are approximately equal.

B The alternatives, however, have marked differences in their engineering and regulatory maturity. These differences create a defacto environmental risk not evaluated in the EIS -- namely, the Navy's potential inability to implement a selected alternative within the required time frame due to unresolved engineering and regulatory issues. Of the four dual-purpose system options, only the transportable storage cask, the NAC-STC, possesses the required regulatory approvals allowing for its immediate deployment. Upon certification of an internals package customized to meet the Navy's demands, the NAC-STC could be put into immediate use to store spent fuel in Idaho or transport spent fuel to an interim storage facility. The uncertain lead time necessary for the design and certification of other systems could conflict with the implementation schedule in the Idaho Settlement Agreement, thereby making these unlicensed systems far less viable choices as a "preferred alternative" in the foreseeable future.

NAC INTERNATIONAL

Further distinguishing NAC's transportable storage cask is its inherent capability to accommodate a multi-purpose canister. While other alternatives examined in the EIS focus only on the canister design, the NAC-STC provides an engineered system that is highly flexible --- one capable of uncanistered storage or transport, or accommodating a dual/multi-purpose canister (NAC-MPC). It is a level of versatility not found in other alternatives and one that ideally fulfills the rigorous schedules and practices mandated by the Idaho Settlement Agreement. The NAC-STC system can be placed in immediate service today, yet can accept an MPC when Federally driven disposal criteria are put forth.

For the record, the NAC-MPC technology, which uses the NAC-STC as an overpack, was recently selected by Yankee Atomic Electric Company to meet its transportable storage needs at the Yankee Rowe plant in Rowe, Mass. This system is the nation's first generation MPC and exceeds Department of Energy criteria. An additional dimension of the NAC-MPC is that its transport overpack, fuel basket and overall design methodology closely parallel those of the private sector Universal MPC System™ (UMS™), which is under development by an NAC-led team to accommodate virtually all of the nation's commercial spent fuel.

NAC views these differentiating characteristics as profound enough to justify the selection of the NAC-STC transportable storage cask as the "preferred alternative" in the Navy's final EIS. We believe it is a conclusion fully justified by objective evaluation of the designs and by the engineering and regulatory maturity of the concepts.

We appreciate the opportunity to provide our comments on the EIS and look forward to helping the Navy achieve its important spent fuel management objectives.

Sincerely,

Edward M. Davis
President and CEO

Attachment

cc: Mr. Richard A. Guida, NAVSEA
Ms. Jill Lytle, DOE-HQ
Adm. Bruce Demars, DOE-HQ

NAC
INTERNATIONAL

Comments on the Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel

General Comments

1) The Introduction to the EIS (S.1) states that factors to be taken into consideration in developing a preferred alternative include public comments, protection of human health and the environment, cost, technical feasibility, operational efficiency, regulatory impacts, and storage or disposal criteria. Schedule realism is an equally important factor for evaluation, one that is tied to environmental impacts. The Idaho Agreement encourages near-term movement of fuel from basin storage to dry storage. It also states that Navy fuel is to be among the first to be transported to an interim storage or permanent disposal site. These principles were derived from public safety and environmental concerns. Since not all concepts evaluated in the EIS are equally far developed, they represent differing risk in terms of meeting the
C Agreement's schedule objectives. An environmental evaluation of the alternative concepts is incomplete without an assessment of comparative ability to meet schedule-driven environmental criteria. It is our judgment that such an evaluation would demonstrate the superiority of more mature technologies that are capable of both storage and shipment in the same vehicle. The NAC-STC dual-purpose cask is such a vehicle—one that is amenable to canistered or uncanistered application.

2) The EIS and its transmittal letter conclude that the environmental impacts of any of the alternative concepts are very small—a conclusion with which we are in general agreement. However, the purpose of the EIS, as described in Section 1.0, **Proposed Action,** was not to evaluate the environmental acceptability of dry storage but rather to assess the environmental impacts associated with the several types of container systems capable of performing that function. It is, therefore, imperative that the assumptions used in the EIS not introduce biases that would have a significant effect on the comparative performance of one system versus another. There are several instances in the EIS where the assumptions fail to meet this standard, resulting in comparative performance differences of an order of magnitude or more. For the reader who is interested in comparative risks, however small, the assumptions will distort the conclusions. The specific comments below address these points in detail, but it is the assumptions relative to shipment external dose rate (Section B.5.1), probability of missile or aircraft impact (Section A.2.5), and normal/off-normal handling risk (Sections A.2.4 and A.2.5) that we conclude introduce biases in the evaluation.

Specific Comments

i) Figures D.5 through D.9 (Section D.2.1) show in cartoon form the operational steps required for each concept. The number of handling iterations varies greatly for the alternative concepts. Every nuclear facility probabilistic risk assessment that we have studied concludes that such handling operations are a dominant factor in
D cumulative risk. However, the EIS assumes that only the movement of fuel into and out of the cask or container contributes to risk, in effect ignoring the effects of other handling operations. Since the concepts involve varying numbers of handling operations other than the initial loading in Idaho or transfer at a repository, this significant differentiating factor ends up neglected in the EIS.

ii) The hypothetical accident risks during dry storage focus on projectile-based accidents, either aircraft or wind-driven projectile. Our reading of the EIS suggests that a fixed event probability is assumed (independent of the number of casks or size of the footprint), while damage is assumed to be a function of the quantity of fuel in the cask. These assumptions combine to produce a higher risk for a larger-capacity cask. In reality, the probability of occurrence is a function of the footprint of the
E storage site. Smaller cask usage will require more casks and produce a larger footprint (consequently a higher probability of occurrence) but a smaller probable release. Larger cask usage will produce a smaller footprint (consequently a lower probability of occurrence) but a higher probable release. While we have not performed the analysis, it is our judgment that the combined probabilities will nearly equal each other.

iii) The estimated container capacity is an important factor since it influences concept cost, schedule and risk. The transportable storage cask (NAC-STC), having the largest bore of any concept under evaluation, is shown to have the highest capacity for submarine fuel (Section B.1, Table B.1). However, the EIS shows it to have only half the capacity for surface ship fuel. In the absence of dimensional information, we cannot make any conclusive statements relative to the estimated capacity. Based
F on the large bore of the NAC-STC and our knowledge of alternative systems, however, the degradation of capacity for the NAC-STC would appear to be in error.

iv) The shipment external dose rate affects the risk to transportation personnel and to the general public. The EIS (Section B.5.1) uses measured values for the M-140 but uses regulatory limits for the other concepts. This assumption results in an order of magnitude difference in risk. In reality, we find it common that the as-fabricated cask will result in dose rates one or more orders of magnitude lower than design. This is because conservative design codes and limiting case loadings are used in the
G design process. Use of a regulatory limit for casks other than the M-140 creates an artificial bias that dominates the overall risk evaluation of the alternative concepts. To rectify this discrepancy, a regulatory limit should be used for all concepts or, alternatively, a code evaluation of the performance of each design relative to an assumed source term should be performed.

Commenter: Edward M. Davis - NAC International, Georgia

Response to Comment:

A. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for use must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, used safely and reliably.

B.&C. The Navy understands that the different alternatives have different degrees of engineering and regulatory maturity. The Navy realizes that these differences may result in some uncertainty in cost and schedule for procurement of components of the container system. However, the Navy does not consider that these differences create a defacto environmental risk not evaluated in the EIS.

The criteria used to select the alternate container systems are listed in the EIS Chapter 3, Section 3.0. All the container systems are assumed to be able to meet the technical requirements in 10 CFR 71 and 10 CFR 72, and 10 CFR 60 when these are finalized. If a preferred container system cannot meet these technical requirements, it would not be used - and a container which does meet these requirements would be used instead. Thus, no additional environmental risk would arise.

With regard to schedule constraints, there appears to be sufficient time to allow design work and regulatory review to proceed on a normal pace. There also appears to be sufficient time to allow competitive bidding to identify the containers to be procured once the container system is selected. The agreement with the State of Idaho requires that the transfer of spent fuel from wet to dry storage shall commence by July 1, 2003 and that transfer to dry storage be completed by Calendar Year 2023. The agreement also requires that removal of spent fuel from Idaho be completed by Calendar Year 2035. These dates appear to be appropriate to select the container system to be used and to initiate design work and regulatory review.

D. A complete probabilistic risk assessment was not needed and was not performed for this EIS. The analyses for normal handling operations focused on the differences among the alternative container system concepts and how those might cause the impacts on human health and the environment to vary among alternatives. For the normal operations analyses presented in Appendix A, Section 2.4, the operations which resulted in a radiological release or direct radiation exposure were evaluated to estimate the resultant health effects. The radiological analyses results presented for normal facility operations take into account radiological releases or direct radiation exposure during spent nuclear fuel loading, storage, and unloading operations. For example, for loading operations, the alternative container systems fall into two categories, those that require repackaging prior to shipping and those that do not. The expected radiological releases resulting from repackaging operations are reflected in Table A.10. These results show larger risks for the No-Action and Current Technology/Rail Alternatives. Once the container lids are sealed, there are no radiological releases expected due to normal handling operations. The operations required to move a sealed container or cask into dry storage or prepare for shipment are expected to be very similar for all alternative container systems. Differences can also be seen in Table A.12, results for unloading operations at a repository, where the Multi-Purpose Canister Alternatives do not require repackaging into a disposal container. Hypothetical accident scenarios are covered in Section A.2.5.

Commenter: Edward M. Davis - NAC International, Georgia

E. The commenter claims that large container systems will occupy less area than small container systems and that the resultant lower probability of occurrence of hypothetical accidents (due to a smaller target size) will essentially cancel the higher expected consequences (due to the amount of fuel in the large container), such that the overall risk for all of the container system alternatives would be equal.

The area of the storage footprint does not necessarily increase with a greater number of smaller containers because the number of containers in a given area increases and the spacing between different types of container varies. The design of the storage container also affects the area required and varies from vendor to vendor for a given category of container. In addition, the probability of an airplane crash is not directly proportional to the area occupied by the storage containers. For example, a 10 percent decrease in the assumed storage area at the Idaho Chemical Processing Plant would decrease the airplane crash probability by approximately 5 percent. In contrast, the dose is directly proportional to the source term used for the container alternatives. To reduce the airplane crash probability by 50 percent the storage area would have to be reduced approximately 80 percent. Although detailed container system designs for naval spent nuclear fuel would be prepared by the eventual successful bidder, the differences in the actual size of the dry storage area for the alternative container systems are not expected to be large enough to change the conclusions of these analyses.

For the wind-driven missile and airplane crash hypothetical accident scenarios, the same probability of occurrence was used when calculating the risk for all container system alternatives. In addition, the source term was developed based on damage to only one container, regardless of the number of containers in the dry storage array or the size of the dry storage systems. Analysis of existing naval spent nuclear fuel transportation casks (M-130s and M-140s) has shown that they are strong enough to prevent penetration of the cask or damage to the spent fuel by a wind-driven missile or the largest parts from a large jet aircraft, even assuming a direct hit normal to the container surface. Of course, an object striking the container at an angle more oblique than 90 degrees would inflict even less damage. Despite these analysis results, damage to the container seal of a single container was assumed for both of these hypothetical accident scenarios. Similar analyses for the other container system alternatives could not be completed, since specific detailed designs have not been prepared for all container systems which might be used for naval spent nuclear fuel. Actual damage to these container systems during such hypothetical accidents may be greater or less than the damage to an M-140 cask; however, it is expected that any radiological releases would be similar because all dry storage container systems would be designed to the requirements of 10 CFR Part 72.

There are many factors which determine the actual consequences for a particular accident, many of which are container system design details such as structural integrity, size of the container, size of the storage system, and geometric shape of the storage system. In addition, the type of naval spent nuclear fuel (specific design of submarine or surface ship fuel) impacts the actual consequences of an accident. Other factors impact the actual probability of occurrence for these hypothetical accident scenarios, including target size (number, size, and spacing of the container systems in the dry storage array), size of the missile, energy of the missile, the angle of the hit, and the location of the hit on the dry storage system. Since all of these details are not known for all container system alternatives, an assumption was made that one container seal could be breached as a result of these accidents. This assumption results in consequences and risks which are not expected to be exceeded should an actual accident occur.

Commenter: Edward M. Davis - NAC International, Georgia

As a result of this approach, the source terms, and thus the consequences, for these hypothetical accident scenarios are proportional to the amount of naval spent nuclear fuel that can be loaded into a single container system. For the wind-driven missile scenario, a corrosion product release, the source term was developed based on the surface area of the most limiting fuel type (by surface area) for each container alternative. The results in Tables A.22 through A.24 show annual risks at ICPP ranging from 7.0×10^{-9} to 1.2×10^{-8}, with the largest risk (High Capacity M-140, Transportable Storage Cask, and Dual-Purpose Canister) being 1.7 times larger than the smallest risk (Small Multi-Purpose Canister and M-140). For the airplane crash scenario, a corrosion product release plus a fission product release due to a subsequent fire, the source term was developed based on the fission products available for release in the most limiting fuel type (by fission product inventory) for each container alternative. The results in Table A.26 show annual risks ranging from 5.2×10^{-7} to 1.0×10^{-6}, with the largest risk (Large Multi-Purpose Canister) being 1.9 times larger than the smallest risk (Small Multi-Purpose Canister). These ranges in risk are very small when compared to the results of the uncertainty analysis which show that the risks presented in this EIS are believed to be 10 to 100 times larger than what would actually occur (see Section A.2.7). When taken in context with the conservatism applied in these analyses, the risks associated with all of the container alternatives are essentially similar; therefore, the analysis results of these hypothetical accidents do not distinguish among the alternatives. This conclusion is supported by the selection of a large container system, not one of the smaller containers, as the preferred alternative for dry storage and transportation of naval spent nuclear fuel (see Section 3.9).

F. Although the NAC-STC bore has the largest diameter, it also has the shortest length cavity. For the surface ship fuel, length is more restrictive in determining cargo capacities. The geometry results in fewer submarine fuel shipments but more surface ship fuel shipments; however, the net number of shipments is about the same as the large multi-purpose canister or the dual-purpose canister (325 shipments compared to 300 shipments). This small difference in the number of shipments produces only a small difference on the effect on the environment.

G. The Navy agrees with the commenter that any as-fabricated cask often produces dose rates which are lower than the regulatory limit. In the EIS Executive Summary, Sections S.6.1 and Chapter 3, Section 3.8 and Tables S.6 and 3.2 it is clearly stated that the actual historic doses have been used for the alternatives based on the M-140 and not for the other container systems. Section 3.8 of the EIS describes the Navy's preferred alternative which is not the M-140 containers. The best available data have been used in this EIS to estimate environmental impacts. Actual measurements are available for the M-140 container but none of the other containers have been used for naval fuel so the regulatory limit which serves as the design basis represents the best estimate of the external exposure rate for such containers. The use of actual measurements did not bias the selection of the preferred alternative.

State of Idaho

PHILIP E BATT
Governor

OVERSIGHT PROGRAM
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ROBERT N. FERGUSON
Coordinator/Administrator

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July 18, 1996

Mr. William Knoll
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

RE: State of Idaho Comments on the Department of the Navy *Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel.*

Dear Mr. Knoll:

Thank you for the opportunity to comment on the above referenced document. Our comments are both general and specific. Attached is a copy of Idaho Governor Phil Batt's testimony from the June 5, 1996 public meeting in Boise.

General Comments

A Of the six canister alternatives evaluated in this EIS, the Dual-Purpose Canister (DPC) and Multi-Purpose Canister (MPC) will have the fewest environmental impacts. For this reason, we encourage the selection of one of these alternatives.

Advantages of these alternatives include measures that will minimize worker exposure and provide additional protection from rupture and subsequent radiological release. Worker exposure will be minimized with DPCs and MPCs because the spent nuclear fuel (SNF) is dry sealed inside the canisters for storage and transport. And, in the case of the MPC, the SNF remains sealed in the same canister for disposal as well. Once sealed, the SNF cannot be directly handled or exposed to the environment. This minimizes worker exposure. The shielding, which includes the canister and an overpack, also protects against rupture and accidental release to the environment.

B The siting alternatives for a dry storage facility at the INEL include the Naval Reactors Facility and the Idaho Chemical Processing Plant. The EIS evaluated two sites off the Snake River Plain Aquifer and determined that there are environmental disadvantages to both of them. The analysis that is referenced as the basis for this conclusion has been reviewed by the INEL Oversight Program.[1] At this time, many questions remain as to the adequacy of the referenced document. Specific comments and concerns in this regard are included in this transmittal.

[1] Paul C. Rizzo Associates, *Siting Feasibility of Locations for Dry Storage Facility on the INEL that are Removed from Over the Snake River Plain Aquifer/*, July 1996

Also from a siting alternative perspective, the question remains as to whether all reasonable alternatives were considered. In other words, are there other locations at the INEL that may be preferable with respect to potential seismic activity, distance to off-site populations, and possible volcanic activity? If so, these locations should be included in the siting evaluation. If not, then the EIS should explain why these other sites are not suitable and therefore rejected from the analysis.

Specific Comments

C Page S-12, First Paragraph

The last sentence mistakenly equates the likelihood of a latent cancer fatality of 0.00004 to "1 in 25,000 years." The word "years" should be deleted.

D Page 3-6, Section 3.1

The MPC alternative uses a permanently welded container that will not be opened. Will this container configuration require that special analysis, arrangements, and provisions be made in the future repository prior to the fuel being accepted for permanent storage?

E Page 5-1, Second Paragraph

Since the M-140 cask cannot be moved by truck, a rail line will need to be laid from NRF to CPP if the M-140 cask options are to be utilized at the ICPP. The potential impacts of building such a line should be discussed in the EIS.

F Page 5-7, Table 5.2 and Page 5-9, Table 5.3

Worker doses based on past history (tab. 5.3; 550 to 1500 person-rem) do not compare well with estimated facility worker doses in tab. 5.3 (maximum of about 127 person-rem, assuming 280 workers for 40 years). Presumably these estimates are different because of their different bases, but the differences should at least be discussed.

G Page 5-13, Paragraph 6

Please identify the "fault segment" near Mackay Dam (i.e. Mackay segment of the Lost River Fault).

H Page 5-17, Table 5.4

At what distances (population areas) are the latent cancer fatalities predicted?

I Page 6-3, Tables 6.1, 6.2

The impacts to the workers from both normal operations and accidents involving unloading are not predicted.

J Page 7-6, Table 7.3

Please explain why the MPC latent cancer fatalities are greater than those in some of the other alternatives. Is the external dose equivalent rate (TI) expected to be higher than commercially available container systems?

K Page A-3, Table A.2

Health effects to both workers and the MEI should be summarized here.

L Page A-11, Second Paragraph

The 100 mrem/yr limit from 10 CFR 20 refers to Total Effective Dose Equivalent not just the contribution from ground surface dose. The dose from the impacted area needs to include the contributions from inhalation, ingestion (if off-site) and cloud gamma if the limit in 10 CFR 20 is to be cited.

M Page A-20, Table A.13

Ingestion data changes in RSAC5 should be justified and referenced.

N Page A-21, Bullet 5

Please provide references for the 1% release of corrosion products from the fuel and the 10% release of corrosion products to the environment with the pool water.

O Page A-28, Second Bullet

Please provide references for the 1% HEPA filter fire release fraction.

P Page A-38, Last Paragraph

An airplane crash could involve an array of dry storage casks. If this were the case, some of the aircraft that have been involved in testing and research at the INEL (including a large military transport) would likely have an effect on more the one cask. The momentum of a large aircraft could conceivably topple several casks to the ground or into one another if it crashed into them. Has this been analyzed?

Q Page B-20, Second Paragraph

Please provide a reference basis for the estimated 10% of the fuel that might be damaged in an accident.

R Page B-22, Section B.6.2

95% meteorological conditions should also be used for accident analysis in order to better portray a range of worst case impacts.

Should you have any questions regarding the State's comments, please contact Alan Merritt of this office at (208) 528-2620.

Sincerely

Robert N. Ferguson

Robert N. Ferguson
Administrator/Coordinator

cc: Jeff Schrade, Special Assistant to the Governor
Ann Dold, Manager, INEL Oversight
Kathleen Trever, Deputy Attorney General
Delbert Farmer, Chairman, Ft. Hall Business Council
Roger Twitchell, DOE-ID NEPA Compliance Officer

S

Comments on "Siting Feasibility of Locations for Dry Storage Facility on the INEL that are Removed from Over the Snake River Plain Aquifer"
(by Paul C. Rizzo Associates, July 1996)

General Comment

1) Please provide copies of the following references:

a) Irving, J.S., 1992, Draft environmental resource document for the INEL, vol. 1; EG&G Idaho, Inc., DE-AC07-761DO1570.

b) Taylor, D.D., and others, 1994, Preliminary siting activities for new waste handling facilities at the INEL; EG&G Idaho, Inc., EGC-WN-1118.

2) The discussion of ground-water flow near the Lemhi range and the Birch Creek valley should include quantitative information (i.e. water table maps, water budgets, etc). A list of references which may provide a more detailed discussion of these areas is attached.

Specific Comments

1) Page 3, paragraph 1 -

Please reference the page number in Orr and Cecil (1991) which discusses the "shallow water table" of the alluvial aquifer.

2) Page 8, paragraph 2 -

The document states that "the aquifer is between 840 and 1,220 feet *thick* (Mann, 1986)" [emphasis added]. This appears to be incorrect. Mann (1986) states on page 21 that "the effective base of the Snake River Plain aquifer near the test hole is somewhere between 850 and 1,220 ft *below land surface*." [emphasis added]

3) Page 8, paragraph 4 -

The text states "Decreases of head with depth in recharge areas were verified in a U.S. Geological Survey test hole at INEL (Garabedian, 1992; p. F24)." In fact, the "test hole" discussed on page F24 (4N-38E-12BBB1,2,3,4,5) is not "at INEL". As shown on plate 4 of Garabedian (1992), the well is near Rigby, Idaho.

At the INEL, water level data from well INEL-1 indicated that the hydraulic head increases with depth. Mann (1986) notes that "The upward vertical movement of water into the Snake River Plain aquifer from underlying rock units could be on the order of 15,000 acre-feet per year at the INEL" (page 1).

4) Page 9, paragraph 4 -

The text states that "Presumably, underflow [from the Little Lost River drainage] reaches the INEL and recharges the SRP Aquifer." In lieu of "presumably", suggest using quantitative estimate of recharge from Garabedian (1992) (i.e. 155,000 acre-feet per year).

5) Page 10, paragraph 1 -

The text states "Further, Garabedian (1992; Plate 8) concludes that recharge from the Alluvial Aquifer associated with the Big Lost River is up to 10 inches (25 mm) per year, which is an order of magnitude greater than that from the surrounding portions of the ESRP. Therefore, the recharge to the SRP Aquifer from the Alluvial Aquifer is significant." The appropriateness of this reference is questionable for several reasons:

a) The title of plate 8 (Garabedian, 1992) is "Maps showing recharge from *surface-water irrigation and precipitation*, eastern Snake River Plain, Idaho" [emphasis added]. Clearly, this reference does not apply to underflow from the "Alluvial Aquifer."

b) The recharge rate of up to 10 inches/year appears to apply to the period of 1926 to 1930. The most recent data on plate 8 would be more appropriate, and the maximum recharge rate near the Big Lost River for 1976 to 1980 is 5 inches/year.

It would appear that more appropriate estimates for underflow from the "Alluvial Aquifer" would be 78,000 acre-feet per year from the Birch Creek drainage and 155,000 acre-feet per year from the Little Lost River drainage (Garabedian, 1992; Table 11).

6) Page 10, paragraph 2 -

The text states that "The surface water run-off from this area as well as groundwater in the Uplifts area recharges the SRP aquifer." However, no quantitative discussion of the amount of recharge from ground water in the uplifts is provided. Page 3 references Irving (1992) as supporting documentation for the recharge from the Uplifts. This comment will be reconsidered pending receipt and review of Irving (1992).

7) Page 10, paragraph 2 -

The text indicates that the low relief sections on the western side of the Lemhi Range are adjacent to farm land and downgradient with respect to ground water flow from the Lemhi Range area. A topographic map showing land ownership and water table elevation should be included as supporting documentation for these statements.

8) Page 11, paragraph 1 -

The document states "The Alluvial Aquifer ... is hydrologically connected to the SRP Aquifer since it is downgradient of the ESRP." This sentence is not clear, and seems to imply that the Alluvial Aquifer receives underflow from the SRP Aquifer, since the former is "downgradient" from the ESRP.

9) Page 11, bullet item 1 -

On what basis is the vertical hydraulic conductivity of the Alluvial Aquifer "inferred" to be higher than that of the SRP Aquifer? Quantitative information should be supplied to support this statement.

10) Page 11, bullet item 2 -

It is not clear how the "estimate" of the depth to the water table at Birch Creek was developed. Again, quantitative data (e.g. water level measurements) would be beneficial.

11) Page 11, paragraph 3 -

The text states that "infiltrating water may be temporarily perched by fine-grained sediment" at the ICPP and the NRF; however, no site-specific information is provided on the presence or absence of "fine-grained sediments" at these facilities. Several boreholes have been drilled at each of these sites, so this information should be available for inclusion in the report.

12) Page 12, footnote -

Please specify the "regulatory agencies" and the applicable regulations which pertain to the siting of nuclear storage facilities and seismic hazards.

13) Page 13, paragraph 2 -

a) Two statements in this paragraph refer to "precedence" for the position taken by the USNRC regarding siting facilities near a fault. Please reference the specific site(s) where the precedent-setting decision was applied.

B) Please provide a reference for the study of the Beaverhead Fault.

14) Page 15, paragraph 1 -

The text makes several references to "inferred" higher vertical conductivity and "potentially higher hydraulic conductivity" which are not supported by the document.

BIRCH CREEK BASIN

List of References

Garabedian, S.P., 1992, Hydrology and digital simulation of the regional aquifer system, eastern Snake River Plain, Idaho: U.S. Geological Survey Professional Paper 1408-F, 102p.

Kjelstrom, L.C., 1986, Flow characteristics of the Snake River and water budgets for the Snake River Plain, Idaho and eastern Oregon: U.S. Geological Survey Hydrologic Investigations Atlas HA-680.

Mundorff, M.J., Crosthwaite, E.G., and Kilburn, C., 1964, Ground water for irrigation in the Snake River basin in Idaho: U.S. Geological Survey Water-Supply Paper 1654, 224p.

Stearns, H.T., Crandall, L., and Steward, W.G., 1938, Geology and ground-water resources of the Snake River Plain in southeastern Idaho: U.S. Geological Survey Water-Supply Paper 774, 268p.

Warnick, C.C., Heitz, L.F., Kirkland, L.A., and Burke, G.G., 1981, User guide for Idaho hydrologic maps: Moscow, University of Idaho, Idaho Water and Energy Resources Research Institute, 46p.

Johnson, G.S., Brockway, C.E., & Luttrell, S.P., 1984, Application of a numerical gw flow model to the Mud Lake area in SE Idaho: U of I, Technical Completion Report, Contract # 14-08-0001-A 0016, 60p.

List of References

Clebsch, A., Jr., Waite, H.A., and Decker, S.O., 1974, The availability of water in the Little Lost River basin, Idaho: Idaho Department of Water Resources Water Information Bulletin 37, 60p.

Harenberg, W.A., Jones, M.L., O'Dell, I., Brennan, T.S., Lehmann, A.K., and Tungate, A.M., 1993, Water resources data, Idaho, water year 1993: U.S. Geological Survey Water-Data Report ID-93-1.

Kjelstrom, L.C., 1986, Flow characteristics of the Snake River and water budgets for the Snake River Plain, Idaho and eastern Oregon: U.S. Geological Survey Hydrologic Investigations Atlas HA-680.

Mundorff, M.J., Broom, H.C., and Kilburn, C., 1963, Reconnaissance of the hydrology of the Little Lost River basin, Idaho: U.S. Geological Survey Water-Supply Paper 1539-Q, 50p.

Mundorff, M.J., Crosthwaite, E.G., and Kilburn, C., 1964, Ground water for irrigation in the Snake River basin in Idaho: U.S. Geological Survey Water-Supply Paper 1654, 224p.

Stearns, H.T., Crandall, L., and Steward, W.G., 1938, Geology and ground-water resources of the Snake River Plain in southeastern Idaho: U.S. Geological Survey Water-Supply Paper 774, 268p.

Waite, H.A., and Decker, S.O., 1967, A reexamination of water yield in the Little Lost River basin, Idaho: U.S. Geological Survey Open-File Report, 35p.

Warnick, C.C., Heitz, L.F., Kirkland, L.A., and Burke, G.G., 1981, User guide for Idaho hydrologic maps: Moscow, University of Idaho, Idaho Water and Energy Resources Research Institute, 46p.

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Governor Phil Batt

T

Testimony
regarding the

Department of Navy
Draft Environmental Impact Statement
for a Container System for the
Management of Naval Spent Fuel

Cooperating Federal Agency
U.S. Department of Energy

Boise Centre on the Grove
June 5, 1996

As Governor of the great state of Idaho, I want you to know that I appreciate the Navy's effort in holding this hearing here in Boise today. I extend my sincere gratitude for the efforts you have made -- both in preparing this document and traveling throughout the state to hold public hearings.

Two days ago you held a similar hearing at Fort Hall, Idaho, on the Sho-Ban Indian Reservation. I appreciate that effort to listen to the concerns of those important citizens. In a few more days you will travel to Salt Lake City to hold another hearing.

Undoubtedly, one of the main reasons why you are holding these hearings is directly due to the settlement agreement I reached with the U.S. Navy and other federal officials last year.[1]

Until that agreement was reached, there was no plan to ship spent Navy fuel out of Idaho. Now, quoting from the settlement agreement, "the naval spent fuel stored at INEL on the date of the opening of a permanent repository or interim storage facility shall be among the early shipments of spent fuel to the first permanent or interim repository."[2]

To help facilitate the shipment of the Navy's fuel out of Idaho, the agreement further requires that the U.S. Department of Energy (DOE) "and the Navy shall employ Multi-Purpose Canisters ('MPCs') or comparable systems to prepare spent fuel located at INEL for shipment and ultimate disposal of such fuel outside Idaho."[3]

In order to determine what kind of canister should be used to get spent nuclear fuel out of Idaho, the Navy must prepare an Environmental Impact Statement. Part of that EIS process requires the soliciting of comments from the public. That is why we are here today.

I am hopeful that those shipments out of Idaho will begin well before the 2010 date outlined in the EIS.[4] Indeed, the Navy should be looking at a deadline closer to the year 2000. I say this because there is legislation currently before Congress that would open an interim repository for spent nuclear fuel by 1999.[5] That legislation allows enough room at the interim facility to accommodate all of the Navy fuel now in Idaho. And as I've noted, the settlement agreement requires Navy fuel to be among the first spent fuel to enter such a repository. Therefore, I urge the Navy to move quickly in selecting a canister system. By so doing, the Navy will be able to meet its agreement obligation to get its

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[1] United States of America v. Batt, Civil No. 91-0054-S-EJL

[2] United States of America v. Batt, Civil No. 91-0054-S-EJL, D.1.e

[3] United States of America v. Batt, Civil No. 91-0054-S-EJL, F.4

[4] Department of the Navy Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel, Executive Summary, p. S-2.

[5] The Nuclear Waste Policy Act of 1996, S. 1271 (sponsored by Idaho's U.S. Sens. Larry Craig and Dirk Kempthorne) and H.R. 1020 (co-sponsored by Idaho U.S. Congressman Mike Crapo). While President Clinton has expressed opposition to building an interim facility, the President has signed the Energy and Water Development Appropriations Act of 1996 (H.R. 1905, P.L. 104-46), which contains language directing the Department of Energy to develop an interim storage site. That direction is dependent upon passage of authorizing legislation, such as the Nuclear Waste Policy Act of 1996.

spent nuclear fuel "road-ready" to ship out of Idaho as soon as the interim or permanent repository opens.

That is why this hearing today in Boise is so important. This hearing is another step in the right direction for my state-- an important first step to get nuclear waste out of Idaho. I believe that the hearing here today is a clear indication of the tremendous value of the agreement I reached last year.

This hearing is also a clear indication of the federal government's commitment to live up to its legally binding commitments to get spent nuclear fuel out of Idaho. I must say that it is encouraging to see the Navy making progress to meet the terms of the agreement that we worked so hard to solidify last year.

Frankly, the only reason Idaho was able to reach an agreement was due to the federal government's effort to accommodate the needs of the U.S. Navy. The Navy has always needed Idaho -- and Idaho needed the Navy to get an agreement.

Unfortunately, as many of you in the Navy are aware, there are those who are trying to undo the agreement by getting the "Stop the Shipments" initiative on the ballot in Idaho. Those signature gatherers -- who I've been told are being paid 50 cents a signature -- have failed to appreciate the difficult situation the state faced. Federal courts have consistently ruled that states and localities can't stop the shipment of radioactive materials. It's in the record.

Indeed, in his legal opinion on the "Stop the Shipments" initiative, Idaho Attorney General Al Lance noted that federal courts have "uniformly interpreted federal statues and the U.S. Constitution as preventing state legislatures or citizens initiatives from enacting legislation to prohibit the shipment of radioactive waste into a particular state."[6] Therefore, he concluded that the initiative "is very likely to be ruled unconstitutional" if it passes.

Given that reality, it is no wonder that the settlement agreement between Idaho and the federal government is the envy of other states. Not only does the agreement reduce the number of spent nuclear fuel shipments into Idaho, but it also specifies specific

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[6] Idaho Attorney General Alan Lance, "Certificate of Review: Initiative Regarding Radioactive Waste," March 19, 1996, p. 2.

dates by which the waste must leave. And these are only two major highlights of the agreement. Other important achievements include the legally binding commitments that the federal government will accelerate cleanup of radioactive wastes already at INEL -- in some cases by as much as forty years ahead of previously established targets; transuranic waste must begin leaving in the next three years, starting April 31, 1999; and no commercial spent nuclear fuel will ever again be brought into Idaho for storage.

And despite what the critics say, there are teeth in this agreement.

If INEL is not cleaned up as established in the agreement, U.S. Department of Energy shipments into Idaho will cease. If the U.S. Navy fails to meet its commitments, Navy shipments into Idaho will stop. And if spent nuclear fuel is not removed from our state on schedule, the agreement allows for fines of up to $21,900,000 a year. In addition, the court can award additional financial damages to the state and even request that federal officials be thrown in jail for their failure to comply with terms of the agreement.

With all these facts, I must reiterate that the people who are gathering signatures to "Stop the Shipments" are, in my opinion, completely misguided in their efforts.

If the initiative passes, and in the unlikely even that the court allows the initiative to stand, the agreement I reached will then come before a vote of the citizens. If the citizens overturn the agreement, Idaho will have no ability to limit any shipments or stop any waste from coming into the state. There will be no legal requirement to remove spent Navy fuel from Idaho. There will be no legal requirement for *any* waste to leave. In the end, the so-called effort to "Stop the Shipments" will mean "increase the shipments and Idaho keeps the nuclear waste."

That would truly be a sad day for Idaho.

That, in essence, is again why this hearing here today is so important.

I hope the citizens of Idaho take note of this hearing. Again, this hearing is a clear indication of the federal government's commitment to remove nuclear waste from Idaho.

Now when it comes to the containers that are being considered, I understand that the Navy is evaluating six container alternatives in the Environmental Impact Statement. Of those six, only four meet the stated objective outlined in the Executive Summary of the EIS calling for a "container system which allows naval spent nuclear fuel to be loaded and stored dry at the INEL in the same container that would be used to ship the naval spent nuclear fuel outside the State of Idaho could be advantageous in meeting the Navy's current and future needs."[7] Of the six canisters under consideration, the four that meet the objective of the Executive Summary are: (1) the Multi-Purpose Canister (MPC); (2) the Dual-purpose Canister; (3) the Transportable Storage Cask; and (4) the Small Multi-Purpose Canister Alternative.[8]

It is my understanding that of those four, the preliminary economic estimates indicate that no single container is a clear cost leader. It is also my understanding that the minimal radiation exposure from each of the casks are essentially the same. That being the case, I suggest that the Navy chose a container system that will accommodate the Navy's needs while minimizing the total number of shipments required to remove all Navy spent fuel from Idaho. Such a decision would eliminate at least the Small Multi-Purpose Canister.

The state of Idaho will have more to say about this Environmental Impact Statement. I have directed the state's INEL Oversight Program to evaluate the document in detail. They will provide a technical review as well as check on the adequacy from a NEPA perspective. As you can tell from testimony, it is important to Idaho that this document be prepared properly so that the Navy can proceed expeditiously to carry out its end of the settlement agreement to remove its fuel from Idaho.

Thanks once again for holding this hearing today. I hope the citizens of Idaho will take note of it, and I hope you will take note of my counsel.

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[7] Department of the Navy Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel, Executive Summary, p. S-1.

[8] Western Energy Update, May 24, 1996, published by the Western Interstate Energy Board, 600 17th Street, Suite 1704 South Tower, Denver, CO 80202.

Commenter: Robert N. Ferguson - Idaho National Engineering Laboratory Oversight Program, Idaho

Response to Comments:

General Comments

A. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for dry storage and transportation (either by rail, heavy-haul truck, or a combination of both) must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably.

B. The Programmatic SNF and INEL EIS (DOE 1995) identified that either wet storage or dry storage at the Naval Reactors Facility or the Idaho Chemical Processing Plant was acceptable as locations for storage of naval spent nuclear fuel. The risk of storage of naval spent nuclear fuel at Naval Reactors Facility and Idaho Chemical Processing Plant from natural phenomena hazards has been shown to be small. Also the potential risk to off-site population has been shown to be small in this EIS and the Programmatic SNF and INEL EIS.

Section E.8 of the agreement (U.S. District Court, 1995) between the state of Idaho and the federal government that resolved the law suit relative to the Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory EIS required that "Department of Energy shall, after consultation with the state of Idaho, determine the location of the dry storage facilities within the Idaho National Engineering Laboratory, which shall, to the extent technically feasible, be at a point removed from above the Snake River Snake River Plain Aquifer."

This EIS has discussed a reasonable range of alternative sites at Idaho National Engineering Laboratory that include existing industrial sites (Naval Reactors Facility and Idaho Chemical Processing Plant) and two undisturbed sites. Consistent with the agreement between the state of Idaho and the federal government, the Department of Energy has considered, for purposes of consultation with the state of Idaho, undisturbed sites with the potential "to be removed from above the Snake River Plain Aquifer". The environmental impacts of a dry storage facility for spent nuclear at the industrial sites and the undisturbed sites are small. However, the undisturbed locations did not meet the objective of being hydrologically removed from above the Snake River Plain Aquifer and they had seismic disadvantages because of their proximity to known faults.

Development of the undisturbed would result in construction impacts (i.e., additional support buildings, roads and railroads), cultural impacts (i.e., Native American cultural resources), as well as a slight increase in transportation risk (i.e., transport from Naval Reactors Facility and Idaho Chemical Processing Plant to the new site). Development of any other undisturbed sites would also entail these impacts. Because Naval Reactors Facility and Idaho Chemical Processing Plant are developed sites, they will not engender these additional impacts.

Other undisturbed areas on the Idaho National Engineering Laboratory within the Snake River Plain were not evaluated, as they offer no significant environmental advantage over those areas already developed. In addition, all undisturbed sites at the Idaho National Engineering Laboratory would have the additional impacts discussed above. The Navy believes this satisfies the consultation agreement with the State of Idaho.

Commenter: Robert N. Ferguson - Idaho National Engineering Laboratory Oversight Program, Idaho

C. **Page S-12**

This statement has been revised as noted in the comment.

D. **Page 3-6, Section 3.1**

Among the criteria that were used to select the alternatives to be assessed for the potential environmental effects of using such containers for disposal of naval spent nuclear fuel, there is the criterion that designs shall meet the technical requirements found in the regulations of the Nuclear Regulatory Commission for disposal of high-level radioactive waste (10 CFR Part 60). Such waste that is emplaced in the underground facility shall be placed in sealed containers (Section 60.135(c)(1). Criteria being developed for acceptance of spent nuclear fuel at a geologic repository include provision for containerized material. Unless the Nuclear Regulatory Commission regulations which require sealed containers are revised, there is no anticipated need for special analysis, arrangements, or provisions to be made in the future repository prior to the fuel being accepted for permanent storage.

E. **Page 5-1**

As discussed in Appendix B, Section B.4, the M-140 shipping cask could be moved via heavy-haul truck to a centralized interim storage facility or geologic repository. Similarly, use of a heavy-haul truck, if needed, would be practical for the short distance between the Idaho Chemical Processing Plant and the rail loading locations available at the Idaho National Engineering Laboratory. However, a rail line between the Naval Reactors Facility and the Idaho Chemical Processing Plant would not be required under the No-Action or Current Technology/Rail Alternatives. As described in Chapter 3, Sections 3.2 and 3.3, under these two alternatives commercially available dry storage containers would be used for the Idaho National Engineering Laboratory storage. Reloading into M-140 casks would most likely take place at Naval Reactors Facility under these two options. Therefore, only the commercial dry storage container would need to be moved from the storage area to the loading area.

F. **Pages 5-7 and 5-9**

The differences between the data in these two tables are presented in Chapter 5, Sections 5.3.2.1 and 5.3.2.2. The first section, titled "Occupational Health and Safety," presents estimates of occupational radiation exposure (Table 5.2) while the second section, titled "Public Health and Safety," presents estimates of radiation exposure to people surrounding the facility (Table 5.3). The "Facility Worker," as defined in Appendix A.2.3, is an individual located 100 meters from the radioactive material release point. This individual is not involved in radioactive material work and does not receive occupational radiation exposure. Therefore, a comparison of the exposures in these two tables cannot be made.

G. **Page 5-13**

This fault has been identified in Chapter 5, Section 5.6.2 as the Mackay Dam segment of the Lost River Fault.

H. **Page 5-17**

As described in Appendix A, Section A.2.3, the radiation exposure to the general population in a 50-mile radius of the facility is evaluated for normal operations and hypothetical accident scenarios. The analyses consider actual population distributions around the site in 16 compass directions, site specific meteorological history, and all of the potential pathways for the radioactive materials to reach the general population.

I. **Page 6-3**

This information was not included in Chapter 6, Tables 6.1 and 6.2 of the Draft EIS; however, it is presented in Tables A.12, A.27, and A.28 of Appendix A. This information has been added to Tables 6.1 and 6.2 of the Final EIS for completeness.

J. **Page 7-6**

Chapter 7, Section 7.3.3 of the EIS states that the conservative calculation of the transportation impacts results in the conclusion that as a group all of the alternatives are about the same. It also explains that "The latent cancer fatalities associated with incident-free transportation are noticeably lower for both the No-Action Alternative and the Current Technology/Rail Alternative because the calculations are based on the actual historic measured dose rates for the M-140 casks." For all other alternatives the regulatory limit of 10 millirem per hour at 2 meters has been used (TI=10). In many cases the external dose rates of commercially available containers are lower than the regulatory limit by as much as an order of magnitude.

K. **Page A-3**

Section A.1 of Appendix A was prepared as a summary of the analyses. By nature, summary sections cannot contain all of the detailed information; thus, decisions are required by the preparers as to the content of the summary section. In preparing this section, it was decided to limit the summary statements and tabular information to the health effects to the general population, since most members of the public are interested in this information. The information on facility workers and maximally exposed off-site individuals, hypothetical individuals, is presented in Section A.2.5 of the EIS for those people interested in this level of information.

L. **Page A-11**

The statement made in the comment, that the 100 mrem/yr limit from 10 CFR Part 20 refers to the Total Effective Dose Equivalent, is correct for dose limits for individual members of the public due to licensee operations. In the EIS, the purpose of the "Evaluation of Impacted Area" section is to determine the impact on land use due to fallout of a radioactive plume resulting from hypothetical accident scenarios. As discussed in Appendix A, Section A.2.3, the impacted area was defined and estimated to be the area in which the plume deposited radioactive material to such a degree that an individual standing on the boundary of the fallout area would receive approximately 0.01 mrem/hour of exposure. The evaluation in this section does not purport to calculate the total dose to an individual spending time in what would be a restricted area. Rather, the evaluation was performed to estimate the amount of land which might require restricted access while cleanup operations were completed after a hypothetical accident scenario.

M. **Page A-20**

The ingestion data values used in the RSAC 5 program for the accident analyses were the same as those used in the GENII program for the normal operations analyses. The reference for the ingestion values has been added to the Final EIS.

N. **Page A-21**

Since the source terms used in the accident analyses are typically for accidents which have never occurred, there is some uncertainty in the values selected. All of the accidents analyzed in this EIS are intended to be accidents which produce consequences which are unlikely to be exceeded by any reasonably foreseeable accident. As a result, the accidents themselves and the sequences of events during the accidents have been chosen to maximize the source term.

In this particular scenario, a drained water pool, the source term includes airborne corrosion products due to thermal drafts that are generated by the hot fuel and water borne corrosion products which could be shaken loose from the fuel cladding during the postulated earthquake. When this total corrosion product release percentage is combined with the maximum number of fuel units that the water pool could possibly store, the source term developed is one that is not expected to be exceeded.

The estimate of the amount of radioactivity that might be released from naval spent nuclear fuel as a result of a severe accident was developed by experts familiar with the design and characteristics of naval fuel. They used their knowledge, experience, and results of available tests and measurements and considered the forces and conditions which might occur during a severe accident.

As stated in Section A.2.7, Analysis of Uncertainties, the risks presented in the EIS are believed to be at least 10 to 100 times larger than what would actually occur.

O. **Page A-28**

The reference for the measurements from experiments which show that one one-hundredth of 1 percent of the material in high-efficiency particulate air (HEPA) filters could be released during a fire is DOE-STD-0013-93, Department of Energy Handbook, Recommended Values and Technical Bases for Airborne Release Fractions, Airborne Release Rates, and Respirable Fractions at Department of Energy Non-Reactor Nuclear Facilities, July 1993. Despite this data, 1 percent (that is; 100 times higher than the actual data) was used in the analyses to allow for uncertainties. This reference has been added to the Final EIS.

P. **Page A-38**

An airplane crash into an array of dry storage casks was analyzed. The probability of occurrence for this accident was calculated assuming an array of almost 600 storage casks. A target area this large is not expected, but was used to conservatively bound the probability of the event. Such an array would only be possible if naval spent nuclear fuel was stored at one location and was never transported to a repository or interim storage location during the 40-year period evaluated in the EIS. In addition to assuming a very large storage array, the annual accident probability calculation used flight statistics from the peak activity year of National Oceanographic and Atmospheric Administration testing, 1990, the last year of testing at the Idaho National Engineering Laboratory tower. Despite current National Oceanographic and Atmospheric Administration plans to never use the Idaho National Engineering Laboratory tower for any future testing, the statistics from the peak year of testing were used.

From analyses of existing naval spent nuclear fuel container designs, the rotor of a large jet engine, including those from the largest aircraft such as a Boeing 777, Russian Antonov An-225, or a Lockheed C-5, would not penetrate a container during an airplane crash but, for the purposes of evaluation, calculations were performed for one container, damaged to the extent that fission products and corrosion products might be released.

Q. **Page B-20**

The estimate of the percentage of fuel that could be damaged in a shipment following a severe accident is the result of Naval Nuclear Propulsion Program knowledge based on the results of years of examination, laboratory testing, and transportation analysis of naval nuclear fuel. The transportation risk analysis of the Type B package in the Department of Energy *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* of April 1995 assumed that 10 percent of the fuel could be damaged following a severe accident. This assumption is considered to be conservative based on the rugged nature of Navy fuel described in Chapter 2, Section 2.3 of the EIS and the robust design of the shipping container described in Appendix B, Section B.2.2 of the EIS.

R. **Page B-22, Section B.6.2**

The 50 percent and 95 percent meteorological conditions were both used in the transportation analyses.

The EIS provides detailed discussion of the meteorological conditions used in the transportation accident analyses in Appendix B, Section B.3.2. To estimate the probability of the meteorological conditions, Pasquill Class D was considered to be equivalent to the 50 percent meteorology; that is, 50 percent of the time, conditions are expected to be more severe, and 50 percent of the time, conditions are expected to be less severe. Pasquill Class F was considered to be equivalent to 95 percent meteorology; that is, 5 percent of the time, conditions might be more severe, and 95 percent of the time, conditions would be less severe. Analyses performed by the National Oceanic and Atmospheric Administration (Doty et al. 1976) confirm that this assumption is reasonable.

General population exposure under accident conditions is estimated to increase by a factor of 2 if the 95 percent or worst case meteorological condition is employed. The 50 percent or average meteorological condition was used to estimate the general population exposure in accident conditions because it is impossible to predict the specific location of a transportation accident (Section B.6.2) and the average meteorology would most likely exist.

Estimates of the effects on the maximally exposed individual under accident conditions, if the overall probability of an accident meets the criteria for a 95 percent meteorological condition as described in Section B.3.2, then the maximum individual exposure is based on the use of the 95 percent meteorological condition.

S. **Rizzo**

The State of Idaho Comments on this EIS also transmitted comments on the Paul C. Rizzo Associates document titled "Siting Feasibility of Location for Dry Storage Facility on the Idaho National Engineering Laboratory that are Removed from Over the Snake River Plain Aquifer" which is referenced in Appendix F of this EIS. The responses to the comments on the Paul C. Rizzo Associates document have not been included in Chapter 11 of this EIS since the Paul C. Rizzo Associates document is only a reference in the EIS. The responses to the comments on the Paul C. Rizzo Associates document have been made in consultation with the State of Idaho and have been included in Revision 1 of the Paul C. Rizzo Associates document dated August 1996.

T. **Governor Philip Batt's Testimony**

Responses to comments made by Governor Batt in his testimony at the June 5, 1996 public meeting in Boise can be found following Document 21, earlier in this section.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUL 18 1996

OFFICE OF
ENFORCEMENT AND
COMPLIANCE ASSURANCE

William Knoll
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Dear Mr. Knoll:

In accordance with our responsibilities under Section 309 of the Clean Air Act and the National Environmental Policy Act (NEPA), the Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel.

This EIS evaluates a range of alternate systems for the loading, storage, transport, and possibly disposal of naval spent nuclear fuel following examination at the Idaho National Engineering Laboratory (INEL). All pre-examination naval spent nuclear fuel is shipped to INEL for examination and temporary storage pending ultimate disposition outside the State of Idaho. All alternatives addressed in this EIS utilize dry storage of naval spent nuclear fuel at INEL. This EIS provides the details and results of specific evaluations of environmental effects associated with each alternative.

In general, EPA believes that dry storage is an acceptable storage method, since the spent nuclear fuel will eventually need to be transported out of INEL and the State of Idaho. In addition, dry storage technology has been assessed in other federal agency EISs. EPA has no objection to the proposed action and has rated this draft EIS LO (Lack of Objection). We have enclosed a few technical clarification comments for your consideration when preparing the final EIS.

Thank you for the opportunity to review this EIS. The staff contact for this review within the Office of Federal Activities is Ken Mittelholtz (202-564-7156).

Sincerely,

Richard E. Sanderson
Director
Office of Federal Activities

Enclosure

EPA's Technical Comments
on the Navy Draft EIS for a
Container System for the Management
of Naval Spent Nuclear Fuel

A **Page S-2, 3rd bullet** - Special Case Waste is described as containing concentrations of transuranic constituents exceeding Class C limits. Appendix E, however, describes Special Case Waste as containing no fuel and only activation products. The description of this type of waste should be clarified.

B **Page 2-6, 3rd paragraph** - It is not clear whether possible airborne emissions from fuel elements which have been cut are included in the analysis of radiological impacts under normal conditions (section 6.3.4). Evaluations for loading and unloading (Section A.2.4) only address carbon-14 releases.

C **Page B-17, 2nd paragraph** - Radiation dose decrease with distance is described using 1/x2 (inverse square law). This is also shown in equation B.1 (page B-6). On page B-16 (3rd paragraph), however, some sources are described as more properly modeled as line sources. The inverse square approximation is only appropriate where the physical dimensions of the source are small relative to the distance from the source. In the case of the dimensions on page B-6, some of the source distances from the source (e.g. 6 meters) are similar to the source dimensions. In these cases it is not clear that the inverse square approximation is appropriate.

Commenter: Richard E. Sanderson - U. S. Environmental Protection Agency, Washington, D.C.

Response to Comment:

A. The commenter requested a clarification of the description of special case waste, noting an inconsistency in the descriptions provided in the Executive Summary and in Appendix E.

Appendix E correctly states in Section E.1 that the upper and lower non-fuel bearing structures (including those portions which are classified as special case waste), which are removed during the preparation of naval fuel assemblies, do not contain transuranic elements. The fourth bullet on page S-2 of the Executive Summary has been revised to correct the description of this special case waste, associated only with naval spent nuclear fuel, as having concentrations of certain short- and long-lived isotopes which are greater than those specified for Class C in 10 CFR Part 61.55.

B. No fission product releases are expected at the repository from spent fuel elements which have been destructively examined. Chapter 2, Section 2.5 of the EIS states that prior to placing this fuel in a dry storage container, it would be repackaged in canisters of highly corrosion resistant metal. Therefore, this sealed package would not result in an airborne release during unloading operations.

C. Large radiation sources act like plane sources of exposure to individuals very close to the source. A large radiation source acts like a line source of exposure and then like a point source of exposure as distance from it increases.

In general, the decrease in radiation exposure is inversely proportional to the distance from the source or 1/radius(r) fall-off applies to the locations extending from points very close to the container to those at a distance equal to half the height of the line source. Beyond that distance a line source behaves like a point source and the decrease in radiation exposure is inversely proportional to the square distance from the source or $1/r^2$ fall-off applies. Table B.5 of the EIS shows the effective package dimensions for the alternative shipping containers. A $1/r^2$ fall-off is appropriate even for the largest package since 2.4 meters (half the height of 4.8 meters) is less than 8.4 meters (6.0 meters, which is the radial distance to the container for the person stuck in traffic, plus 2.4 meters, which is the distance from the center of the source inside the container to the outside surface of the container.)

Robert F. Deegan
Sierra Club Virginia Chapter
340 Ramapo Road
Virginia Beach, VA 23462

VIRGINIA CHAPTER SIERRA CLUB

"When we try to pick out anything by itself, we find it hitched to everything else in the universe."
John Muir

July 18, 1996

William Knoll
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, Va. 22242-5160

Thank you for this opportunity to comment on the Draft Environmental Impact Statement (EIS) for a Container System for the Management of Naval Spent Nuclear Fuel (SNF). Please put my name on the mailing list for all future correspondence on this and related matters. The Virginia Chapter of the Sierra Club is an environmental group with about 11,000 members throughout Virginia.

A This Draft EIS segments management (transport, storage, and disposal) of naval SNF from the problem of commercial reactor SNF. This Draft EIS is thus inadequate because the EIS covers only a small portion of the total SNF that must be moved to a repository, or interim storage site. This is improper segmenting of the environmental impacts. The decision on this partial analysis of the problem would improperly set precedents for all SNF shipments, while only considering the environmental impacts of a small portion of the SNF to be managed. What is needed is an EIS for a container system that covers all SNF to be shipped to a repository or interim storage site.

B The scope of this Draft EIS is also inadequate in other respects. The Draft EIS fails to consider transport of naval SNF from the shipyards where it is removed from warships going to INEL, Idaho. Further, the Draft EIS fails to consider temporary storage of SNF at shipyards. What is needed is an EIS that covers all transport and storage of naval SNF that could be applicable to a container system. The failure of this Draft EIS to include application of its container system to SNF transport from shipyard sites to INEL is a major omission that constitutes segmenting of the environmental impacts, in violation of NEPA regulations.

C The Draft EIS is incorrect in stating that any of the alternatives considered are suitable for use as a container system for naval SNF. The Navy must take all reasonable

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VIRGINIA CHAPTER
SIERRA CLUB

"When we try to pick out anything by itself, we find it hitched to everything else in the universe."
John Muir

steps tominimize the SNF risks to handling workers and to the public near SNF handling facilities and transport routes. Because the choice of the preferred alternative for management of naval SNF will set precedents for all SNF, the Navy must seek the risk-minimizing alternative.

Our recommendation of a preferred alternative is subject to the above stated inadequacies of this Draft EIS. We note in the Draft EIS that the radiological risks associated with the multi-purpose canister (MPC) systems are smaller than those for the other alternatives (since the naval SNF would not need to be removed from the canisters once inserted).
D Accordingly, because of the very large number of SNF shipments that will eventually arrive at the repository (commercial reactor SNF as well as naval SNF), we urge a multi-purpose canister system. A key objective of SNF management should be to minimize the handling of fuel assemblies and the MPC approach furthers that objective to a large degree.

E Maximum feasible use of rail (vs.truck) transport of SNF reduces overall risks to our country's citizens. The choice of MPC system (125-ton vs. 75-ton) must be coordinated with the choice of a rail MPC system for the transport of commercial reactor SNF. We urge that the Departments of Navy and Energy jointly choose an appropriate size MPC system suitable for both naval and commercial reactor SNF.

Yours respectfully,

Robert F. Deegan

Robert F. Deegan
Nuclear Waste Issues Chairman

Copy to: Richard Guida, Naval Nuclear Propulsion Program

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
2531 JEFFERSON DAVIS HWY
ARLINGTON VA 22242-5160

IN REPLY REFER TO

24 July 1996

Mr. Robert F. Deegan
Nuclear Waste Issues Chairman
Sierra Club, Virginia Chapter
340 Ramapo Road
Virginia Beach, VA 23462

Dear Mr. Deegan:

Thank you for your letter to Mr. Knoll of my staff dated July 18, 1996, providing comments on the Navy's draft Environmental Impact Statement covering selection of a container system for the storage and shipment of post-examination naval spent fuel. All of your comments will be included and evaluated in the final EIS.

With respect to one of your key issues, however, I wanted to allay concerns that the draft EIS is deficient. In particular, you stated that the draft EIS fails to analyze naval spent fuel shipments from shipyards to the Idaho National Engineering Laboratory (INEL), thus missing a substantial amount of naval spent fuel requiring shipment. All shipments of naval spent fuel from shipyards to INEL through the year 2035 were covered under the previous DOE/Navy programmatic spent fuel EIS, a copy of which was sent to you in April 1995. Those shipments ensure naval spent fuel can be examined at existing facilities at INEL, avoiding construction of new facilities elsewhere. The current draft EIS covers dry storage of that post-examination naval spent fuel at INEL, and its ultimate shipment from INEL to an interim storage site or geologic repository. Thus, we have not reduced the quantities under consideration or altered the role of naval shipyards as evaluated in the programmatic EIS; the shipyards remain responsible for refueling and defueling warships, and transporting all naval spent fuel so generated to INEL.

Thank you for your comments, and I hope that the information above is helpful.

Sincerely,

Richard A. Guida

Richard A. Guida
Associate Director
for Regulatory Affairs
Naval Nuclear Propulsion Program

Commenter: Robert F. Deegan, Sierra Club, Virginia

Response to Comment:

A. The issue of an EIS by the U. S. Navy, analyzing the alternatives for a container system for naval spent nuclear fuel, was preceded by the Department of Energy's decision not to proceed with preparation of an EIS that would cover both civilian and naval spent nuclear fuel due to programmatic decisions and funding changes. The Navy decided in December 1995 to assume the lead responsibility for this EIS for naval spent nuclear fuel. It is understood that the conclusions of this EIS will be considered by the Department of Energy, including the requirements of the National Energy Policy Act, in the course of actions pertinent to the selection of a container system for commercial spent nuclear fuel. The Navy does not agree that this approach can be construed as improper segmenting of environmental impacts because the selection of a container system for naval spent nuclear fuel is independent of the container systems to be used by the Department of Energy or the utilities. To summarize, the choice of a container system by the Navy does not mean that any other party or utility must also select that system.

B. As discussed in the Navy letter dated July 24, 1996, 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 1995) covered in detail the proper management and transportation of pre-examination naval spent nuclear fuel. In particular, it specifically addressed environmental impacts related to the shipment of naval spent nuclear fuel from the shipyard, where nuclear-powered naval vessels are serviced, to the Idaho National Engineering Laboratory. That analysis included the two types of shipping containers certified for movement of naval spent nuclear fuel. It should be noted that there are valid Certificates of Compliance for both shipping casks used in transporting naval spent nuclear fuel from the shipyards to the Idaho National Engineering Laboratory. A Record of Decision was issued for the Programmatic SNF and INEL EIS in June 1996 and the use of either shipping container for dry storage was not the preferred alternative selected.

This EIS focuses on the selection of a container system for loading, storage, and transportation of naval spent nuclear fuel and special case waste following examination at the Idaho National Engineering Laboratory, including transportation from the Idaho National Engineering Laboratory to a geologic repository or centralized interim storage facility. Four of the six alternative container systems analyzed in this EIS would allow naval spent nuclear fuel to be loaded and stored dry at the Idaho National Engineering Laboratory in the same container that would be used to ship the naval spent nuclear fuel outside the state of Idaho.

The issue of two EIS documents addressing specific but different aspects and impacts related to naval spent nuclear fuel does not violate National Environmental Policy Act regulations.

C. Analyses of the potential impacts associated with all of the container systems considered for management of naval spent nuclear fuel are presented in this EIS. These include the impacts for manufacturing, loading and storage, and shipment over public transportation routes. These analyses show that any effects on human health or the environment would be small for all of the alternatives considered. The potential impacts due to normal operations or hypothetical accident conditions associated with the alternative containers systems evaluated present little or no significant risk to public health or the environment and do not constitute a high and adverse impact to any population in the vicinity of the activities involved. These risks are similarly so small that they do not assist in discriminating among the alternatives.

D. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for use must meet the requirements of 10 CFR Part 71,

Commenter: Robert F. Deegan, Sierra Club, Virginia

Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably.

E. The Navy agrees with the commenter that the use of rail reduces overall risks based on the national average statistics comparing truck and rail accidents and fatalities.

The reference for this statement is *Trends in State-Level Accident Rates: An Extension of the Risk Factor Development for RADTRAN 4* (Saricks and Kvitek 1994b) which states that rail traffic fatalities per kilometer traveled due to accidents are 2.8×10^{-8} and the fatalities per kilometer due to truck accidents are 5.82×10^{-8}. The national average for rail accidents per kilometer traveled in rural, urban and suburban zones for rail transportation is 5.57×10^{-8} while for truck accidents in rural zones the national average is 2.03×10^{-7} and in urban and suburban zones it is 3.58×10^{-7}. This reference has been added to the EIS, Chapter 3, Section 3.7 and to the list of references.

The Navy has not selected the multi-purpose canister as the preferred alternative and therefore it is not necessary for the Navy to coordinate the size of the choice with the multi-purpose canister for commercial spent nuclear fuel.

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County of Inyo
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July 18, 1996

William Knoll
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COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR A CONTAINER SYSTEM FOR THE MANAGEMENT OF NAVEL SPENT NUCLEAR FUEL

Thank you for the opportunity to comment on this document. Inyo County has closely followed issues and events connected to the proposed high-level radioactive waste repository at Yucca Mountain, Nevada. Our proximity to this site, the discharge of the regional aquifer into Inyo County, and the potential for the use of transportation routes to the site that cross the county have made these activities of great interest to Inyo County government and its residents.

A With the reorganization of the Department of Energy's Office of Civilian Radioactive Waste Management (in response to congressional direction), that office has transferred development of a multipurpose canister (MPC) and the associated National Environmental Policy Act requirements to the Navy. The Navy has elected to consider only those impacts that relate to the selection, manufacturing, storage and transport of canisters used for naval spent fuel and special case waste. The Draft Environmental Impact Statement (DEIS) does not discuss the cumulative environmental or socioeconomic impact of the development of a MPC in regards to the ultimate shipment of civilian spent nuclear fuel.

B The availability of a MPC developed specifically for disposal in a geologic repository, prior to the need for such a container for the shipment of civilian spent nuclear fuel, has the effect of prejudicing decisions regarding the use of the shipping container for these later civilian shipments. This observation is based on the assumption that the Navy will carry forward the design begun by the Department of Energy, which was developed to accommodate the entire range of fuel designs intended for disposal in a geologic repository. If the Navy intends to optimize that design for naval fuel to the point that civilian shippers will need to redesign and certify a different cask for their shipments, then the cumulative impacts of other MPC's can be examined at a later date. There is no indication in this document that this is the case, therefor these impacts must be considered here.

C The repeated assertion in this DEIS that the naval fuel comprises a small percentage (1 to 4 percent[1]) of the total volume of spent nuclear fuel destined for a geologic repository, and therefor imposes minimal additional environmental impact, is unfounded.

D The DEIS assumes that loaded containers will be transported entirely by rail[2]. At the same time, the DEIS assumes "as a convenience for analysis"[3] that the proposed repository at Yucca Mountain is the destination point for shipments. Unfortunately, the analysis does not take into account the fact that there is no rail access to Yucca Mountain. In fact the transportation chapter makes the assertion that "Since the naval spent nuclear fuel would be transported over existing rail lines, or new rail lines built for other projects, there would be no appreciable commitment of resources that would be irreversible or irretrievable."[4] However, the use by the Navy of a canister transportable only by rail would make it the only spent nuclear fuel in the nation that could not be transported by truck. The assumptions that other shipments to a geologic repository will be made by rail, and that the repository location will either have rail, or other programs will construct it, is unsupported. The Department of Energy's Office of Civilian Radioactive Waste Management has recently released its Revised Program Plan, in which it describes a "market-driven" transportation plan. This plan gives no assurance that rail will be the mode of choice. The DEIS must consider the impacts of heavy-haul of these canisters along existing available roadways

E Despite the dependence in some parts of the DEIS upon Yucca Mountain as the ultimate destination for naval fuel, the discussion on the environmental impacts of transportation[5] does not discuss route-specific impacts because "it is not possible to select a route since the repository location is unknown."[6] Either the ultimate destination is known (or assumed), or it is unknown. It is not possible to adequately comment on a document that assumes both. If it is assumed that the destination is known, the discussion of potential environmental impacts due to transportation of naval spent nuclear fuel is incomplete, lacking adequate data on route-specific conditions and impacts. This is despite the fact that the section that deals with air quality[7] seems to be able to determine the rail routes adequately to map them[8]. If the destination is unknown, the attempt of the DEIS to deal with route-related impacts is overly ambitious. Instead, the document should be considered programmatic in that additional tiers of documents may be developed when the destination is known and routing can be determined. At that time, route-specific analyses must be prepared, either for rail, some combination of rail and highway, or highway routes.

F If one of the MPC options are chosen for use with naval fuel and special case waste, the effect will be to both prejudice future civilian waste decisions (as previously described), and to limit the alternatives available for disposal. The DEIS also assumes that the MPC will be suitable for disposal[9], which the Department of Energy had considered to be a management risk. If the agency originally responsible for the specifications and design of the canister had been unable to determine the suitability of the canister for disposal with certainty, then the inheritor of that design cannot assume it. If either of the MPC options are to be considered, the DEIS must determine the effects and potential environmental impacts of the possible need to open and re-canister the naval fuel and special case waste prior to disposal.

---

[1] S 8 1 Cumulative Impacts, 3.8.5 Summary of Cumulative Impacts, 4 10 Cumulative Impacts, 6 4 Cumulative Impacts, 7 3 7 Cumulative Impacts, C 4 Cumulative Socioeconomic Impacts.
[2] S.2, paragraph one
[3] Ibid
[4] 7.3.8
[5] 7.1-7 4
[6] 7.2
[7] 7.3 2
[8] Appendix B, pages B-31—B-33
[9] S 2 1,S.2.6,3.0,4 1.1.etc

G The DEIS assumes the shipment of naval spent fuel by rail in general freight. At meetings held by the Department of Energy on the MPC, the American Association of Railroads has indicated their concerns regarding train dynamics, rail conditions, switchyard considerations, security, and speeds in the modern rail system when considering shipment of MPCs or other large, heavy casks by general freight. These concerns must be addressed and resolved in the DEIS.

H There is insufficient information concerning the physical and radiological characteristics of naval spent fuel or special case waste. This makes it impossible to review the potential public health, environmental, and socioeconomic impacts for each alternative, both during transport and disposal.

I I hope these comments are of assistance in the preparation of the National Environmental Policy Act documentation for this proposed action. In its current form, the draft does not meet the requirements of that Act. It either needs to be revised in the form of a programmatic environmental impact statement and reissued in draft, or redrafted to incorporate the whole of the action and recirculated in draft form. In any case, please provide this office with a copy of the subsequent document issued by the Navy. If there are any questions, please contact me at the above address.

Sincerely,

Brad Mettam

Brad Mettam

Commenter: Brad Mettam - Inyo County Planning Department, California

Response to Comment:

A. This Environmental Impact Statement is issued by the Navy with the Department of Energy acting as a cooperating agency pursuant to National Environmental Policy Act regulations. The intent and focus of this EIS are dedicated to naval spent nuclear fuel concerns. Only the environmental or socioeconomic impacts associated with the container system for naval spent nuclear fuel are considered. Environmental or socioeconomic impacts of the selection of a container system for civilian spent nuclear fuel are considered to be outside of the scope of this EIS. The Navy assumed the lead to write this EIS for naval spent nuclear fuel when the Department of Energy halted its proposal to fabricate and deploy a multi-purpose canister based system and ceased preparation of the EIS for the management of naval and civilian spent nuclear fuel. Pursuant to a court ordered agreement among the State of Idaho, the U. S. Department of the Navy, and the U. S. Department of Energy, the Navy needs to ensure that its spent nuclear fuel is transported from Idaho National Engineering Laboratory to a geologic repository or centralized interim storage site outside the State of Idaho when either would become available. This EIS is necessary to allow the Navy to fulfill its obligations under that court order.

B. The designs of the container systems presented in this EIS are solely for the use of naval spent nuclear fuel. The dimensions and weight of naval spent nuclear fuel assemblies would allow them to fit into the same container system as those designed for civilian spent nuclear fuel; however, the structural integrity of naval and civilian spent nuclear fuel are not the same. These container designs may not be appropriate for the use of civilian spent nuclear fuel. A statement has been added to this EIS in Chapter 1, Section 1.0 to clarify this point. It is beyond the scope of this EIS to evaluate a container system for the storage, transportation and delivery of civilian spent nuclear fuel to a geologic repository or centralized interim storage facility.

   It is not correct to say that the availability of a container system for naval spent nuclear fuel prejudices decisions regarding the use of the shipping container for civilian shipments. It is recognized that the conclusions and decisions reached as a result of this EIS along with the requirements of the National Environmental Policy Act might provide some information of use in the selection of a container system for civilian spent nuclear fuel. However, many environmental impact statements and policies are "tiered" from what has occurred before and what is expected to occur in the future and this is consistent with National Environmental Policy Act regulations in 40 CFR 1501.7(a)(5). It is noted in the Executive Summary, Section S.8.1 of the EIS that the number of containers needed for naval spent nuclear fuel represent about 1 to 4 percent of the total number of containers needed for both naval and civilian spent nuclear fuel which would be shipped to a repository or centralized interim storage site.

C. Naval nuclear reactors are small and have had infrequent refuelings, when compared to the size and fuel needs of commercial nuclear reactors. As noted in Chapter 1, Section 1.1 of the Draft EIS and presented on the table below, there are approximately 12 metric tons of heavy metal of naval spent nuclear fuel at Idaho National Engineering Laboratory and a total of approximately 65 metric tons of naval spent nuclear fuel is expected to exist by the year 2035. When compared to the current 30,000 metric tons and projected 80,000 metric tons inventories of commercial spent nuclear fuel, it is clear that the naval spent nuclear fuel is a very small percentage of the total amount. Therefore, it is unlikely that any environmental or socioeconomic impacts resulting from the storage, transport and disposal associated with naval spent nuclear fuel would represent a significant increase in the impacts associated with the storage, transport and disposal of all spent nuclear fuel.

Commenter: Brad Mettam - Inyo County Planning Department, California

AMOUNT OF SPENT NUCLEAR FUEL		
	CURRENT INVENTORIES	2035 PROJECTED INVENTORIES
Naval spent fuel at Idaho National Engineering Laboratory	12 metric tons	65 metric tons
Non-naval DOE spent fuel	250 metric tons at Idaho National Engineering Laboratory	2700 metric tons in US
Commercial spent fuel in US	30,000 metric tons	80,000 metric tons

D. The Navy is aware that no rail link to the Yucca Mountain site currently exists, and that if it were to become the site of a repository or centralized interim storage facility, heavy-haul transport might be used in place of a rail connection. However, the resolution of that issue will depend on the site eventually selected and the evaluation of the environmental impacts and other factors specific to that site. The routes, distances, and potentially affected populations would be the same for all of the alternative container systems considered for naval spent fuel because the shipments will use the same route--the route selected for shipment of commercial spent nuclear fuel and high-level radiological waste to the repository or centralized interim storage site. Similarly, all container systems considered would have the same design dose rate, 10 millirem per hour at 2 meters, as required by the Department of Transportation regulations (49 CFR 100 et seq). Therefore, the key difference in the alternatives for the purposes of comparing the impacts associated with heavy-haul transport for naval spent nuclear fuel using the alternative container systems is the number of shipments. Text which explains this matter has been added to Appendix B, Section B.4.

The radiological risks of shipping naval spent nuclear fuel have been conservatively analyzed in this EIS and are described in Section B.5.1. The analyses use a train speed of 15 miles per hour. This is slower than the actual expected transport speed. Using the slower train speed is conservative because that results in higher calculated radiation exposure to the public (trains spend more time proximate to the public). This conservatively slow train speed means that the exposure associated with the transport speeds for possible heavy-haul transport would be similar to the results for rail shipments of the same length over similar routes (e.g., Caliente to Yucca Mountain).

Text has been added to Section B.5.2 to specifically cover these points.

The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses. Comparison of heavy-haul transportation routes is pertinent to this EIS to the extent that it helps to discriminate among the alternatives considered.

All of the alternative container systems would be suitable for heavy-haul transportation, as illustrated by prior use of the containers based on M-140 in heavy-haul transport. However, it is accurate to state that the alternatives based on M-140 would be less suitable due to size, height, and weight. This statement has been added to Chapter 3, Sections 3.2, 3.8.4 and Chapter 7, Section 7.3 of the EIS.

E. A range of routes to a repository or centralized interim storage site is used for the transportation analysis in this EIS in order to determine whether different routing characteristics, such as distance or differences in population distribution, would affect the comparison of the alternative container types. Since no repository or centralized interim storage site has yet been selected, the transportation routing in this EIS uses a site being evaluated by the Department of Energy pursuant to the Nuclear Waste Policy Act as the destination point for the naval spent nuclear fuel shipments.

The Navy recognizes that the legal and regulatory climate is evolving on nuclear waste transportation matters and is keeping abreast of the requirements. From the historical perspective, naval spent nuclear fuel has been shipped safely by rail for almost 40 years (over 660 container shipments) without release of radioactivity to the environment. Federal, state and local regulations have been fully met in the past. This EIS addresses issues in the light of the existing laws and regulations and the best information available on the future conditions. The Navy's shipment history demonstrates that the Navy is committed to ensuring the safety of spent nuclear fuel transportation. This commitment to safety will continue in the future as the new laws and regulations affecting transportation of spent nuclear fuel and high-level radioactive waste are implemented. For the sake of comparing a reasonable range of alternatives the current regulations have been applied conservatively in the EIS transportation analysis.

The DOE’s Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that “The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...”. The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses.

Additional discussion to clarify these points has been added to the EIS in Chapter 7, Section 7.1 and Appendix B, Section B.1.

F. It is advantageous to seal the fuel elements and special case waste in a canister-type container that would not have to be opened before disposal to protect the workers at the geologic repository. However, it is incorrect to characterize this advantage as "prejudicial" or limiting for civilian waste decisions. Since the National Environmental Policy Act regulations encourage environmental assessments and environmental impact statements to be tiered to what has been done before and what is planned or anticipated for the future (40 CFR 1502.20), it is possible that decisions regarding civilian spent nuclear fuel may make use of some information from this EIS.

Commenter: Brad Mettam - Inyo County Planning Department, California

The acceptance criteria for a container that will be used for final disposal to a geologic repository has not yet been established. Although the multi-purpose canister is one of the alternatives proposed for use for disposal in a geologic repository, it is recognized that a special overpack container will be necessary for final disposal. It is beyond the scope of this EIS to determine the appropriate characteristics of the disposal container in a geologic repository. The analysis of impacts for a disposal container, including any handling required in a geologic repository or centralized interim storage facility, will be part of the site-specific EIS prepared for such a facility by the Department of Energy.

G. The shipment of naval spent nuclear fuel containers in general commerce; i.e., as part of freight trains carrying other cargo to many destinations has proven to be acceptable and practical in almost 40 years of experience, including over 660 shipments of naval spent nuclear fuel. This practice is not especially complex and has been proven to cause no increase in difficulty or hazards of point-of-entry inspections for railroad or other personnel. It has not contributed to any derailments and the railroads have provided clearance for the shipments and associated railcars, frequently being involved in the design process for the systems. The shipping containers are designed to meet the requirements for shipping in general commerce, including withstanding high temperature fires. Safety precautions, such as using buffer cars, have worked well over time.

The issue of whether dedicated trains will be used to ship naval spent nuclear fuel to a geologic repository or a centralized interim storage facility has not been decided, but the safety and practicality of making the shipments in general commerce have been established. The shipments are accompanied by escorts who are able to establish communications with law enforcement or emergency response agencies immediately in either case. The number of containers of naval spent nuclear fuel is the same for any of the alternative systems considered, whether in general interchange or by dedicated train, and this is the primary factor in determining the environmental impacts associated with the decision supported by this EIS. Therefore, the analyses in Chapter 7 and Appendix B evaluate the alternatives sufficiently.

H. The level of information in the Container System EIS is sufficient. Although the detailed design of Navy fuel is classified, the EIS contains significant information concerning its performance characteristics and the contents of the loaded container systems such that the environmental impacts from its shipment, storage, and management can be assessed and independent analyses can be performed to verify the results presented in this EIS. Chapter 2, Section 2.3 of the EIS presents the general characteristics of naval nuclear fuel, including design description, U-235 enrichment range, the amount of U-235 in a loaded container, criticality control measures, and the results of decay heat calculations. Appendices A and B contain detailed numerical data on the source terms and on corrosion product and fission product releases expected for each container system for each hypothetical accident scenario analyzed. The Appendices also identify the computer programs which were used, along with the specific assumptions for each accident scenario.

For example, Table B.8 provides a list of the radioactive nuclides which might be released in a shipping accident involving naval spent nuclear fuel. The data on the amount of radioactivity are divided into the amounts released from the fission products in the fuel and the amount in the activated corrosion products attached to the surface of the fuel. The data are provided for typical spent fuel in nuclear-powered submarine and surface ship fuel assemblies to demonstrate the range of radioactivity. Using the information in this table, along with the other detailed information on the calculations provided in Appendix B, allows independent reviewers to evaluate the calculation of impacts of a hypothetical accident on human health and the environment. It also permits an independent reviewer to perform analyses using alternate methods, such as other computer programs, or utilizing other conditions, such as different weather or accident conditions.

Commenter: Brad Mettam - Inyo County Planning Department, California

The information in Appendix A, including the amount of radioactivity released and the fraction of the total activity in naval spent nuclear fuel it represents, is provided in similar detail to permit independent analyses for normal and accident conditions.

The Navy has provided in this EIS, and in documents referenced in the EIS, a substantial amount of information on the handling, storage, and shipment of naval spent nuclear fuel and the types and amounts of radiation or radioactive material involved in releases from normal operations and postulated accidents in this EIS. The Navy has attempted to provide enough information on radiation, radioactivity, and other aspects of operations or hypothetical accidents to allow independent calculation and verification of all estimates of environmental impacts.

I. This Draft EIS does meet the requirements of the National Environmental Policy Act. Various references have been provided throughout the Draft EIS and in these comment responses to document National Environmental Policy Act compliance. National Environmental Policy Act requires environmental documents to concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail (40 CFR 1500.1(b)). It is unclear why the commenter thinks this EIS might not to be in compliance with National Environmental Policy Act. The comments received from Inyo County resulted in only minor changes to the wording in this EIS to clarify a few points. Inyo County will be provided with a copy of the Final EIS for a Container System for the Management of Naval Spent Nuclear Fuel.

Dear Sir;

This is in response to your E.I.S. dated May 1996.

You have addressed many concerns that Idahoans have.

The continual repeating was a challenge to get thru. But I understand the need to be sure that there is no misunderstanding.

A Safety must be first from today until the health risks are depleted.

Containers must meet safety concerns for handling, shipping

B and storing. a thought about the accessibility of the fuel to unforseen future exams. In considering cost it would be worth considering accessibility in the future for physical exams.

as an employee at the N.R.F., I am aware of the safety steps that are taken for the well being of people, animals and environment.

Keep up the good work.

Sincerely
Chuck Kamka
434 Moonlite Dr.
Idaho Falls, Ida 83402

Commenter: Chuck Kamka, Idaho

Response to Comment:

A. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has safely shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for dry storage and transportation (either by rail, heavy-haul truck, or a combination of both) must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, other containers can also be used safely and reliably.

B. The Navy agrees that until the containers are permanently disposed of, the container system must allow the ability to retrieve the spent fuel. Current regulations, 10 CFR Part 60.11 and 10 CFR Part 72.122, require that spent nuclear fuel be retrievable from either disposal or storage containers. Since any container system selected must be designed to meet these requirements, no one alternative is more preferable than the others on that point.

Clark County

Department of Comprehensive Planning

RICHARD B. HOLMES
DIRECTOR

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July 18, 1996

William Knoll
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

44

Subject: Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel [The "DEIS]

Dear Mr. Knoll:

With this letter, the staff of the Clark County Department of Comprehensive Planning is submitting its formal comments on the above-referenced DEIS. These comments reflect the position of Clark County government officials who have had frequent interaction with representatives of civilian and defense-related programs of the Department of Energy [DOE], Nevada Operations Office, and related federal agencies. The views expressed herein are well-known to our colleagues at the DOE and, in many instances have been expressed as we have commented on a number of environmental impact statements regarding nuclear waste storage or disposal activities at or near the Nevada Test Site [NTS]. We urge you to review comments on any EIS that includes use of the NTS or Yucca Mountain as an option so that you may appreciate the context within which we make our comments.

A **Content and Direction of DEIS.** Usually, the lead agency for an EIS provides a preferred alternative against which other alternatives are evaluated. While this approach is not necessary, we feel that the lack of a preferred alternative in this case has resulted in a diffusion of the direction that you have taken in completing the DEIS. For example, use of the Yucca Mountain as a representative site has led you to the assessment of impacts along a transportation system that [1] would probably not be used in the foreseeable future, and, [2] is nonexistent, as you define it. There is no direct rail access to the NTS or Yucca Mountain and use of rail from INEL to Yucca Mountain would call for the siting and operation of an intermodal transfer facility, a major federal action that would call for its own EIS, under present federal law.

B It appears that the effort and thought that you have given this would be better applied to a INEL-specific EIS regarding storage options until there is clear guidance from DOE regarding complex-wide waste management and environmental restoration policies. Your reference to the 1995 Programmatic EIS for SNF and INEL indicates that you recognize the need for such guidance. As program policies are formed and programmatic EISs completed by DOE, a complex-wide impact assessment effort regarding transportation between and among generator, storage, and disposal sites would be more useful as a decision tool for specific programs such as yours.

C **Nature of the Spent Nuclear Fuel and Radioactive Waste and Relationship to the MPC.** This DEIS addresses naval spent fuel and special case low-level radioactive waste, both of which are noted as unique. However, the conceptual MPC needs to be modified from its previously-planned configuration [for civilian spent nuclear fuel] in order to accommodate these unique forms. Analyses of the characteristics [e.g., critically, thermal loading], similarities and differences of each waste type must be presented in order to fully represent their potential risks and impacts within the Yucca Mountain context and design. For example, it is not clear whether the present repository design will accept a modified MPC. If not, how must the design be modified and what effect would the emplacement of this small percentage of the total repository waste have on the entire program.

D **Adherence to the Civil Suit and Agreement [Case 91-00540-5].** This case is of utmost importance to the disposition of naval spent nuclear fuel and must be fully discussed in Chapter 8 of the DEIS and in the final document. The DEIS mentions Birch Creek and the Lemhi Range as alternatives for the transfer of the SNF from wet to dry storage. It is then pointed out that each site poses significant problems. Further, it is not clear that any site in Idaho meets the requirements of the suit. Does this leave Yucca Mountain as the only acceptable storage area? If so, this site can no longer be considered as representative, but must be evaluated as a candidate site. This is an area that needs much clarification.

E **Transportation Analysis, Cumulative Impacts and Environmental Justice Along Transportation Routes.** We feel that the analysis of transportation effects is inadequate for a number of reasons - the major one being the unrealistic and simplistic scenarios that are presented. For instance, all shipments are said to be by rail even though there is presently no railroad within 100 miles of Yucca Mountain. Rail access may be provided only by the construction of a rail spur, the location, feasibility and cost of which F is the subject of much study and disagreement. Further, there is little attention paid to the use of heavy haul trucks, the necessity for and the cost of siting and construction of an intermodal transfer facility and related considerations. If transportation is to be addressed, it would be advisable to consider and fully describe and analyze one realistic route that corresponds to other DOE scenarios. Until this is done, any finding of minimal impact is open to question just because of the underlying assumptions. Each of the three projected transportation routes pass through Las Vegas, Nevada, an area which is home to two-thirds the population of the state [over 1,000,000 residents] and which hosts a daily visitor count of over 80,000 people. In addition, 38% of the population along the Union Pacific Railroad is considered to be members of minority or low income groups. Two rural Indian reservations located within the Clark County G jurisdiction straddle the mainline railroad tracks. Despite these statistics, there is little evidence that the DEIS considered the issues of environmental justice or risk to an urban population. Instead, the statement was made that since no site is actually being considered, it was not necessary to take this information into account. Instead, only cursory attention was paid to the issue of environmental justice for one Indian reservation in Idaho. If Yucca Mountain is to be the representative destination site in the transportation analysis, then all aspects of the journey to that site must be addressed. Either there must be a generic site that provides an opportunity for generic analyses or, as in this case, there must be a full accounting of all variables related to the site chosen for analysis. They cannot be mixed.

H We also feel that the EIS must take into account cumulative impacts on Clark County that may result from the use of Yucca Mountain or the NTS as a storage or disposal site for a number of DOE activities. Given the approach taken in the DEIS that identifies only impacts from this one activity, it is not possible to reliably estimate the impacts to a geographic area or jurisdiction that may result from a number of initiatives taken by DOE. That is, even though other related EISs are mentioned, there appears to be no analysis of potential interaction among the various DOE activities that are referenced. While any one activity may have negligible impacts on Clark County, significant impacts would result from a scenario where Yucca Mountain is selected a major site for storage or disposal of nuclear materials. Based upon the fact that Yucca Mountain and the NTS are being considered as storage or disposal sites in a number of ongoing DOE EISs, this latter situation is a distinct possibility.

I **On-Site Scenarios.** Weather conditions at the NTS do not lend themselves to tornadoes or severe thunderstorm episodes that would produce wind-driven projectiles of a sufficient mass to effect the mechanical damage suggested in the report. However, Yucca Mountain is near the flight path for military and commercial aircraft and it may be more appropriate to address the potential for an aircraft crash into the unloading area. Military aircraft bound for the Nellis ranges usually carry on-board munitions.

J **Health Effects.** Since Yucca Mountain is named as the representative storage site, consideration should be given to utilizing actual site meteorology in the evaluation of health effects, even though such effects would be small. This would provide a more realistic appraisal than is presently the case. Accordingly, the actual NTS/Yucca Mountain climatology should be used to study the unloading facilities. It would show that the prevailing winds are bimodal, southwesterly in the summertime and north to northeasterly in the winter. To protect people and equipment, this information should be used to site ancillary facilities outside the downwind sectors for these prevailing winds.

K It should be noted that the dispersion of a plume of ionizing radiation and the downwind fallout footprint it produces, is dependent upon the stability of the atmosphere and the associated wind speeds. A very stable atmosphere with low wind speeds would mix the plume into a very much smaller volume than an unstable atmosphere and stronger wind speeds which would dilute the plume into a very much larger volume and thereby reduce the potential negative health effects.

We hope that these comments are helpful to you in your work to complete the *Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel.* We look forward to commenting on the final EIS and other documents regarding this initiative.

Sincerely,

Richard B. Holmes

RICHARD B. HOLMES
DIRECTOR

cc: Clark County Board of County Commissioners
Jim Ley, Clark County Manager's Office
Dennis Bechtel, Nuclear Waste Division

12navy.eis

Commenter: Richard B. Holmes - Clark County/Dept of Comprehensive Planning, Nevada

Response to Comment:

A. The County is correct in observing that the Draft EIS does not contain a preferred alternate. 40 CFR 1502.14(e) states that the Draft EIS should include a preferred alternative if one exists. None was identified in the Draft EIS since the Navy had no preferred alternative at that time. A preferred alternative has been identified in the Final EIS.

The Draft EIS contains six alternate container systems. Each of the six systems has been evaluated for loading at Idaho National Engineering Laboratory, dry storage at Idaho National Engineering Laboratory, loading for shipment, and shipment outside the State of Idaho to a representative or notional repository and unloading at that hypothetical location. The systems are similar, yet different.

All six of the container systems are practical for use in managing naval spent nuclear fuel and special case waste. The differences in environmental impacts between the six systems are small.

The proposed action of this EIS does not entail actual shipment to a repository or a centralized interim storage site. Rather such a shipment to a notional repository or centralized interim storage site is evaluated to help distinguish among the six container alternatives. As stated in the EIS, the proposed action is the selection of a container system for the management of post-examination naval spent nuclear fuel and Navy-generated special case waste. The proposed action also includes:

- Manufacturing the container system.
- Loading, handling and storage of the container system at Idaho National Engineering Laboratory.
- Modifications to the Expended Core Facility and the Idaho Chemical Processing Plant at Idaho National Engineering Laboratory to support loading the containers at Idaho National Engineering Laboratory.
- Selection of the location of the dry storage area at Idaho National Engineering Laboratory.
- Evaluating the impacts of transporting the container system to a representative or notional interim storage facility or repository and unloading the container system at that hypothetical location.

Including the impacts of transporting the container system to, and unloading at, a representative or notional interim storage facility or repository ensures that the container system selected is compatible with these operations at these facilities to the extent they are defined at this time. The EIS shows that the differences between container systems are very small and the impacts of any of the alternate systems is also small. Since the specific location of a repository is not known at this time, there is little use to add details such as the specific heavy-haul route to Yucca from the main rail line at Caliente, Nevada. This EIS is to pick a container system - not to pick a repository.

B. In regard to Clark County's comment that a complex-wide EIS evaluating transportation between and among all generator, storage and disposal sites would be more useful, this is not a matter under the Navy’s purview. Congress has determined that, with respect to the requirements imposed by the National Environmental Policy Act of 1969 (42 U. S.C. 4321), compliance with the procedures and requirements of the Nuclear Waste Policy Act (42 U.S.C. 10101, et seq, as amended) shall be deemed adequate consideration of the "...need for a repository, the time of initial availability of a repository, and all alternates to the isolation of high-level radioactive waste and spent nuclear fuel in a repository..." and that "...alternate sites to Yucca Mountain..." and "...nongeologic alternatives to such site..." need not be considered as alternates. (42 U.S.C. 4321, Article 114(f)).

On August 7, 1995 Department of Energy announced (60 FR 40164) its intent to prepare an EIS in accordance with Nuclear Waste Policy Act for a geologic repository at Yucca Mountain. The environmental issues to be examined in the Department of Energy EIS were identified as including "...the potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and Department of Energy facilities to the Yucca Mountain site ...including impacts of constructing and operating a rail spur, a heavy-haul route and/or a transfer facility..." Following a 90-day scoping period which ended December 5, 1995, Department of Energy deferred action on the EIS until Fiscal Year 1997 for budgetary reasons.

C. With respect to storage, transportation, and disposal, the fact that naval nuclear fuel is unique is a positive characteristic, not a negative one as the comment implies. A complete discussion of these unique characteristics of naval nuclear fuel is presented in Chapter 2, Section 2.3 of the EIS. Section S.2 of the EIS states that because of differences in configurations and sizes of naval spent nuclear fuel and assemblies, all of the alternatives would require containers to have internal baskets designed for specific spent nuclear fuel types. Evaluations completed to date show that naval spent nuclear fuel can be packaged into the conceptual multi-purpose canister without requiring any modifications to the previously planned disposal configuration at a geologic repository.

D. The Navy will add a brief discussion of related civil actions to Chapter 8.

E. The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses. Comparison of heavy-haul transportation routes is pertinent to this EIS to the extent that it helps to discriminate among the alternatives considered.

All of the alternative container systems would be suitable for heavy-haul transportation, as illustrated by prior use of the M-140 containers in heavy-haul transport. However, it is accurate to state that the M-140 based alternatives would be less suitable due to size, height, and weight. This statement has been added to Chapter 3, Sections 3.2, 3.8.4 and Chapter 7, Section 7.3 of the EIS.

The Navy is aware that no rail link to the Yucca Mountain site currently exists, and that if it were to become the site of a repository or centralized interim storage facility, heavy-haul transport might be used in place of a rail connection. However, the resolution of that issue will depend on the site eventually selected and the evaluation of the environmental impacts and other factors specific to that site. The routes, distances, and potentially affected populations would be the same for all of the alternative container systems considered for naval spent fuel because the shipments will use the same route--the route selected for shipment of commercial spent nuclear fuel and high-level radiological waste to the repository or centralized interim storage site. Similarly, all container systems considered would have the same design dose rate, a maximum of 10 millirem per hour at 2 meters, as required by the Department of Transportation regulations (49 CFR 100 et seq.). Therefore, the key difference in the alternatives for the purposes of comparing the impacts associated with heavy-haul transport for naval spent nuclear fuel using the alternative container systems is the number of shipments. Text which explains this matter has been added to Appendix B, Section B.4.

The radiological risks of shipping naval spent nuclear fuel have been conservatively analyzed in this EIS and are described in Section B.5.1. The analyses use a train speed of 15 miles per hour. This is slower than the actual expected average transport speed. Using slower train speeds is more conservative because that results in a higher calculated radiation exposure to the public (trains spend time proximate to the public). This conservatively slow train speed means that the exposure associated with the transport speeds for possible heavy-haul transport would be similar to the results for rail shipments of the same length over similar routes (e.g., Caliente to Yucca Mountain).

It is unlikely that passengers in recreational vehicles and buses (elevated vehicles) traveling in the vicinity of an oversized load on a heavy-haul transport vehicle would be as close as the 2 meter distance of the maximum regulatory package external exposure of 10 millirem per hour at 2 meters. First, the length of the tractor and the overlap of the trailer on the sides and at the rear would prevent any vehicle approaching as close as 2 meters (about 6.5 feet) to the exterior surface of the container. Second, the routine safety precautions for shipping would involve at least one escort vehicle for the tractor-trailer rig due to its size and speed. This escort vehicle would add several meters to the distance from the spent nuclear fuel shipping cask. In the EIS, a maximally exposed individual for shipments has been described in Section B.3.1, and the results in Table B.10 are evidence of small impact for such a person.

It should be observed that containers used for legal-weight truck transfer would also be designed to produce a maximum exposure rate of 10 millirem per hour at 2 meters in accordance with the regulations and their use would present the same opportunity for the elevated vehicles to be in traffic with them as would occur for heavy-haul transport. Further, many more legal-weight truck shipments would be required to move all spent fuel. Text has been added to Chapter 3, Section 3.7 which summarizes the evaluation of legal-weight truck use.

The range of accidents analyzed in Section B.5.2 would bound the impacts from a hypothetical heavy-haul transportation accident at an intersection in Las Vegas, such as at the intersection of I-15 and U.S. Route 95 on a week day during rush hour. Such an event would be expected to produce impacts which would be within the scope of the accidents analyzed in Section B.5.2, using an urban population density of 3,861 people per square kilometer. These severe hypothetical accidents have also been analyzed for the rural population density of six people per square kilometer and would produce estimates of effects similar to those which might result from the scenario postulating an accident at the intersection of Nevada State Routes 375 and 318 at Crystal Springs.

Text has been added to Section B.5.2 to specifically cover these points.

F. Although the transportation analysis performed in this EIS is based on three potential rail routes, the scope of the analysis encompasses the different population densities of the rural, suburban and urban communities along the routes. The specific distances through the cities and towns along the way were considered and estimates were used for the population densities for cities along the way that are highly unlikely to be exceeded. The commenter is referred to Appendix B, Section B.3.2, B.4 and Table B.15 for the details of this portion of the analysis. The responses above provide the details of the evaluations of heavy-haul transport.

G. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires federal agencies to identify and address, as appropriate, disproportionately high and adverse effects on human health or the environment of its programs, policies, or activities on minority populations or low-income populations. This EIS addresses environmental justice for minority, low-income, and Native American populations in sections related to manufacturing (Chapter 4, Section 4.8), loading and storage (Chapter 5, Section 5.8), and shipment over public transportation routes (Chapter 7, Section 7.3.5) and in the Executive Summary.

Analyses of the potential impacts associated with all of the container systems considered for management of naval spent nuclear fuel are presented in this EIS for manufacturing, loading and storage, and shipment over public transportation routes. These analyses show that any effects on human health or the environment would be small for all of the alternatives considered. The potential impacts due to normal operations or hypothetical accident conditions associated with the alternative container systems evaluated present little or no significant risk to public health or the environment and do not constitute an adverse impact to any population in the vicinity of the activities involved, including Native American, minority and low-income populations.

This EIS includes specific demonstrations that the impacts resulting from any of the alternatives considered would not be high and adverse for any group. For example, Section 7.3.5 includes an analysis of the impacts of shipments on minority and low-income populations. This analysis assumed that all of the latent cancer fatalities which might occur as the result of a severe accident during transportation of naval spent nuclear fuel using any of the container systems considered were among members of minority populations and demonstrated that they would experience far less than one additional fatality per year. Section 7.3.5 also includes a comparison of this less than one potential additional accidental death per year among members of minority populations to the approximately 7400 deaths in minority populations due to traffic accidents in 1994 to provide perspective.

Similarly, the radiation exposure from incident-free shipment for the total number of shipments for 40 years is presented in Section 7.3.5 for the Fort Hall Reservation as a concrete example of the very small risk to a minority population or low-income population who might be exposed to every shipment. The Shoshone-Bannock Reservation at Fort Hall was used to illustrate the absence of high and adverse impact because every shipment of naval spent nuclear fuel would pass through those Native American lands on the way from the Idaho National Engineering Laboratory to any repository. Other minority or low income populations would not be exposed to human health or environmental effects which would differ greatly from those estimated for Fort Hall. Similarly, the accident risks in Table 7.4 and the maximum consequences of a severe hypothetical accident in Table B.13 were determined for urban, suburban, and rural populations and the input to the analyses make these results applicable to any population group in those categories. The discussion of environmental justice in this EIS is sufficient and in compliance with the Council on Environmental Quality regulations in 40 CFR 1502.2(b).

As pointed out by the commenter and described in Section B.4 of the EIS, specific routes, including the fraction of the total distance of each route that would be through rural, urban, or suburban localities, were used to compare the possible impacts of the alternatives. Also as identified in Sections B.4 and B.5, the analyses used estimates of the population density in the rural, urban, and suburban areas which are unlikely to be exceeded. The probabilities of accidents for the transportation used in the analyses were specific to each state along the route to correctly represent variations in accident rates, as described in Section B.5.2 of the EIS. Table B-13 provides a summary of the maximum consequences of a severe hypothetical accident broken down by rural, urban, and suburban areas.

As shown by the analyses in this EIS, including the analyses for minority, Native American, or low-income populations presented, there are no high and adverse impacts associated with the alternatives considered. Even if all of the impacts were assumed to occur only among minority or low-income populations, the impacts for any of the container systems for naval spent nuclear fuel management would not constitute a disproportionately high and adverse impact to any particular segment of the population, minorities and low-income groups included. Since there are no disproportionately high and adverse human health or environmental effects for any population, no mitigating measures beyond the normal practices for shipment of spent nuclear fuel will be necessary.

The text of Section 7.3.5 of the EIS has been modified to enhance the reader's ability to use the results of the analyses to evaluate the possibility that any of the alternatives might have a disproportionately high and adverse impact on minority populations or low-income populations.

H. Since no repository or centralized interim storage site has yet been selected, this EIS uses a site being evaluated by Department of Energy pursuant to the Nuclear Waste Policy Act as the destination point for naval spent nuclear fuel shipments.

Management of spent nuclear fuel at a repository or centralized interim storage site will be the subject of the site-specific EIS for the particular facility. The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses.

Additional discussion to clarify these points has been added to the EIS in Chapter 7, Section 7.1 and Appendix B, Section B.1.

In this EIS estimates of impacts are discussed and summarized in Chapter 3, Section 3.8.5 and are within the range of 1 to 4 percent of the total impact of civilian spent nuclear fuel management. An estimation of the total impact can be made by using that range and impacts provided in Chapter 3. Since transportation of spent nuclear fuel would be of primary interest to Clark County, Chapter 7, Section 7.3.7 provides the estimated cumulative impacts for transportation of all spent nuclear fuel to a geologic repository are described. These impacts are further described in the Department of Energy *Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Final Environmental Impact Statement* of April 1995 in Appendix I of Volume 1.

I. As stated in Appendix A, Section A.4, the probability of an airplane crash was evaluated for all locations, including the Nevada Test Site. Details of this evaluation are presented in the Programmatic SNF and INEL EIS and incorporated into the EIS by reference. This document (Volume 1, Appendix D, Table F.3-5) presents the site specific data, including details of the data for large civilian, large military, and military high performance aircraft used for the analysis. The results show that the probability of an airplane crash into dry storage containers at the Nevada Test Site is approximately 5×10^{-8} per year. Such an accident was, therefore, not analyzed in detail since accidents which are less likely than 10^{-7} per year are not expected to contribute in any substantial way to the risk and this is the case for this hypothetical accident.

Commenter: Richard B. Holmes - Clark County/Dept of Comprehensive Planning, Nevada

J. Unloading operations were evaluated at a notional geologic repository to determine if there is a difference between container system alternatives. The results of this evaluation, presented in Appendix A, Table A.12, show that the Multi-Purpose Canister Alternatives would have a smaller environmental impact during operations at a repository surface facility since the canisters do not require opening. The analysis results suggest that a similar conclusion would be reached regardless of the meteorology and population distributions used. Site specific meteorology and population will be used as needed when appropriate environmental documentation is prepared for an interim storage facility or repository in accordance with the Nuclear Waste Policy Act.

K. Appendix A, Section A.2.3 of the EIS was revised to incorporate this comment.

Eureka County
Yucca Mountain Information Office
P.O. Box 714
Eureka, Nevada 89316
Phone (702) 237-5407 FAX (702) 237-5169

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July 18, 1996

Richard A. Guida
Associate Director for Regulatory Affairs
Naval Nuclear Propulsion Program
Department of the Navy
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Dear Mr. Guida:

Eureka County, Nevada is one of ten affected units of local government provided for under the Nuclear Waste Policy Act as Amended (NWPAA). We would like to take this opportunity to express our concerns regarding the Navy's Draft EIS for a Container System for Naval Spent Fuel.

A (1) Since the U.S. Navy has assumed responsibility from the Department of Energy (DOE) for development of what used to be known as the Multiple Purpose Canister (MPC) Environmental Impact System (EIS), this draft document has been significantly scaled back. It has also become more narrowly focused and deals only with the storage and potential transport of spent naval reactor fuel and small amounts of "special case waste" at Idaho National Engineering Laboratory (INEL). It does not address canister systems for commercial spent fuel or other forms of high-level waste. Eureka County, therefore, is concerned that the level of information in the draft EIS is totally
B inadequate. Without information on the different characteristics of Naval reactor spent fuel and commercial spent fuel, issues such as criticality, thermal impacts, and compatibility with other waste forms cannot be assessed. Technical data regarding the comparative health risks analysis is also lacking.

C (2) A proposed action or preferred alternative is not specified in the draft EIS. It would seem essential that the final EIS include sufficient information so that once a preferred alternative is identified it can be adequately evaluated.

D (3) Without adequate information on waste form characteristics, the claim that the Naval SNF waste form presents little risk is a specious one. The Navy must be required to evaluate the risks and impacts from low probability/high consequence events.

E (4) A more thorough analysis must be made on the potential for disproportionate impacts to rural communities along shipping routes. The issue of environmental justice must be addressed more adequately along with the specific mitigation measures the Navy is committed to implementing.

F (5) Because there could be significant differences in risks, environmental and health and safety impacts, not to mention costs associated with various transportation systems, the final EIS must evaluate heavy haul/intermodal transport, not just rail and highway.

G (6) Many other stakeholders are involved besides DOE, the Navy and the State of Idaho. The final EIS must address the potential conflict between DOE's agreement with Idaho and its agreements with utility companies regarding waste acceptance. This lack of clarity could have implications for a preferred alternative by requiring longer term on-site storage at INEL.

H (7) In order to fully integrate and assess the impacts of Naval reactor spent fuel on Yucca Mountain, the final EIS should address how the Navy's EIS will complement DOE's Yucca Mountain EIS.

I hope these comments will be helpful to you in your preparation of the final EIS. If you have have questions please do not hesitate to write or call.

Sincerely,

Sandy Green

Sandy Green, Project Coordinator

Commenter: Sandy Green - Eureka County/Yucca Mountain Information Office, Nevada

Response to Comment:

A. As a result of the Department of Energy's decision to terminate preparation of a proposal for a multi-purpose canister system for the management of civilian and naval spent nuclear fuel, the Department of the Navy assumed lead responsibility for an EIS evaluating a container system for naval spent nuclear fuel only. At the same time, the Department of Energy's role in the preparation of this EIS became that of a cooperating agency. Although the intent and focus of this EIS is dedicated to the selection of a container system for naval spent nuclear fuel, future decisions regarding commercial or other spent nuclear fuel can make use of some information from this EIS.

B.&D. The level of information in the Container System EIS is sufficient. Although the detailed design of Navy fuel is classified, the EIS contains significant information concerning its performance characteristics and the contents of the loaded container systems such that the environmental impacts from its shipment, storage, and management can be assessed and independent analyses can be performed to verify the results presented in this EIS. Chapter 2, Section 2.3 of the EIS presents the general characteristics of naval nuclear fuel, including design description, U-235 enrichment range, the amount of U-235 in a loaded container, criticality control measures, and the results of decay heat calculations. Appendices A and B contain detailed numerical data on the source terms and on corrosion product and fission product releases expected for each container system for each hypothetical accident scenario analyzed. The Appendices also identify the computer programs which were used, along with the specific assumptions for each accident scenario.

For example, Table B.8 provides a list of the radioactive nuclides which might be released in a shipping accident involving naval spent nuclear fuel. The data on the amount of radioactivity are divided into the amounts released from the fission products in the fuel and the amount in the activated corrosion products attached to the surface of the fuel. The data are provided for typical spent fuel in nuclear-powered submarine and surface ship fuel assemblies to demonstrate the range of radioactivity. Using the information in this table, along with the other detailed information on the calculations provided in Appendix B, allows independent reviewers to evaluate the adequacy of the calculation of impacts of a hypothetical accident on human health and the environment. It also permits an independent reviewer to perform analyses using alternate methods, such as other computer programs, or utilizing other conditions, such as different weather or accident conditions. The information in Appendix A, including the amount of radioactivity released and the fraction of the total activity in naval spent nuclear fuel it represents, is provided in similar detail to permit independent analyses for normal and accident conditions.

The Navy has provided in this EIS, and in documents referenced in the EIS, a substantial amount of information on the handling, storage, and shipment of naval spent nuclear fuel and the types and amounts of radiation or radioactive material involved in releases from normal operations and postulated accidents in this EIS. The Navy has attempted to provide enough information on radiation, radioactivity, and other aspects of operations or hypothetical accidents to allow independent calculation and verification of all estimates of environmental impacts.

As discussed in Section A.2.3, beyond design-basis accidents were evaluated in this EIS. These accidents have a probability of occurrence in the range of 10^{-6} to 10^{-7} per year and could have large or catastrophic consequences. For example, an airplane crash into dry storage containers was evaluated at the Idaho Chemical Processing Plant. Despite the consequences (1.3 to 2.6 latent cancer fatalities estimated), the annual risk associated with this hypothetical accident (1×10^{-6}) is less than the risk associated with a drained water pool due to an earthquake (2.4×10^{-6}) because of the low probability of the airplane crash. These analyses results and others are presented in Section A.2.5 of the EIS.

Commenter: Sandy Green - Eureka County/Yucca Mountain Information Office, Nevada

C. The Draft EIS for a Container System for the Management of Naval Spent Nuclear Fuel proposes and evaluates a range of alternatives that would provide a system of containers for the management of naval spent nuclear fuel. Although any of the six alternative container systems would provide a suitable container for naval spent nuclear fuel, the identification of a preferred alternative in the Final EIS has taken into consideration factors relating to protection of human health and environment, cost, technical feasibility, operational efficiency, regulatory impacts, and storage or disposal criteria which may be established for a repository or centralized interim storage site outside the state of Idaho. Also, public comments on the Draft EIS were an important factor in the selection of a preferred alternative container system. The preferred alternative has been chosen from among the six container systems analyzed in the Draft EIS with no further evaluations of the selected preferred alternative required.

D. See the response to comment B above.

E. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires federal agencies to identify and address, as appropriate, disproportionately high and adverse effects on human health or the environment of its programs, policies, or activities on minority populations or low-income populations. This EIS addresses environmental justice for minority, low-income, and Native American populations in sections related to manufacturing in Chapter 4, Section 4.8, loading and storage in Chapter 5, Section 5.8, and shipment over public transportation routes in Chapter 7, Section 7.3.5 and in the Executive Summary.

Analyses of the potential impacts associated with all of the container systems considered for management of naval spent nuclear fuel are presented in this EIS for manufacturing, loading and storage, and shipment over public transportation routes. These analyses show that any effects on human health or the environment would be small for all of the alternatives considered. The potential impacts due to normal operations or hypothetical accident conditions associated with the alternative container systems evaluated present little or no significant risk to public health or the environment and do not constitute an adverse impact to any population in the vicinity of the activities involved, including Native American, minority and low-income populations.

This EIS includes specific demonstrations that the impacts resulting from any of the alternatives considered would not be high and adverse for any group. For example, Section 7.3.5 includes an analysis of the impacts of shipments on minority and low-income populations. This analysis assumed that all of the latent cancer fatalities which might occur as the result of a severe accident during transportation of naval spent nuclear fuel using any of the container systems considered were among members of minority populations and demonstrated that they would experience far less than one additional fatality per year. Section 7.3.5 also includes a comparison of this less than one potential additional accidental death per year among members of minority populations to the approximately 7400 deaths in minority populations due to traffic accidents in 1994 to provide perspective.

Similarly, the radiation exposure from incident-free shipment for the total number of shipments for 40 years is presented in Section 7.3.5 for the Fort Hall Reservation as a concrete example of the very small risk to a minority population or low-income population who might be exposed to every shipment. The Shoshone-Bannock Reservation at Fort Hall was used to illustrate the absence of high and adverse impact because every shipment of naval spent nuclear fuel would pass through those Native American lands on the way from the Idaho National Engineering Laboratory to any repository. Other minority or low income populations would not be exposed to human health or environmental effects which would differ greatly from those estimated for

Fort Hall. Similarly, the accident risks in Table 7.5 and the maximum consequences of a severe hypothetical accident in Table B.13 were determined for urban, suburban, and rural populations and the input to the analyses make these results applicable to any population group in those categories. The discussion of environmental justice in this EIS is sufficient and in compliance with the Council on Environmental Quality regulations in 40 CFR 1502.2(b).

As pointed out by the commenter and described in Section B.4 of the EIS, specific routes, including the fraction of the total distance of each route that would be through rural, urban, or suburban localities, were used to compare the possible impacts of the alternatives. Also as identified in Sections B.4 and B.5, the analyses used estimates of the population density in the rural, urban, and suburban areas which are unlikely to be exceeded. The probabilities of accidents for the transportation used in the analyses were specific to each state along the route to correctly represent variations in accident rates, as described in Section B.5.2 of the EIS. Table B-13 provides a summary of the maximum consequences of a severe hypothetical accident broken down by rural, urban, and suburban areas.

As shown by the analyses in this EIS, including the analyses for minority, Native American, or low-income populations presented, there are no high and adverse impacts associated with the alternatives considered. Even if all of the impacts were assumed to occur only among minority or low-income populations, the impacts for any of the container systems for naval spent nuclear fuel management would not constitute a disproportionately high and adverse impact to any particular segment of the population, minorities and low-income groups included. Since there are no disproportionately high and adverse human health or environmental effects for any population, no mitigating measures beyond the normal practices for shipment of spent nuclear fuel will be necessary.

The text of Section 7.3.5 of the EIS has been modified to enhance the reader's ability to use the results of the analyses to evaluate the possibility that any of the alternatives might have a disproportionately high and adverse impact on minority populations or low-income populations.

F. The DOE’s Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that “The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...”. The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses. Comparison of heavy-haul transportation routes is pertinent to this EIS to the extent that it helps to discriminate among the alternatives considered.

All of the alternative container systems would be suitable for heavy-haul transportation, as illustrated by prior use of the M-140 containers in heavy-haul transport. However, it is accurate to state that the M-140 based alternatives would be less suitable due to size, height, and weight. This statement has been added to Chapter 3, Section 3.2 and 3.8.4 and Chapter 7, Section 7.3 of the EIS.

The Navy is aware that no rail link to the Yucca Mountain site currently exists, and that if it were to become the site of a repository or centralized interim storage facility, heavy-haul transport might be used in place of a rail connection. However, the resolution of that issue will depend on the site eventually selected and the evaluation of the environmental impacts and other factors specific to that site. The routes, distances, and potentially affected populations would be the same for all of the alternative container systems considered for naval spent fuel because the shipments will use the same route--the route selected for shipment of commercial spent nuclear fuel and high-level radiological waste to the repository or centralized interim storage site. Similarly, all container systems considered would have the same design dose rate, a maximum of 10 millirem per hour at 2 meters, as required by the Department of Transportation regulations (49 CFR 100 et seq.). Therefore, the key difference in the alternatives for the purposes of comparing the impacts associated with heavy-haul transport for naval spent nuclear fuel using the alternative container systems is the number of shipments. Text which explains this matter has been added to Appendix B, Section B.4.

The radiological risks of shipping naval spent nuclear fuel have been conservatively analyzed in this EIS and are described in Section B.5.1. The analyses use a train speed of 15 miles per hour. This is slower than the actual expected average transport speed. Using slower train speeds is more conservative because that results in a higher calculated radiation exposure to the public (trains spend more time proximate to the public). This conservatively slow train speed means that the exposure associated with the transport speeds for possible heavy-haul transport would be similar to the results for rail shipments of the same length over similar routes (e.g., Caliente to Yucca Mountain).

It is unlikely that passengers in recreational vehicles and buses (elevated vehicles) traveling in the vicinity of an oversized load on a heavy-haul transport vehicle would be as close as the 2 meter distance of the regulatory package maximum external exposure of 10 millirem per hour. First, the length of the tractor and the overlap of the trailer on the sides and at the rear would prevent any vehicle approaching as close as 2 meters (about 6.5 feet) to the exterior surface of the container. Second, the routine safety precautions for shipping would involve at least one escort vehicle for the tractor-trailer rig due to its size and speed. This escort vehicle would add several meters to the distance from the spent nuclear fuel shipping cask. In the EIS a maximally exposed individual for shipments has been described in Section B.3.1, and the results in Table B.10 are evidence of small impact for such a person.

The range of accidents analyzed in the Section B.5.2 would bound the impacts from a hypothetical heavy-haul transportation accident at an intersection in Las Vegas, such as at the intersection of I-15 and U.S. Route 95 on a week day during rush hour. Such an event would be expected to produce impacts which would be within the scope of the accidents analyzed in Section B.5.2, using an urban population density of 3,861 people per square kilometer. These severe hypothetical accidents have also been analyzed for the rural population density of six people per square kilometer and would produce estimates of effects similar to those which might result from the scenario postulating an accident at the intersection of Nevada State Routes 375 and 318 at Crystal Springs.

Text has been added to Section B.5.2 to specifically cover these points.

G. There are no conflicts between the Department of Energy's agreement with Idaho, dated October 16, 1995 and Department of Energy's agreements with utility companies regarding acceptance of civilian spent nuclear fuel. The standard contract between the Department of Energy and utility companies (10 CFR Part 961) identifies that Department of Energy will take title to, transport, and dispose of spent nuclear fuel from civilian nuclear power reactor plant owners or generators of such fuel. The standard contract allows Department of Energy, after it takes title, to transport this spent nuclear fuel to a Department of Energy facility prior to its transportation to a disposal facility. The DOE has advised the Navy that a number of DOE facilities could be used for that purpose.

Commenter: Sandy Green - Eureka County/Yucca Mountain Information Office, Nevada

H. There is no connection between the Navy Container System EIS and the EIS which the Department of Energy is preparing for a geologic repository for the disposal of spent nuclear fuel and high-level radioactive waste at Yucca Mountain, Nevada. The intent to prepare the Department of Energy EIS was announced (60 FR 40164) on August 7, 1995 and its purpose is identified to support a recommendation to the President to approve the site for development of a repository.

The proposed action of this EIS does not entail actual shipment to a repository or a centralized interim storage site. Rather such a shipment to a notional repository or centralized interim storage site is evaluated to help distinguish among the six container alternatives. As stated in the EIS, the proposed action is the selection of a container system for the management of post-examination naval spent nuclear fuel and Navy-generated special case waste. The proposed action also includes:

- Manufacturing the container system.
- Loading, handling and storage of the container system at Idaho National Engineering Laboratory.
- Modifications to the Expended Core Facility and the Idaho Chemical Processing Plant at Idaho National Engineering Laboratory to support loading the containers at Idaho National Engineering Laboratory.
- Selection of the location of the dry storage area at Idaho National Engineering Laboratory.
- Evaluating the impacts of transporting the container system to a representative or notional interim storage facility or repository and unloading the container system at that hypothetical location.

Including the impacts of transporting the container system to, and unloading at, a representative or notional interim storage facility or repository ensures that the container system selected is compatible with these operations at these facilities to the extent they are defined at this time. The EIS shows that the differences between container systems are very small and the impacts of any of the alternate systems is also small. Since the specific location of a repository is not known at this time, the Navy Container System EIS used Yucca Mountain, Nevada as the representative location since it is the only location currently approved for site characterization.

P&A Engineers
William D. (Bill) Peterson, M.S., P.E.
2127 Lincoln Lane
Holladay, Utah 84124
Tel/FAX 801/277-3981

July 6, 1996

Will Knoll
Department of the Navy
Code NAVSEA 08U,
2531 Jefferson Davis Highway,
Arlington, VA 22242-5160,
(703)602-8229, travel 800-800-7759 beeper No. 33305

Subject: PROPOSAL TO PROVIDE NUCLEAR STORAGE TECHNOLOGY

Dear Mr. Knoll:

On June 7, 1996 in your public hearing on the "Draft
Environmental Impact Statement for a Container System for the
A Management of Naval Spent Nuclear Fuel" I proposed that you use
my design for your naval spent fuel storage at INEL in Idaho.
See enclosed drawings of two versions of a smaller, 360 canister
size, monitored storage and retrieval (MRS) systems of my design
per my patent serial No. 5448604 issued September 5th, 1995. My
site system is designed to adapt to the multi-purpose canister
system which was indicated in your hearing as a favored container
system. The site system is state of the art computer controlled
for moving a canister from known transporter location $X_1Y_1Z_1$ to
B known storage location $X_2Y_2Z_2$. I further purpose that you
consider using my design for a Modular On Site Storage System
(MOSSS) which would have the flexibility of enabling the moving
of the concrete cask system from INEL to another sites as
proposed at the Pigeon Spur in Western Box Elder County, Utah and
Area 25 at the Nevada Test Site.

The proposed system is designed to demonstrate safety and security of storage of nuclear material and the Navy's use of this at INEL can calm the public fears of this process and instill acceptance of this procedure at INEL and other sites.

For this proposal we reference other drawings previously provided, other site plan designs, drawings of the railroad gear, the showing of our models, and other information provided to you at the June 7th hearing. We ask you consider this and that we open a dialogue that can lead to some form of joint participation leading to storage of Navy nuclear spent fuel at INEL.

Sincerely yours,

William D. (Bill) Peterson, M.S., P.E.
P&A Engineers

Commenter: William D. Peterson - P&A Engineers, Utah

Response to Comment:

A.&B. It is premature to provide comments on the specific design proposed. Once the Final EIS and the Record of Decision have been issued, the performance specifications will be developed for the naval spent nuclear fuel container system. As stated in the EIS, the container system selected must meet the requirements of 10 CFR Parts 71 and 72.

Ponca Industrial Corporation
P.O. Box 154082
Irving, TX 75015-4082
(214) 579-1144

July 17, 1996

Mr. William Knoll
NAVSEA Code O8U
2531 Jefferson Highway
Arlington, VA 22242-5160

Re: Proposal for Nuclear Waste Containment Facility

Dear Mr. Knoll:

Thank you for the opportunity to present the above referenced proposal to the U.S. Department of the Navy. We hope that you will consider this as an alternative to previously proposed solutions. Our research indicates that ours is the more cost effective, and environmentally sound method of nuclear waste storage.

Should you have any questions, or require additional information, please contact us as the above address. We are looking forward to hearing from you with your response.

Sincerely,

John W. King
Agent/Negotiator

PROPOSAL
for Nuclear Waste Containment Facility

Prepared for:
U.S. Department of the Navy
William Knoll
NAVSEA Code O8U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Submitted by:
John W. King, Agent/Negotiator
Ponca Industrial Corporation
P.O. Box 154082
Irving, TX 75015-4082

July 17, 1996

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CORPORATE PROFILE

Ponca Industrial Corporation was formed by members of the Ponca tribe of Native American Indians November 18, 1986, to stimulate economic growth for the Ponca and other Indian tribes. Ponca Industrial Corporation is doing business under the laws of the state of Oklahoma, is tax exempt, and is registered with the Bureau of Indian Affairs. Ponca Industrial Corporation qualifies as a Small Business Firm as defined in 10 CFR Part 33 (b) (1). Under Public Law 93-638, Indian tribes are privileged to self-determination; meaning that they have the right to independently determine, without government intervention, whatever actions are in the tribal members' best interest.

John W. King is the registered agent for Ponca Industrial Corporation. Over a span of several years, Mr. King has recruited a network of consultants with appropriate backgrounds to aid him in the stimulation of economic growth for the Indian Tribes. He has performed as entrepreneur, owning two businesses. He was Liaison for twelve (12) years with the Los Angeles District Attorney's office and was active with the Los Angeles Indian Center in Los Angeles for fourteen (14) years. He has spent the last several years in the Dallas area, where he has concentrated on the nuclear waste storage project. He is presently involved with the Dallas Indian Center. Mr. King will act as Agent/Negotiator for Ponca Industrial Corporation.

BACKGROUND

Ponca Industrial Corporation has been participating in ongoing feasibility studies concerning the storage of nuclear waste for several years. In 1993, we were the recipient of DOE grant #DE-PS01-92RW00231 to assess the feasibility of siting a Monitored Retrievable Storage (MRS) facility. Although the feasibility study was completed to all parties' satisfaction, the proposed process was not implemented. A copy of this study is included with this proposal.

In the interim, a study has been produced by the U. S. Department of Energy's Office of Civilian Radioactive Waste Management (OCRWM). In this study, the Site Characterization Progress Report: Yucca Mountain, Nevada, the Department of Energy attempts to analyze the site conditions and processes to determine the technical suitability of the Yucca Mountain site for the underground permanent disposal of spent nuclear fuel and high-level radioactive waste. The National Academy of Sciences has released its recommendations on Yucca Mountain public health and safety standards. Regardless of the site and method of storage, these standards will be utilized in any analysis of the safety of the resulting program.

In all scenarios being considered as to the method of storage, the current intent involves only burial of contaminated waste. Research by Ponca Industrial Corporation has determined that in an irretrievable facility, there exists a very real possibility of the contamination of groundwater resulting from a variety of events: decomposition/deterioration of containers, faulty storage methods, damage to a container by impact by dropping, crushing, or earthquake, etc. Any contamination, however small, is unacceptable to both Ponca Industrial Corporation and to the American public.

The Nuclear Waste Policy Act, as amended, designates Yucca Mountain at the Department of Energy's (DOE's) Nevada test site as the only site currently authorized by legislation to be characterized as a geologic repository. It's suitability has not yet been determined.

The Yucca Mountain study has concentrated on the environmental impact of the repository based on certain waste package design concepts. Presently being considered are four basic types of disposal containers: those for multi-purpose canisters, those for uncanistered fuel, and those for defense high level water glass canisters. A revision of the Controlled Design Assumptions Document (CRWMS M&O, 1995a), specifies that a high thermal load is now the reference case. Accordingly, disposal containers for high thermal loads are being emphasized in this study.

Concurrently, a study has been released by the U.S. Department of the Navy's Environmental Impact Statement (EIS) for a Container System for the Management of Naval Spent Nuclear Fuel. Under this study, six container types have been identified as appropriate for the storage and management of nuclear waste: multi-purpose canisters, no-action alternative (current technology) involving M-140 transportation casks, current technology/rail alternative, transportable storage casks, dual- purpose canisters, and small multi-purpose canisters.

A Public opinion does not support any of these container choices. Ponca Industrial Corporation's research indicates that the viability of any of these designs used in a facility as being considered at the Yucca Mountain site is predicated upon inherently risky safety projections. We understand and accept that any potential impacts of using containers proposed by Ponca Industrial Corporation or any other licensed vendors are expected to be bounded by the alternatives evaluated in the EIS.

OFFER

B Ponca Industrial Corporation offers to provide to the United States government a subterranean monitored retrievable storage facility. This type of edifice is repairable in the event of natural disaster (earthquake) or explosion, with a negligible chance of releasing any toxins from the containers themselves. Should a facility become contaminated, the containers can be physically moved to another location.

C The proposed containers would be steel, lead lined units covered with a stucco-like material which diffuses heat. These containers are much less expensive than any of the canisters now being evaluated (as referenced above). The containers specified by Ponca Industrial Corporation have a life expectancy of 500 years.

D Ponca Industrial Corporation recommends and proposes the storage facility be located on Indian land by virtue of the 1934 Indian Reorganization Act. Under this Act, the government has the right to cede land to an Indian individual to be held in trust. We offer the possibility of appropriating land parcels that are presently contaminated, and ceding them to the Ponca Industrial Corporation. Under Indian ownership, Indian laws are in effect and govern land use. Taxes are eliminated.

E Ponca Industrial Corporation proposes that transportation to the facility be accomplished by Indian trucking company. The 1858 treaty with the Ponca Indians, Article 5, supports this proposal stating that in accordance with tribal law, customs and bylaws, Poncas have the legal right to move material via the then current mode of transportation of travois. This presents the legal introduction to transporting materials by trucking, which is the accepted method of present day ground transportation. Transportation will be approved by the federal government, thereby avoiding state laws.

COMPENSATION

Ponca Industrial Corporation would expect appropriate compensation to include the following as outlined in the document "An Invitation for Dialogue and Participation" issued by the United States Nuclear Waste Negotiator:

(a) Infrastructure improvements, including highways, railroads, waterways, airports, or other public projects;

(b) Environmental improvements including the cleanup of existing air, water or waste problems,

(c) Public school assistance programs;

(d) Higher education programs;

(e) Health care programs;

(f) Proposed co-locations of other federal projects or existing federal program expansions;

(g) General economic development programs;

(h) The transfer of ownership of federal properties, as discussed in the 1934 Indian Reorganization Act;

(i) Tax subsidy or property value protection programs;

(j) Public recreation improvement programs;

(k) Direct financial assistance;

(l) Local employment or product purchasing agreements;

(m) Any other type of assurance, equity, or assistance desired by the State or Indian Tribe.

BENEFITS

Indian Tribes enjoy several federal considerations which contribute to the viability of this project.

1) Under the Treaty Law of 1858, business transacted by an Indian group is tax exempt,

2) under the same Treaty, Indians have the legal right to move material without interference from any government agency;

3) under Public Law 93-638 of January 4, 1975, Indian Tribes are privileged to self-determination; meaning that they have the right to independently determine, without government intervention, whatever actions are in the tribal members' best interest. Also under this law, Indian Tribes enjoy sovereign immunity from suit;

3) under the 1934 Reorganization Act, the government has the right to cede land to Indian tribes and hold it in trust;

4) after the project is strategically defined, thousands of jobs will be created in the area of the facility.

CONCLUSION

Ponca Industrial Corporation presents this proposal as an alternative to those currently being considered. We feel as though the merits of our plan far outweigh those as otherwise proposed. By utilizing the many benefits afforded Indian tribes, costs of any proposed method of storage is greatly reduced. Further, by using the containers as described in this proposal, and by creating a retrievable storage facility, both the costs and the possible environmental, health and safety risks decrease.

Commenter: John W. King - Ponca Industrial Corp., Texas

Response to Comment:

A. In Chapter 3, Section 3.8, Comparison of Alternatives, the EIS states that the impacts for most categories are small or nonexistent for all alternatives. Since 1957, the Navy has shipped over 660 containers of spent nuclear fuel from the shipyards and prototype sites to the Naval Reactors Facility. All of the shipments were made safely by rail and without release of radioactivity. Since any container alternative selected for use must meet the requirements of 10 CFR Part 71, Packaging and Transportation of Radioactive Material, and 10 CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Waste, the other containers can also be used safely and reliably.

B.&D. The location and design of a centralized interim storage facility or geologic repository is outside the scope of this EIS. As stated in Chapter 2, Section 2.8.1 of the EIS, the Department of Energy has published a notice of its intention to prepare an EIS for a geologic repository at Yucca Mountain.

C. It is premature to provide comments on the specific design proposed. Once the Final EIS and the Record of Decision have been issued, the performance specifications will be developed for the naval spent nuclear fuel container system and a competitive bidding process will be started in accordance with federal acquisition regulations. As stated in the EIS, the container system selected must meet the requirements of 10 CFR Parts 71 and 72.

D. See the response to Comment B above.

E. Containers used for legal-weight truck transfer would also be designed to produce a maximum exposure rate of 10 millirem per hour at 2 meters in accordance with the Department of Transportation regulations and their use would present the same opportunity for the elevated vehicles to be in traffic with them as would occur for heavy-haul transport. Further, many more legal-weight truck shipments would be required to move all spent nuclear fuel.

All of the alternative container systems would be suitable for heavy-haul transportation, as illustrated by prior use of the M-140 containers in heavy-haul transport. However, it is accurate to state that the M-140 based alternatives would be less suitable due to size, height, and weight. This statement has been added to Chapter 3, Sections 3.2, 3.8.4 and Chapter 7, Section 7.3.3 of the EIS.

Therefore, the key difference among the alternatives for the purposes of comparing the impacts associated with heavy-haul transport for naval spent nuclear fuel using the alternative container systems is the number of shipments. Text which explains this matter has been added to Appendix B, Section B.4.

The radiological risks of shipping naval spent nuclear fuel have been conservatively analyzed in this EIS and are described in Section B.5.1. The analyses use a train speed of 15 miles per hour. This is slower than the actual expected transport speed. Using slower train speeds is more conservative because that results in a higher calculated radiation exposure to the public (trains are more proximate to the public). This conservatively slow train speed means that the exposure associated with the transport speeds for possible heavy-haul transport would be similar to the results for rail shipments of the same length over similar routes.

It is too early to select companies to ship spent nuclear fuel to a repository or centralized interim storage site because the location, routes and the responsible federal agency have not yet been decided. There is, however, a Notice of Waste Acceptance, Storage and Transportation Services for the Office of Civilian Radioactive Waste Management in the May 28, 1996 Federal

Register. The notice requests comment or expression of interest in transporting spent nuclear fuel from commercial reactor sites.

NYE
COUNTY

July 18, 1996

Mr. William Knoll
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

RE: Nye County Comments on Draft EIS for Container System for the Management of Naval Spent Nuclear Fuel

Dear Mr. Knoll:

Nye County is the host jurisdiction for the Yucca Mountain Project, and if pending legislation is passed, will also be designated as the location for the nation's only centralized spent fuel storage facility. The Nye County Board of Commissioners established the Nuclear Waste Repository Project Office to provide local oversight of the Yucca Mountain Project and associated activities, including the potential disposal of naval spent fuel at a geologic repository. We appreciate the opportunity to submit these comments on the Navy's Draft EIS for a Container System for the Management of Naval Spent Nuclear Fuel.

A At the outset, Nye County wishes to repeat our request that a public hearing on the EIS be held in Nye County. Our residents have a direct interest in the Navy's decisions regarding the management of its spent fuel. We are particularly mindful of the fact that decisions regarding Naval spent fuel will set important precedents for how the Department of Energy manages much larger volumes of civilian spent fuel.

B In general, we find that the draft EIS gives insufficient attention to potential impacts of transporting, storing, and disposing of Naval spent fuel in Nevada, and at Yucca Mountain in particular. The lack of attention to impacts in Nevada is especially egregious since Naval spent fuel is likely to be stored or disposed of in Nevada permanently, whereas all such fuel is scheduled to be removed from Idaho by 2035, according to the EIS.

C The analysis of repository impacts does not consider a wealth of site-specific information about the site. Similarly, the transportation analysis ignores the potential rail routes to the site that are actually under consideration and it fails to consider the potential need for long-distance heavy haul transport of spent fuel containers from a rail head to the site.

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D The rationale for providing this relatively generic analysis of impacts in Nevada appears to be that Yucca Mountain has not been designated as a repository. We believe this reasoning is flawed. The only repository site that will be available under any foreseeable scenario is Yucca Mountain. We urge that the Navy to provide the most detailed analysis of transportation, storage, and disposal impacts in Nevada that the available data will permit.

Our other comments are keyed to relevant sections of the EIS, as follows:

E **Section 3** The description of alternatives assumes that casks will be transported by rail "using commercial rail lines as part of commonly scheduled trains traveling to the vicinity of a repository...Dedicated trains may be used when appropriate." (p. 3-8, para 2) We note that the closest rail head to Yucca Mountain is some 100 miles away, and that most of the potential routes to the site including the Carlin and Caliente routes are more than 300 miles long. We recommend that the EIS account for these alternatives. We also note that virtually all stakeholders recommend the use of dedicated trains, and we therefore recommend that the transportation analysis assume the use of dedicated trains.

F **Sections 3.1 and 3.6** The analysis assumes that multi-purpose canisters will be placed directly into a repository and not opened. Since repository thermal loads and many other design considerations at the repository are currently unknown, we believe it would be more appropriate (and conservative) to assume that MPCs would be opened at the repository. At a minimum, some MPCs would probably have to be opened to allow inspection and verification of spent fuel characteristics, especially after a long storage period.

Section 3.8

G <u>Risk Assessment</u> Although we do not dispute the assessment of radiological and accident risks, we question its interpretation. Admittedly the potential impacts are very small for all alternatives, but there are significant differences that should be highlighted. For example, table 3.2 shows that there are orders of magnitude differences between, for example, the small MPC and current technology/rail in the number of latent cancer fatalities expected as a result of transportation.

H We also note that the risk analysis does not consider impacts of a terrorist attack or sabotage of a cask. Although we realize these issues (and worst case scenarios in general) pose difficult methodological challenges, they are significant public concerns and must be addressed for the EIS to be credible.

I (p.3-18, last para) This paragraph indicates that the main sources of differences in the radiation doses from accidents or routine operations are the number of people who live near a facility and where they live in relation to the facility. We could not have stated a better reason for using site-specific information about Yucca Mountain.

J <u>Environmental Justice</u> We believe the analysis of environmental justice impacts (p. 3-19, 4-16) is incomplete. It is not sufficient to consider impacts only to minority and disadvantaged populations adjacent to cask manufacturing facilities, as does the EIS. The EIS should also recognize that there is an environmental justice dimension to waste disposal in rural areas. The EIS is, in addition, virtually silent on potential impacts to Native American through whose reservations naval spent fuel could be transported.

K There are fundamental questions of equity that should be addressed as part of the environmental justice assessment. In particular, does disposal of the nation's most toxic material in one jurisdiction (Nye County) impose an unfair burden on that jurisdiction? If so, to what equity offsets should that jurisdiction be entitled?

L Cumulative Impacts (p. 3-25, last two paragraphs) The summary of cumulative impacts states that naval waste would be 3 percent of the total number of containers of civilian spent fuel shipments, and in the next paragraph that total transportation impacts of naval fuel shipments would be 1 to 4 percent of the impact of all shipments. In and of themselves these comparisons are meaningless. What is important in our view is not the *relative* impact of naval shipments, but the *absolute* impact.

Chapter 6

M This chapter is seriously deficient. The last paragraph on page 6-1, for example, is simply astounding in view of the actual situation "on the ground." We find the claim that "A site specific environmental setting cannot be presented here since the exact location of the repository would be needed" to be utterly mystifying. **There is no potential site for a repository other than Yucca Mountain.**

Likewise the last paragraph on page 6-3 states that:

> Several other resources and environmental attributes were evaluated for INEL in Chapter 5. These attributes were not evaluated in detail for a hypothetical geologic repository or centralized interim storage site, since a specific site location is not known, *the impact on the attributes are not expected to be large*, and the evaluation would not help to discriminate among the container alternatives. These areas include ecology, air quality, cultural resources, socioeconomics, water resources, environmental justice, aesthetic and scenic resources, geology, noise, and electricity consumption. (emphasis ours)

N The logic here is puzzling. In effect, this paragraph says that "we chose not to evaluate the impacts of managing naval spent fuel at the repository because we don't think there are going to be any impacts." How can you know this without any analysis?

Section 6.5 on page 6-4 continues:

> Since the amount of spent nuclear fuel and special case low-level waste handled at the repository or centralized interim storage facility will be extremely small when compared to the amount of civilian spent nuclear fuel, cumulative impacts were evaluated qualitatively...It is expected that the environmental impacts due to unloading naval spent fuel and special case low-level waste at the surface facility would be in proportion to the total number of spent fuel containers received at the facility, and thus, these activities would have a small impact on the environment and the surrounding population.

O This is in sharp contrast to the detailed evaluation of cumulative impacts at INEL in section 5.11. Section 6.5 assumes (with no analysis) for the repository site what section 5.11 concludes (after extensive analysis) for INEL, namely, that the cumulative impacts of managing naval fuel are so small in comparison to other activities, such as managing civilian fuel, that they are insignificant. We believe ~~it is indefensible to assume for one section~~ what you conclude for an earlier section.

Chapter 7

P We find many of the same shortcomings in this chapter as in Chapter 6. Section 7.2 states that "It is impossible to select a route since the repository site is unknown." Yet all three routes that are evaluated terminate at Yucca Mountain by way of Las Vegas. None of the actual potential rail routes to Yucca Mountain are considered. We believe the analysis would be significantly strengthened by considering the Carlin, Caliente, Jean, and Modified Valley routes, and we urge you to do so.

Q Likewise, the transportation analysis does not adequately consider the need for heavy haul truck transport in the absence of a rail link to Yucca Mountain. It is irrelevant in our view that "The ultimate decision...on transportation options...will be made by DOE on the basis of analyses to be performed in the repository EIS." (page 7-1, para 2) All the likely potential routes to Yucca Mountain options are now known, and the EIS should consider them in an much detail as the available data permit.

Later (page 7-5, para 3) the EIS states that "If heavy haul transporters were needed...the air quality effects due to heavy haul transporters would be expected to be small due the distance traveled and the small number of shipments." While we do not disagree your assessment of air quality effects, a campaign involving 300 to 500 shipments can scarcely be considered small. Moreover, heavy haul shipments to Yucca Mountain would cover a much larger distance than any other heavy haul

R campaign ever has before. We believe that a much more specific analysis of heavy haul impacts should be included in the EIS.

S In conclusion, we find that (1) the EIS makes unreasonable assumptions about the location of a repository, and (2) does not take advantage of available data about Yucca Mountain and potential transportation routes in Nevada. As the result the EIS fails almost totally to adequately assess potential impacts in Nevada. This deficiency is especially glaring in view of the extensive attention to impacts at INEL and the fact that naval spent fuel is likely to spent a much longer time in Nevada than in Idaho.

The irony, of course, is that the impacts of managing naval spent fuel *are* likely to be minimal. In failing to make the most reasonable assumptions about the anticipated repository and to use available data for Yucca Mountain, however, the Navy undermines the overall credibility of its conclusions.

Thank you again for the opportunity to comment on the EIS. Please call me at (703) 482-8183 or our Washington representative, Phillip Niedzielski-Eichner at (703) 818-2434 if you have any questions.

Sincerely,

Les W Bradshaw

Les Bradshaw
County Manager

cc: Nye County Commissioners
Dr. Daniel Dreyfus, OCRWM Director
Phillip Niedzielski-Eichner, Governmental Dynamics, Inc.

Commenter: Les Bradshaw - Nye County/County Manager

Response to Comments:

A. The public involvement/participation process for this EIS meets applicable requirements. Over 1,600 copies of the Draft EIS and EIS Summary were mailed to interested members of the public, federal, state, tribal, and local agencies. The Draft EIS was placed in 43 public reading rooms and libraries spread throughout the western states and numerous advertisements were placed in local newspapers announcing the availability of the Draft EIS for public review and comment. In addition, six public hearings were held at three locations (Boise, Idaho Falls area, and Salt Lake City) in Idaho and Utah. The locations selected covered those regions where naval spent nuclear fuel will be loaded and stored, and a large urban area along a possible transportation route. These locations are consistent with the proposed action covered in the Container System EIS. The EIS does not lead to selection of a centralized interim storage site or a site for ultimate disposal of spent fuel, since those matters are under the cognizance of the Department of Energy. The EIS does analyze shipment to Yucca Mountain, but for analytical purposes of comparing alternative container systems only, recognizing that location as the only one authorized under the Nuclear Waste Policy Act for evaluation as a potential repository. The analysis does not presume, however, that Yucca Mountain will be found suitable as a repository.

The actual routes to be used for shipment of naval spent nuclear fuel to a repository will be evaluated along with other routes to be used for a geologic repository or centralized interim storage facility in the site specific EIS for such a facility. The evaluation of the environmental impacts due to transportation of naval spent nuclear fuel in this EIS was performed in part to determine whether or not there were any differences among the six container system alternatives. In order to perform the analysis, a destination had to be selected. In addition, three routes were evaluated to identify a range of potential impacts to see if that would produce differences among the alternative container systems. As the summary in Chapter 7, Section 7.3 states, the environmental impacts are very small in each case and the differences among the container system alternatives are negligible. The analysis suggests that a similar conclusion would be reached, regardless of the location of the destination or route selected for analysis. The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses.

B. Nye County's concern about the sufficiency of attention in the Draft EIS to impacts of transporting, storing and disposal of naval spent nuclear fuel in Nevada is outside the scope of the Navy Container System EIS. These topics are appropriate for the Department of Energy EIS that supports a recommendation to the President for the location of a repository but are not appropriate for the Navy Container System EIS.

The proposed action of this EIS does not entail actual shipment to a repository or a centralized interim storage site. Rather such a shipment to a notional repository or centralized interim storage site is evaluated to help distinguish among the six container alternatives. As stated in the EIS, the proposed action is the selection of a container system for the management of post-examination naval spent nuclear fuel and Navy-generated special case waste. The proposed action also includes:

- Manufacturing the container system.

Commenter: Les Bradshaw - Nye County/County Manager

- Loading, handling and storage of the container system at Idaho National Engineering Laboratory.

- Modifications to the Expended Core Facility and the Idaho Chemical Processing Plant at Idaho National Engineering Laboratory to support loading the containers at Idaho National Engineering Laboratory.

- Selection of the location of the dry storage area at Idaho National Engineering Laboratory.

- Evaluating the impacts of transporting the container system to a representative or notional interim storage facility or repository and unloading the container system at that hypothetical location.

Including the impacts of transporting the container system to, and unloading at, a representative or notional interim storage facility or repository ensures that the container system selected is compatible with these operations at these facilities to the extent they are defined at this time. The EIS shows that the differences between container systems are very small and the impacts of any of the alternative systems is also small. Since the specific location of a repository is not known at this time, the Navy Container System EIS used Yucca Mountain, Nevada as the representative location since it is the only location currently approved for site characterization.

C.&Q. The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses. Comparison of heavy-haul transportation routes is pertinent to this EIS to the extent that it helps to discriminate among the alternatives considered.

All of the alternative container systems would be suitable for heavy-haul transportation, as illustrated by prior use of the M-140 containers in heavy-haul transport. However, it is accurate to state that the M-140 based alternatives would be less suitable due to size, height, and weight. This statement has been added to Chapter 3, Sections 3.2, 3.8.4 and Chapter 7, Section 7.3 of the EIS.

The Navy is aware that no rail link to the Yucca Mountain site currently exists, and that if it were to become the site of a repository or centralized interim storage facility, heavy-haul transport might be used in place of a rail connection. However, the resolution of that issue will depend on the site eventually selected and the evaluation of the environmental impacts and other factors specific to that site. The routes, distances, and potentially affected populations would be the same for all of the alternative container systems considered for naval spent fuel because the shipments will use the same route--the route selected for shipment of commercial spent nuclear fuel and high-level radiological waste to the repository or centralized interim storage site. Similarly, all container systems considered would have the same design dose rate, a maximum of 10 millirem per hour at 2 meters, as required by the Department of Transportation regulations (49 CFR 100 et seq.). Therefore, the key difference in the alternatives for the purposes of comparing the impacts associated with heavy-haul transport for naval spent nuclear fuel using the alternative container systems is the number of shipments. Text which explains this matter has been added to Appendix B, Section B.4.

The radiological risks of shipping naval spent nuclear fuel have been conservatively analyzed in this EIS and are described in Section B.5.1. The analyses use a train speed of 15 miles per hour. This is slower than the actual expected average transport speed. Using the slower train speeds is more conservative because that results in higher calculated radiation exposure to the public (trains spend more time proximate to the public). This conservatively slow train speed means that the exposure associated with the transport speeds for possible heavy-haul transport would be similar to the results for rail shipments of the same length over similar routes (e.g., Caliente to Yucca Mountain).

It is unlikely that passengers in recreational vehicles and buses (elevated vehicles) traveling in the vicinity of an oversized load on a heavy-haul transport vehicle would be as close as the 2 meter distance of the regulatory package maximum external exposure of 10 millirem per hour. First, the length of the tractor and the overlap of the trailer on the sides and at the rear would prevent any vehicle approaching as close as 2 meters (about 6.5 feet) to the exterior surface of the container. Second, the routine safety precautions for shipping would involve at least one escort vehicle for the tractor-trailer rig due to its size and speed. This escort vehicle would add several meters to the distance from the spent nuclear fuel shipping cask. In the EIS a maximally exposed individual for shipments has been described in Section B.3.1, and the results in Table B.10 are evidence of small impact for such a person.

Containers used for legal-weight truck transfer would also be designed to produce a maximum exposure rate of 10 millirem per hour at 2 meters in accordance with the DOT regulations and their use would present the same opportunity for the elevated vehicles to be in traffic with them as would occur for heavy-haul transport. Further, many more legal-weight truck shipments would be required to move all spent fuel. Text has been added to Chapter 3, Section 3.7 which summarizes the evaluation of legal-weight truck use.

The range of accidents analyzed in the EIS Section B.5.2 would bound the impacts from a hypothetical heavy-haul transportation accident at an intersection in Las Vegas, such as at the intersection of I-15 and U.S. Route 95 on a week day during rush hour. Such an event would be expected to produce impacts which would be within the scope of the accidents analyzed in Section B.5.2, using an urban population density of 3,861 people per square kilometer. These severe hypothetical accidents have also been analyzed for the rural population density of six people per square kilometer and would produce estimates of effects similar to those which might result from the scenario postulating an accident at the intersection of Nevada State Routes 375 and 318 at Crystal Springs.

Text has been added to Section B.5.2 to specifically cover these points.

D. Evaluating disposal at Yucca Mountain is outside the scope of this EIS. The Navy is attempting to select a container system that would be used to store naval spent nuclear fuel at the Idaho National Engineering Laboratory. The Navy is not trying to identify the location of a repository.

The Nuclear Waste Policy Act (42 U.S.C. 10101 et seq. as amended) identifies that Yucca Mountain, Nevada is the only site currently authorized for characterization as a repository. However, Nuclear Waste Policy Act also identifies the steps that must be taken before a repository site is approved as a repository. The environmental impacts of disposal will be covered in the EIS that Department of Energy is preparing to support a recommendation to the President for a repository site.

E. The response to Comment C. discusses the issue of heavy-haul transport.

The shipment of naval spent nuclear fuel containers in general commerce, i.e., as part of freight trains carrying other cargo to many destinations, has proved to be acceptable, practical and safe in almost 40 years of experience, during which over 660 shipments of naval spent nuclear fuel have been done safely. This practice is not especially complex and has been proven not to increase the difficulty or hazards of point-of-entry inspections for railroad or other personnel. It has not contributed to any derailments and the railroads have provided clearance for the shipments and associated railcars, frequently being involved in the design process for the systems. The shipping containers are designed to meet the requirements for shipping in general commerce, including withstanding high temperature fires. Safety precautions, such as using buffer cars, have worked well over time.

The use of general freight trains has been proven safe during the almost 40 years of shipping over 660 container shipments of naval spent nuclear fuel. These shipments have been made with no release of radioactivity to the environment. Dedicated trains have been used only when the need for urgent delivery or other considerations justified the increased cost. The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses.

From the mid-1970s to the early 1990s the Department of Energy and Department of Defense argued before the Interstate Commerce Commission and civil courts in multiple proceedings against the railroads imposition of special (dedicated) train service on radioactive shipments. In every case, including exhaustive reviews of safety and railroad and train operations, the Interstate Commerce Commission and courts determined and upheld that special train service for radioactive shipments, including spent nuclear fuel, was unnecessary, wasteful and unlawful. In 1993, the railroad industry refunded to the federal government $8 million it had collected, plus interest, for imposed special train service.

The Navy remains of the view that any additional safety resulting from dedicated train service is insignificant and, when compared to the substantial increase in cost associated with dedicated trains, simply cannot be justified. A dedicated train may be used in a particular instance if schedule or other considerations dictate that it is necessary but not as a matter of policy or routine and clearly not to increase safety.

The safety of naval spent nuclear fuel shipments rests squarely on the robust shipping containers and the rugged nature of the contents as discussed below in the response to comment I. Generally speaking, naval spent nuclear fuel shipments do not need to be treated or handled any differently than any other hazardous materials handled by the railroads in interchange service. Certainly unnecessary or lengthy delays and layovers in railyards and at interchanges should be avoided; but the normal times required for train switching and makeup, train crew reliefs, and connections between railroads are not a concern during movement of naval spent nuclear fuel just as they are not a concern during movement of any other hazardous material. Expedited movement beyond what the Code of Federal Regulations, Title 49, Section 174.14 requires for any hazardous material is not necessary for naval spent nuclear fuel shipments for safety.

The Government will own the escort and container cars to be used in the future for shipping naval spent nuclear fuel to a geologic repository or centralized interim storage site just as it has for almost 40 years of naval spent nuclear fuel movements. This equipment is unique to the purpose and cargo and must be dedicated to naval spent nuclear fuel shipments without availability for other railroad customers, therefore it is appropriate for it to be government, not railroad owned. Current practice is and future practice will be to ensure in careful fashion that the equipment meets all railroad industry standards of railcar construction and operation, including Association of American Railroads review of the railcar design prior to construction and testing of new equipment at the Transportation Test Center in Pueblo, Colorado for dynamic handling. Association of American Railroads requirements for railcars used to transport radioactive material, for example as set forth in Field Manual Of Interchange Rule 88.A.15.c.(2), will be met.

If onboard defect detection equipment is required under Department of Transportation regulations, it will be used for naval spent nuclear fuel shipments.

Naval spent nuclear fuel shipments are intended to move in regular interchange freight service. Since specially designed buffer cars are not necessary for any other hazardous material which moves in regular interchange freight service in order to achieve 49 CFR separation and segregation requirements, then they should not be necessary for naval spent nuclear fuel shipments.

The current fleet of six escort cabooses has been used successfully, without any significant operational problems, in regular and dedicated interchange freight service in conjunction with naval spent nuclear fuel and other Naval Nuclear Propulsion Program shipments for approximately 20 years. Scrapping this equipment in favor of newer equipment before the existing equipment's useful life of 40 years, as defined by railroad industry standards, is not considered warranted. Navy equipment is expected to be replaced after the year 2010. When the time comes to replace the existing escort cabooses, the Naval Nuclear Propulsion Program will work closely with the Association of American Railroads, as it does for container cars, to ensure the new equipment meets railroad industry standards.

F. In concept, the design of the multi-purpose canister system would not require the canister to be opened at the repository since the canister would meet all disposal criteria. The commenter is correct that if the disposal criteria changed after an multi-purpose canister has been loaded and seal welded, then the package might have to be opened. Under such circumstances, the Multi-Purpose Canister Alternative becomes similar to the Dual-Purpose Canister Alternative which has been evaluated in this EIS. The analyses performed for this EIS show that the environmental impacts are small for all container system alternatives.

G. In the EIS Executive Summary, Section S.6.1 and Chapter 3, Section 3.8 and Tables S.6 and 3.2 it is clearly stated that the actual historic doses have been used for the alternatives based on the M-140 (the No-Action Alternative and the Current Technology/Rail Alternative) and not for the other container systems. The best available data have been used in this EIS to estimate environmental impacts. Actual measurements are available for the M-140 container but none of the other containers have been used for naval fuel so the regulatory limit which serves as the design basis represents the best estimate of the maximum external exposure rate for such containers. The use of actual measurements did not bias the selection of the preferred alternative described in Section 3.8.

H. As stated in Appendix A, Section A.2.2 of the EIS, human-induced events such as terrorism were considered in selecting accidents to include in the detailed analyses. Acts of terrorism are expected to result in consequences which are bounded by the results of accidents which are evaluated. Naval spent nuclear fuel is not considered to be attractive to terrorists due to the bulk of the fuel containers and due to high radiation fields involved with unshielded spent nuclear fuel. However, terrorist attacks on naval fuel during shipment were evaluated. The massive structure of the containers used for naval spent nuclear fuel makes them an unlikely target of a terrorist attack. No such attacks have occurred in the almost 40 years of rail shipments which have now traveled about 2 million container kilometers. Thus, the probability of a terrorist attack on a shipment is no higher than the probability of a rail accident which is listed in Appendix B, Section B.5.2 of this EIS. Even if an attack were to occur, the likelihood of it causing a breach in a container is not high owing to the rugged nature of the containers (high explosives by themselves would be insufficient to breach a container). The consequences of a terrorist attack are also no more severe than those listed for the transportation accidents for reasons explained below. Therefore, the same conclusions reached for transportation accidents apply to the risk to the extremely rugged shipping containers from terrorist attack during a shipment. In addition, during shipment, all naval spent nuclear fuel containers are accompanied by escorts who remain in contact with headquarters, such that a failure to regularly check in with headquarters due to their incapacitation would result in a response. In the event of an emergency, state and federal resources would be quickly summoned. The issue of acts of terrorism was also addressed in the Programmatic SNF and INEL EIS and the same conclusions were reached.

For an act of war, sabotage, or terrorist attack, it is likely the risk would be lower than calculated for an airplane crash because it should be less probable that a force would exist to disperse radioactive products into the atmosphere from a weapon as compared to the motive force of the fire assumed in the case of an airplane crash. For example, attacks on containers using anti-tank weapons would be less severe than the accidents analyzed because: (a) anti-tank weapons would cause a self-sealing penetration in the metal of a container, unlike that which is assumed from the airplane crash (impact from a 50-inch diameter engine rotor); (b) there is no explosive material inside the container, so it will not "blow-up" as a tank would if hit by such a weapon (in a tank attack, the tank shells inside the turret detonate); (c) there would be no fire to disperse the radioactivity that is released when the container is breached, unlike an aircraft crash where the jet fuel will burn creating such a fire. The rugged design of containers reduce the effects of other types of explosive charges. It is not credible that a terrorist attack would result in a criticality or meltdown of spent nuclear fuel; however, in Section A.2.5, the consequences of a hypothetical criticality accident are presented. The risks associated with an accidental criticality are less than those associated with a drained water pool or an airplane crash into dry storage containers.

The effect of a terrorist attack or an act of sabotage is expected to be conservatively bounded by the limiting accident discussed at each facility under each alternative. For example, the most limiting accident involving naval spent nuclear fuel is described in this EIS to be an airplane crash into a 125 ton multi-purpose canister at the Idaho Chemical Processing Plant. This accident could lead to 2.6 latent fatal cancers over the next 50 years in the population within 50 miles of the site. Since the probability of the event is one chance in 2,500,000 per year, the risk would be 0.00000104 latent fatal cancer fatalities per year or, in other words, about one chance in 960,000 of a single fatal cancer fatality over a year. This risk is shared among the approximately 120,000 people residing within 50 miles of the site who would be expected to have over 300 cancer fatalities from all causes every year. For an act of war, sabotage, or terrorist attack, it is likely the risk would be lower than calculated because it should be less probable that a force would exist to disperse radioactive products into the atmosphere from a weapon as compared to the motive force of the fire assumed in the case of an airplane crash.

This information has been added to Section A.2.2 of the EIS.

I.&M. Unloading operations were evaluated at a notional geologic repository to determine if there is a difference between container system alternatives. The results of this evaluation, presented in Table A.12, show that the multi-purpose canister alternatives would have a smaller environmental impact during operations at a repository surface facility since the canisters do not require opening. The analysis results suggest that a similar conclusion would be reached regardless of the meteorology and population distributions used. Site specific meteorology and population will be used as needed when appropriate environmental documentation is prepared for an interim storage facility or repository in accordance with the Nuclear Waste Policy Act.

J. In addition to the environmental justice impacts associated with manufacturing (Chapter 4, Section 4.8), this EIS analyzes the impacts for loading and storage operations (Chapter 5, Section 5.8) and transportation (Chapter 7, Section 7.3.5) of post-examination naval spent nuclear fuel.

The impacts on any segment of the population, including minorities and low-income groups, resulting from all normal operations or accidents associated with the loading or storage of naval spent nuclear fuel at the Idaho National Engineering Laboratory would be extremely small for any of the alternatives considered in this EIS. For example, under any of the alternative container systems it is unlikely that a single fatal cancer would occur over the 40 years considered in this EIS.

Similarly, for populations along the transportation routes which include population densities for rural, suburban and urban communities, the analysis of this EIS concludes that impacts resulting from any of the alternatives considered would not be high and adverse to any group. The analysis included in Section 7.3.5 included a demonstration, assuming that all of the latent cancer fatalities which might occur as the result of a severe accident during transportation of naval spent nuclear fuel, using any of the container systems considered. This analysis illustrated that members of minority and low-income populations would experience far less than one additional fatality per year. It can also be seen from the data presented in this section that the effects of radiation exposure from the total number of incident-free shipments over almost 40 years for the Shoshone-Bannock Reservation at Fort Hall are a very low risk to a Native American population who might be exposed to every shipment from the Idaho National Engineering Laboratory.

The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "Potential for disproportionately high and adverse impacts on minority or low-income populations" will be examined.

K. This EIS does not make presumptions concerning the Yucca Mountain site's designation for use as a geologic repository, designation for use as a centralized interim storage site or burdens imposed on the jurisdiction in which it is located. Furthermore, appropriations for fiscal resources to support the activities of the federal Government are determined by Congress and are beyond the scope of this EIS. As stated earlier, environmental justice issues will be addressed by the Department of Energy in their repository EIS.

L. Transportation impacts are discussed and summarized in Chapter 3, Sections 3.8.4 and 3.8.5. Transportation impacts in absolute terms are provided in Tables 3.8 and 3.9. Further information on transportation is provided in Chapter 7. Relative impacts, expressed as percentages of the total impacts which are due to naval spent nuclear fuel and special case waste, are also included to provide a convenient perspective. In Section 7.3.7 estimated cumulative impacts for transportation of all spent nuclear fuel to a geologic repository are described. These impacts are further described in the Department of Energy *Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Final Environmental Impact Statement* of April 1995 in Appendix I of Volume 1.

Therefore, this EIS does provide sufficient information on the absolute as well as the relative effect on cumulative impacts.

M. See the response to Comment I above.

N. & O. Unloading operations were evaluated at a notional geologic repository to determine if there is a difference between container system alternatives. The results of this evaluation, presented in Appendix A, Table A.12, show that the Multi-Purpose Canister Alternatives would have a smaller environmental impact during operations at a repository surface facility since the canisters do not require opening. The analysis results suggest that a similar conclusion would be reached regardless of the meteorology and population distributions used. Site specific meteorology and population will be used as needed when appropriate environmental documentation is prepared for an interim storage facility or repository in accordance with the Nuclear Waste Policy Act.

Executive Summary, Section S.1 of the Final EIS states that before the Navy container system is actually used for shipments off the Idaho National Engineering Laboratory Site, appropriate environmental documentation will be prepared in support of an interim storage facility or a repository in accordance with the Nuclear Waste Policy Act. This documentation will include the potential impacts of shipments of spent nuclear fuel and high-level waste from reactor sites and Department of Energy facilities to the recommended location and the site specific impacts of operations at that location.

P. The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses.

A range of routes to a repository or centralized interim storage site is used for the transportation analysis in this EIS in order to determine whether different routing characteristics, such as distance or differences in population distribution, would affect the comparison of the alternative container types. Since no repository or centralized interim storage site has yet been selected, the transportation routing in this EIS uses a site being evaluated by the Department of Energy pursuant to the Nuclear Waste Policy Act as the destination point for naval spent nuclear fuel shipments.

The Navy recognizes that the legal and regulatory climate is evolving on nuclear waste transportation matters and is keeping abreast of the requirements. From the historical perspective, naval spent nuclear fuel has been shipped safely by rail for almost 40 years (over 660 container shipments) without release of radioactivity to the environment. Federal, state and local regulations have been fully met in the past. This EIS addresses issues in the light of the existing laws and regulations and the best information available on the future conditions. The Navy's shipment history demonstrates that the Navy is committed to ensuring the safety of spent nuclear fuel transportation. This commitment to safety will continue in the future as the new laws and regulations affecting transportation of spent nuclear fuel and high-level radioactive waste are implemented. For the sake of comparing a reasonable range of alternatives the current regulations have been applied conservatively in the EIS transportation analysis.

Additional discussion to clarify these points has been added to the EIS in Chapter 7, Section 7.1 and Appendix B, Section B.1.

Q. See the response to comment C above.

R. The transportation analysis in the EIS covers the scope of heavy-haul transportation as described in the response to C and Q above. As previously discussed, analysis of specific heavy-haul routes is appropriately the subject of the site-specific EIS to be prepared for a geologic repository or centralized interim storage site. Such analyses would not help to differentiate the impacts of the alternatives considered.

S. The Navy considers that Nye County's comment that the Draft EIS does not take advantage of available data about Yucca Mountain and potential transportation routes in Nevada is outside the scope of this EIS for the reasons previously stated.

Robert F. Deegan
Sierra Club Virginia Chapter
340 Ramapo Road
Virginia Beach, VA 23462

VIRGINIA CHAPTER
SIERRA CLUB

"When we try to pick out anything by itself, we find it hitched to everything else in the universe."

John Muir

July 31, 1996

Richard A. Guida
Associate Director for Regulatory Affairs
Naval Nuclear Propulsion Program
2531 Jefferson Davis Highway
Arlington, Va. 22242-5160

Dear Mr. Guida:

A Thank you for your letter of 24 July concerning our comments on the Navy's Draft Environmental Impact Statement (EIS) on a Container system for naval spent nuclear fuel (SNF). You responded to our comment on storage and shipments of naval SNF from shipyards (removing the SNF from warships) until the SNF reaches INEL in Idaho. Our comment on this point seems to have been misunderstood; therefore, we request that the following further explanation on this point be included and evaluated in the Final EIS.

The 1995 DOE/Navy Programmatic EIS on Spent Nuclear Fuel Management is a programmatic EIS evaluating broad alternative strategies for managing DOE and Navy SNF. That programmatic EIS does not remove the need for EIS analysis of specific hardware or site-specific alternatives within the context of the broad management strategy adopted in 1995. The Navy decision now to be made on the possibility of a new multi-purpose container (MPC) system is just such a case.

The Navy is correctly preparing the EIS because of the environmental implications of the choice of container systems. Surely, the Navy must not omit from its analysis the potential good use of a new MPC container system for SNF shipments from shipyards to INEL in Idaho. Such an omission would be a grevious flaw in the container system EIS analysis.

We are not urging that the role of INEL or the shipyards in naval SNF management be reanalyzed. We are merely insisting that the full scope of potential use of these container systems be analyzed, which includes SNF storage and transport from the shipyards to INEL in Idaho.

"When we try to pick out anything by itself, we find it hitched to everything else in the universe."
John Muir

The 1995 DOE/Navy Programmatic EIS described the available M-130, M-140, and M-160 shipping containers. (Volume 1, Appendix D, Attachment A) The 1995 PEIS did not compare the environmental merits of those containers or of any potential new MPC systems. Thus, we assert that the scope of the current Navy Draft EIS analyzing SNF container systems is inadequate. We urge that the Navy reconsider the scope of this container EIS.

Yours respectfully,

Robert F. Deegan,

Nuclear Waste Issues Chairman

Robert F. Deegan
Sierra Club Virginia Chapter
340 Ramapo Road
Virginia Beach, VA 23462

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
2531 JEFFERSON DAVIS HWY
ARLINGTON, VA 22242-5160

IN REPLY REFER TO

August 14, 1996

Mr. Robert F. Deegan
Nuclear Waste Issues Chairman
Sierra Club, Virginia Chapter
340 Ramapo Road
Virginia Beach, VA 23462

Dear Mr. Deegan:

Thank you for your letter of July 31, 1996 amplifying on comments which you previously supplied concerning the Navy's draft Environmental Impact Statement covering selection of a container system for the storage and shipment of post-examination naval spent fuel.

Your amplifying comments will be addressed in the final EIS. However, your comments suggest that there may be some misunderstanding concerning the scope of the subject EIS. Specifically, the comments request that the Navy consider the use of multi-purpose containers (MPCs) for the shipment of pre-examination naval spent fuel from shipyards to the Idaho National Engineering Laboratory. That is not the subject of the container system EIS. The Navy currently has a fleet of shipping containers which it uses to transport pre-examination naval spent fuel to INEL; we have no need to procure additional containers, thus there is no need to consider the use of MPCs or other containers for that purpose. By contrast, we have no containers available for shipment of post-examination naval spent fuel; hence, the proposed federal action covered in the subject EIS is to acquire such containers.

Even if a need were to arise to procure additional shipping containers for pre-examination naval spent fuel, the benefits which MPCs provide for some types of shipments - i.e., no need to unload and reload spent fuel from the internal canister - do not apply to shipments of pre-examination naval spent fuel, since such spent fuel must be unloaded at INEL for examination.

Thank you for your comments, and I hope that the information above is helpful.

Sincerely,

Richard A. Guida

Richard A. Guida
Associate Director
for Regulatory Affairs
Naval Nuclear Propulsion Program

VIRGINIA CHAPTER
SIERRA CLUB

"When we try to pick out anything by itself, we find it hitched to everything else in the universese."
John Muir

August 21, 1996

Mr. Richard A. Guida
Associate Director for Regulatory Affairs
Naval Nuclear Propulsion Program
2531 Jefferson Davis Highway
Arlington, Va. 22242-5160

Dear Mr. Guida:

Thank you for your letter of August 14th concerning our comments on the Navy's Draft Environmental Impact Statement (EIS) for a Container System for the Management of Naval Spent Nuclear Fuel (SNF). We appreciate the close attention to our comments on the Draft EIS.

B The limitation on the scope of the EIS described in your two letters (7-24-96 and 8-14-96) would, in our view, bar the Navy in the future from (a) ever using any of the existing containers for future storage or shipment of "post-examination" SNF, and (b) ever using any of the newly procured containers for future storage or shipment of "pre-examination" SNF. We are puzzled that the Navy would be willing to place itself in that difficult position.

C Since the Navy did not hold scoping hearings on this EIS, nor issue an Implementation Plan prior to the Draft EIS, we urgethat the Navy at this point reconsider and broaden the scope of this EIS as requested in our several comments.

All best wishes in your important work on behalf of the citizens of our country.

Yours respectfully,

Robert F. Deegan

Robert F. Deegan
Nuclear Waste Issues Chair

Robert F. Deegan
Sierra Club Virginia Chapter
340 Ramapo Road
Virginia Beach, VA 23462

Commenter: Robert F. Deegan, Sierra Club, Virginia

Response to Comment:

A. The Navy did not misunderstand the comment. In Chapter 1, Section 1.0 of the EIS. The proposed action of this EIS does not entail actual shipment to a repository or a centralized interim storage site. Rather such a shipment to a notional repository or centralized interim storage site is evaluated to help distinguish among the six container alternatives. As stated in the EIS, the proposed action is the selection of a container system for the management of post-examination naval spent nuclear fuel and Navy-generated special case waste. The proposed action also includes:

- Manufacturing the container system.
- Loading, handling and storage of the container system at Idaho National Engineering Laboratory.
- Modifications to the Expended Core Facility and the Idaho Chemical Processing Plant at Idaho National Engineering Laboratory to support loading the containers at Idaho National Engineering Laboratory.
- Selection of the location of the dry storage area at Idaho National Engineering Laboratory.
- Evaluating the impacts of transporting the container system to a representative or notional interim storage facility or repository and unloading the container system at that hypothetical location.

In evaluating alternatives for such a system, it is incumbent upon the Navy under National Environmental Policy Act to evaluate how the system affects ultimate transport to an interim storage facility or repository, since such an action is reasonably foreseeable.

As the Navy discussed in the letter dated August 14, 1996, the selection and use of a new container system for transporting pre-examination naval spent nuclear fuel from the shipyards to Idaho National Engineering Laboratory is not a reasonably foreseeable action. The containers currently used for this purpose exist in sufficient quantities and meet all applicable federal regulations, including valid Certificates of Compliance. The Navy is not proposing that these existing containers be replaced in the future; therefore, under National Environmental Policy Act regulations (40 CFR Part 1508), there is no major federal action requiring preparation of an EIS.

B. The Navy agrees with the commenter that the use of any of the newly procured containers for future storage or shipment of pre-examination naval spent nuclear fuel is not covered by this EIS. Because pre-examination naval spent fuel is not within the scope of the EIS and a fleet of containers already exists for its shipment making procurement of additional containers for that purpose unnecessary. The commenter is incorrect in stating that the Navy cannot use any of the existing containers for future storage or shipment of post-examination spent nuclear fuel. Chapter 3, Sections 3.2 and 3.3 of the EIS clearly state that the No-Action and Current Technology/Rail Alternatives would make use of existing container designs (the M-130 and M-140 casks) for transportation of post-examination spent nuclear fuel.

C. The Navy believes that it properly fulfilled the public involvement obligations of NEPA. Thus the EIS did not require another scoping process. In particular, the extent of public involvement is described in Section 1.0 of the EIS as follows:

"On October 24, 1994, the DOE published a Notice of Intent in the *Federal Register* (59 FR 53442) for a multi-purpose canister system for the management of civilian spent nuclear fuel.

Commenter: Robert F. Deegan, Sierra Club, Virginia

As part of the public scoping process, the scope of the EIS for the multi-purpose canister system was broadened to include naval spent nuclear fuel. This determination was included in the Implementation Plan whose availability was announced in the *Federal Register* on August 30, 1995 (60 FR 45147). However, DOE has halted its proposal to fabricate and deploy a multi-purpose based canister system and has ceased preparation of that EIS."

"On December 7, 1995 the Department of the Navy published a notice in the *Federal Register* (60 FR 62828) assuming the lead responsibility for an Environmental Impact Statement Evaluating Container Systems for the Management of Naval Spent Nuclear Fuel. The Department of the Navy assumed lead responsibility from the Department of Energy and narrowed the focus of the EIS to include only naval spent nuclear fuel. The Department of Energy is now the cooperating agency rather than the lead agency in the preparation for this EIS."

"Despite the narrowing of the focus to only naval spent nuclear fuel and the change in lead agency, the range of the container alternatives being considered did not change."

With respect to the assertion that the Navy failed to publish an Implementation Plan, that is correct since such a plan is required only under DOE NEPA regulations, not those of the Navy.

The Navy considers that the process followed for completing this EIS is in full compliance with the National Environmental Policy Act and the implementing regulations of the Council on Environmental Quality.

Nova Plasma Technologies Incorporated
P.O. Box 235 Hamer,Idaho 83425 - Phone 208-662-5268

Richard A. Guida
Associate Director
Regulatory Affairs
Naval Nuclear Propulsion Program

Dear Mr. Guida :

Thank you for your correspondence in regard to the public comment period on a container system for the management of spent Naval Nuclear Fuel.

My work in particle plasma physics indicates that it is possible for the law of conservation of mass and energy to be broken by the amount ΔE, providing this only occurs for a time Δt such that $\Delta E \Delta t \leq h/4\pi$. This makes it possible for particles to be created for a short time where their creation would normally violate conservation of energy. These particles are called virtual particles.
By adding Implosion we get a breaking or reversing action or cooling effect, this is supported by the physical law of action / reaction as it appears at this time interaction of neutrons by exchange of a virtual pion (document enclosed). Also enclosed is Nova Plasma Tech, Inc's., President Sonne Ward's explanation of the opposing laws on conservation of mass.

We have taken this to higher plains and it appears are presently reversing the aging process in human beings on a limited basis, This brings us to
A the Navy, Nova Plasma Tech. Inc, requests that we be allowed to submit a bid of five (5) million dollars for research and development , to be conducted at the INEL in southern Idaho.

Our credibility in particle plasma physics and implosion technologies is gaining world wide acceptance and is well known in the U.S. and Canada . Just recently Sonne received the Hall of Fame Award for Implosion Theories. Enclosed are some of the many newspaper articles that have appeared recently. We feel that when perfected the implosion machine could be of great value for the ratification of all waste including the displacement rods from the nuclear reactors on the Navy's nuclear subs. Our request at this time is to have an open minded entity in Idaho Falls to work with such as Howard.

We have contacted two major universities to conduct testing and analysis on LP-10 as well as a Laboratory in Idaho Falls, Idaho. It appears that LP-

10 may have the ability to affect the aging process reducing wrinkles, hair growth, and other aging processes. It appears that this is accomplished by reversing the pions from action to reaction or better put interaction. In the modern world it is called electron donors or soft shelled electrons and falls under the category of free energy.

A subsidiary of NPTI, Future Free Transportation, pioneered and developed a system for the burning of gasoline with near 0 emissions or residue by using IMPLOSION technology.

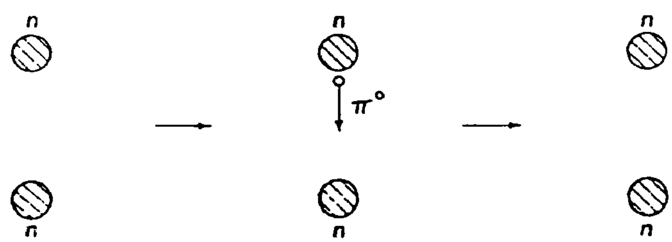
It is our desire that the public / private partnership in this effort produce the very best technology possible . Please let us know if further communication is in order or if we can answer any questions this letter may generate.

Sincerely,

Sonne Ward

Sonne Ward
President
Nova Plasma Technologies Inc.

virtual particle Because of the *uncertainty principle it is possible for the law of *conservation of mass and energy to be broken by an amount ΔE providing this only occurs for a time Δt such that $\Delta E \Delta t \leqslant h/4\pi$. This makes it possible for particles to be created for short periods of time where their creation would normally violate conservation of energy. These particles are called virtual particles. The electrostatic force between charged particles may be described in terms of the emission and absorption of virtual photons by the particles. Similarly the *nuclear force between *nucleons may be thought of as being due to the emission and absorption of virtual pions. The diagram below illustrates how two neutrons can interact by the



Interaction of neutrons by exchange of a virtual pion

exchange of virtual π°. The law of conservation of energy is broken for a time Δt, where

$$\Delta t \leqslant \frac{h}{4\pi c^2 m_\pi},$$

m_π being the mass of the pion. Other conservation laws such as those applying to angular momentum, *isospin etc., cannot be violated even for short periods of time.

Mesolithic Period. See Prehistoric people (How prehistoric hunters lived; diagram); Stone Age.

Meson, *MEHS ahn* or *MEHZ ahn,* is a subatomic particle. Mesons form one of the classes of a family of particles called *hadrons.* The other class consists of *baryons,* which include protons, neutrons, and hyperons. All hadrons act upon one another through a force called the *strong interaction,* or the *strong nuclear force.* This force holds an atomic nucleus together.

Mesons are *unstable particles.* Within a fraction of a second after they are created, they *decay* (break down) into lighter particles. Mesons carry a positive or negative electric charge, or they are neutral.

There are many types of mesons. The lightest is called a *pion* or *pi-meson.* It has a mass equal to 15 per cent of the mass of a proton. The heaviest meson, called an *upsilon particle,* is about 10 times as heavy as a proton. Other mesons include *k-mesons* (also called *kaons*) and *psi particles* (also known as *J particles*).

Hideki Yukawa, a Japanese physicist, predicted the existence of mesons in 1935. He thought they would be fundamental particles and would carry the strong interaction, in much the same way as *photons* are carriers of the electromagnetic force (see Photon). But physicists have since determined that mesons are not fundamental particles. Instead, each meson consists of two particles that are fundamental, a quark and an antiquark. Physicists now also believe the strong nuclear force is transmitted by particles called *gluons* (see Gluon).

In 1937, the American physicist Carl D. Anderson identified a particle as a meson. But researchers found the particle, called a *muon,* was not readily affected by the strong nuclear force, and so could not be classified as a meson. The first known meson was detected in 1947 when Cecil Powell, a British physicist, discovered a pion in a shower of cosmic rays. Today, mesons are made artificially in huge machines called *particle accelerators* (see Particle accelerator). Lee Smolin

See also Anderson, Carl David; Baryon; Hadron; Psi particle; Upsilon particle; Yukawa, Hideki.

Commenter: Sonne Ward, Nova Plasma Technologies, Inc., Idaho

Response to Comment:

A. Consideration of alternatives to geologic disposal of naval spent nuclear fuel is outside the scope of this EIS.

Congress has determined that, with respect to the requirements imposed by the National Environmental Policy Act of 1969 (42 U. S.C. 4321), compliance with the procedures and requirements of the Nuclear Waste Policy Act (42 U.S.C. 10101, et seq, as amended) shall be deemed adequate consideration of the "...need for a repository, the time of initial availability of a repository, and all alternates to the isolation of high-level radioactive waste and spent nuclear fuel in a repository..." and that "...alternate sites to Yucca Mountain..." and "...nongeologic alternatives to such site..." need not be considered as alternates (42 U.S.C. Article 114 (f)).

Western Interstate Energy Board/ WINB

51

July 17, 1996

Mr. William Knoll
Department of the Navy
Code NAVSEA 08U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Dear Mr. Knoll:

Enclosed are the comments of the Western Interstate Energy Board's High-Level radioactive Waste Committee on the Navy's *Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel.*

A The Committee appreciates the opportunity to provide input during the Navy's process of developing its spent fuel container system. However, the Committee regrets that the limited time which the Navy allotted for comment on the *Draft EIS* did not allow for further, more in-depth analysis.

B The Committee wishes to stress that the scope of the *Draft EIS* is very limited. This document therefore can only be used to potentially satisfy NEPA requirements for the shipment of naval spent fuel and special case waste. It cannot be used to support decisions on the transportation of other types of wastes under the Nuclear Waste Policy Act (NWPA). Nor can this document be used to satisfy NEPA requirements for the shipment of naval spent fuel and special case waste to any other location outside of Yucca Mountain, or from any other origin outside of the Idaho National Engineering Laboratory.

C The *Draft EIS* clearly needs to provide more analysis and information to support a variety of its assumptions. In its present form, the document does not adequately address western stakeholder concerns with regard to ensuring the safe and uneventful transportation of naval nuclear waste.

Sincerely,

Daniel Nix, Co-Chair
High-Level Radioactive Waste Committee

Richard Moore, Co-Chair
High-Level Radioactive Waste Committee

cc: Richard A. Guida, Associate Director for Regulatory Affairs, Naval Nuclear Propulsion Program, Department of the Navy
~~Daniel Dreyfus, Director, Office of~~ Civilian Radioactive Waste Management

600 17th Street, Suite 1704 South Tower, Denver, CO 80202-5447
Phone 303/573-8910 Fax 303/573-9107

Comments of the High-Level Radioactive Waste Committee of the Western Interstate Energy Board on the Department of the Navy Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel

The following comments of the High-Level Radioactive Waste Committee of the Western Interstate Energy Board are focused solely on the transportation aspects of the Draft EIS. The Committee consists of representatives of the states of Arizona, California, Colorado, Idaho, Nebraska, Nevada, New Mexico, Oregon, Utah and Washington.

Inapplicability of the EIS to Non-Navy Shipments Under the NWPA

D The scope of the Draft EIS is very limited (shipments of Navy fuel and special case waste by rail from INEL to Yucca Mountain). As a result, the EIS cannot satisfy NEPA requirements for shipment of Navy waste to other locations or to support decisions on the transportation of other types of wastes under the Nuclear Waste Policy Act (NWPA). The Committee recognizes the budget shortfalls at DOE which caused the narrowing of the scope of the EIS. However, it is unfortunate, and probably wasteful of government resources in the long-run, to piecemeal the analysis of shipping containers that may be used in shipping campaigns to a repository or interim storage site under the NWPA.

Inconsistency Between the Transportation Mode Assumptions in the Draft EIS and Potential Access to a Yucca Mountain Repository and Interim Storage Facility Near Yucca Mountain

E All the alternatives examined in the Draft EIS assume rail shipments from INEL to Yucca Mountain. However, at present there is no rail access to Yucca Mountain. Pending legislation to amend the Nuclear Waste Policy Act proposes to use heavy haul trucks to transport rail casks from a transfer station at Caliente, Nevada. However, based on national security concerns the Air Force has objected to the proposed route from Caliente to Yucca Mountain.

F Furthermore, the Draft EIS notes that the ultimate modal decision will be made by DOE (pages S-6, 3-12). DOE may decide not to ship Navy fuel by train. In such an event the Draft EIS will have failed to be of sufficient scope to cover the shipment decision.

To rectify this shortcoming, the final EIS should examine rail, rail/heavy haul truck, and legal-weight truck shipments to Yucca Mountain.

No Evaluation of General Commerce Versus Dedicated Train Shipment

The Draft EIS assumes shipments from INEL to Yucca Mountain will use "commonly scheduled trains." In several places in the Draft EIS (e.g., page 3-7) it is stated that shipment by "commonly scheduled trains...is an extension of the proven safe, historical practices used to transport naval spent fuel from shipyards to INEL since 1957." It is the Committee's understanding that naval spent fuel has also been shipped by special trains that carried only spent fuel and which followed special operating procedures.

G The Committee believes that dedicated trains employing special measures offer an increased margin of safety compared with general commerce trains. The final EIS should evaluate the use of dedicated trains employing various special precautions (e.g., controlling the time of day of travel) which may not be available on general commerce trains.

The National Environmental Policy Act requires the examination of all reasonable alternatives and the Committee believes that the use of dedicated trains is a very reasonable alternative, and possibly the preferred alternative, and therefore must be evaluated in the final EIS.

Risk Assessment May Be Inappropriately Based on an Extrapolation of the Findings of Modal Study to the Six Alternative Casks in the Draft EIS

H The models and analysis used in the Draft EIS relies heavily on the findings of the NRC-sponsored Modal Study. The Modal Study, however, has limitations, including the use of a generic cask for determining the potential releases from accidents. It is not clear that the types of casks being evaluated in the Draft EIS would perform under accident conditions in the same manner as the generic cask in the Modal Study. Therefore, it is not clear that the consequences of severe accidents are accurately portrayed in the Draft EIS.

The Draft EIS includes a section on "Analysis of Uncertainties" in Appendix B *(Detailed Evaluation of the Radiological and Nonradiological Risks Associated with Transportation of Naval Spent Nuclear Fuel*). The Appendix notes that: "An extensive discussion of uncertainty analysis related to this Environmental Impact Statement can be found in Volume 1, Appendix D, Attachment F, Section F.1.5 of the Programmatic SNF and INEL EIS (DOE 1995)."
I Unfortunately, this Attachment does not discuss any of the uncertainties involved in extrapolating the findings of the Modal Study to the six alternative casks being evaluated in the Draft EIS. Other factors, such as the increasing train speeds on western railroads, may also need to be incorporated into any review of the applicability of the findings of the Modal Study to the risk factors reported in the Draft EIS.

See *Nuclear Waste Shipping Container Response to Severe Accident Conditions: A Brief Critique of the Modal Study*, December 1990, Nevada Nuclear Waste Project Office.

Draft EIS Shipping Schedule May Not Be Realistic

Tables B.3 and B.4 present yearly shipping schedules. The text accompanying the tables states that the numbers are "...consistent with the expectation that naval fuel will be among the

J earliest placed in the centralized interim storage site or geologic repository." The Committee notes that pending legislation would generally place naval fuel low in priority for acceptance at an interim storage facility.

Other Comments

K 1. The Draft EIS provides little information about the character of Navy fuel (other than that it is rugged). The lack of information on the fuel makes it difficult to evaluate the validity of the analysis in the Draft EIS.

L 2. The Draft EIS does not evaluate the impacts from transporting spent fuel/special case waste in transportable storage casks following an extended period of storage (e.g., 20 years). In addition, there is some confusion surrounding the statement in the Draft EIS that: "Likewise, decay heat calculations have been made which demonstrate that no fission product releases will occur from naval spent nuclear fuel inside a container even assuming about 3 years of cooling after reactor
M operation." (page 2-4) The analysis of fission product releases should cover a period substantially longer than three years.

N 3. The comparison of radiological exposure from each of the cask alternatives may be skewed in the Draft EIS by the use of actual radiation levels for the M-140 cask and maximum allowable radiation levels for all other alternatives. Thus the relative risk associated with use of the M-140 may be understated when compared to the alternative casks.

O 4. The Committee is interested in understanding the sources of data supporting the statement that "...transportation accident rates in general commerce are higher per truck mile than per rail mile." (page 3-11)

P 5. The Draft EIS appropriately notes that: "The analysis in this EIS covers transportation from INEL to the Yucca Mountain location as a representative or notional destination. This EIS does not make presumptions concerning the Yucca Mountain site's suitability for a geological repository or designation for use as a centralized interim storage site." The identification of three rail shipping routes may be adequate for bounding rail routing options in this EIS, but it is clearly not adequate to support shipments.

Commenter: Daniel Nix - Western Interstate Energy Board, Colorado

Response to Comment:

A. The Navy extended the comment period from 45 to 60 days (ending July 18, 1996) in response to requests from the state of Nevada. A further extension could not be provided because of the need to complete the EIS to support actions required under a court agreement among the Department of Energy, Navy, and State of Idaho covering spent fuel management at the Idaho National Engineering Laboratory.

B.&D. The Board's comment is correct that the EIS is limited to naval spent nuclear fuel and Navy-generated special case waste. The Board's comment is incorrect in the implication that transportation to Yucca Mountain is supported by the EIS. The proposed action of this EIS does not entail actual shipment to a repository or a centralized interim storage site. Rather such a shipment to a notional repository or centralized interim storage site is evaluated to help distinguish among the six container alternatives. As stated in the EIS, the proposed action is the selection of a container system for the management of post-examination naval spent nuclear fuel and Navy-generated special case waste. The proposed action also includes:

- Manufacturing the container system.
- Loading, handling and storage of the container system at Idaho National Engineering Laboratory.
- Modifications to the Expended Core Facility and the Idaho Chemical Processing Plant at Idaho National Engineering Laboratory to support loading the containers at Idaho National Engineering Laboratory.
- Selection of the location of the dry storage area at Idaho National Engineering Laboratory.
- Evaluating the impacts of transporting the container system to a representative or notional interim storage facility or repository and unloading the container system at that hypothetical location.

In evaluating alternatives for such a system, it is incumbent upon the Navy under National Environmental Policy Act to evaluate how the system affects ultimate transport to an interim storage facility or repository, since such an action is reasonably foreseeable. Including the impacts of transporting the container system to, and unloading at, a representative or notional interim storage facility or repository ensures that the container system selected is compatible with these operations at the facilities to the extent they are defined at this time. The location of the facilities is not known at this time and waste acceptance criteria have not yet been established. The site for a geologic repository or centralized interim storage facility is neither a decision which the Navy will make nor a matter covered under this EIS. Likewise, the routes for transporting loaded containers to that specific location are not selected by the Navy. For the former, further National Environmental Policy Act evaluation will be needed in site-specific environmental documentation for an interim storage facility or repository when the specific location is established. A possible location (Yucca Mountain) has been included in this EIS only for transportation analysis purposes, since it is the only location identified for characterization in the Nuclear Waste Policy Act. Routes to Yucca Mountain as examples were chosen with different distances and through different population densities to identify whether different routes or different population densities would have a significant impact on the container system selection. Since the impacts of transporting to and unloading at this representative or notional location are shown to be small, and little difference exists among the alternate containers evaluated, this enables the Navy to select a container system now, taking these factors into account in the most reasonable and appropriate fashion.

Commenter: Daniel Nix - Western Interstate Energy Board, Colorado

C.&K. The level of information in the Container System EIS is sufficient. Although the detailed design of Navy fuel is classified, the EIS contains significant information concerning its performance characteristics and the contents of the loaded container systems such that the environmental impacts from its shipment, storage, and management can be assessed and independent analyses can be performed to verify the results presented in this EIS. Chapter 2, Section 2.3 of the EIS presents the general characteristics of naval nuclear fuel, including design description, U-235 enrichment range, the amount of U-235 in a loaded container, criticality control measures, and the results of decay heat calculations. Appendices A and B contain detailed numerical data on the source terms and on corrosion product and fission product releases expected for each container system for each hypothetical accident scenario analyzed. The Appendices also identify the computer programs which were used, along with the specific assumptions for each accident scenario.

For example, Appendix B, Table B.8 provides a list of the radioactive nuclides which might be released in a shipping accident involving naval spent nuclear fuel. The data on the amount of radioactivity are divided into the amounts released from the fission products in the fuel and the amount in the activated corrosion products attached to the surface of the fuel. The data are provided for typical spent fuel in nuclear-powered submarine and surface ship fuel assemblies to demonstrate the range of radioactivity. Using the information in this table, along with the other detailed information on the calculations provided in Appendix B, allows independent reviewers to evaluate the adequacy of the calculation of impacts of a hypothetical accident on human health and the environment. It also permits an independent reviewer to perform analyses using alternate methods, such as other computer programs, or utilizing other conditions, such as different weather or accident conditions. The information in Appendix A, including the amount of radioactivity released and the fraction of the total activity in naval spent nuclear fuel it represents, is provided in similar detail to permit independent analyses for normal and accident conditions.

The Navy has provided in this EIS, and in documents referenced in the EIS, a substantial amount of information on the handling, storage, and shipment of naval spent nuclear fuel and the types and amounts of radiation or radioactive material involved in releases from normal operations and postulated accidents in this EIS. The Navy has attempted to provide enough information on radiation, radioactivity, and other aspects of operations or hypothetical accidents to allow independent calculation and verification of all estimates of environmental impacts.

D. See the response to comment B above.

E. Comparison of specific heavy-haul transportation routes is properly the subject for a site-specific repository EIS. Comparison of heavy-haul transportation routes is pertinent to this EIS to the extent that it helps to discriminate among the alternatives considered.

All of the alternative container systems would be suitable for heavy-haul transportation, as illustrated by prior use of the M-140 containers in heavy-haul transport. However, it is accurate to state that the M-140 based alternatives would be less suitable due to size, height, and weight. This statement has been added to Chapter 3, Sections 3.2, 3.8.4 and Chapter 7, Section 7.3 of the EIS.

The Navy is aware that no rail link to the Yucca Mountain site currently exists, and that if it were to become the site of a repository or centralized interim storage facility, heavy-haul transport might be used in place of a rail connection. However, the resolution of that issue will depend on the site eventually selected and the evaluation of the environmental impacts and other factors specific to that site. The routes, distances, and potentially affected populations would be the same for all of the alternative container systems considered for naval spent nuclear fuel because the shipments will use the same route--the route selected for shipment of commercial spent nuclear fuel and high-level radiological waste to the repository or centralized interim storage site. Similarly, all container systems considered would have the same design dose rate, a maximum of 10 millirem per hour at 2 meters, as required by the Department of Transportation regulations (49 CFR 100 et seq.). Therefore, the key difference in the alternatives for the purposes of comparing the impacts associated with heavy-haul transport for naval spent nuclear fuel using the alternative container systems is the number of shipments. Text which explains this matter has been added to Appendix B, Section B.4.

The radiological risks of shipping naval spent nuclear fuel have been conservatively analyzed in this EIS and are described in Section B.5.1. The analyses use a train speed of 15 miles per hour. This is slower than the actual expected transport speed. Using slower train speeds is more conservative because that results in a higher calculated radiation exposure to the public (trains spend more time proximate to the public). This conservatively slow train speed means that the exposure associated with the transport speeds for possible heavy-haul transport would be similar to the results for rail shipments of the same length over similar routes.

Containers used for legal-weight truck transfer would also be designed to produce a maximum exposure rate of 10 millirem per hour at 2 meters in accordance with Department of Transportation regulations and their use would present the same opportunity for the elevated vehicles to be in traffic with them as would occur for heavy-haul transport. Further, many more legal-weight truck shipments would be required to move all spent nuclear fuel. Text has been added to Chapter 3, Section 3.7 which summarizes the evaluation of legal-weight truck use.

The range of accidents analyzed in Appendix B, Section B.5.2 would bound the impacts from a hypothetical heavy-haul transportation accident at an intersection in Las Vegas, such as at the intersection of I-15 and U.S. Route 95 on a week day during rush hour. Such an event would be expected to produce impacts which would be within the scope of the accidents analyzed in Section B.5.2, using an urban population density of 3,861 people per square kilometer. These severe hypothetical accidents have also been analyzed for the rural population density of six people per square kilometer and would produce estimates of effects similar to those which might result from the scenario postulating an accident at the intersection of Nevada State Routes 375 and 318 at Crystal Springs.

Text has been added to Section B.5.2 to specifically cover these points.

F. If the Department of Energy should decide to adopt a method of transportation for naval spent nuclear fuel which does not make use of containers suitable for rail shipment, a new evaluation would be performed. Appropriate environmental review would also be performed to support that decision should it become necessary.

G. The shipment of naval spent nuclear fuel containers in general commerce, i.e., as part of freight trains carrying other cargo to many destinations has proven to be acceptable and practical in almost 40 years of experience, during which over 660 shipments of naval spent nuclear fuel have been done safely. This practice is not especially complex and has been proven to cause no increase in difficulty or hazards of point-of-entry inspections for railroad or other personnel. It has not contributed to any derailments and the railroads have provided clearance for the shipments and associated railcars, frequently being involved in the design process for the systems. The shipping containers are designed to meet the requirements for shipping in general commerce, including withstanding high temperature fires, and safety precautions, such as using buffer cars, have worked well over time.

The use of general freight trains has been proven safe during the almost 40 years of shipping over 660 container shipments of naval spent nuclear fuel. These shipments have been made with no release of radioactivity to the environment. Dedicated trains have been used only when the need for urgent delivery or other considerations justified the increased cost. The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses.

From the mid-1970s to the early 1990s the U.S. Department of Energy and U.S. Department of Defense argued before the Interstate Commerce Commission and civil courts in multiple proceedings against the railroads imposition of special (dedicated) train service on radioactive shipments. In every case, including exhaustive reviews of safety and railroad and train operations, the Interstate Commerce Commission and courts determined and upheld that special train service for radioactive shipments, including spent nuclear fuel, was unnecessary, wasteful and unlawful. In 1993, the railroad industry refunded to the federal government $8 million it had collected, plus interest, for imposed special train service.

The Navy remains of the view that any additional safety resulting from dedicated train service is insignificant and when compared to the substantial increase in cost associated with dedicated trains simply cannot be justified. A dedicated train may be used in a particular instance if schedule or other considerations dictate that it is necessary but not as a matter of policy or routine and clearly not to increase safety.

The safety of naval spent nuclear fuel shipments rests squarely on the robust shipping containers and the rugged nature of the contents as discussed below in the response to comment I. Generally speaking, naval spent nuclear fuel shipments do not need to be treated or handled any differently than any other hazardous materials handled by the railroads in interchange service. Certainly unnecessary or lengthy delays and layovers in railyards and at interchanges should be avoided; but the normal times required for train switching and makeup, train crew reliefs, and connections between railroads are not a concern during movement of naval spent nuclear fuel just as they are not a concern during movement of any other hazardous material. Expedited movement beyond what the Code of Federal Regulations, Title 49, Section 174.14 requires for any hazardous material is not necessary for naval spent nuclear fuel shipments for safety.

The Government will own the escort and container cars to be used in the future for shipping naval spent nuclear fuel to a geologic repository or centralized interim storage site just as it has for almost 40 years of naval spent nuclear fuel movements. This equipment is unique to the purpose and cargo and must be dedicated to naval spent nuclear fuel shipments without availability for other railroad customers, therefore it is appropriate for it to be government, not railroad owned. Current practice is and future practice will be to ensure in careful fashion that the equipment meets all railroad industry standards of railcar construction and operation, including Association of American Railroads review of the railcar design prior to construction and testing of new equipment at the Transportation Test Center in Pueblo, Colorado for dynamic handling. Association of American Railroads requirements for railcars used to transport radioactive material, for example as set forth in Field Manual Of Interchange Rule 88.A.15.c.(2), will be met.

If onboard defect detection equipment is required under Department of Transportation regulations, it will be used for naval spent nuclear fuel shipments.

Naval spent nuclear fuel shipments are intended to move in regular interchange freight service. Since specially designed buffer cars are not necessary for any other hazardous material which moves in regular interchange freight service in order to achieve 49 CFR separation and segregation requirements, then they should not be necessary for naval spent nuclear fuel shipments.

The current fleet of six escort cabooses has been used successfully, without any significant operational problems, in regular and dedicated interchange freight service in conjunction with naval spent nuclear fuel and other Naval Nuclear Propulsion Program shipments for approximately 20 years. Scrapping this equipment in favor of newer equipment before the existing equipment's useful life of 40 years, as defined by railroad industry standards, is not considered warranted. Navy equipment would be replaced after the year 2010. When the time comes to replace the existing escort cabooses, the Naval Nuclear Propulsion Program will work closely with the Association of American Railroads, as it does for container cars, to ensure the new equipment meets railroad industry standards.

H.&I. The assertion by the commenter that the EIS relies excessively on the Modal Study is not correct. The analyses presented in this EIS use the Modal Study in only one portion of the development of the probabilistic estimate of the risks associated with accidents which might occur during shipment of naval spent nuclear fuel. Other key data required to perform the assessment were developed from the best available information. The estimate of risk is based on potential routes through representative population areas over a range of distances (Section B.4). The national average probabilities of accidents are used (Appendix B, Section B.3.2). The population densities and the fraction of each route in rural, urban, and suburban areas were input to the analysis (Section B.3.2). Pasquill D and F meteorological conditions were used to represent the 50% and 95% conditions, as shown to be appropriate by the National Oceanic and Atmospheric Administration. The amounts of radioactive material which might be released for accidents of specified severity were determined specifically for naval spent nuclear fuel, using the characteristics of naval fuel and the amounts of fission and activated corrosion products present in both typical submarine and surface ship fuel (Section B.5.2 and Table B.8). The relative capacity of each alternative container type is provided in Table B.1 and the release for each container type can be estimated by multiplying information in Tables B.1 and B.8.

The Modal Study was used to provide only one parameter in the equation in Section B.3.2 used to estimate accident risk: the probability that, if an accident were to occur, the severity of the accident might exceed a given level. That is, the Modal Study was used only for the purpose of estimating that if an accident were to occur what the probability might be that the temperatures and strains produced by the accident would exceed certain levels. The accident risk calculations were performed especially for naval spent nuclear fuel using the RADTRAN and RISKIND computer programs.

Commenter: Daniel Nix - Western Interstate Energy Board, Colorado

The Modal Study offers the best available data for estimating the probability that a given level of severity might be exceeded if an accident occurs during shipping. The commenter does not suggest a better source for such data. The Modal Study has become the standard source for estimating such probabilities in probabilistic analyses of risks for shipping spent nuclear fuel and radioactive waste, as documented in 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), in the *Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel* (DOE/EA-0912) and in the *Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel* (DOE/EIS-0218-F).

The Naval Nuclear Propulsion Program's 35 mile per hour speed limitation is not a requirement for safety purposes or railcar stability; nor is it imposed because of a concern over the ability of the container to maintain its integrity in an accident. There is utmost confidence in the containers. The railcars have been tested and have demonstrated satisfactory performance. The speed restriction is imposed to minimize the financial and schedule risk of exterior damage requiring refurbishment to a scarce, multi-million dollar asset. The ability to get a container back in service quickly at minimal refurbishment cost is the overriding concern. The Navy does note that based on our extensive public interface, we have also found the fact that the speed of these shipments is restricted has been reassuring to many member of the general public.

J. The Navy realizes that the shipping schedules presented in Appendix B, Tables B.3 and B.4 cannot be guaranteed. The EIS notes in Appendix B, Section B.3.2 that these schedules are presented "...for the purpose of analysis... and "...there would be little difference in impacts if the schedule were accelerated or delayed..."

K. See response to comment C above.

L. The 20 years of storage mentioned by the commenter has been covered in the EIS analyses. The containers are designed to be stored for periods of this length without degradation and naval spent nuclear fuel has been demonstrated to experience no deterioration over such periods.

M. The discussion of decay heat calculations in Chapter 2, Section 2.3 for 3 years of cooling after reactor operations is part of the discussion on the characteristics of naval nuclear fuel and is not specific to the EIS analysis periods. The 3-year cooling period refers to the earliest possible time after reactor operations that naval spent nuclear fuel could be placed into dry storage containers without the possibility of fuel damage due to decay heat generation.

The fission product inventories or source terms used for transportation analysis are provided in the EIS, Appendix B, Section B.5.2, Table B.8. The source terms are based on the fission product inventory at 5 years after reactor operations. The source terms are conservative because transportation to a repository or centralized interim storage site is expected to occur at least 5 years after reactor operation. Fission product releases which could occur during transportation accidents with naval spent nuclear fuel that has been shut down for 5 years, would be even lower than those analyzed in this EIS.

N. The Navy agrees with the commenter that any as-fabricated cask often produces dose rates which are lower than the regulatory limit. In the EIS Executive Summary, Section S.6.1, in Chapter 3, Section 3.8 and in Tables S.6 and 3.2 it is clearly stated that the actual historic doses have been used for the M-140 based alternatives and not for the other container systems. Section 3.8 of the EIS describes the Navy's preferred alternative which is not the M-140 based containers. The best available data have been used in this EIS to estimate environmental impacts. Actual measurements are available for the M-140 container but none of the other containers have been used for naval fuel so the regulatory limit which serves as the design basis represents the best estimate of the external exposure rate for such containers. The use of actual measurements did not bias the selection of preferred equipment systems.

O. The reference for this statement is *Trends in State-Level Accident Rates: An Extension of the Risk Factor Development for RADTRAN 4* (Saricks 1994b) which states that rail fatalities per kilometer due to accidents are 2.8×10^{-8} and the fatalities per kilometer due to truck accidents are 5.82×10^{-8}. The national average for rail accidents per kilometer in rural, urban and suburban zones for rail is 5.57×10^{-8} while for truck accidents in rural zones the national average is 2.03×10^{-7} and in urban and suburban zones it is $3.58 \times 10^{-7.}$ This reference has been added to the EIS, Chapter 3, Section 3.7 and to the references.

P. A range of routes to a repository or centralized interim storage site is used for the transportation analysis in this EIS in order to determine whether different routing characteristics, such as distance or differences in population distribution, would affect the comparison of the alternative container types. Since no repository or centralized interim storage site has yet been selected, the transportation routing in this EIS uses a site evaluated by the Department of Energy pursuant to the Nuclear Waste Policy Act as the destination point for naval spent nuclear fuel shipments.

The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses.

Additional discussion to clarify these points has been added to the EIS in Chapter 7, Section 7.1 and Appendix B, Section B.1.

APPENDIX A
DETAILED EVALUATION OF NORMAL OPERATIONS AND ADJACENT CONDITIONS DURING LOADING, STORAGE, AND UNLOADING OPERATIONS

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APPENDIX A

A. DETAILED EVALUATION OF NORMAL OPERATIONS AND ACCIDENT CONDITIONS DURING LOADING, STORAGE, AND UNLOADING OPERATIONS

This section presents estimated environmental consequences, event probabilities, and risks (a product of probability and consequence) for both normal operations and postulated accident scenarios related to the loading, storage, and unloading of naval spent nuclear fuel. Normal operations and accidents are evaluated to estimate the potential for releases of radioactive material. The results of these analyses are presented in terms of the predicted health effects to facility workers and the public due to the release of radioactive materials into the environment. Effects on environmental factors are also presented, based on the amount of land which could be affected due to postulated accidents.

Analytical results for loading are presented for two locations at the Department of Energy's (DOE's) Idaho National Engineering Laboratory (INEL), the Naval Reactors Facility and the Idaho Chemical Processing Plant, which hold all of the naval spent nuclear fuel. Analytical results for dry storage are presented for these same two locations in addition to a location on the INEL site near Birch Creek (hereafter referred to as the Birch Creek Area), which is representative of a hypothetical dry storage location which is not immediately above the Snake River Plain Aquifer. It is expected that other areas on the western boundary of the INEL site which may not be located above the Snake River Plain Aquifer, like the Lemhi Range Area, would have radiological impacts similar to those presented in this Appendix for the Birch Creek Area. For more detailed information on alternative dry storage locations, see Appendix F. Analytical results for surface facility unloading operations are presented for a hypothetical mined deep geologic repository or a centralized interim storage facility.

A.1 Summary

Analyses of normal operations, and design basis and beyond design basis hypothetical accidents, were performed to estimate the potential consequences due to release of radioactive materials. The analytical results for radiological operations have been summarized by the locations and alternatives being considered in this Environmental Impact Statement (EIS).

A.1.1 Historical Accident Record

The Naval Nuclear Propulsion Program has a well documented nuclear safety record. In more than 4,600 reactor-years of operation and more than 350 refuelings and defuelings of naval reactors, there has never been a nuclear reactor accident or criticality accident. Moreover, there has never been a transportation accident that has resulted in any significant release of radioactivity to the environment.

A.1.2 Normal Operations

Table A.1 presents the estimated number of annual latent cancer fatalities to the general population living within a 50-mi (approximately 80-km) radius of each facility due to radiological releases from normal operations. The results in this table were calculated using the methods described in Section A.2.3. The number of latent cancer fatalities is very low at all locations and for all alternatives. The number of total health effects (deaths, nonfatal cancers, genetic effects, and other impacts on human health) may be obtained by multiplying the latent cancer fatalities by the factor of 1.46, as described in Section A.2.3. For normal operations, the impacts on the general population are similar for both Multi-Purpose Canisters, the Dual-Purpose Canister, and the Transportable Storage Cask Alternatives for loading and dry storage at INEL; however, for the No-Action and Current Technology/Rail Alternatives, the impacts are greater since the dry storage containers must be opened at INEL to load the spent nuclear fuel into the M-140 shipping containers. At a repository or centralized interim storage facility, the Multi-Purpose Canister Alternatives result in a lower risk than the other container alternatives since the canisters are not opened to remove the spent nuclear fuel.

TABLE A.1 Annual Latent Cancer Fatalities from Normal Operations[a]

	Latent Cancer Fatalities to General Population within 50-Mile Radius of Site		
Alternative	NRF	ICPP	Repository or Storage Facility
Multi-Purpose Canister Alternatives	5.4×10^{-8}	7.2×10^{-7}	N/A[b]
Transportable Storage Cask and Dual-Purpose Canister Alternatives	5.4×10^{-8}	7.2×10^{-7}	1.2×10^{-5}
No-Action and Current Technology/Rail Alternatives	4.6×10^{-6}	5.3×10^{-6}	1.2×10^{-5}

[a] Notation: ICPP = Idaho Chemical Processing Plant; NRF= Naval Reactors Facility.
[b] Multi-Purpose Canisters are not opened at a repository or centralized interim storage facility, thus there is no release of radiological materials to the environment.

A.1.3 Hypothetical Accident Evaluations

Several hypothetical accidents were analyzed at each facility for each of the alternatives. The results are summarized in Tables A.2 and A.3. The results in these tables were calculated using the methods described in Section A.2.3. Both latent cancer fatalities from the maximum foreseeable accident at each location and the most severe risk from a facility accident at each location are presented. Risk is defined as the product of the consequences of an event multiplied by the probability of that event. The risks associated with the accidents analyzed have not been added together because the occurrences of the postulated accidents are independent events. The risks presented in this appendix cover the complete range of accidents which might make a detectable contribution to overall risk and additional analyses would not be expected to result in increases in calculated risk. Due to low altitude testing of commercial jetliners near to the Idaho Chemical Processing Plant, the facility accident which results in the highest number of latent cancer fatalities (consequences) is an airplane crash into either a multi-purpose canister or a high-capacity M-140 cask at the Idaho Chemical Processing Plant. The facility accident which results in the highest risk (a product of probability and consequence) is a drained water pool at the Idaho Chemical Processing Plant. The risk is higher at the Idaho Chemical Processing Plant than at the Expended Core Facility due to the large amount of naval spent nuclear fuel stored in the Building 666 water pools. As was the case for the normal operations evaluation, the accident risk is very low at all locations and for all alternatives. In addition, as discussed in Section A.2.7, due to conservative analysis techniques (e.g., worst case meteorological conditions, conservative source terms, no mitigative measures, etc.), the risks presented in this Appendix are believed to be at least 10 to 100 times larger than would actually occur.

TABLE A.2 Latent Cancer Fatalities from a Maximum Foreseeable Facility Accident[a]

	Latent Cancer Fatalities per Accident to General Population within a 50-Mile Radius of Site over 50 Years		
Alternative	NRF[b]	ICPP[c]	Repository or Storage Facility[d]
Multi-Purpose Canister	1.7×10^{-2}	2.6	1.5×10^{-3}
No-Action	1.7×10^{-2}	1.6	1.0×10^{-3}
Current Technology/Rail	1.7×10^{-2}	2.4	1.8×10^{-3}
Transportable Storage Cask	1.7×10^{-2}	2.4	1.8×10^{-3}
Dual-Purpose Canister	1.7×10^{-2}	2.4	1.8×10^{-3}
Small Multi-Purpose Canister	1.7×10^{-2}	1.3	1.0×10^{-3}

[a] Notation: ICPP = Idaho Chemical Processing Plant; NRF= Naval Reactors Facility.
[b] Drained water pool.
[c] Airplane crash.
[d] Wind-driven projectile.

TABLE A.3 Most Severe Risk from a Facility Accident[a]

	Annual Risk of Latent Cancer Fatalities to General Population within a 50-Mile Radius of Site		
Alternative	NRF[b]	ICPP[b]	Repository or Storage Facility[c]
Multi-Purpose Canister	1.7×10^{-7}	2.4×10^{-6}	1.5×10^{-8}
No-Action and Small Multi-Purpose Canister	1.7×10^{-7}	2.4×10^{-6}	1.0×10^{-8}
All others	1.7×10^{-7}	2.4×10^{-6}	1.8×10^{-8}

[a] Notation: ICPP = Idaho Chemical Processing Plant; NRF= Naval Reactors Facility.
[b] Drained water pool.
[c] Wind-driven projectile.

Table A.4 presents a summary of the risk of latent cancer fatalities by alternative for normal operations and most severe facility accident for each alternative. Consistent with the detailed tables, this summary table shows that all alternatives and all locations associated have very low risk.

TABLE A.4 Risk of Latent Cancer Fatalities by Alternative

Alternative	Annual Risk of Latent Cancer Fatalities to General Population within a 50-Mile Radius of Site	
	Normal Operations[a]	Facility Accident
Multi-Purpose Canister Alternatives	7.7×10^{-7}	2.4×10^{-6}
Transportable Storage Cask and Dual-Purpose Canister Alternatives	1.3×10^{-5}	2.4×10^{-6}
No-Action and Current Technology/Rail Alternatives	2.2×10^{-5}	2.4×10^{-6}

[a] The normal operations risk presented here is a summation of the risks at INEL and a geologic repository or centralized interim storage facility.

A.1.4 Other Radiological Impacts

The radiological impact of accidents on the environs of a facility was determined by examining the area that could be contaminated following such an event. Calculations using average meteorological conditions were performed for each accident scenario. These calculations determined the extent of the contamination which might cause an increase over the background radiation from naturally occurring sources. For the accidents evaluated, the contaminated area would be confined within the boundaries of the site. The impact of this contamination would be temporary while the area was isolated and remediation efforts completed. Although not specifically analyzed due to a probability of less than 1×10^{-7}, an airplane crash into a new dry storage facility near the Birch Creek Area at INEL could result in about 500 acres becoming contaminated outside the boundary of INEL due to its location close to the site boundary. However, even in this case the level of contamination would be low and the impact temporary.

A.2 Radiological Issues from Naval Spent Nuclear Fuel Loading, Storage, and Unloading

Naval spent nuclear fuel is currently held in water pools at the Idaho Chemical Processing Plant and at the Naval Reactors Facility's Expended Core Facility, both located on the INEL. The Expended Core Facility is a large laboratory facility used to receive, examine, and prepare for shipment, naval spent nuclear fuel and irradiated test specimen assemblies. Enclosed work areas at the Expended Core Facility include an array of interconnected reinforced concrete water pools which permit visual observation of naval spent nuclear fuel during handling and inspection while shielding workers from radiation. Adjacent to the water pools are shielded cells used for operations which must be performed dry. From 1953 to 1992 the Idaho Chemical Processing Plant recovered usable uranium from spent nuclear fuel; however, in 1992, DOE shutdown the reprocessing operation.

A.2.1 Normal Operations

Loading Operations. The activities analyzed in this EIS for naval spent nuclear fuel loading operations are those that would take place at INEL. These activities include handling and removal of the spent nuclear fuel from the water pools at either the Expended Core Facility or the Idaho Chemical Processing Plant and loading the spent nuclear fuel into a container. The loading operations analyses cover operations at these facilities which could take place while handling spent nuclear fuel both in the water pools and in a dry cell facility, and encompassing all operations to load the containers and prepare them for either dry storage at INEL or transportation to a repository. Since loading operations involve handling individual spent fuel assemblies and are similar for all alternatives, the container hardware system has no impact on the expected radiological releases due to normal operations. Separate analyses were performed for the Expended Core Facility and the Idaho Chemical Processing Plant.

Dry Storage. The activities analyzed in this EIS for naval spent nuclear fuel dry storage are those that take place at INEL. These activities include dry storage in the container hardware system selected for use at either the Expended Core Facility, the Idaho Chemical Processing Plant, or the Birch Creek Area. Since similar amounts of spent nuclear fuel will be stored at each location under the various alternatives and no airborne releases are expected from the sealed containers, the alternative container designs do not impact the normal operations analyses results.

Unloading Operations. The activities analyzed in this EIS for naval spent nuclear fuel unloading operations are those that would take place at a repository surface facility. These activities include receipt of and preparation for disposal of the naval spent nuclear fuel shipments from INEL. For the purpose of this EIS, it has been assumed that under the alternatives which result in spent nuclear fuel arriving in multi-purpose canisters, the fuel will not be removed from the canister; however, for all other alternatives, the containers will be opened to remove the spent nuclear fuel and to place it in a separate disposal container. For all alternatives, the unloading operations will take place in dry, heavily shielded transfer rooms within the surface facility waste handling building.

A.2.2 Screening/Selection of Accidents for Detailed Examination

Accidents were considered for inclusion in detailed analyses if they were expected to contribute substantially to risk. Accidents were categorized into three types as either Abnormal Events, Design-Basis Accidents, or Beyond Design-Basis Accidents. These categories are characterized by their probability of occurrence as described further in Section A.2.3. Construction and industrial accidents are included in these categories.

In selecting accidents to include in detailed analyses, several considerations were utilized. Initiating events included natural phenomena (earthquakes, volcanic activity, tornadoes, hurricanes, and other natural events) and human-induced events (human error, equipment failures, fires, explosions, plane crashes, transportation accidents, and terrorism). Guiding principles were established, such as, the radioactive materials involved must be available in a dispersible form; there must be a mechanism available for release of such materials from the facility; and, there must be a mechanism available for off-site dispersion of the released materials. The pathways whereby members of the public can be affected from the radiological aspects of spent nuclear fuel operations are direct exposure to radiation, inhalation of radioactive materials, and ingestion of radioactive materials.

Recognizing these fundamental processes and pathways, accidents involving the following basic phenomena were identified:

- Loss of shielding of radioactive materials,
- Release of radioactive products to the environment due to overheating of fuel,
- Release of radioactive products to the environment due to mechanical shock or damage, or inadvertent breaching of fuel cladding or containment,
- An unplanned criticality, and
- Transportation accidents.

After the basic phenomena were identified, other references were consulted to ensure that all important accidents were considered. These included safety analysis reports, court decisions, other EISs, and summary documents such as the "Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Reactor Power Reactor Fuel" (Nuclear Regulatory Commission (NRC 1979a)) and "The Safety of the Nuclear Fuel Cycle" (Nuclear Energy Agency 1993).

Examining the kinds of accidents which could result in release of radioactive material to the environment or an increase in radiation levels shows that they can only occur if an accident produces severe conditions. Some types of accidents, such as procedure violations, spills of small volumes of water containing radioactive particles, and most other types of common human error, may occur more frequently than the more severe accidents analyzed. However, they do not involve enough radioactive material or radiation to result in a significant release to the environment or a meaningful increase in radiation levels. Stated another way, the very low consequences associated with these events produce smaller risks than those for the accidents analyzed, even when combined with a higher probability of occurrence. Consequently, they have not been included in the results presented in this EIS.

Acts of terrorism are expected to result in consequences which are bounded by the results of accidents which are evaluated. Naval spent nuclear fuel is not considered to be attractive to terrorists due to the bulk of the fuel containers and due to high radiation fields involved with unshielded spent nuclear fuel. However, terrorist attacks on naval fuel during shipment were evaluated. The massive structure of the containers used for naval spent nuclear fuel makes them an unlikely target of a terrorist attack. No such attacks have occurred in the nearly 40 years of rail shipments which have now traveled about 2 million kilometers. Thus, the probability of a terrorist attack on a shipment is judged to be no more than the probability of a rail accident which is listed in Section B.5.2 of this Environmental Impact Statement. The consequences of a terrorist attack are also judged to be no more severe than those listed for the transportation accidents. Therefore, the same conclusions reached for transportation accidents apply to the risk to the extremely rugged shipping containers from terrorist attack during a shipment. In addition, during shipment, all naval spent nuclear fuel containers are accompanied by escorts who remain in contact with the communications center. In the event of an emergency, state and federal resources would be quickly summoned to stabilize the situation.

For an act of war, sabotage, or terrorist attack, it is likely the risk would be lower than calculated for an airplane crash because it should be less probable that a force would exist to disperse radioactive products into the atmosphere from a weapon as compared to the motive force of the fire assumed in the case of an airplane crash. For example, attacks on containers using anti-tank weapons would be less severe than the accidents analyzed because: (a) anti-tank weapons would cause a self-sealing penetration in the metal of a container, unlike that which is assumed from the airplane crash (impact from a 50-inch diameter engine rotor); (b) there is no explosive material inside the container, so it will not “blow-up” as a tank would if hit by such a weapon (in a tank attack, the tank shells inside the turret detonate); (c) there would be no fire to disperse the radioactivity that is released when the container is breached, unlike an aircraft crash where the jet fuel will burn creating such a fire. The rugged design of containers reduces the effects of other types of explosive charges. It is not credible that a terrorist attack would result in a criticality or meltdown of spent nuclear fuel; however, in Section A.2.5, the consequences of a hypothetical criticality accident are presented. The risks associated with an accidental criticality are less than those associated with a drained water pool or an airplane crash into dry storage containers.

The effect of a terrorist attack or an act of sabotage is expected to be conservatively bounded by the limiting accident discussed at each facility under each alternative. For example, the most limiting accident involving naval spent nuclear fuel is described in this attachment to be an airplane crash into a 125-ton multi-purpose canister at the Idaho Chemical Processing Plant. This accident could lead to 2.6 latent fatal cancers over the next 50 years in the population within 50 miles of the site. Since the probability of the event is one chance in 2,500,000 per year, the risk would be 0.00000104 latent cancer fatalities per year or, in other words, about one chance in 960,000 of a single fatal cancer fatality over a year. This risk is shared among the approximately 120,000 people residing within 50 miles of the site who would be expected to have over 300 cancer fatalities from all causes every year. For an act of war, sabotage, or terrorist attack, it is likely the risk would be lower than calculated because it should be less probable that a force would exist to disperse radioactive products into the atmosphere from a weapon as compared to the motive force of the fire assumed in the case of an airplane crash.

Accidents initiated at nearby facilities, by other activities unrelated to spent nuclear fuel handling or storage, or during construction of a facility, would not produce effects more severe than the sequences of events described in this EIS. This is because naval spent nuclear fuel undergoing loading, storage, or unloading under the conditions associated with the alternatives evaluated would not need special conditions or uninterrupted operator attention to prevent overheating, failure of containment, or loss of shielding. Therefore, evacuation in response to an accident at some other facility would not compromise safety. This inherent safety, combined with the distance between naval spent nuclear fuel facilities and any other activities which might suffer a catastrophic accident, means that the accidents analyzed in this document produce conditions at a naval spent nuclear fuel facility which would be more severe than those for any hypothetical synergistic combination of events resulting from accidents at other, unrelated facilities. Therefore, such analyses have not been included in this evaluation.

The existence of common cause accidents at a facility has been considered. In general, only one spent nuclear fuel facility is located at a particular site. However, it is possible for natural phenomena, like an earthquake, to produce more than one accident at some sites causing the release of radioactive material into the atmosphere or an increase in radiation levels due to loss of shielding. However, the probability of two or more accidents having maximum consequences occurring concurrently is less than the probability of the individual events. For example, if an earthquake affected the Naval Reactors Facility at INEL, a crane might fail causing damage to stored spent nuclear fuel, and the water pool might drain. The impacts for this could conservatively be estimated by summing the consequences. A combined total of 1.7×10^{-2} latent cancer fatalities is estimated. Similarly, consequences from several spent nuclear fuel facilities within a large site like INEL could be combined to estimate sitewide impacts conservatively. Once again, the probability of a common cause event resulting in this number of consequences is lower than the probability of the individual accidents because the severity of impact will vary between facilities due to separation distances.

Several accident scenarios were developed for the loading, storage, and unloading of naval spent nuclear fuel. All potential accidents were not evaluated, but cases which are considered to be more severe than all other reasonably foreseeable accidents were analyzed. Like the evaluations for normal operations, population and meteorology data specific to each site were used to estimate health effects.

It should be noted that this EIS does not evaluate the possibility of hydrogen ignition during container welding, as was recently experienced at a commercial nuclear power facility. That occurrence was caused by a chemical reaction between boric acid in the water within the container and the container's interior zinc coating. This situation cannot exist for loading operations involving naval spent nuclear fuel because the Naval Nuclear Propulsion Program does not use boric acid for this purpose.

Loading Operations. For completeness, several hypothetical accident scenarios were evaluated for naval spent nuclear fuel loading operations at both the Expended Core Facility and the Idaho Chemical Processing Plant. Since the procedures for loading spent nuclear fuel into a container will be similar for all container alternatives, the container hardware system involved has no impact on the accident analytical results. These hypothetical sequences of events include a drainage of the water pool caused by an earthquake, an accidental criticality, mechanical damage due to operator error or crane failure, an airplane crash into the water pool facility, a fire in a high-efficiency particulate air (HEPA) filter, minor water pool leakage, and a dropped fuel unit during loading operations in a Dry Cell Facility. Radiation dose to on-site individuals, an individual at the site boundary, and the general population was estimated for airborne releases of radioactivity, water releases, and direct radiation exposure.

Dry Storage. Several hypothetical accident scenarios were evaluated for naval spent nuclear fuel stored in containers at the Naval Reactors Facility, the Idaho Chemical Processing Plant, and a possible new facility near Birch Creek. Since the alternatives result in differing amounts of spent nuclear fuel in the containers, the hardware system does have an impact on the accident analyses. The first scenario postulates that a wind-driven projectile crashes into a storage cask, with mechanical damage causing a release of corrosion products into the environment. It is expected that the consequences from this scenario exceed those which would result from a container or canister drop during handling. The second hypothetical scenario is based on an airplane crash into the dry storage area at the Idaho Chemical Processing Plant. Once again, radiation dose to on-site individuals, an individual at the site boundary, and the general population was estimated for airborne releases, water releases, and direct radiation dose.

Unloading Operations. Several hypothetical accident scenarios were evaluated for naval spent nuclear fuel unloading operations at a repository surface facility. Since the alternatives result in differing amounts of spent nuclear fuel in the containers, the hardware system does have an impact on the accident analyses. These hypothetical sequences of events include mechanical damage to a container and a dropped transfer container.

A.2.3 Analytical Methods for Evaluation of Radiation Exposure

General. Evaluations of normal operations and hypothetical accidents at the sites were performed to assess the possible radiation exposure to individuals due to the release of radioactive materials. For the Naval Reactors Facility and the Idaho Chemical Processing Plant, the analyses are based on the same operations carried out at each location and the same accidents at both sites. With this approach, it is possible to compare the incremental effect of the alternatives or the different impacts of the postulated accidents at the different locations.

Exposures Calculated. Radiation exposure to the following different individuals and the general population is calculated for normal operation of the spent nuclear fuel facility and for accident conditions:

- Facility Worker (worker). An individual located 328 ft (approximately 100 m) from the radioactive material release point. (The impact of accidents on close-in workers is not calculated numerically but is discussed qualitatively for each accident in Section A.2.6.) |

- Maximally exposed off-site individual (MEI). A theoretical individual living at the site boundary receiving the maximum exposure.

- Nearest public access (NPA) individual. At INEL, highways used by the public cross the federal reservation which includes the facility where naval spent nuclear fuel operations could be conducted. Consequently, these analyses included evaluation of the exposure to a theoretical motorist who might be stranded on such a highway at the time of an accident. Based on experience from emergency exercises, emergency response teams would be able to evacuate such an individual within 2 hours, so this was the exposure time used in the calculations. No nearest public access value was calculated for a geologic repository location because there are no public roads which cross this hypothetical site, there are no residents on the site, and there are no other public accesses.

- General population within a 50-mi (approximately 80-km) radius of the facility. |

Exposure is calculated to result from direct radiation from the facility and exposure to radioactive contamination released to the air. The exposure pathways are described in detail in the Programmatic SNF and INEL EIS (DOE 1995 Volume 1, Appendix D, Attachment F, Section F.1.3.2) and include all internal and external pathways for exposures, including food and water.

Evaluation of Health Effects. Health effects are calculated from the exposure results. The risk factors used for calculations of health effects are taken from Publication 60 of the International Commission on Radiological Protection (ICRP 1991). Table A.5 lists the appropriate factors used in the analysis of both the normal operations and the hypothetical accident scenarios.

TABLE A.5 Risk Estimators for Health Effects from Ionizing Radiation

Effect	Nuclide	Risk Factor[a] (probability per rem) Worker	General Population
Fatal cancer (all organs)	All	4.0×10^{-4}	5.0×10^{-4}
Weighted nonfatal cancer[b]	All	8.0×10^{-5}	1.0×10^{-4}
Weighted genetic effects[b]	All	8.0×10^{-5}	1.3×10^{-4}
Weighted total effects[b]	All	5.6×10^{-4}	7.3×10^{-4}

[a] For high individual doses ($\geq$20 rem), the above risk factors are multiplied by a factor of two. General population doses were not modified because the large drop in exposure with increasing distances results in average exposure rates well below 20 rem.

[b] In determining a means of assessing health effects from radiation exposure, the ICRP has developed a weighting method for nonfatal cancers and genetic effects to obtain a total weighted effect, or "health detriment."

Cancer fatalities were used to summarize and compare the results in this EIS since this effect was viewed to be of the greatest interest to most people. The number of total health effects (deaths, nonfatal cancers, genetic effects, and other impacts on human health) may be easily obtained by multiplying the latent cancer fatalities by the factor of 1.46, which is the ratio of 7.3×10^{-4} divided by 5.0×10^{-4} from Table A.5 above.

The numerical estimates of cancer deaths and other health detriments presented were obtained by the practice of linear extrapolation. Other methods of extrapolation to the low-dose region could yield higher or lower numerical estimates of cancer deaths. Studies of human populations exposed at low doses are inadequate to demonstrate the actual level of risk. There is scientific uncertainty about cancer risk in the low-dose region below the range of epidemiologic observation, and the possibility of no risk cannot be excluded (Committee on Interagency Radiation Research and Policy Coordination 1992). In this appendix, the doses have been provided in all cases to allow independent evaluation using any relation between exposure and health effects.

Population. Population distributions specific to INEL (the Expended Core Facility, the Idaho Chemical Processing Plant, and Test Area North (TAN) for Birch Creek Area) were used and were obtained from 1990 U.S. Census data. The population information was obtained in 16 compass directions and 5 equal radial distances from the likely location of a naval spent nuclear fuel site to a 50 mi (approximately 80 km) total distance.

For calculation purposes, a population density of 45 persons/mi^2 (17 persons/km^2) was used for distances from 3 mi (approximately 4.8 km) to 50 mi (approximately 80 km) at the representative geologic repository site. This density is equivalent to the average in the western United States. At distances closer than 3 mi (approximately 4.8 km), it was assumed that there were no members of the general public. The population was assumed to be uniform in all radial directions.

Meteorology. The Naval Reactors Facility tower meteorological data for the years 1987-1991 were used for both Naval Reactors Facility and Idaho Chemical Processing Plant analyses. The

TAN tower meteorological data for the years 1987-1991 were used for the Birch Creek analyses. The data were used to develop a joint frequency distribution of 6 wind speed intervals, 16 wind directions, and 6 stability categories for the GENII program, described below, to evaluate normal operations. The data were also used to calculate the 50% and 95% meteorological conditions for the accident analyses. The 50% condition represents the average meteorological condition. This condition is defined as that for which more severe conditions with respect to accident consequences occur less than 50% of the time. The 95% condition represents the meteorological conditions which could produce the highest calculated exposures. This is defined as that condition which is not exceeded more than 5% of the time or is the worst combination of weather stability category and wind speed. Each of these conditions is evaluated for 16 wind directions.

For the hypothetical geologic repository site, the meteorology used in all directions was Pasquill Class D with a wind speed of 13.2 ft/s (approximately 4 m/s) for normal conditions (50%) and Pasquill Class F with a wind speed of 3.3 ft/s (approximately 1 m/s) for severe weather conditions (95%). These values are consistent with national averages for the above conditions.

Computer Programs. Five computer programs were used to evaluate the radiation exposures to the specified individuals and general population: GENII, RSAC-5, ORIGEN, SPAN and WATER RELEASE. These codes are discussed in detail in the Programmatic SNF and INEL EIS (DOE 1995 Volume 1, Appendix D, Attachment F, Section F.1.3.6).

Categorization of Accidents. For this analysis, accidents have been categorized in terms of abnormal events, design-basis accidents, and beyond design-basis accidents.

Abnormal Events. Abnormal events are unplanned or improper events which result in little or no consequence. Abnormal events include industrial accidents and accidents that occur during normal operations, such as skin contamination with radioactive materials, spills of radioactive liquids, or exposure to direct radiation due to improper placement of shielding. The occurrence of these unplanned events has been anticipated and mitigative procedures are in place which promptly detect and eliminate the events and limit the effects of these events on individuals. As a result, there is little hazard to the general population from abnormal events. Such events are considered to occur in the probability range of 1 to 10^{-3} per year or greater. The probability referred to here is the total probability of occurrence and includes the probability that the event occurs times other probabilities required for the consequences. For accidents included in this range, results are presented for both the 50% meteorological condition (average meteorology) and the 95% meteorological condition.

Design-Basis Accident Range. Accidents which have a probability of occurrence in the range of 10^{-3} to 10^{-6} per year are included in the range called the design-basis accident range. The terminology "design-basis accident," which normally refers to facilities to be constructed, also includes the "evaluation" basis accident which applies to existing facilities. For accidents included in this range, results are presented for both the 50% meteorological condition (average meteorology) and the 95% meteorological condition. Risk calculations for accidents in this range utilize the consequences associated with 95% meteorological conditions.

Beyond Design-Basis Accidents. This range of accidents includes those which are less likely to occur than design-basis accidents but which may have very large or catastrophic consequences. Accidents included in this range typically have a total probability of occurrence in the range of 10^{-6} to 10^{-7} per year. Accidents which are less likely than 10^{-7} per year typically are not discussed since they are not expected to contribute in any substantial way to the risk. For these beyond design-basis accidents, consequences are presented for 50% and 95% meteorological conditions. Risk calculations for accidents in this range utilize the consequences associated with 95% meteorological conditions.

Evaluation of Impacted Area. The impacted area surrounding a facility following an accident was determined for each scenario evaluated. The impacted area was defined as that area in which the plume deposited radioactive material to such a degree that an individual standing on the boundary of the fallout area would receive approximately 0.01 mrem/h of exposure. If this individual spends 24 hours per day at this location, that person would receive about 88 mrem/yr from the ground surface shine. This is within the 100 mrem/yr limit of 10 CFR Part 20.

To best characterize the affected areas for each casualty, a typical 50% meteorology was chosen (Pasquill-Gifford Class D, wind speed 4 mph) and applied to each accident scenario. The dispersion of a plume of ionizing radiation and the downwind fallout footprint it produces, is dependent upon the stability of the atmosphere and the associated wind speeds. A very stable atmosphere with low wind speeds would mix the plume into a very much smaller volume than an unstable atmosphere and stronger wind speeds which would dilute the plume into a very much larger volume and thereby reduce the potential negative health effects. The RSAC-5 results for ground surface dose were interpolated to determine the distance downwind where the centerline dose had dropped to approximately 88 mrem/yr based on 24 hours per day exposure. For the wind class chosen, the plume remains within a single 22.5 degree sector. The area affected by the plume is determined as the entire sector contaminated to the calculated downwind distance. Table A.6 lists each facility accident analyzed and the contaminated footprint associated with the accident.

TABLE A.6 Footprint Estimates for Facility Accidents

Accident Scenario	Footprint Length (miles)	Footprint Area[a] (acres)
Drained water pool	1.2	11
Criticality	0.25	8
Loading mechanical damage	<0.06	<0.5
Loading airplane crash	0.27	9
Dry storage mechanical damage[b]	0.11	1.4
Dry storage airplane crash[b]	2.2	629
Unloading mechanical damage[b]	0.11	1.4
Dropped transfer container	<0.06	<0.5

[a] Based on contamination of a single sector.
[b] Results for these accident scenarios vary by container alternative. The numbers presented here are for the container alternatives which would contain the most spent nuclear fuel.

With the exception of the Birch Creek Area dry storage location, the footprint length does not extend beyond the site boundary for any accident so the contaminated area would be on-site. However, for the Birch Creek Area location, the boundary of INEL would be about 1 mile from the dry storage location. Although not specifically evaluated due to the low probability, for an accident such as the dry storage airplane crash, about 500 of the 629 acres would be off-site if the wind were blowing in the most unfavorable direction.

Although the plume would be contained within a single sector, the direction of the wind is unknown. Therefore, each site was examined for impacts in all directions around the facility site out to a distance equal to the footprint length. Since the postulated accidents would occur over a short duration of time, the acreage of the sector quoted is still an accurate indication of the total contaminated area. Identification of the potential impacts is contained in Table A.7.

TABLE A.7 Secondary Impacts of Facility Accidents at Idaho National Engineering Laboratory or the Hypothetical Geologic Repository

Parameter	Impact
Biotic resources	Plants and animals on the site and around the site will experience no long-term impacts.
Water resources	The water used for drinking and industrial purposes is monitored and use may be temporarily suspended during cleanup operations. No enduring impacts are expected.
Economic impacts	A small number of individuals may experience temporary job loss due to temporary restrictions on support activities near the facility during cleanup operations. Some costs would also be incurred for the actual cleanup operation.
National defense	No impacts.
Environmental contamination	Except for the Birch Creek dry storage location, contamination would remain within the site boundaries. Table A.6 lists the amount of area that could be contaminated.
Endangered species	The facility accident would not result in the extermination of any species, nor would it affect the long-term potential for survival of any species.
Land use	Access to some areas may be temporarily restricted until cleanup is completed.
Treaty rights	Some temporary restrictions on access may be required until cleanup is completed. No enduring impacts are expected.

Emergency Preparedness and Mitigative Measures. Emergency plans are in effect at the INEL site to ensure that workers and the public would be properly protected in the event of an accident. In addition, emergency plans are in effect for accidents involving the transportation of radioactive materials. These response plans include the activation of emergency response teams provided by the site and a site emergency control center, as well as activation of a command and control network with Naval Reactor Headquarters and support laboratories. The long standing emergency planning program that exists within the Naval Nuclear Propulsion Program includes the ability to utilize the comprehensive and extensive emergency response resources of the site and provides for coordination with appropriate civil authorities. In addition to the Naval Nuclear Propulsion Program resources, extensive federal emergency response resources are available as needed to support state or local response.

Emergency response measures include provisions for immediate response to any emergency at the site, identification of the accident conditions, and communications with civil authorities providing radiological data and recommendations for any appropriate protective actions. In the event of an accident involving radioactive or toxic materials, workers in the vicinity of the accident would promptly evacuate the immediate area. This evacuation can typically be accomplished within minutes of the accident and would reduce the hazard to workers.

Exercises are conducted periodically at the site in order to test the ability of personnel to respond to accidents. These exercises include realistic tests of people, equipment, and communications involved in all aspects of the plans, and the plans are regularly reviewed and modified to incorporate experience gained from the exercises. These exercises also periodically include steps to verify the adequacy of interactions with local hospitals and emergency personnel and state officials.

For members of the general public residing at the site boundary or beyond, no credit is taken for any preventive or mitigative actions that would limit their exposure. These individuals are calculated as being exposed to the entire contaminated plume as it travels downwind from the accident site. Similarly, no action is taken to prevent these people from continuing their normal day-to-day routine, and ingestion of terrestrial food and animal products continues on a yearly basis. If needed, action would be taken to prevent the public from exceeding a Protective Action Guideline. No reduction of exposure due to these actions is accounted for in this analysis. The public is assumed to spend approximately 30% of the day within their homes or other buildings, and the exposure to ground surface radiation is therefore reduced appropriately on a yearly basis.

Individuals that reside or work on-site, or those that may be traversing the site in a vehicle would be evacuated from the affected area within 2 hours. This is based on the availability of security personnel at all locations to oversee the removal of residents, collocated workers, and travelers in a safe and efficient manner. Periodic training and evaluation of the security personnel is conducted to ensure that correct actions are taken during an actual casualty. Therefore, residents, collocated workers, and travelers would be exposed to the entire contaminated plume as it travels downwind for a period not to exceed 2 hours. Similarly, the radiation shine from the deposited radioactive materials would be limited to a 2-hour period. No ingestion of contamination is calculated for these individuals.

Facility workers all undergo training to take quick, decisive action during a casualty. These individuals quickly evacuate the area and move to previously defined "relocation" areas on the facility site. Workers could be exposed to a full 5 minutes of the radioactive plume as they move to the "relocation" centers. Once the immediate threat of the plume has moved off-site and downwind, the workers would be instructed to walk to vehicles waiting to evacuate them from the site. An additional 15 minutes would be required to evacuate the workers from the contaminated area and therefore the workers receive a total of 20 minutes of groundshine. No ingestion of contamination is calculated for these individuals.

The individual exposure times utilized in the accident analyses presented in Section A.2.5 are summarized in Table A.8.

TABLE A.8 Estimated Time an Individual Might Be Exposed[a]

Receptor	Estimated Exposure Time per Exposure Pathway: Plume	Fallout on Ground Surface	Food
Worker at 100 m	5 min	20 min	N/A
NPA	100% of release time up to 120 min	120 min	N/A
MEI	100% of release time	0.7 yr	1 yr

[a] Notation: MEI = individual at nearest site boundary; NPA = nearest public access individual.

Perspective on Calculations of Cancer Fatalities and Risk. The topics of human health effects caused by radiation and the risks associated with normal operations or postulated accidents associated with spent nuclear fuel management are discussed many times throughout this EIS. It is important to understand these concepts and how they are used in order to understand the information presented in this document. It is also valuable to have some frame of reference or comparison for understanding how the risks compare to the risks of daily life.

The method used to calculate the risk of any impact is fundamental to all of the evaluations presented and follows standard accepted practices. The first step is to determine the probability that a specific event will occur. For example, the probability that a routine task, such as operating a crane, will be performed sometime during a year of normal operations at a facility would be 1.0. That means that the action would certainly occur. The probability that an accident might occur is less than 1.0. This is true because accidents occur only infrequently and some of the more severe accidents, such as a catastrophic earthquake, might occur at any location only once in hundreds, thousands, or millions of years.

Once the probability of an event has been determined, the next step is to predict what the consequences of the event being considered might be. One important measure of consequences chosen for this EIS is the number of human fatalities from cancer induced by radiation. This was chosen because this document deals with radioactive materials. The number of cancer fatalities that might be caused by any routine operation or any postulated accident can be calculated using a standard technique based on the amount of radiation exposure that might occur from all conceivable pathways and the number of people who might be affected.

A couple of examples should serve to illustrate the calculation of risk. A summary of these examples is presented in Table A.9. In the first, the lifetime risk of dying in a motor vehicle accident can be computed from the likelihood of an individual being in an automobile accident and the consequences or number of fatalities per accident. There were 10,000,000 motor vehicle accidents during 1992 in the United States resulting in about 40,000 deaths (National Safety Council 1993). Thus, the probability of a person being in an automobile accident is 10,000,000 accidents divided by approximately 250,000,000 persons in the United States, or 0.04 per year. The number of fatalities per accident, 0.004 (40,000 deaths divided by 10,000,000 accidents), is less than 1.0 since many accidents do not cause fatalities. Multiplying the probability of the accident (0.04 per year) by the consequences of the accident (0.004 deaths per accident) by the number of years the person is exposed to the risk (72 years is considered to be an average lifetime) gives the risk for any individual being killed in an automobile accident. From this calculation, the overall risk of someone dying in a motor vehicle accident is about 1 chance in 87 over a lifetime.

A second example illustrates the calculation of risk for another event which occurs daily. Fossil fuels, such as natural gas or coal, contain naturally occurring radioactive material that is released into the air during combustion. This radioactivity in the air finds its way into our bodies through our food and the air we breathe. This radioactivity has been estimated to produce about 0.5 mrem of radiation dose to the average U.S. resident each year (NCRP 1987b). The probability of this happening is essentially 1.0 since these fuels are burned every day all over the country. The number of fatal cancers from exposure to 0.5 mrem/yr is calculated by taking 0.5 mrem/yr times the 72 years considered to be an average lifetime times the 0.0005 fatal cancers estimated to be caused by each rem (0.5 mrem/yr × 72 years × 0.0005 fatal cancers per rem = 0.000018 fatal cancers per individual lifetime). The risk is the probability (1.0) times the consequences (0.000018 cancer fatalities) which equals about 1 chance in 55,000 of death from this cause over a lifetime.

These risks and others from everyday life can be used to gain a perspective on the risks associated with the alternatives in this EIS. As illustrated, the risk of death from cancer from the radioactivity released daily from combustion of fossil fuels is about 1 chance in 55,000 for the average U.S. resident. As a further comparison, the naturally occurring radioactive materials in agricultural fertilizer contribute about 1 to 2 mrem/yr to an average U.S. resident's exposure to radiation (NCRP 1987b). A calculation similar to the one in the preceding paragraph shows that the use of fertilizer to produce food crops in the United States results in a risk of death from cancer between 1 chance in 12,500 and 1 chance in 25,000. Finally, the average U.S. resident's risk of dying from cancer from all causes is 1 chance in 5 over his or her lifetime. These risks can be compared, for example, to the average individual risk of less than 1 chance in 30 billion for a resident in the vicinity of the INEL developing a fatal cancer due to normal operations at the Expended Core Facility (see the data in Section A.2.4).

A frame of reference for the risks from accidents associated with spent nuclear fuel management alternatives can be developed in the same way. For an average resident in the vicinity of the INEL, the individual risk of death from cancer caused by the water leaking from the Idaho Chemical Processing Plant after a large earthquake would be approximately 1 chance in 600 million. This individual risk was determined by dividing the risk value to the population within 50 mi (approximately 80 km) (2.4×10^{-6} fatalities per year per accident from Table A.14) by the total | population of 120,003 and multiplying by an average life span of 72 years. This risk can be compared to the risks of death from other accidental causes to gain a perspective (see Table A.9). For example, the risk of death for the average U.S. resident from fires is approximately 1 chance in 500, and for death from accidental poisoning the risk is about 1 chance in 1,000 (Crouch 1982).

TABLE A.9 Risk Comparisons[a]

Cause of Death	Individual Lifetime Risk of Dying
Cancer: All causes	1 Chance in 5
Cancer: Exposure to Fossil Fuel Emissions	1 Chance in 55,000
Cancer: Naturally Occurring Radiation	1 Chance in 93
Cancer: INEL/ECF Operations	1 Chance in 30,000,000,000
Cancer: Incident-Free Transportation	1 Chance in 9,300,000
Automobile Accident	1 Chance in 87
Naval Spent Nuclear Fuel Transportation Accident	1 Chance in 39,000,000,000
Fire	1 Chance in 500
Poisoning	1 Chance in 1,000
Cancer: ICPP Water Pool Draining	1 Chance in 600,000,000

[a] Notation: ECF = Expended Core Facility; ICPP = Idaho Chemical Processing Plant

A.2.4 Analytical Results: Normal Operations

The purpose of this analysis is to determine the hypothetical health effects on workers and the public due to routine handling of naval spent nuclear fuel. Radioactive releases from facilities involved in routine handling of naval spent nuclear fuel are small. The releases at the Idaho Chemical Processing Plant are expected to be larger than those at the Expended Core Facility due to the larger storage capacity of the Idaho Chemical Processing Plant water pool. Meteorological and population data, as discussed in Section A.2.3, were used at each of the locations analyzed. For normal operations at INEL, exposure to the nearest public access individual is not estimated due to the short period of time that such an individual would spend on-site while driving on the public access road.

Loading Operations. The airborne release of radioactive materials from water pool storage of naval spent nuclear fuel units prior to loading into the containers for dry storage and subsequent shipment is extremely small. Only the corrosion product film on the fuel is capable of being released into the air under normal operations. Most of the nuclides in the corrosion film are solid elements and, thus, would not be released from the water pool into the air even if they can become released from the corrosion film. Since separate reporting of releases from water pool storage activities are not available for the Expended Core Facility or the Idaho Chemical Processing Plant, a calculated release was used to evaluate the potential exposure to workers and the public due to routine water pool storage and loading operations. At the Expended Core Facility, an annual release of 4.6×10^{-2} Ci of carbon-14 was used for the evaluation. A higher release of 6.1×10^{-1} Ci/yr was used for the Idaho Chemical Processing Plant since the Building 666 water pool has a much higher storage capacity and much more fuel than the Expended Core Facility. For the No-Action and Current Technology/Rail Alternatives only, an additional Carbon-14 release (3.9 Ci/yr) is expected when the dry storage containers are opened at INEL in preparation for loading the fuel and special case waste into the M-140 shipping containers, resulting in larger exposures for these two alternatives.

Table A.10 provides an indication of the incremental change at each location due to the addition of naval spent nuclear fuel loading operations.

TABLE A.10 Estimated Annual Health Effects from Naval Spent Nuclear Fuel and SCW: Loading Operations[a]

	Estimated Exposure					
	Facility Worker		MEI		General Population	
Activity/ Location	Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities
Loading operations - MPC, TSC, DPC, and SmMPC Alternatives						
NRF	2.8×10^{-6}	1.1×10^{-9}	1.7×10^{-8}	8.4×10^{-12}	1.1×10^{-4}	5.4×10^{-8}
ICPP	3.7×10^{-5}	1.5×10^{-8}	2.6×10^{-7}	1.3×10^{-10}	1.4×10^{-3}	7.2×10^{-7}
Loading operations - NAA and CTR Alternatives						
NRF	2.3×10^{-4}	9.4×10^{-8}	1.4×10^{-6}	7.0×10^{-10}	9.2×10^{-3}	4.6×10^{-6}
ICPP	2.7×10^{-4}	1.1×10^{-7}	1.9×10^{-6}	9.4×10^{-10}	1.1×10^{-2}	5.3×10^{-6}

[a] Notation: ICPP = Idaho Chemical Processing Plant; MEI = individual at nearest site boundary; NRF = Naval Reactors Facility; MPC = Multi-Purpose Canister; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister; NAA = No-Action Alternative; CTR = Current Technology/Rail.

Dry Storage. Another operation analyzed was the storage of naval spent nuclear fuel in containers in a safe array at three INEL locations. Shielding and physical boundaries would be established in accordance with existing regulations to protect facility workers. No routine airborne or water releases are expected from the dry storage activity; therefore, only direct radiation exposure was evaluated. The source term consists of an array of filled storage containers. Supplementary shielding would be provided as needed to ensure that there would be no measurable increase in radiation levels at the perimeter of the industrial area and that radiation levels within the industrial area but outside the storage area would not require occupational radiation exposure monitoring for workers. As containers are received over time, shielding will be provided to limit radiation exposure rates as discussed above. Distance falloff for radiation levels was determined using SPAN computer calculations as discussed in Section A.2.3.

Table A.11 provides an indication of the incremental change at each location due to the addition of dry storage areas. The health effect due to dry storage of spent nuclear fuel is extremely small at all locations.

TABLE A.11 Estimated Annual Health Effects from Naval Spent Nuclear Fuel and SCW: Dry Storage, All Alternatives[a]

	Estimated Exposure					
	Facility Worker		MEI		General Population	
Activity/ Location	Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities
Dry Storage						
NRF	1.1×10^{-2}	4.4×10^{-6}	6.5×10^{-14}	3.3×10^{-17}	1.7×10^{-12}	8.6×10^{-16}
ICPP	1.1×10^{-2}	4.4×10^{-6}	6.1×10^{-8}	3.1×10^{-11}	8.1×10^{-8}	4.1×10^{-11}
Birch Creek Area	1.1×10^{-2}	4.4×10^{-6}	4.7×10^{-4}	2.4×10^{-7}	5.1×10^{-5}	2.6×10^{-8}

[a] Notation: ICPP = Idaho Chemical Processing Plant; MEI = individual at nearest site boundary; NRF = Naval Reactors Facility.

Unloading Operations. The airborne release of radioactive materials from unloading naval spent nuclear fuel at a repository surface facility is expected to be extremely small. In addition, releases are not anticipated for all of the alternatives. The multi-purpose canisters will not be opened and, therefore, will not contribute any airborne releases. For the other container alternatives carbon-14 in the form of carbon dioxide gas will be generated during storage or shipping. The carbon-14 could be released to a repository surface facility and pass through the HEPA filters and into the environment. An annual release of 4.0 Ci of carbon-14 was used for the evaluation of all of these alternatives. It is expected that the actual releases of carbon-14 for any container alternative which is backfilled with an inert gas will be less than this value.

Table A.12 presents tabulated radiation exposure results for the unloading operations at the hypothetical geologic repository site.

Summary. Evaluations of environmental impacts at INEL are presented in the Programmatic SNF and INEL EIS (DOE 1995; Volume I, Appendix B). The radiological impacts at these sites are quite low in that latent cancer fatality projections to the population within 50 mi (approximately 80 km) from normal operations are well below 1.0. Hence, the addition of the above values due to normal operations related to naval spent nuclear fuel to those which may already exist at INEL result in total values which are still well below 1.0.

TABLE A.12 Estimated Annual Health Effects from Unloading Operations for Naval Spent Nuclear Fuel and SCW at a Hypothetical Geologic Repository Site: Normal Operations, All Container Alternatives Except MPCs[a]

	Estimated Exposure					
	Facility Worker		MEI		General Population	
Activity/ Location	Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities
Unloading Operations						
Repository	5.4×10^{-5}	2.2×10^{-8}	1.4×10^{-6}	7.2×10^{-10}	2.4×10^{-2}	1.2×10^{-5}

[a] Notation: MEI = individual at nearest site boundary.

A.2.5 Analytical Results: Accident Evaluation

The analysis of airborne releases at INEL from hypothetical accidents is evaluated with RSAC-5. Unless stated otherwise, the conditions listed in Table A.13 were used when performing calculations with RSAC-5. In most cases, these conditions are taken directly as defaults from the code. For airborne releases at a repository, the GENII code was used.

Loading Operations. Accidents during loading operations of naval spent nuclear fuel are considered for the Naval Reactors Facility and the Idaho Chemical Processing Plant at INEL. Six of the hypothetical accident scenarios evaluated during loading operations for this EIS are the same as those evaluated for water pool storage of naval spent nuclear fuel in the Programmatic SNF and INEL EIS (DOE 1995; Volume I, Appendix D, Attachment F, Section F.1.4.2.1). In addition, a dropped fuel unit scenario was evaluated for loading operations which would take place in a Dry Cell Facility. A prerequisite for a large release of radioactive material to the environment under more severe accident conditions is the damage of the cladding of a fairly large amount of stored fuel, with an accompanying release of gaseous and airborne particles of radioactive material from the fuel.

Drained Water Pool. In the hypothetical drained water pool scenario, a catastrophic event, like an earthquake, causes severe damage to the structure of the water pool, resulting in a complete loss of pool water. A thermal analysis of spent nuclear fuel in a water pool was conducted to demonstrate that clad failure or fuel melting is not possible in the event of an accidentally drained water pool. Air circulation through the fuel racks and fuel units was shown to be sufficient to prevent clad failure in the unlikely event of complete loss of pool water. However, the loss of water could result in increased direct radiation and a release of corrosion products.

TABLE A.13 Conditions Used as Input to the RSAC-5 Code for Estimating Airborne Releases from Hypothetical Accidents

Meteorological Data

- Wind speed, direction, and Pasquill stability are taken from 50% and 95% meteorology. See Section A.2.3 for a discussion of meteorological conditions.
- The release is calculated as occurring at ground level (0 ft or m).
- Mixing layer height is 1,320 ft (approximately 400 m). Airborne materials freely diffuse in the atmosphere near ground level in what is known as the mixing depth. A stable layer exists above the mixing depth which restricts vertical diffusion.
- Wet deposition is zero (no rain occurs to accelerate deposition and reduce the area affected).
- Dry deposition of the cloud is modeled. During movement of the radioactive plume, a fraction of the plume is deposited on the ground due to gravitational forces and becomes available for exposure by ground surface radiation and ingestion.
- The quantity of deposited radioactive material is proportional to the material size and speed. The following dry deposition velocities (m/s) were used:
  solids = 0.001 halogens = 0.01 noble gases = 0.0
  cesium = 0.001 ruthenium = 0.001.
- If radioactive releases occur through a stack, then additional plume dispersion can be accounted for by calculating a jet plume rise. In this analysis, jet plume rise is ignored.
- When released gases have a heat content, the plume can disperse more quickly. In this calculation, buoyant plume effects are ignored.

Inhalation Data

- Breathing rate is 3.33×10^{-4} m^3/s for worker and NPA; 2.66×10^{-4} m^3/s for people at site boundary and beyond.
- Particle size is 1.0 µm.
- The internal exposure period is 50 years for individual organs and tissues which have radionuclides committed.
- Exposure to the entire plume for the general public. The worker and NPA are exposed as discussed in Section A.2.3.
- Inhalation exposure factors are based on ICRP 30.

Ground Surface Exposure

- Exposed to contaminated soil for 1 year for the general public. See Section A.2.3 for additional details.
- Building shielding factor is 0.7 which exposes the individual to contaminated soil for 16 hours per day.

Ingestion Data

- Ingestion numbers will be reduced by a factor of 10 to account for only 10% of the food consumed being grown locally (such as in a person's garden).
- The following changes from RSAC-5 defaults were used (Rupp 1980):
  Annual Dietary Consumption Rates:
  177 kg/yr stored vegetables (produce)
  18.3 kg/yr fresh vegetables (leafy)
  94 kg/yr meat
  112 L/yr milk

Conditions used in developing the source term for the drained water pool accident are as follows:

- 300 naval fuel units would be in the water pool at the Expended Core Facility and 4,031 units at the Idaho Chemical Processing Plant.
- The thermal analysis demonstrates that no fission product release would occur during the accident.
- The amount of corrosion products on the fuel units is based on best estimate values.
- The release to the environment would occur at a constant rate over a 15-minute period.
- One percent of the original corrosion products from the fuel units might be released to the atmosphere due to thermal air currents. Additionally, 10% of the corrosion products could be released to the environment with the pool water.
- No filtration by HEPA filters is assumed.
- The following amounts of corrosion product nuclides might be released to the atmosphere. As noted above, the release to the water environment is 10 times these values. This listing includes nuclides that result in at least 99% of the exposure.

	Curies	
Nuclide	NRF	ICPP
Cobalt-60	3.6	48
Iron-55	6.6	89
Cobalt-58	1.3	17
Manganese-54	2.2×10^{-1}	2.9
Iron-59	1.9×10^{-2}	2.5×10^{-1}

The estimated health risks to the general population that might result from the hypothetical drained water pool accident at INEL are presented in Table A.14. The number of fatal cancers would be expected to occur over a 50-year period. "Risk" is defined as the number of fatal cancers times the probability of occurrence. The results are presented for the design basis accident with 50% and 95% meteorology. A probability of occurrence of 10^{-5} was used to develop the risk results in the table (DOE 1995; Volume 1, Appendix D, Part B, Section F.1.4.2.1.1.3).

The consequences calculated stem from the release of radioactive corrosion products within the pool water and would be the same for the design basis and beyond design basis seismic events.

Since the consequences are the same, the values shown in Table A.14 are based on the accident probability for the design-basis seismic event because that results in the larger risk.

For the hypothetical drained water pool scenario, the radioactive plume might result in contamination of the ground to a downwind distance of 0.29 mi (approximately 0.5 km) at the Naval Reactors Facility and 1.2 mi (approximately 1.9 km) at the Idaho Chemical Processing Plant. This would yield a total area impacted by the accident of approximately 11 acres (approximately 4.5 ha) and 175 acres (approximately 71 ha) respectively at the two sites. The calculated downwind distance would be contained within the boundaries of INEL.

TABLE A.14 Estimated Health Risks from a Drained Water Pool Accident at the Naval Reactors Facility or Idaho Chemical Processing Plant[a]

	50% Meteorology		95% Meteorology	
Site/ Individual	Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities
NRF				
Worker	7.5×10^{-1}	3.0×10^{-4}	2.1	8.3×10^{-4}
NPA	3.9×10^{-4}	2.0×10^{-7}	2.3×10^{-3}	1.2×10^{-6}
MEI	2.8×10^{-3}	1.4×10^{-6}	1.7×10^{-2}	8.5×10^{-6}
ICPP				
Worker	10	4.0×10^{-3}	28	2.2×10^{-2}
NPA	7.3×10^{-3}	3.6×10^{-6}	9.8×10^{-2}	4.9×10^{-5}
MEI	1.6×10^{-2}	8.2×10^{-6}	1.4×10^{-1}	7.0×10^{-5}

	50% Meteorology		95% Meteorology		
Population within 50-Mile Radius of Site	Collective Dose (person-rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities	Annual Risk
NRF					
115,690	6.7	3.3×10^{-3}	35	1.7×10^{-2}	1.7×10^{-7}
ICPP					
120,003	91	4.6×10^{-2}	460	2.4×10^{-1}	2.4×10^{-6}

[a] Notation: ICPP = Idaho Chemical Processing Plant; MEI = individual at nearest site boundary; NPA = nearest public access individual; NRF = Naval Reactors Facility.

Accidental Criticality. In the hypothetical accidental criticality scenario, an accidental uncontrolled chain reaction producing 1×10^{19} fissions is postulated. The criticality occurs in the water pool which is not emptied by the event and does not subsequently empty. Release of fission products includes those specified in Regulatory Guide 3.34 (NRC 1979b) from the criticality, plus fission products remaining in the fuel as a result of the original use. Removal of fission products by the pool water is included.

Conditions used in developing the source term for the accidental criticality are as follows:

- The fraction of the fission products released to the building is 100% of the noble gases, 25% of the halogens, 0.1% of the ruthenium (Elder et al. 1986), and 0.05% of the cesium and remaining solids.

- The original inventory of fission products from two naval fuel units are available for release in addition to those created by the criticality event.

- A HEPA filter removes 99.9% of the solid fission products from the plume.

- The release to the environment occurs at a constant rate over a 15-minute period. This is conservative as compared to the 8-hour release allowed in Regulatory Guide 3.34.

- The following amounts of radionuclides are released to the environment. This listing includes nuclides that result in at least 99% of the possible exposure.

Nuclide	Curies	Nuclide	Curies
Tellurium-133	3.4×10^{3}	Iodine-132	1.7
Iodine-134	3.5×10^{2}	Strontium-90	1.9×10^{-2}
Iodine-135	1.2×10^{2}	Yttrium-91m	4.3×10^{-8}
Cesium-138	1.6×10^{-4}	Rubidium-88	1.7×10^{-5}
Rubidium-89	6.1×10^{-4}	Yttrium-91	1.1×10^{-2}
Plutonium-238	3.7×10^{-4}	Cesium-139	7.3×10^{-3}
Bromine-84	2.3×10^{2}	Barium-142	4.8×10^{-3}
Iodine-133	2.4	Yttrium-93	1.3×10^{-6}
Strontium-91	5.4×10^{-6}	Barium-137m	1.9×10^{-2}
Strontium-92	2.4×10^{-4}	Rubidium-106	7.6×10^{-3}
Barium-139	6.9×10^{-6}	Zirconium-95	1.4×10^{-2}
Barium-141	8.8×10^{-4}	Strontium-89	7.0×10^{-3}
Iodine-129	5.1×10^{-3}	Europium-154	1.3×10^{-3}
Iodine-131	3.2×10^{-1}	Cesium-137	2.0×10^{-2}
Tritium (H-3)	1.4×10^{2}	Cerium-144	4.5×10^{-2}
Cesium-134	1.5×10^{-2}	Niobium-95	2.7×10^{-2}
Barium-140	2.5×10^{-5}	Rubidium-90	2.2×10^{-2}
Iodine-136	1.1×10^{4}		

The estimated health risks to the general population that might result from the hypothetical criticality accident at each location are presented in Table A.15. The number of fatal cancers would be expected to occur over a 50-year period. An accidental criticality during spent nuclear fuel handling operations is extremely unlikely. The probability of occurrences of an accidental criticality at the Expended Core Facility is identified as 1×10^{-5} per year and as 1×10^{-4} per year in Building 666 at the Idaho Chemical Processing Plant (DOE 1995; Volume 1, Appendix D, Part B, Section F.1.4.2.1.2.3).

TABLE A.15 Estimated Health Risks from Accidental Criticality at the Naval Reactors Facility or Idaho Chemical Processing Plant[a]

Site/ Individual	50% Meteorology		95% Meteorology	
	Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities
NRF				
Worker	3.0	1.2×10^{-3}	8.0	3.2×10^{-3}
NPA	5.9×10^{-4}	2.9×10^{-7}	2.8×10^{-3}	1.4×10^{-6}
MEI	2.0×10^{-3}	1.0×10^{-6}	9.2×10^{-3}	4.6×10^{-6}
ICPP				
Worker	3.0	1.2×10^{-3}	8.0	3.2×10^{-3}
NPA	8.3×10^{-4}	4.1×10^{-7}	9.1×10^{-3}	4.6×10^{-6}
MEI	8.6×10^{-4}	4.3×10^{-7}	5.4×10^{-3}	2.7×10^{-6}

Population within 50-Mile Radius of Site	50% Meteorology		95% Meteorology		
	Collective Dose (person-rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities	Annual Risk
NRF					
115,690	5.5	2.8×10^{-3}	13	6.4×10^{-3}	6.4×10^{-8}
ICPP					
120,003	5.6	2.8×10^{-3}	13	6.4×10^{-3}	6.4×10^{-7}

[a] Notation: ICPP = Idaho Chemical Processing Plant; MEI = individual at nearest site boundary; NPA = nearest public access individual; NRF = Naval Reactors Facility.

For the hypothetical criticality accident scenario, the radioactive plume might cause contamination of the ground to a downwind distance of 0.25 mi (approximately 0.4 km) at both the Naval Reactors Facility and the Idaho Chemical Processing Plant. This would yield a total area impacted by the accident of approximately 8 acres (approximately 3.2 ha). The calculated downwind distance would be contained within the boundaries of INEL.

Mechanical Damage from Operator Error, Crane Failure, or Similar Accidents. Accidental mechanical damage to spent nuclear fuel was evaluated. The hypothetical accident included damage to one fuel unit, allowing fission products within the assembly to escape through the clad failures. The cause was attributed to be crane failure, operator error, or a similar accident. All gas and some volatile and solid nuclides were calculated to be released to the pool. The release fractions are consistent with severe accident analyses and Nuclear Regulatory Commission Regulatory Guide 1.4. Due to the presence of pool water, no solids would be released into the air inside the facility.

Conditions used in developing the source term for the mechanical damage scenario are as follows:

- One fuel unit is damaged because only one fuel unit would be handled at a time and the storage facility design prevents damage to stored units from such events.
- One percent of the fuel is damaged and those fission products are available for release.
- All (100%) of the noble gases are released to the environment.
- Approximately 25% of the halogens are released to the pool and 90% of these fission products are absorbed in the water as they rise through the pool water. Therefore, 2.5% of the halogens are released to the air inside the facility.
- Due to the gaseous nature of the released fission products, installed HEPA filters would not remove them once they are released to the air in the building.
- The release to the environment occurs at a constant rate over a 15-minute period.
- There is no particulate fission product release to the atmosphere due to the presence of pool water.
- The following amounts of radionuclides could be released to the environment. This listing includes nuclides that result in at least 99% of the possible exposure.

Nuclide	Curies
Tritium (H-3)	1.4
Iodine-129	2.5×10^{-6}
Iodine-131	5.4×10^{-5}

The estimated health risks to the general population that might result from the hypothetical mechanical damage accident at each location are presented in Table A.16. The number of fatal cancers would be expected to occur over a 50-year period. The probability of the occurrence of fuel damage is small based on the conservative fuel handling rules. The probability of occurrence of such a mechanical damage accident for the INEL Expended Core Facility is 10^{-5} (DOE 1995; Volume 1,

Appendix D, Part B, Section F.1.4.2.1.3.3). The same value was assumed for the Idaho Chemical Processing Plant.

For the hypothetical wet storage mechanical damage accident scenario, the radioactive plume might cause contamination of the ground to a downwind distance of less than 0.06 mi (approximately 0.1 km). This would yield a total area impacted by the accident of less than 0.5 acre (approximately 0.2 ha) at both the Naval Reactors Facility and the Idaho Chemical Processing Plant. The calculated downwind distance would be contained within the boundaries of INEL.

TABLE A.16 Estimated Health Risks from a Mechanical Damage Accident (Fuel Unit Drop) at the Naval Reactors Facility or Idaho Chemical Processing Plant (All Alternatives)[a]

	50% Meteorology		95% Meteorology		
Site/ Individual	Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities	
NRF					
Worker	1.9×10^{-4}	7.6×10^{-8}	5.2×10^{-4}	2.1×10^{-7}	
NPA	1.5×10^{-7}	7.4×10^{-11}	8.3×10^{-7}	4.2×10^{-10}	
MEI	5.7×10^{-7}	2.9×10^{-10}	2.6×10^{-6}	1.3×10^{-9}	
ICPP					
Worker	1.9×10^{-4}	7.6×10^{-8}	5.2×10^{-4}	2.1×10^{-7}	
NPA	2.1×10^{-7}	1.1×10^{-10}	2.7×10^{-6}	1.3×10^{-9}	
MEI	2.5×10^{-7}	1.2×10^{-10}	1.5×10^{-6}	7.7×10^{-10}	
	50% Meteorology		95% Meteorology		
Population within 50-Mile Radius of Site	Collective Dose (person-rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities	Annual Risk
NRF					
115,690	5.0×10^{-3}	2.5×10^{-6}	1.1×10^{-2}	5.3×10^{-6}	5.3×10^{-11}
ICPP					
120,003	5.1×10^{-3}	2.6×10^{-6}	1.1×10^{-2}	5.3×10^{-6}	5.3×10^{-11}

[a] Notation: ICPP = Idaho Chemical Processing Plant; MEI = individual at nearest site boundary; NPA = nearest public access individual; NRF = Naval Reactors Facility.

Airplane Crash. Impact into water pools by aircraft with resulting damage to the naval fuel units stored inside the pool was evaluated. Based on the probability of occurrence, specific analyses were only performed for the Idaho Chemical Processing Plant. The hypothetical accident included damage to all fuel units stored at the water pool. Fission products and corrosion products are released from the fuel units into the water pool; however, the pool water is not released to the environment. An airplane crash into a water pool would not produce enough force to cause the pool to leak because the walls of the water pool are constructed of thick, reinforced concrete with earth surrounding them, making them very strong. In addition, it was considered unlikely that an airplane would impact the water pool at an angle steep enough to expose the floor of the pool or the walls of the pool below the water level to the direct impact. The presence of pool water results in only a release of gaseous fission products to the atmosphere.

Conditions used in developing the source term for the airplane crash scenario are as follows:

- One percent of the fission products from each of the fuel units stored inside the pool is available for release.
- Of the available fission products, 100% of the noble gases and 25% of the halogens are released to the pool water. Due to the presence of pool water, a reduction of the halogen release by a factor of 10 prior to release to the atmosphere occurs.
- No solid fission products or corrosion products are released to the environment due to the continued presence of pool water.
- The release to the environment occurs at a constant rate over a 15-minute period.
- 4,031 naval fuel units would be in the water pool.
- No filtration by high-efficiency particulate air (HEPA) filters is assumed.
- The following amounts of radionuclides could be released to the environment. This listing includes nuclides that result in at least 99% of the possible exposure.

Nuclide	Curies
Iodine-129	1.0×10^{-2}
Iodine-131	2.2×10^{-1}
Tritium (H-3)	5.7×10^{3}

The estimated health risks to the general population that might result from the hypothetical airplane crash accident at the Idaho Chemical Processing Plant are presented in Table A.17. The number of fatal cancers would be expected to occur over a 50-year period. At the Naval Reactors Facility, the likelihood of occurrence is 7×10^{-8} per year into the water pool and the probability at the Idaho Chemical Processing Plant is estimated to be 4 to 8 times greater (DOE 1995; Volume 1, Appendix D, Part B, Section F.3). The airplane crash probability is higher at the Idaho Chemical Processing Plant since low altitude testing of commercial jet airliners has been conducted near the National Oceanic and Atmospheric Administration tower, which is located about 1.5 miles from the Idaho Chemical Processing Plant. A probability of 6×10^{-7} is used for the probability of an airplane crash into the Building 666 water pool.

For the hypothetical airplane crash into a water pool facility accident scenario, the radioactive plume might result in contamination of the ground to a downwind distance of less than 0.27 mi (approximately 0.43 km). This would yield a total area impacted by the accident of less than 9 acres (approximately 3.6 ha). The calculated downwind distance would be contained within the boundaries of INEL.

TABLE A.17 Estimated Health Risks from an Airplane Crash at the Idaho Chemical Processing Plant[a]

Individual	50% Meteorology: Dose (rem)	50% Meteorology: Latent Cancer Fatalities	95% Meteorology: Dose (rem)	95% Meteorology: Latent Cancer Fatalities
Worker	7.6×10^{-1}	3.1×10^{-4}	2.1	6.4×10^{-5}
NPA	8.8×10^{-4}	4.4×10^{-7}	1.1×10^{-2}	5.4×10^{-6}
MEI	9.8×10^{-4}	4.9×10^{-7}	5.9×10^{-3}	3.0×10^{-6}

Population within 50-Mile Radius of Site	50% Meteorology: Collective Dose (person-rem)	50% Meteorology: Latent Cancer Fatalities	95% Meteorology: Collective Dose (person-rem)	95% Meteorology: Latent Cancer Fatalities	Annual Risk
120,003	21	1.1×10^{-2}	41	2.1×10^{-2}	$1.3 \text{ x } 10^{-8}$

[a] Notation: MEI = individual at nearest site boundary; NPA = nearest public access.

HEPA Filter Fire. In the hypothetical HEPA filter fire scenario, a fire in the bank of HEPA filters is postulated. This accident could be initiated by the ignition of a flammable mixture released upstream of the system or by an external, unrelated fire that spreads to this system. Although the risks associated with this accident are relatively minor, it was analyzed to bound the higher probability, lower consequence type accident category. The airborne release fractions associated with this accident were conservatively chosen so that a HEPA filter failure by crushing or impact was also bounded.

Conditions used in developing the source term for the HEPA filter fire accident are as follows:

- The original inventory of fission products in the filters is based on the total estimated unabated Expended Core Facility releases over a 5-year period.

- One percent of the radionuclide inventory present on the filters becomes airborne during the fire. Release fractions for HEPA filters are small because the filters are constructed of material containing glass fibers which would melt during a fire and trap particles in the medium. Measurements from experiments show that one one-hundredth of 1% of the material in HEPA filters could be released during a fire (DOE 1993b), but 1% has been used in these analyses to allow for uncertainties in the final results of an individual fire.

- The release to the environment occurs at a constant rate over a 15-minute period.

- There is no increase in direct radiation due to this accident.

- No filtration by HEPA filters is assumed.

- The following amounts of radionuclides could be released to the environment. This listing includes nuclides that result in at least 99% of the possible exposure.

Nuclide	Curies	Nuclide	Curies
Cesium-137	1.5×10^{-3}	Cobalt-60	2.1×10^{-3}
Cesium-134	2.0×10^{-4}	Strontium-90	8.9×10^{-4}
Barium-137m	6.3×10^{-6}	Yttrium-90	8.9×10^{-4}
Iron-55	2.3×10^{-3}	Europium-154	9.8×10^{-5}
Nickel-63	3.0×10^{-3}		

The estimated health risks to the general population that might result from the hypothetical HEPA filter fire accident at each location are presented in Table A.18. The number of fatal cancers would be expected to occur over a 50-year period. The probability of a fire in a HEPA filter is estimated based on the probability of other fires spreading to the HEPA filter system. As discussed in the Programmatic SNF and INEL EIS (DOE 1995; Volume 1, Appendix D, Section F.2.4.2), a probability of 5×10^{-3} is assigned to chemical fires. The probability of HEPA fires is considered less than a chemical fire since chemicals would not be stored in the immediate vicinity of the HEPA filter system. Additionally, HEPA filters are not inherently volatile or explosive. It is estimated that the probability for an existing chemical fire to spread to the HEPA filters is less than 0.1. This results in a probability of less than 5×10^{-4} for a HEPA filter fire. A value of 5×10^{-4} was used to develop the risk results in the table.

For the hypothetical HEPA filter fire accident scenario, the radioactive plume might cause contamination of the ground to a downwind distance of less than 0.06 mi (approximately 0.1 km) at the Naval Reactors Facility and the Idaho Chemical Processing Plant. This would yield a total area impacted by the accident of less than 0.5 acre (approximately 0.2 ha). The calculated downwind distance would be contained within the boundaries of INEL.

TABLE A.18 Estimated Health Risks from a HEPA Filter Fire at the Naval Reactors Facility or Idaho Chemical Processing Plant[a]

Site/ Individual	50% Meteorology Dose (rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Dose (rem)	95% Meteorology Latent Cancer Fatalities
NRF				
Worker	8.7×10^{-4}	3.5×10^{-7}	2.4×10^{-3}	9.6×10^{-7}
NPA	4.5×10^{-7}	2.2×10^{-10}	2.7×10^{-6}	1.4×10^{-9}
MEI	9.9×10^{-6}	5.0×10^{-9}	2.5×10^{-5}	1.3×10^{-8}
ICPP				
Worker	8.7×10^{-4}	3.5×10^{-7}	2.4×10^{-3}	9.6×10^{-7}
NPA	6.3×10^{-7}	3.2×10^{-10}	8.8×10^{-6}	4.4×10^{-9}
MEI	4.3×10^{-6}	2.1×10^{-9}	1.5×10^{-5}	7.4×10^{-9}

Population within 50-Mile Radius of Site	50% Meteorology Collective Dose (person-rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Collective Dose (person-rem)	95% Meteorology Latent Cancer Fatalities	95% Meteorology Annual Risk
NRF					
115,690	7.6×10^{-2}	3.8×10^{-5}	1.1×10^{-1}	5.3×10^{-5}	2.7 x 10^{-8}
ICPP					
120,003	7.7×10^{-2}	3.9×10^{-5}	1.1×10^{-1}	5.3×10^{-5}	2.7 x 10^{-8}

[a] Notation: ICPP = Idaho Chemical Processing Plant; MEI = individual at nearest site boundary; NPA = nearest public access individual; NRF = Naval Reactors Facility.

Minor Water Pool Leakage. In the hypothetical minor water pool leakage scenario, a minor leak develops in the water pool resulting in a gradual discharge to the environment. There is no danger of uncovering any spent nuclear fuel in the water pool, since the leak is so small that it is undetected and water level is maintained in the water pool. Since a strict accounting of water added to and removed from the water pool is maintained, the magnitude of this leak would be less than 4,400 gal/yr (approximately 16,600 L/yr). The 4,400 gal/yr (approximately 16,600 L/yr) value is the maximum amount of water which might leak out of the water pool before periodic review of the water balance would detect a leak. This leak rate is specifically evaluated for the Naval Reactors Facility and conservatively represents the leak rate at the Idaho Chemical Processing Plant.

There is no airborne release above normal levels in the hypothetical water pool leakage scenario. The radionuclide inventory in the leaking water is based on radioactivity analysis of the Expended Core Facility water pool water. The isotopes that were analyzed for but not detected could exist at the minimum detection limit.

TABLE A.19 Radionuclide Releases from a Water Pool Leakage Accident

Nuclide	Sample Results (μCi/mL)	10 CFR Part 20 Effluent Limit (μCi/mL)	Annual Releases (Ci/yr)
Tritium (H-3)	2.0×10^{-4}	1.0×10^{-3}	3.3×10^{-3}
Manganese-54	2.5×10^{-8}	3.0×10^{-5}	4.1×10^{-7}
Iron-55[a]	1.0×10^{-8}	1.0×10^{-4}	1.6×10^{-7}
Cobalt-58	7.0×10^{-8}	2.0×10^{-5}	1.1×10^{-6}
Cobalt-60	1.6×10^{-5}	3.0×10^{-6}	2.6×10^{-5}
Nickel-63	2.3×10^{-7}	1.0×10^{-4}	3.8×10^{-6}
Strontium-90	4.0×10^{-9}	5.0×10^{-7}	6.5×10^{-8}
Yttrium-90	4.0×10^{-9}	7.0×10^{-6}	6.5×10^{-8}
Iodine-129[a]	4.0×10^{-7}	2.0×10^{-7}	6.5×10^{-6}
Cesium-137	4.2×10^{-8}	1.0×10^{-6}	6.9×10^{-7}

[a] Iron-55 and iodine-129 were not detected in the Expended Core Facility water. The numbers quoted reflect the detection limit of the analysis.

It should be noted that the sample results for the water pool indicate that the nuclide levels are all below the Code of Federal Regulations limits for liquid effluent in 10 CFR Part 20 with the exception of cobalt-60. The level of iodine-129 used in the calculations was based on the minimum detection limit of the sample. This level exceeds the effluent limit; however, iodine-129 was not actually detected in the water sample. Since strontium-90 has comparable water solubility to iodine-129 and exists in spent nuclear fuel at about a factor of 1.0×10^6 higher than iodine-129, it is inferred from the detected level of strontium-90 that the actual level of iodine-129 is well below the 10 CFR Part 20 effluent limit.

The estimated health risks to the general population that might result from the hypothetical minor water pool leak at each location are presented summarized in Table A.20. The number of fatal cancers would be expected to occur over a 50-year period. The probability of a leak developing is 10^{-1} per year (DOE 1995; Volume 1, Appendix D, Part B, Section F.1.4.2.1.6.3).

TABLE A.20 Estimated Health Effects from Minor Water Pool Leakage at the Naval Reactors Facility or Idaho Chemical Processing Plant[a]

Location	Dose (rem)	Latent Cancer Fatalities	
NRF			
Worker	N/A	N/A	
NPA	1.6×10^{-13}	8.0×10^{-17}	
MEI	2.5×10^{-9}	1.3×10^{-12}	
ICPP			
Worker	N/A	N/A	
NPA	1.6×10^{-13}	8.0×10^{-17}	
MEI	2.5×10^{-9}	1.3×10^{-12}	
Population within 50-Mile Radius of Site	Collective Dose (person-rem)	Latent Cancer Fatalities	Annual Risk
NRF			
115,690	2.6×10^{-5}	1.3×10^{-8}	1.3×10^{-9}
ICPP			
120,003	2.7×10^{-5}	1.3×10^{-8}	1.3×10^{-9}

[a] Notation: ICPP = Idaho Chemical Processing Plant; MEI = individual at nearest site boundary; NPA = nearest public access; NRF = Naval Reactors Facility.

Dropped Fuel Unit. Loading of fuel into containers for storage or shipment to a repository would be done in the proposed Dry Cell Facility at the Expended Core Facility or at the Idaho Chemical Processing Plant. The conceptual method of such an operation involves bringing a container or cask in below the shielded cell and loading it remotely through a hole in the bottom of the cell. No heavy containers are brought into the shielded dry cell. An accident during loading of any container type that could result in a radiological release to the environment would be dropping of an unshielded fuel assembly during handling. This accident would be the same for loading operations for all container alternatives. No rupture of the fuel would occur due to the limited drop height and the robust nature of the Navy fuel designs. Some of the adherent activated corrosion products would be loosened from the surface of the fuel unit by the impact.

The development of the radioactive source term for the dropped fuel unit scenario is based on the following:

- The source term is based on best estimate spent nuclear fuel corrosion products.

- Ten percent of the original corrosion products associated with the single fuel unit with the largest inventory could be released into the dry cell atmosphere.

- The corrosion product inventory route to the environment would be through the dry cell HEPA filters over a 15 minute period.

- All products released to the environment, except carbon-14, would be reduced by a factor of 0.001 by the HEPA filters. The carbon-14 inventory is assumed to all be in the form of CO_2 and, therefore, would not be reduced by the filters.

- There would be no increase in direct radiation due to this accident.

- The following amounts of radionuclides could be released to the environment. This listing includes nuclides that result in at least 99% of the possible exposure.

Nuclide	Curies
Manganese-54	7.5×10^{-6}
Iron-55	2.2×10^{-4}
Iron-59	6.4×10^{-7}
Cobalt-58	4.2×10^{-8}
Cobalt-60	1.2×10^{-4}
Carbon-14	1.3×10^{-3}

The estimated health risks to the general population that might result from the hypothetical dropped fuel unit are presented in Table A.21. The number of latent cancer fatalities would be expected to occur over a 50-year period. The probability of a fuel unit drop accident with the release of radioactive corrosion products is based on the probability of a severe uncontrolled crane failure of 10^{-8} per lift. This is combined with a conservative estimate of 1,000 fuel unit lifts per year resulting in an annual accident probability of 10^{-5} per year. A value of 1×10^{-5} was used to develop the risk results in the table.

For the hypothetical dropped fuel unit accident scenario, the radioactive plume might cause contamination of the ground to a downwind distance of less than 0.06 mi (approximately 0.1 km). | This would yield a total area impacted by the accident of less than 0.5 acre (approximately 0.2 ha). | The calculated downwind distance would be contained within the boundaries of the INEL site.

TABLE A.21 Estimated Health Effects from a Dropped Fuel Unit in a Dry Cell Facility[a]

	50% Meteorology		95% Meteorology	
Individual	Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities
NRF				
Worker	2.9×10^{-5}	1.2×10^{-8}	8.0×10^{-5}	3.2×10^{-8}
NPA	5.3×10^{-9}	2.6×10^{-12}	9.0×10^{-8}	4.5×10^{-11}
MEI	3.0×10^{-7}	1.5×10^{-10}	7.9×10^{-7}	4.0×10^{-10}
ICPP				
Worker	2.9×10^{-5}	1.2×10^{-8}	8.0×10^{-5}	3.2×10^{-8}
NPA	7.4×10^{-9}	3.7×10^{-12}	2.9×10^{-7}	1.5×10^{-10}
MEI	1.3×10^{-7}	6.5×10^{-11}	4.7×10^{-7}	2.3×10^{-10}

	50% Meteorology		95% Meteorology		
Population within 50-Mile Radius of Site	Collective Dose (person-rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities	Annual Risk
NRF					
115,690	6.8×10^{-4}	3.4×10^{-7}	1.6×10^{-3}	8.1×10^{-7}	8.1×10^{-12}
ICPP					
120,003	6.9×10^{-4}	3.4×10^{-7}	1.6×10^{-3}	8.1×10^{-7}	8.1×10^{-12}

[a] Notation: MEI = individual at nearest site boundary; NPA = nearest public access individual; NRF = Naval Reactors Facility; ICPP = Idaho Chemical Processing Plant.

Dry Storage. Accidents during dry storage of naval spent nuclear fuel are considered for the Naval Reactors Facility, the Idaho Chemical Processing Plant and the Birch Creek Area storage site at INEL. The two hypothetical accident scenarios evaluated are the same as those evaluated in the Programmatic SNF and INEL EIS (DOE 1995; Volume 1, Appendix D, Section F.1.4.2.2).

Wind-Driven Projectile Impact into Storage Casks with Mechanical Damage. In the hypothetical projectile impact accident, it is assumed that no fuel damage would result from the impact. Dry storage containers could experience a major wind storm or tornado which could propel a large object into a storage container causing the container seal to be breached. Analysis of the M-140 container shows that it is strong enough to prevent crushing of the naval spent nuclear fuel and release of fission products. For other container types similar analyses have not been performed; however, the consequences due to damage from a wind-driven projectile are expected to be less than those presented for the Idaho Chemical Processing Plant hypothetical airplane crash accident scenario in the next section. If a canister or cask were dropped during handling operations during movement into or out of storage, it is expected that the consequences of such a scenario would be less than those presented for this hypothetical accident scenario.

Conditions used in developing the source term for the projectile impact scenario are as follows:

- The source term is based on best estimate spent nuclear fuel corrosion products.
- One percent of the original corrosion products associated with the fuel could be released from the cask to the atmosphere. This is based on experimental measurements of the fraction of corrosion products loosened from naval spent nuclear fuel by shock and vibration. It was assumed the container seal would be breached enough to allow some leakage even though analysis has shown that a wind-driven missile would not penetrate the container or damage the fuel inside. Only loose corrosion products would be available for release from the container, and any release from the container would have to occur via a convoluted path through the damaged seal.
- The release to the environment occurs at a constant rate over a 15-minute period.
- There is no increase in direct radiation due to this accident.
- The following amounts of radionuclides could be released to the environment. This listing includes nuclides that result in at least 99% of the possible exposure.

	Alternative/Curies		
Radionuclide	MPC	Small MPC and M-140	All Others
Cobalt-60	2.0×10^{-1}	1.3×10^{-1}	2.4×10^{-1}
Iron-55	3.7×10^{-1}	2.5×10^{-1}	4.4×10^{-1}
Cobalt-58	7.4×10^{-2}	5.0×10^{-2}	8.9×10^{-2}
Manganese-54	1.3×10^{-2}	8.4×10^{-3}	1.5×10^{-2}
Iron-59	1.1×10^{-3}	7.2×10^{-4}	1.3×10^{-3}

The estimated health risks to the general population that might result from the hypothetical wind-driven missile accident at each location are summarized in Tables A.20 through A.24. The number of fatal cancers would be expected to occur over a 50-year period. The probability of a wind-driven missile damaging a container is less than 10^{-5}, and a probability of 10^{-5} per year was used in the risk assessment (DOE 1995; Volume 1, Appendix D, Part B, Section F.1.4.2.2.1.3).

For the hypothetical wind-driven missile accident scenario, the radioactive plume might cause contamination of the ground to a downwind distance of less than 0.11 mi (approximately 0.18 km). This would yield a total area impacted by the accident of less than 1.4 acres (approximately 0.57 ha). The calculated downwind distance would be contained within the boundaries of INEL.

TABLE A.22 Estimated Health Risks from Dry Storage Mechanical Damage at INEL: Multi-Purpose Canister [a]

Site/ Individual	50% Meteorology Dose (rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Dose (rem)	95% Meteorology Latent Cancer Fatalities
NRF				
Worker	4.3×10^{-2}	1.7×10^{-5}	1.2×10^{-1}	4.8×10^{-5}
NPA	2.1×10^{-5}	1.1×10^{-8}	1.4×10^{-4}	7.0×10^{-8}
MEI	1.7×10^{-4}	8.5×10^{-8}	9.9×10^{-4}	5.0×10^{-7}
ICPP				
Worker	4.3×10^{-2}	1.7×10^{-5}	1.2×10^{-1}	4.8×10^{-5}
NPA	3.0×10^{-5}	1.5×10^{-8}	4.4×10^{-4}	2.2×10^{-7}
MEI	7.4×10^{-5}	3.7×10^{-8}	5.8×10^{-4}	2.9×10^{-7}
Birch Creek Area				
Worker	4.3×10^{-2}	1.7×10^{-5}	1.2×10^{-1}	1.8×10^{-5}
NPA	1.6×10^{-4}	7.8×10^{-8}	5.5×10^{-3}	2.8×10^{-6}
MEI	3.7×10^{-4}	1.8×10^{-7}	1.3×10^{-2}	6.5×10^{-6}

Population within 50-Mile Radius of Site	50% Meteorology Collective Dose (person-rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Collective Dose (person-rem)	95% Meteorology Latent Cancer Fatalities	95% Meteorology Annual Risk
NRF					
115,690	4.9×10^{-1}	2.5×10^{-4}	2.1	1.1×10^{-3}	1.1×10^{-8}
ICPP					
120,003	5.0×10^{-1}	2.5×10^{-4}	2.0	1.0×10^{-3}	1.0×10^{-8}
Birch Creek Area					
138,026[b]	3.5×10^{-1}	1.8×10^{-4}	1.8	8.8×10^{-4}	8.8×10^{-9}

[a] Notation: ICPP = Idaho Chemical Processing Plant; MEI = individual at nearest site boundary; NPA = nearest public access individual; NRF = Naval Reactors Facility.

[b] Test Area North population used for this hypothetical location.

TABLE A.23 Estimated Health Risks from Dry Storage Mechanical Damage at INEL: Small Multi-Purpose Canister and M-140 Cask[a]

Site/ Individual	50% Meteorology Dose (rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Dose (rem)	95% Meteorology Latent Cancer Fatalities
NRF				
Worker	2.9×10^{-2}	1.2×10^{-5}	8.0×10^{-2}	3.2×10^{-5}
NPA	1.4×10^{-5}	7.0×10^{-9}	9.0×10^{-5}	4.5×10^{-8}
MEI	1.1×10^{-4}	5.5×10^{-8}	6.6×10^{-4}	3.3×10^{-7}
ICPP				
Worker	2.9×10^{-2}	1.2×10^{-5}	8.0×10^{-2}	3.2×10^{-5}
NPA	2.0×10^{-5}	1.0×10^{-8}	2.9×10^{-4}	1.5×10^{-7}
MEI	4.9×10^{-5}	2.4×10^{-8}	3.9×10^{-4}	1.9×10^{-7}
Birch Creek Area				
Worker	2.9×10^{-2}	1.2×10^{-5}	8.0×10^{-2}	3.2×10^{-5}
NPA	1.0×10^{-4}	5.1×10^{-8}	3.6×10^{-3}	1.8×10^{-6}
MEI	2.4×10^{-4}	1.2×10^{-7}	8.4×10^{-3}	4.2×10^{-6}

Population within 50-Mile Radius of Site	50% Meteorology Collective Dose (person-rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Collective Dose (person-rem)	95% Meteorology Latent Cancer Fatalities	95% Meteorology Annual Risk
NRF					
115,690	3.3×10^{-1}	1.7×10^{-4}	1.4	7.0×10^{-4}	7.0×10^{-9}
ICPP					
120,003	3.3×10^{-1}	1.7×10^{-4}	1.4	7.0×10^{-4}	7.0×10^{-9}
Birch Creek Area					
138,026[b]	2.3×10^{-1}	1.2×10^{-4}	1.2	5.8×10^{-4}	5.8×10^{-9}

[a] Notation: ICPP = Idaho Chemical Processing Plant; MEI = individual at nearest site boundary; NPA = nearest public access individual; NRF = Naval Reactors Facility.

[b] Test Area North population used for this hypothetical location.

TABLE A.24 Estimated Health Risks from Dry Storage Mechanical Damage at INEL: High-Capacity M-140 Cask, Transportable Storage Cask, and Dual-Purpose Canister [a]

Site/ Individual	50% Meteorology Dose (rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Dose (rem)	95% Meteorology Latent Cancer Fatalities
NRF				
Worker	5.0×10^{-2}	2.0×10^{-5}	1.4×10^{-1}	5.6×10^{-5}
NPA	2.5×10^{-5}	1.3×10^{-8}	1.6×10^{-4}	8.0×10^{-8}
MEI	2.0×10^{-4}	1.0×10^{-7}	1.2×10^{-3}	6.0×10^{-7}
ICPP				
Worker	5.0×10^{-2}	2.0×10^{-5}	1.4×10^{-1}	5.6×10^{-5}
NPA	3.5×10^{-5}	1.7×10^{-8}	5.1×10^{-4}	2.6×10^{-7}
MEI	8.6×10^{-5}	4.3×10^{-8}	6.8×10^{-4}	3.4×10^{-7}
Birch Creek Area				
Worker	5.0×10^{-2}	2.0×10^{-5}	1.4×10^{-1}	5.6×10^{-5}
NPA	1.9×10^{-4}	9.3×10^{-8}	6.6×10^{-3}	3.3×10^{-6}
MEI	4.4×10^{-4}	2.2×10^{-7}	1.5×10^{-2}	7.7×10^{-6}

Population within 50-Mile Radius of Site	50% Meteorology Collective Dose (person-rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Collective Dose (person-rem)	95% Meteorology Latent Cancer Fatalities	95% Meteorology Annual Risk
NRF					
115,690	5.7×10^{-1}	2.9×10^{-4}	2.4	1.2×10^{-3}	1.2×10^{-8}
ICPP					
120,003	5.8×10^{-1}	2.9×10^{-4}	2.4	1.2×10^{-3}	1.2×10^{-8}
Birch Creek Area					
138,026[b]	4.2×10^{-1}	2.1×10^{-4}	2.1	1.1×10^{-3}	1.1×10^{-8}

[a] Notation: ICPP = Idaho Chemical Processing Plant; MEI = individual at nearest site boundary; NPA = nearest public access individual; NRF = Naval Reactors Facility.

[b] Test Area North population used for this hypothetical location.

Airplane Crash. A hypothetical aircraft accident scenario was developed. Based on the probability of occurrence, specific analyses were only performed for the Idaho Chemical Processing Plant. The accident is postulated to cause damage to a single container. This is based on the fact that containers currently used to ship naval spent nuclear fuel are very rugged. Due to the severity of the shock, the cask might be breached resulting in damage to the fuel. The severe mechanical shock results in the release of corrosion products to the environment. The release of fission products also occurs due to the impact and resultant fire. The fission product release factors are based on overheating testing performed on the naval fuel systems.

Conditions used in developing the source term for the airplane crash scenario are as follows:

- One percent of all of the fuel units stored inside the cask are damaged either by the impact or the resultant fire and those fission products are available for release.

- Of the available fission products, 100% of the noble gases, 3% of the halogens, 1.1% of the cesium, and 0.1% of the remaining solids are released to the environment.

- The release to the environment occurs at a constant rate over a 15-minute period.

- Ten percent of the original corrosion products from the fuel units are released from the cask to the atmosphere.

- The amounts of radionuclides that could be released to the environment are listed in Table A.25. This listing includes nuclides that result in at least 99% of the possible exposure.

TABLE A.25 Radionuclide Releases from a Dry Storage Airplane Crash Accident[a]

	Radionuclide Releases (Ci)			
Nuclide	MPC	Small MPC	M-140 Cask	High Capacity M-140 TSC and DPC
Strontium-90	7.9	4.1	4.9	7.3
Plutonium-241	8.4×10^{-2}	4.3×10^{-2}	5.9×10^{-2}	7.8×10^{-2}
Plutonium-238	2.4×10^{-1}	1.2×10^{-1}	1.5×10^{-1}	2.2×10^{-1}
Cesium-137	91	47	57	84
Cesium-134	71	37	37	66
Cerium-144	18	9.2	7.5	17
Barium-137m	86	44	54	79
Ruthenium-106	1.8	9.0×10^{-1}	7.4×10^{-1}	1.6

[a] Notation: DPC = dual-purpose canister; MPC = multi-purpose canister; TSC = transportable storage cask.

The estimated health risks to the general population that might result from the hypothetical airplane crash accident at each location are summarized in Table A.26. The number of fatal cancers would be expected to occur over a 50-year period. At NRF, the likelihood of occurrence is 5×10^{-8} per year based on a large storage array and the probability at the Idaho Chemical Processing Plant is 4 to 8 times larger (DOE 1995; Volume 1, Appendix D, Part B, Section F.3). The airplane crash probability is higher at the Idaho Chemical Processing Plant since low altitude testing of commercial jet airliners has been conducted near the National Oceanic and Atmospheric Administration tower, which is located about 1.5 miles from ICPP. A probability of 4×10^{-7} is used for the Idaho Chemical Processing Plant.

For the hypothetical airplane crash into a dry storage cask accident scenario, the radioactive plume might cause contamination of the ground to a downwind distance of approximately 2.2 mi (approximately 3.5 km). This would yield a total area impacted by the accident of about 629 acres (approximately 255 ha). The calculated downwind distance would be contained within the boundaries of INEL.

Unloading Operations. Accidents during unloading operations of naval spent nuclear fuel are considered at the hypothetical geologic repository site.

Mechanical Damage. The hypothetical mechanical damage accident at a geologic repository is the same as that discussed for dry storage, namely a wind-driven projectile.

The estimated health risks to the general population that might result from the hypothetical wind-driven projectile accident at the hypothetical geologic repository site are presented in Table A.27. The number of fatal cancers would be expected to occur over a 50-year period. Like the dry storage analysis, a probability of 10^{-5} per year was used in the risk assessment.

For the hypothetical mechanical damage accident scenario, the radioactive plume might result in contamination of the ground to a downwind distance of less than 0.11 mi (approximately 0.18 km). This would yield a total area impacted by the accident of less than 1.4 acres (approximately 0.57 ha). The calculated downwind distance would be contained within the boundaries of a geologic repository site.

Dropped Transfer Container. For the M-140 container alternatives, the naval spent nuclear fuel must be removed from the M-140 transportation casks and placed in an interim container at a repository surface facility. This interim container can then be accepted into the surface facility for subsequent transfer of the fuel to a disposal container. During this fuel movement sequence, it is postulated that the crane or rigging fails resulting in a dropped transfer container which contains a single naval spent nuclear fuel assembly. For all other alternatives, the surface facility will be designed to handle the shipping container, resulting in all fuel handling being conducted in a shielded, filtered facility. Therefore, this postulated accident applies to the M-140 alternatives only.

TABLE A.26 Estimated Health Risks from a Dry Storage Airplane Crash Accident at the Idaho Chemical Processing Plant [a]

Container Type/ Individual	50% Meteorology Dose (rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Dose (rem)	95% Meteorology Latent Cancer Fatalities
MPC				
Worker	120	9.5×10^{-2}	330	2.6×10^{-1}
NPA	8.2×10^{-2}	4.1×10^{-5}	1.6	7.9×10^{-4}
MEI	4.1×10^{-1}	2.1×10^{-4}	1.0	5.0×10^{-4}
Small MPC				
Worker	61	4.9×10^{-2}	170	1.4×10^{-1}
NPA	4.2×10^{-2}	2.1×10^{-5}	8.1×10^{-1}	4.0×10^{-4}
MEI	2.1×10^{-1}	1.1×10^{-4}	5.1×10^{-1}	2.6×10^{-4}
M-140 cask				
Worker	73	5.8×10^{-2}	200	$1.6 \text{ x } 10^{-1}$
NPA	5.0×10^{-2}	2.5×10^{-5}	9.6×10^{-1}	4.8×10^{-4}
MEI	2.5×10^{-1}	1.3×10^{-4}	6.0×10^{-1}	3.0×10^{-4}
TSC, DPC, and High-Capacity M-140				
Worker	110	8.8×10^{-2}	300	2.4×10^{-1}
NPA	7.6×10^{-2}	3.8×10^{-5}	1.5	7.3×10^{-4}
MEI	3.8×10^{-1}	1.9×10^{-4}	9.2×10^{-1}	4.6×10^{-4}

Container Type	50% Meteorology Collective Dose[b] (person-rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Collective Dose[b] (person-rem)	95% Meteorology Latent Cancer Fatalities	95% Meteorology Annual Risk
125-ton MPC	3.4×10^{3}	1.7	5.2×10^{3}	2.6	1.0×10^{-6}
75-ton MPC	1.7×10^{3}	8.6×10^{-1}	2.7×10^{3}	1.3	5.2×10^{-7}
M-140 cask	2.1×10^{3}	1.0	3.2×10^{3}	1.6	6.4×10^{-7}
TSC, DPC, and High-Capacity M-140	3.1×10^{3}	1.6	4.8×10^{3}	2.4	9.6×10^{-7}

[a] Notation: DPC = dual-purpose canisters; MPC = multi-purpose canister; MEI = individual at nearest site boundary; NPA = nearest public access individual; TSC = transportable storage cask.

[b] Population within a 50-mi (approximately 80-km) radius of the site = 120,003.

TABLE A.27 Estimated Health Effects from a Mechanical Damage (Wind-Driven Projectile) Accident during Unloading Operations at a Geologic Repository Site[a]

Container Type/ Individual	50% Meteorology Dose (rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Dose (rem)	95% Meteorology Latent Cancer Fatalities
MPC				
Worker	1.8×10^{-2}	7.2×10^{-6}	2.9×10^{-1}	1.2×10^{-4}
MEI	5.2×10^{-5}	2.6×10^{-8}	1.7×10^{-3}	8.7×10^{-7}
Small MPC and M-140				
Worker	1.2×10^{-2}	4.8×10^{-6}	2.0×10^{-1}	7.8×10^{-5}
MEI	3.5×10^{-5}	1.7×10^{-8}	1.2×10^{-3}	5.8×10^{-7}
High-capacity M-140, TSC, and DPC				
Worker	2.2×10^{-2}	8.6×10^{-6}	3.5×10^{-1}	1.4×10^{-4}
MEI	6.2×10^{-5}	3.1×10^{-8}	2.1×10^{-3}	1.0×10^{-6}

Container Type	50% Meteorology Collective Dose[b] (person-rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Collective Dose[b] (person-rem)	95% Meteorology Latent Cancer Fatalities	95% Meteorology Annual Risk
MPC	6.3×10^{-2}	3.1×10^{-5}	3.0	1.5×10^{-3}	1.5×10^{-8}
Small MPC and M-140	4.2×10^{-2}	2.1×10^{-5}	2.0	1.0×10^{-3}	1.0×10^{-8}
High-capacity M-140, TSC, and DPC	7.5×10^{-2}	3.7×10^{-5}	3.6	1.8×10^{-3}	1.8×10^{-8}

[a] Notation: DPC = dual-purpose canister; MEI = individual at nearest site boundary; MPC = multi-purpose canister; TSC = transportable storage cask.
[b] Population within 50-mi (approximately 80-km) radius of the site = 352,157.

The development of the radioactive source term for the dropped transfer container scenario is based on the following:

- The source term is based on best estimate spent nuclear fuel corrosion products.

- One percent of the original corrosion products associated with the one fuel assembly could be released from the transfer container to the atmosphere. This is based on experimental measurements of the fraction of corrosion products loosened from naval spent nuclear fuel by shock and vibration. It is also postulated that the container door seal fails and leakage can occur.

- The transfer of fuel from the M-140 is postulated to occur in a unfiltered area and no reduction is taken for filtering.

- The release to the environment occurs at a constant rate over a 1 hour period which is the accident default time in GENII.

- There is no increase in direct radiation due to this accident.

- The following amounts of radionuclides could be released to the environment. This listing includes nuclides that result in at least 99% of the possible exposure.

Nuclide	Curies
Manganese-54	7.51×10^{-4}
Iron-55	2.21×10^{-2}
Iron-59	6.38×10^{-5}
Cobalt-58	4.43×10^{-3}
Cobalt-60	1.20×10^{-2}

The estimated health risks to the general population that might result from the hypothetical dropped transfer container at a geologic repository are presented in Table A.28. The number of latent cancer fatalities would be expected to occur over a 50-year period. This accident would not be applicable to the alternatives making use of multi-purpose canisters because the containers would not be opened during the unloading operations. The probability of a transfer container drop accident with the release of radioactive corrosion products is based on the probability of a severe uncontrolled crane failure of 10^{-8} per lift. This is combined with a conservative estimate of 1,000 lifts per year unloading M-140 or modified M-140 containers at a repository surface facility to obtain an annual accident probability of 10^{-5} per year. An annual probability of occurrence of 1×10^{-5} was used to develop the risk results in the table.

For the hypothetical dropped transfer container accident scenario, the radioactive plume might cause contamination of the ground to a downwind distance of less than 0.06 mi (approximately 0.1 km). This would yield a total area impacted by the accident of less than 0.5 acre (approximately 0.2 ha). The calculated downwind distance would be contained within the boundaries of a geologic repository site.

TABLE A.28 Estimated Health Effects from a Dropped Transfer Container during Unloading Operations at a Geologic Repository Site[a]

Site/ Individual	50% Meteorology Dose (rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Dose (rem)	95% Meteorology Latent Cancer Fatalities
Worker	1.1×10^{-3}	4.3×10^{-7}	1.7×10^{-2}	7.0×10^{-6}
MEI	3.1×10^{-6}	1.6×10^{-9}	1.0×10^{-4}	5.2×10^{-8}

Population within 50-Mile Radius of Site	50% Meteorology Collective Dose (person-rem)	50% Meteorology Latent Cancer Fatalities	95% Meteorology Collective Dose (person-rem)	95% Meteorology Latent Cancer Fatalities	95% Meteorology Annual Risk
352,157	3.7×10^{-3}	1.9×10^{-6}	1.8×10^{-1}	9.0×10^{-5}	9.0×10^{-10}

[a] Notation: MEI = individual at nearest site boundary.

A.2.6 Impact of Accidents on Close-In Workers

An evaluation has been made of the impact to close-in workers involved in naval spent nuclear fuel operations that might occur due to the various radiological accidents postulated. This evaluation focused on the radiological consequences of the accident. Clearly, a limited number of fatalities may occur which are related to spent nuclear fuel handling only in a secondary manner; i.e., the worker who happened to be in the facility may be killed due to a plane crash, seismic event, crane failure, etc. These secondary effects are not discussed in the following. Rather, only radiological consequences are considered.

Drained Water Pool Due to Seismic Event. No fatalities to workers close to the scene of the accident would be expected due to radiological consequences. This is because drainage of the large amount of water in a water pool is expected to take several days which provides ample time for workers to leave the facility.

Accidental Criticality in a Water Pool Due to Human Error. It is likely no fatalities would occur. At most, two or three workers may receive some appreciable radiation exposure. This is because the criticality would occur under approximately 20 ft (approximately 6.1 m) of water. Shielding by the water would be sufficient to prevent exposure of nearby workers. Expulsion of a cone of water above the criticality might lead to significant exposure to any workers who were directly above the location of the criticality.

Mechanical Damage to Fuel in a Water Pool Due to Operator Error or Crane Failure. No fatalities to workers would be expected from radiological consequences. This is because the release of the source term is under water. Attenuation by the water would occur for most products, but release of noble gases would cause a direct radiation exposure to workers in the area. Upon releases from the surface of the water pool, radiation alarms would sound requiring evacuation of nearby workers. Timely evacuation would prevent substantial radiation exposure.

Airplane Crash into Water Pool. No fatalities to workers would be expected from radiological consequences. This is because any release of radioactive products would be underwater and radiation alarms would sound requiring evacuation of nearby workers. Timely evacuation would prevent substantial radiation exposure.

HEPA Filter Fire. No fatalities would be expected among nearby workers from the radiological consequences of a fire in a HEPA filter. This is because HEPA filters are not located in an area where workers are likely to be working. In addition, the release of radioactivity involved in a HEPA filter fire is not large.

Small Leaks from Water Pools. No fatalities are expected among nearby workers from the radiological consequences of a small leak from a water pool. The leak would be expected to be into the ground through the water pathway. Drinking water supplies would not be immediately impacted. In addition, the typical concentration of radioactivity in the water is low.

Dropped Fuel Unit. No fatalities would be expected among nearby workers from the radiological consequences of a dropped fuel unit in the Dry Cell Facility. The drop would occur in a shielded, filtered cell which provides protection to the nearby workers.

Wind-Driven Projectile Impact on Storage Casks. It is likely there would be no fatalities to workers from radiological consequences. This is because there usually would be no nearby workers except for brief periods when a container is being placed in the dry storage array. Since a wind-driven missile is not expected to penetrate a dry storage container, direct radiation exposures even to nearby workers would not be expected. The container seal could be breached and some airborne products released. At most, two or three nearby workers may receive some radiation exposure from inhalation of airborne radioactivity. These same consequences also apply to this hypothetical accident should it occur during unloading operations.

Airplane Crash into Dry Storage. It is not likely that any fatalities would occur to nearby workers due to the radiological consequences of this accident. Workers are usually not in the dry storage array except when a container is being placed into the array. At most, two or three nearby workers might receive significant radiation exposure from inhalation of airborne radioactivity since the container seal may be breached. The low probability of the airplane crash itself, coupled with the probability that workers would be close enough to be affected, coupled with the probability that the wind would be blowing in the direction of the workers, makes it very unlikely that any worker would receive substantial radiation exposure.

Dropped Transfer Container. It is likely there would be no fatalities to workers from radiological consequences. At most, two or three nearby workers may receive some radiation exposure from inhalation of airborne radioactivity.

A.2.7 Analysis of Uncertainties

An extensive discussion of uncertainty analysis related to this Environmental Impact Statement can be found in the Programmatic SNF and INEL EIS (DOE 1995; Volume 1, Appendix D, Attachment F, Section F.1.5). In summary, the calculations in this EIS have been performed in such a way that the estimates of risk provided are unlikely to be exceeded during either normal operations or in the event of an accident. For routine operations, the results of monitoring of actual operations provide clearly realistic source terms, which, when combined with conservative estimates of the effects of radiation, produce estimates of risk which are very unlikely to be exceeded. The effects for all alternatives have been calculated using the same source terms and other factors, so this EIS provides an appropriate means of comparing potential impacts on human health and the environment.

The analyses of hypothetical accidents provide more opportunities for uncertainty, primarily because the calculations must be based on sequences of events and models of effects which have not occurred. In this appendix, the goal in selecting the hypothetical accidents analyzed has been to evaluate events which would produce effects which would be as severe or more severe than any other accidents which might reasonably be postulated. The models have attempted to provide estimates of the probabilities, source terms, pathways for dispersion and exposure, and the effects on human health and the environment which are as realistic as possible. However, in many cases, the very low probability of the accidents postulated has required the use of models or values for input which produce estimates of consequences and risks which are higher than would actually occur because of the desire to provide results which will not be exceeded. In summary, the risks presented in this appendix are believed to be at least 10 to 100 times larger than what would actually occur.

The use of conservative analyses is not an important problem or disadvantage in this EIS since all of the alternatives have been evaluated using the same methods and data, allowing a fair comparison of all of the alternatives on the same basis. Furthermore, even using these conservative analytical methods, the risks for all of the alternatives are small, which greatly reduces the significance of any uncertainty analysis parameters.

A.3 Toxic Chemical Issues Associated with Naval Spent Nuclear Fuel Loading, Storage, and Unloading

An evaluation of the Expended Core Facility normal operations and hypothetical accident scenarios which could result in toxic chemical releases was performed (DOE 1995; Volume 1, Appendix D, Part B, Section F.2). The results for normal operations showed that no ambient air quality standards would be exceeded. For hypothetical accident scenarios, the evaluations showed that no member of the general public near INEL or a geologic repository would exceed Emergency Response Planning Guide-1 (ERPG-1) levels except for a sulfuric acid spill and fire scenario at a geologic repository, where the potential exposure to the maximally exposed offsite individual is greater than ERPG-1 levels but less than ERPG-2 levels under 95% meteorological conditions.

A.4 Aircraft Crash Probabilities

The probability of an airplane crashing into a fuel storage area or a fuel loading or unloading facility was evaluated (DOE 1995; Volume 1, Appendix D, Part B, Section F.3). An airplane crash into these facilities is of concern since it might result in the release of corrosion products from the stored fuel or the release of radioactive fission products from the fuel. The method outlined in "A Methodology for Calculation of the Probability of Crash of an Aircraft into Structures in Weapon Storage Areas" (Sandia 1983) was used to predict the crash probabilities. This calculation methodology takes into consideration the crash probabilities associated with landing and takeoff operations at nearby airports and crashes during in-flight operations.

The aircraft crash probability analysis is based on the examination of large civilian aircraft and military aircraft crossing the space within a 10-mi (approximately 16-km) radius of each site. The crash probability of general aviation aircraft is not included in this assessment since aircraft of this type generally do not possess sufficient mass or attain sufficiently high velocities to produce a serious radiological threat in the event that they crash into a fuel storage area or a fuel examination facility. Further, the crash probability contribution due to air travel beyond 10 mi (approximately 16 km) was determined to be very small based on the models and conditions used in this analysis, and therefore has been omitted.

A.5 Fugitive Dust

An evaluation of fugitive dust emissions that could be generated during the construction of a large laboratory facility like the Expended Core Facility was performed (DOE 1995; Volume 1, Appendix D, Part B, Section F.4). Since it was determined that the release of fugitive dust would not result in any adverse effects for this large spent nuclear fuel handling, examination, and shipping facility, it can be concluded that the construction of a minor addition to an Expended Core Facility type of facility would also result in no adverse impacts.

A.6 Occupational Accidents

Occupational accidents can occur in the workplace during the construction or operation of any industrial facility. In order to assess the possible extent of occupational accidents during construction and nonconstruction operations at naval spent nuclear fuel facilities, projections of the number of fatalities and injuries or illnesses were made (DOE 1995; Volume 1, Appendix D, Part B, Section F.5). The projections are based on average occupational fatality and injury incidence rate data for U.S. Department of Energy operations and their contractors (DOE 1993a). The results of all calculations show that the number of fatalities and injuries or illnesses for construction activities and storage and examination operations would be low.

APPENDIX B
DETAILED EVALUATION OF THE RADIOLOGICAL AND NONRADIOLOGICAL RISKS ASSOCIATED WITH TRANSPORTATION OF NAVAL SPENT NUCLEAR FUEL

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DETAILED EVALUATION OF THE RADIOLOGICAL AND NONRADIOLOGICAL RISKS ASSOCIATED WITH TRANSPORTATION OF NAVAL SPENT NUCLEAR FUEL

B.1 Background

A range of routes to a repository or centralized interim storage site is used for the transportation analysis in this EIS in order to determine whether different routing characteristics, such as distance or differences in population distribution, would affect the comparison of the alternative container types. Since no repository or centralized interim storage site has yet been selected, the transportation routing in this EIS uses a site being evaluated by the Department of Energy pursuant to the Nuclear Waste Policy Act as the destination point for naval spent nuclear fuel shipments. For the sake of comparing a reasonable range of alternatives the current regulations have been applied conservatively in the EIS transportation analysis.

Specific transportation routes have not been evaluated for shipment of naval spent nuclear fuel to a repository or centralized interim storage site because that will be the subject of the site-specific EIS for the particular facility. Transportation of naval spent nuclear fuel to a repository or centralized interim storage site will be addressed in the repository EIS analysis. The Navy will participate and contribute to that EIS, as appropriate. This participation will include, at a minimum, the contribution of naval spent nuclear fuel to the cumulative impact for all of the spent nuclear fuel shipments to the designated repository.

The transportation risk assessment of naval spent nuclear fuel covered in this section is limited to shipments from the Expended Core Facility, the Idaho Chemical Processing Plant, the Birch Creek Area, or the Lemhi Range Area (all located at the Idaho National Engineering Laboratory [INEL]), to a centralized interim storage site or a geologic repository. The Birch Creek and Lemhi Range Areas may not directly overlie the Snake River Plain Aquifer. The Yucca Mountain site, currently being characterized under the Nuclear Waste Policy Act, has been used as the reference destination for all shipments for analytical purposes. These shipments are planned to begin around the year 2010 and would be completed in 2035.

The shipments would be made in one of the alternative container systems evaluated in this EIS: a multi-purpose canister (the conceptual design proposed by TRW [1993] is used as an example), the standard M-140 cask (Current Technology), a high-capacity M-140 (Current Technology/Rail), a transportable storage cask (the NAC design is used as an example), a dual-purpose canister (the NUHOMS-MP187® is used as an example), or the small multi-purpose canister. Typical surface ship and submarine assemblies have been selected as representative naval fuel types in this analysis. The relative container loadings for movement from INEL to a centralized interim storage site or a geologic repository are provided in Table B.1.

TABLE B.1 Estimated Container Capacity for Naval Spent Nuclear Fuel Cargo Relative to the Multi-Purpose Canister

Container Type	Estimated Relative Container Capacity	
	Submarine	Surface Ship
Multi-Purpose Canister	1.0	1.0
No-Action Alternative	0.60	0.57
Current Technology/Rail	0.67	0.71
Transportable Storage Cask	1.2	0.64
Dual-Purpose Canister	1.1	1.0
Small Multi-Purpose Canister	0.57	0.57

Based on the projected fuel inventory at the Expended Core Facility and the Idaho Chemical Processing Plant for the time period between 2010 and 2035, 300 to 500 shipments of naval spent nuclear fuel from INEL to a centralized interim storage site or geologic repository are expected. Table B.2 provides a summary of estimated total shipments, depending on which container is employed. Since special case low-level radioactive waste might be shipped in the same containers, the estimated number of waste shipments is also provided in Table B.2.

TABLE B.2 Estimated Total Number of Shipments from INEL to a Centralized Interim Storage Site or a Geologic Repository for Each Type of Container

Alternative	Estimated Number of Naval SNF Shipments	Estimated Number of SCW Shipments	Total Estimated Number of Shipments
Multi-Purpose Canister	300	60	360
No-Action	425	55	480
Current Technology/Rail	325	55	380
Transportable Storage Cask	325	45	370
Dual-Purpose Canister	300	45	345
Small Multi-Purpose Canister	500	85	585

Notation: SNF = spent nuclear fuel; SCW = special case waste

B.2 General Descriptions

B.2.1 Spent Nuclear Fuel Shipping Containers

In addition to a multi-purpose canister, a small multi-purpose canister, the NAC-STC, and the NUHOMS-MP187®, naval spent nuclear fuel can be shipped in the M-140 or the high-capacity M-140 which are transported by railcars used only for this purpose as part of general-use freight trains. A brief description of the M-140 and the high capacity M-140 follows.

M-140 Transportation Cask. The M-140 transportation cask is a large, stainless steel shipping container that is transported in the vertical position on a specially designed well-type railcar (Figure B.1). The major components of the M-140 transportation cask include the shielded container, closure head, and protective dome. Assembly holders are installed inside the container to hold the irradiated fuel assemblies in place and can be modified to accept different sized fuel assemblies. The container is shipped dry with the exception of a small amount of residual water. Cooling fins on the outside of the container are designed to dissipate the heat generated by the fuel.

The M-140 transportation cask and rail car weigh approximately 190 tons (172,000 kg) in the loaded condition. The container is approximately 16 ft (5 m) tall with a maximum outer diameter of 10.5 ft (approximately 3 m). The container body is made from stainless steel forgings with 14-in. (approximately 36-cm) thick walls and a 12-in. (approximately 31-cm) thick bottom. The closure head and protective dome have a total thickness of 17.5 in. (approximately 45 cm) of stainless steel.

High-Capacity M-140 Transportation Cask. The high-capacity M-140 transportation cask would be the same as the standard M-140 but would have a basket that holds more assemblies.

B.2.2 Shipping Container Design Requirements

The M-140 transportation cask has been designed and built to meet the regulations specified in 49 CFR Part 173, entitled "Shippers — General Requirements for Shipments and Packagings." The M-140 transportation cask also meets the requirements of 10 CFR Part 71, entitled "Packaging of Radioactive Material for Transportation and Transportation of Radioactive Material Under Certain Conditions." These regulations require the shipping container to meet specific criteria under normal transport and accident conditions. The shipping container must be evaluated under free drop, puncture, heat, cold, pressure, water spray, and vibration for normal conditions and a series of severe hypothetical accident conditions, with the results compared against the criteria provided in 10 CFR Part 71.

The M-140 transportation cask has undergone rigorous engineering evaluations to assure compliance with 49 CFR Part 173 and 10 CFR Part 71 requirements. In addition, actual scale model or mock-up tests have been performed to verify selected engineering evaluations. This compliance has been certified by the DOE and Nuclear Regulatory Commission. All container alternatives considered in this EIS would be designed and built to meet the same design criteria when loaded with naval spent nuclear fuel.

FIGURE B.1 M-140 Transportation Cask Mounted on Railcar

B.3 Technical Approach — General

Several computer codes were used to assess the radiological risks associated with the transportation of naval spent nuclear fuel. Specifically, the RADTRAN 4 risk analysis model, developed by Sandia National Laboratories (Neuhauser and Kanipe 1992), was used to calculate the general population and transportation crew (occupational) radiological risks associated with the transportation of radioactive materials. This computer code was used extensively in the incident-free and accident risk assessments. In some cases, other methods were more appropriate than the RADTRAN 4 computer code for naval spent nuclear fuel. In these cases, other calculational models were used and are specifically identified.

The RISKIND computer code, developed by Argonne National Laboratory (Yuan et al. 1993), also specifically analyzes radiological consequences and health risks to individuals from exposure associated with transportation. A version of RISKIND which accepts fuel-specific isotopes was found to be the best code for calculation of the maximally exposed individual and general population maximum consequences for the accident scenario and was used for that purpose.

Several other computer codes were used to provide input for the RADTRAN 4 and RISKIND computer codes. The codes include INTERLINE, SPAN 4, and ORIGEN 2. A description of each computer code and how the code was used is provided below.

The INTERLINE computer code, developed by Oak Ridge National Laboratory (Johnson et al. 1993), was used to evaluate the rail routes.

The SPAN 4 computer code (Wallace 1972) was used to perform gamma exposure rate calculations for the M-140 to assess the effect of increased distance from the source on dose. SPAN 4 was developed by the Bettis Atomic Power Laboratory specifically for naval spent nuclear fuel.

ORIGEN 2, a computer code developed by Oak Ridge National Laboratory (Croff 1980), was used to simulate radiation and decay of materials that are irradiated in a nuclear reactor. The ORIGEN 2 computer code is widely accepted in the public domain and was used to independently confirm the fission product inventory for naval fuel developed using the standard Bettis Atomic Power Laboratory method. In addition, the standard Bettis Atomic Power Laboratory method has been used in Safety Analysis Reports for Packaging, and reviewed and accepted by the Nuclear Regulatory Commission.

The radiological risks associated with the transportation of spent nuclear fuel have been assessed for the general population, transportation workers (occupational), and hypothetical maximally exposed individuals under incident-free and accident conditions. The maximum consequences of the most severe hypothetical accident that is reasonably foreseeable are also provided.

The radiological impacts are first expressed as the calculated total dose for the exposed population, occupational workers, and the maximally exposed individuals. The calculated total doses are then used to estimate the hypothetical health effects, expressed in terms of estimated cancer fatalities. The health risk conversion factors used in this evaluation are taken from Publication 60 of the International Commission on Radiological Protection (ICRP 1991), which specifies 0.0005 latent fatal cancer cases per person-rem for members of the public and 0.0004 latent fatal cancer cases per person-rem for workers.

The numerical estimates of cancer deaths and health detriment were obtained by the practice of linear extrapolation from the nominal risk estimate of 10 rad, assuming the same relationship between radiation exposure and health effects down to zero exposure. Other methods of extrapolation to the low-dose region could yield higher or lower numerical estimates of cancer deaths. Studies of human populations exposed at low doses are inadequate to demonstrate the actual level of risk. There is scientific uncertainty about cancer risk in the low-dose region below the range of epidemiologic observation, and the possibility of no risk cannot be excluded (Committee on Interagency Radiation Research and Policy Coordination 1992). In this appendix, the doses have been provided (in all cases) to allow independent evaluation using any relation between exposure and health effects.

Nonradiological risks related to the transportation of naval spent nuclear fuel are also estimated. The nonradiological risks (fatalities) are the result of vehicle exhaust emission for incident-free transportation and transportation accidents for the accident risk evaluation. The nonradiological risks associated with shipments include a return trip for the transport vehicle. Each shipment is assumed to transport three shipping containers per train. Risk factors for vehicle exhaust emissions and accident fatality rates were obtained from "Non-Radiological Impacts of Transporting Radioactive Material" (Rao et al. 1982) and "Longitudinal Review of State-Level Accident Statistics for Carriers of Interstate Freight" (Saricks and Kvitek 1994), respectively.

B.3.1 Technical Approach for the Assessment of Incident-Free Transportation

General Population and Occupational Dose. For incident-free transportation of naval spent nuclear fuel, the RADTRAN 4 computer code was used to calculate the radiological dose for the general population and occupational dose.

Included in the RADTRAN 4 computer code incident-free risk calculations for transport are models describing (1) doses to persons (e.g., residents) adjacent to the transport route (off-link doses), (2) doses to persons (e.g., passengers on passing trains or vehicles) sharing the transport route (on-link doses), (3) doses to persons at stops (e.g., residents or rail crew not directly involved with the shipment), and (4) doses to transportation crew members (occupational). Dose to handlers at INEL and a centralized interim storage site or repository was not considered to be part of the transportation risk analysis and is analyzed in Appendix A. The doses calculated for the first three groups were added together to estimate the general population dose estimates; the dose calculated for the fourth group (crew exposure) is the occupational dose. For rail transport, RADTRAN 4 assumes that crew dose is from exposure during periods of package inspections and is negligible during the transit time due to relatively long separation distances and massive shielding of the intervening structure.

Maximally Exposed Individual. The maximum possible radiological dose to an individual for the routine transport of naval spent nuclear fuel was estimated for transportation workers, as well as members of the general population. For rail shipments, the four individual members of the general population evaluation were: (1) a railyard worker who might be working at a distance of approximately 32.8 ft (10 m) from the shipping container for 2 hours, (2) a resident who might live approximately 98.4 ft (30 m) from the rail line where the shipping container was being transported, (3) a resident who could be living approximately 656 ft (200 m) from a rail stop where the shipping container was sitting for 20 hours, and (4) a person stopped next to a loaded transportation cask on a railcar at a distance of approximately 19.8 ft (6 m) for one hour. The crew members were used to represent the category of transportation workers (occupational). The crew members were postulated to be the same individuals for all shipments in order to conservatively estimate doses and effects.

For predicting radiological doses to persons at a fixed distance (the maximally exposed individual) from the package during a stop, the following formula was used. Since no credit is provided for shielding, actual doses would be lower than the calculated doses.

Doses to a person at a fixed distance from the container:

$$E = T \times K \times TI/D^2 \qquad \text{(B.1)}$$

where:

E = dose

T = total exposure time

K = shipment external dose rate to exposure rate conversion factor based on package size

TI = shipment external dose rate, dose rate at approximately 3.3 ft (1 m) from the package surface

D = average distance from the center of the container to the exposed person.

The dose to individuals at a fixed distance from the route along which the shipment is being transported was calculated using the following formula for a moving radiation source traveling with a fixed velocity, V. Since no credit is provided for shielding, actual doses would be lower than the calculated doses. All other terms are the same as described for Equation B.1.

$$E = (\pi \times K \times TI) / (V \times D) \qquad \text{(B.2)}$$

B.3.2 Technical Approach for Transportation Accidents

Analytical Approaches. Two separate analytical approaches to transportation accidents are used, one is a probabilistic assessment of impacts to human health and the environment and the other is a deterministic estimate of maximum consequences of a severe hypothetical transportation accident. The results of both analytical approaches have been used for the comparison of alternatives.

General Population Accident Risk. The RADTRAN 4 computer code was used to calculate the radiological risk to the general population under accident conditions where risk includes the probability of occurrence. In the accident situation, the transportation crew dose (occupational) is considered to be part of the general population. The RADTRAN 4 computer code evaluates six pathways for radiation doses resulting from an accident. The six potential pathways are:

- Direct radiation dose from the damaged container;

- Inhalation dose from the plume of radioactive material released from the damaged container;

- Direct radiation dose from immersion in the plume of radioactive material released from the damaged container;

- Direct radiation dose from ground deposition of the radioactive material released from the damaged container;

- Inhalation dose from resuspension of the radioactive material deposited on the ground; and

- Ingestion dose from food products grown on the soil contaminated by ground deposition of radioactive material released from the damaged container.

For each pathway, a specific formula is used to determine an estimate of the radiological risk, expressed in dose, from that particular pathway with the total radiation dose equal to the sum of the dose for each pathway. The total accident radiation dose accounts for the probability of an accident occurring and the probability of an accident of a particular severity. It should be noted that all consequences are included in the risk assessment, regardless of the probability. The general equation for the population dose from all pathways is:

$$D_R = \sum_{c,r} (N_c \times L_r \times P_r \times \sum_{i,j,k} (P_j \times RF_j \times D_{i,j,k})) \qquad \text{(B.3)}$$

where:

D_R = population dose from the accident

N_c = number of naval spent nuclear fuel containers shipped of fuel type c

L_r = shipment distance

P_r = probability of a traffic accident per unit distance

P_j = probability of occurrence of accident severity category j

RF_j = fraction of curies released from shipping container by severity category j

$D_{i,j,k}$ = radiation dose resulting from accident severity category j through pathway I in population density zone k.

The accident risk evaluation was performed using neutral and stable atmospheric conditions (Pasquill Stability Classes D and F, respectively). The neutral atmospheric condition (Class D) results provide a best estimate of the risk. Stable atmospheric conditions (Class F) resulted in values approximately twice the neutral conditions, ignoring the lower probability of occurrence.

Maximum Consequence of an Accident. In addition to the estimation of the radiological risk of an accident described above, an evaluation of the consequences of an accident of the highest severity that is reasonably foreseeable was performed. The consequences, expressed as radiological dose, were calculated for the maximally exposed individual and the general population. Doses to the general population were calculated for each of the three population density regions (rural, suburban, and urban). The maximally exposed individual was assumed to be in the population area which resulted in the highest dose.

The RISKIND computer code, modified by its authors to accept the fission product inventory unique to naval spent nuclear fuel, was used to calculate the maximum consequences. The pathways evaluated by RISKIND are identical to those used in the RADTRAN 4 computer code for the risk evaluation.

The maximum consequence evaluation presents the consequences for accidents which have a probability of greater than 1×10^{-7} per year. Accidents with a probability of occurrence of less than 1×10^{-7} were not analyzed in the maximum consequence evaluation.

To determine the overall probabilities, the following conditions had to be determined:

the probability of an accident,
the fraction of travel in each population area,
the probability of the meteorological conditions, and
the probability of the consequences.

As described later in Section B.5, a study performed by Lawrence Livermore National Laboratory entitled "Shipping Container Response to Severe Highway and Railway Accident Conditions" (NRC 1987) grouped accidents into categories by strain and container mid-wall temperatures and calculated the probabilities of accidents of each category. Section B.5 also describes the consequences associated with each accident category for the naval spent nuclear fuel. The probabilities were summed for the categories which have the same consequences.

The probability of the accident was calculated by multiplying the national average rail accident rate times the total distance traveled times the number of shipments per year. The total number of containers shipped from INEL to a centralized interim storage site or a geologic repository is estimated to be 300 to 500 (360 to 585 for special case waste and naval spent nuclear fuel together) depending on the shipping container and fuel type. Table B.3 provides a proposed shipping schedule by year, although accident probability was based on the total number of container shipments. Based on past experience at Expended Core Facility and Idaho Chemical Processing Plant, one container shipment per month is reasonable and Table B.3 implies that an average of about two containers per month or fewer (300 to 500 shipments between 2010 and 2035) would be made during the periods of peak shipments.

For the purpose of analysis, Table B.3 presents a schedule of shipments of naval spent nuclear fuel (a subsequent Table B.4 includes special case waste as well as naval spent nuclear fuel). Table B.3 is consistent with the expectation that naval fuel will be among the earliest placed in the centralized interim storage site or geologic repository. While this shipment schedule was used as the basis for the transportation analysis, there would be little difference in impacts if the schedule were accelerated or delayed, taking into account that spent nuclear fuel from nuclear powered warships cannot be shipped until the vessels are refueled or defueled.

TABLE B.3 Naval Spent Nuclear Fuel Containers Shipped to a Centralized Interim Storage Site or a Geologic Repository, 2010 to 2035[a,b]

Year	MPC	No-Action	Current Technology/Rail	Transportable Storage Cask	Dual-Purpose Canister	Small MPC
2010	1	1	1	1	1	1
2011	1	2	1	1	1	3
2012	3	4	2	2	3	5
2013	6	7	4	4	6	8
2014	8	8	6	6	8	13
2015	9	10	8	8	9	15
2016	10	12	9	9	10	17
2017	11	15	11	11	11	19
2018	12	17	13	13	12	21
2019	14	19	15	15	14	23
2020	15	22	17	17	15	25
2021	15	22	17	17	15	25
2022	15	22	17	17	15	25
2023	15	22	17	17	15	25
2024	15	22	17	17	15	25
2025	15	22	17	17	15	25
2026	15	22	17	17	15	25
2027	15	22	17	17	15	25
2028	15	22	17	17	15	25
2029	15	22	17	17	15	25
2030	15	22	17	17	15	25
2031	15	22	17	17	15	25
2032	15	22	17	17	15	25
2033	15	22	17	17	15	25
2034	15	22	17	17	15	25
2035	0	0	0	0	0	0
TOTAL	300	425	325	325	300	500

[a] Table is not additive across rows. Each column represents the total shipments for the year depending on the alternative selected.
[b] All container shipments are by rail.

Table B.4 presents a projected shipping schedule that includes the additional special case waste shipments. As indicated in the table, the total shipments (naval spent nuclear fuel and special case waste) would range from a low of approximately 360 to a high of approximately 585. Even with the additional shipments of special case waste, the environmental impacts for any of the alternatives selected remain minimal in each case, therefore, the differences among the alternatives also remain negligible.

TABLE B.4 Naval Spent Nuclear Fuel and Special Case Waste Containers (Cumulative) Shipped to a Centralized Interim Storage Site or a Geologic Repository, 2010 to 2035[a,b]

Year	MPC	No-Action	Current Technology/Rail	Transportable Storage Cask	Dual-Purpose Canister	Small MPC
2010	1	1	1	1	1	1
2011	1	2	1	1	1	3
2012	3	4	2	2	3	5
2013	6	7	4	4	6	8
2014	8	8	6	6	8	13
2015	9	10	8	8	9	15
2016	10	12	9	9	10	17
2017	11	15	11	11	11	19
2018	12	17	13	13	12	21
2019	14	19	15	15	14	23
2020	15	22	17	17	15	25
2021	15	22	17	17	15	25
2022	19	25	20	18	16	28
2023	19	25	20	19	17	28
2024	19	25	20	19	17	28
2025	19	25	20	21	19	31
2026	19	25	20	21	19	32
2027	20	27	22	21	19	32
2028	20	27	22	21	19	33
2029	20	27	22	21	19	33
2030	20	27	22	21	19	33
2031	20	27	22	21	19	33
2032	20	27	22	21	19	33
2033	20	27	22	21	19	33
2034	20	27	22	21	19	33
2035	0	0	0	0	0	0
TOTAL	360	480	380	370	345	585

[a] Table is not additive across rows. Each column represents the total shipments for the year depending on the alternative selected.
[b] All container shipments are by rail.

The fraction of travel in each population area (rural, suburban, and urban) was obtained from the INTERLINE computer program, which is discussed in Section B.4. Given an origin and destination, INTERLINE provides the route of railroad travel as well as weighted population densities in the rural, suburban, and urban areas.

To calculate the probability of the meteorological conditions, Pasquill Class D was considered to be equivalent to 50% meteorology; that is, 50% of the time, conditions are expected to be more severe, and 50% of the time, conditions are expected to be less severe. Pasquill Class F was considered to be equivalent to 95% meteorology; that is, 5% of the time, it is more severe, and 95% of the time, it is less severe. Analyses performed by the National Oceanic and Atmospheric Administration (Doty et al. 1976) confirm that this assumption is reasonable.

The overall probability of the consequence of an accident for each population area was then calculated by multiplying the accident probability times the consequence times the fraction of distance traveled. Starting with the highest consequences, the overall probabilities were then compared to the 1×10^{-6} per year or greater criterion for the design basis accidents and 1×10^{-7} per year or greater criterion for the beyond design basis accidents. If the overall probability was greater than 10 times the criterion (1×10^{-6} or 1×10^{-7}), the most severe Pasquill Class F results were presented. If not, and the overall probability was greater than the criterion (1×10^{-6} or 1×10^{-7}), Pasquill Class D was presented. If the overall probability was less than the cutoff, the probabilities having the next most severe consequences were compared to the same criterion and this step was repeated until all consequences were evaluated.

Careful attention was paid to ensure that the probabilities were not calculated for such small categories that the resulting probabilities were less than the criterion and results would inadvertently present less severe consequences. When the highest consequence accident did not meet the criterion, the probability of the next highest accident was determined by summing both the accident consequence being evaluated and the probability of the higher consequence accidents previously shown to have a probability less than the criterion. This same technique was applied to the fraction of travel (urban fraction is equivalent to highest consequence, suburban fraction is next highest, etc.) as demonstrated in the following example:

Probability of the accident of Consequence A	-	1.17×10^{-7}
Fraction of distance traveled in rural area	-	0.85
Fraction of distance traveled in suburban area	-	0.11
Fraction of distance traveled in urban area	-	0.04

The urban fraction was multiplied by the probability, and the resultant probability of an accident of Consequence A in an urban area was 4.68×10^{-9}. The consequences of this accident would not be evaluated. For the suburban area, the suburban and urban fractions were added (0.15) and then multiplied by the probability (1.17×10^{-7}), resulting in 1.76×10^{-8}. Again, the consequences of this accident would not be evaluated since the probability is less than 1×10^{-7}. Likewise, for the rural area, the rural, suburban, and urban fractions were added and multiplied by the probability. Using this technique, the probabilities would indicate that the rural probability was 1.17×10^{-7}, which is greater than the 1×10^{-7} criterion and the Consequence A results would be presented. If the fractions were used at face value, however, the probability of an accident of Consequence A would have been 4.68×10^{-9} in an urban area, 1.29×10^{-8} in a suburban area, and 9.95×10^{-8} in a rural area. When individually compared to the 1×10^{-7} criterion, this accident would not have been presented for any area.

Accident results are presented in Tables B.11 and B.12 for both the maximally exposed individual and the general population. The transportation crew is considered to be part of the general population under accident conditions, so a member of the transportation crew could be the maximally exposed individual.

B.3.3 Technical Approach for Transportation Air Quality Issues

The air emissions from rail transportation of spent nuclear fuel were estimated for each alternative over the 25 years of shipping within the 40-year analysis period. The air quality assessment includes an estimate of the total quantity of pollutants emitted by the combustion of fossil fuels in rail engines. The pollutants considered included particulates, carbon monoxide, nitrogen oxides, and hydrocarbons.

Emissions were calculated using Environmental Protection Agency (EPA) techniques by considering the total train round-trip shipment mileage for each alternative and emission factors developed by the EPA for pollutant sources (EPA 1985). The locomotive emissions represent average emissions for locomotives in the United States, assumed to represent the railroad emissions in this project from regular freight trains – each consisting of approximately 63 cars, 3 of which contain spent nuclear fuel casks. In practice, the railcars containing spent nuclear fuel casks would likely have empty buffer cars on either end of them (a total of 4). Consequently, the Department of Energy (DOE) might be responsible for, at most, 7 of the 63 cars on the train. However, for this analysis, it was assumed that the DOE would be responsible for emissions from the entire train.

In addition to the computation of total emissions by pollutant for each of the six alternatives for the entire 25 years of shipping within the 40-year analysis period, a separate calculation was made for emissions of ozone, carbon monoxide, and particulate matter through key nonattainment areas. Nonattainment areas are regions of the country (typically urban areas) in which pollutant levels exceed standards set by state regulations or the EPA. The issue of conformity with state regulations (for ozone) was evaluated by comparing emissions to *de minimis* levels of precursor pollutants (such as 100 tons per year for carbon monoxide). *De minimis* refers to the emission levels (different for each pollutant) below which the conformity regulations do not apply. In such areas, the addition of pollutants above these *de minimis* levels (even at moderate levels) would exacerbate already unhealthy air quality. The five nonattainment areas with the largest pollutant emission totals were used to compare the alternatives.

B.3.4 Analysis of Uncertainties

An extensive discussion of uncertainty analysis related to this Environmental Impact Statement can be found in Volume 1, Appendix D, Attachment F, Section F.1.5 of the Programmatic SNF and INEL EIS (DOE 1995). In summary, the calculations in this EIS have been performed in such a way that the estimates of risk provided are unlikely to be exceeded during either normal operations or in the event of an accident. For routine operations, the results of monitoring of actual operations provide clearly realistic source terms, which, when combined with conservative estimates of the effects of radiation, produce estimates of risk which are very unlikely to be exceeded. The effects for all alternatives have been calculated using the same source terms and other factors, so this EIS provides an appropriate means of comparing potential impacts on human health and the environment.

The analyses of hypothetical accidents provide more opportunities for uncertainty, primarily because the calculations must be based on sequences of events and models of effects which have not occurred. The models have attempted to provide estimates of the probabilities, source terms, pathways for dispersion and exposure, and the effects on human health and the environment which are as realistic as possible. However, in many cases, the very low probability of the accidents postulated has required the use of models or values for input which produce estimates of consequences and risks which are higher than would actually occur because of the desire to provide results which will not be exceeded. In summary, the risks presented in this appendix are believed to be at least 10 to 100 times larger than what would actually occur.

The use of conservative analyses is not an important problem or disadvantage in this EIS since all of the alternatives have been evaluated using the same methods and data, allowing a fair comparison of all of the alternatives on the same basis. Furthermore, even using these conservative analytical methods, the risks for all of the alternatives are small, which greatly reduces the significance of any uncertainty analysis parameters.

B.4 Routing Analysis

In order to assess the radiological risks associated with transportation, it was necessary to determine route characteristics based on the origin and destination of each shipment.

For naval spent nuclear fuel shipments, the origin is the INEL (either the Expended Core Facility, the Idaho Chemical Processing Plant, the Birch Creek Area or the Lemhi Range Area). For analytical purposes, the destination is the Yucca Mountain Site. The potential rail route has been generated and analyzed using the INTERLINE computer code (Johnson et al. 1993). Included in the rural segment of the route is 17 mi (approximately 27 km) from the INEL location to Scoville, Idaho.

INTERLINE is an interactive computer program designed to simulate routing using the U.S. rail system. The INTERLINE code used is the latest available from Oak Ridge National Laboratory and contains the 1990 census data. The INTERLINE database consists of networks representing various competing rail companies in the United States. The routes used for the transportation evaluation were identified by the standard INTERLINE model, which simulates the selection procedure that railroad companies would use to direct shipments of spent nuclear fuel. The code is updated periodically to reflect current track conditions and has been benchmarked against reported mileages and observations. INTERLINE also provides the weighted population densities for rural, suburban, and urban populations for each state and averaged over all states along the shipment route and the percentage of mileage traveled in each population density. The distance traveled, weighted population density, and percentage of distance in each population density are input values in the RADTRAN 4 code.

Three routes were used in the evaluation: the most direct, an alternate eastern route, and an alternate western route. It is anticipated that the most direct route would be used a majority of the time; however, the eastern and western routes bound the possible rail routes that could be used during actual shipments. There was very little impact from the different routes. A comparison of the three routes is shown in Table B.15. The two alternate routes are significantly longer and pass through areas containing higher overall population densities than the most direct route.

A discussion of the transportation risks of shipping naval spent nuclear fuel from the Expended Core Facility to the Idaho Chemical Processing Plant was included in the Programmatic SNF and INEL EIS (DOE 1995; Volume 1, Appendix D, Attachment A, Section A.7.2). The risks associated with shipping fuel from the Idaho Chemical Processing Plant to the Expended Core Facility are identical with the risks from the Expended Core Facility to the Idaho Chemical Processing Plant. If fuel would be shipped from the Idaho Chemical Processing Plant or the Expended Core Facility to the Birch Creek or Lemhi Range Area, the risk would be approximately three to eight times the risk of shipping from the Expended Core Facility to the Idaho Chemical Processing Plant.

If no rail spur existed into the centralized interim storage site or geologic repository, heavy-haul trucks would be needed to transport the containers. The effect of these truck shipments would be expected to be small due to 1) the distance traveled; 2) the small number of shipments; and 3) the highly regulated requirements for heavy-haul truck movement, including speed of truck, escort requirements, limited use of high-traffic roads, etc. It is expected there will be a negligible increase in dose to the general population; however, there will be a slight increase in occupational dose. The use of heavy-haul trucks will cause some localized traffic congestion (movements occurring approximately 1 to 3 times per month). In addition, the use of trucks would necessitate additional container handling, which could require additional equipment at the rail/truck junction.

No rail link to the Yucca Mountain Site currently exists, and that if it were to become the site of a repository or centralized interim storage facility, heavy-haul transport might be used in place of a rail connection. However, the resolution of that issue will depend on the site eventually selected and the evaluation of the environmental impacts and other factors specific to that site. The routes, distances, and potentially affected populations would be the same for all of the alternative container systems considered for naval spent nuclear fuel because the shipments will use the same route--the route selected for shipment of commercial spent nuclear fuel and high-level radiological waste to the repository or centralized interim storage site. Similarly, all container systems considered would have the same design dose rate, a maximum of 10 millirem per hour at 2 meters, as required by the regulations. The key difference in the alternatives for the purposes of comparing the impacts associated with heavy-haul transport for naval spent nuclear fuel using the alternative container systems is the number of shipments.

B.5 Input Parameters

The major input parameters and models used to evaluate the radiological risks are provided in this section. Standard RADTRAN 4 computer code values, as well as actual data gathered from historical naval spent nuclear fuel shipments, were used as the basis for the input parameters.

B.5.1 Incident-Free Impacts

Shipment External Dose Rate. Incident-free impacts are directly proportional to the shipment external dose rate, which is the maximum total radiation level (gamma + neutron) at approximately 3.3 ft (1 m) from the cask. Information from actual past shipments of naval spent nuclear fuel in the M-140 container shows that typically the shipment external dose rate at approximately 3.3 ft (1 m) for containers used to transport naval spent nuclear fuel prior to examination is less than 1.0 mrem/h and that the maximum measured neutron radiation level is slightly higher than the gamma radiation level. The M-140 and the high capacity M-140 are considered to be typical shipping containers for naval spent nuclear fuel. Since more naval spent nuclear fuel would be loaded into the high capacity M-140 after examination, the external dose associated with that alternative will be slightly higher. Specifically, the shipment external dose rate was assumed to be 2.0 mrem/h (1.0 mrem/h gamma and 1.0 mrem/h neutron). Since there is no comparable experience for the external dose rate for the remaining containers, the dose rate at approximately 6.6 ft (2 m) is assumed to be the maximum allowable by the Nuclear Regulatory Commission for over-the-road shipment by exclusive use vehicle (10.0 mrem/h). The resulting shipment external dose rate at approximately 3.3 ft (1 m) from the surface of the container is 13.3 mrem/h (total), with gamma and neutron radiation contributing equal amounts. These shipment external dose rate values provide a conservative estimate of radiation dose to the public.

Transportation Distances and Population Densities. Section B.4 of this appendix provides a description of the general methodology used for determining transportation distances and the population densities along the transportation routes.

Train Speed. The RADTRAN 4 computer code provides standard values for train speeds that are dependent on the population density zone. For rural areas, the standard value is 40 mi/h (approximately 64 km/h). For suburban areas, the standard value is 25 mi/h (approximately 40 km/h), and for urban areas, the standard value is 15 mi/h (approximately 24 km/h). However, naval spent nuclear fuel shipments are required to be transported at speeds not to exceed 35 mi/h (approximately 56.3 km/h). Government escort logs from historical naval spent nuclear fuel shipments support use of 15 mi/h (approximately 24.1 km/h). This 15 mi/hr (approximately 24.1 km/h) train speed estimate was used in the analysis in this section. It should be noted that use of the slower speed results in a conservatively higher estimation of radiation dose than would be calculated if a higher speed were assumed.

Train Stop Time. The RADTRAN 4 computer code provides standard values for train stop times that are either dependent or independent of the distances traveled. These values are considered to be appropriate for general freight shipments and were used in the analyses in this EIS.

Number of Train Crew Members. The standard RADTRAN 4 computer code value for the number of train crew members is five, and this number was used for the analyses in this EIS. However, RADTRAN 4 assumes crew exposure is only received during package inspections. Therefore, crew exposure is assumed to be negligible during transit due to the relatively long separation distance between the crew and the container and massive shielding provided by intervening structures. Therefore, for rail shipments, RADTRAN 4 assigns crew exposure to one individual, the inspector.

Effective Package Dimension and Shipment External Dose Rate Conversion Factors. An effective package dimension was developed for the M-140 and high-capacity M-140 containers, which would be shipped in the vertical position. An effective package dimension for use in RADTRAN 4 was selected that most closely agreed with the radiation levels at various distances from the shipment predicted using a SPAN 4 model with explicit package dimensions. The remaining containers will be shipped in the horizontal position and are adequately represented as line sources. The length of the internal cavity was selected as the effective package dimension for these containers. (If the internal cavity length is used as the effective package dimension for the M-140, general population exposure increases by about 20%. However, since the M-140 is shipped in the vertical position; use of the internal cavity length is not appropriate and the selected effective package dimension is still conservative.)

The effective package dimension to dose rate conversion factors were calculated using the standard equation in the RADTRAN 4 computer code.

The values used for the effective package dimension and the shipment external dose rate to personnel dose rate conversion factors are provided in Table B.5.

TABLE B.5 Effective Package Dimensions and Shipment External Dose Rate Conversion Factors for the Alternative Shipping Containers

Alternative	Effective Package Dimension (ft)	(m)	Shipment External Dose Rate to Personnel Dose Rate Conversion Factor
Multi-Purpose Canister	15	4.6	10
No-Action Alternative	11	3.2	6.8
Current Technology/Rail	11	3.2	6.8
Transportable Storage Cask	14	4.2	9.4
Dual-Purpose Canister	16	4.8	10
Small Multi-Purpose Canister	15	4.6	10

Train Stop Shield Factors. For train stops, the standard RADTRAN 4 computer code gamma and neutron radiation shield factors are both assigned as 0.1. This value includes the presence of substantial railyard steel structures equivalent to approximately 4 in. (approximately 10.2 cm) of steel. With 4 in. (approximately 10.2 cm) of steel, gamma radiation is reduced by more than a factor of 10; however, the 4 in. (approximately 10.2 cm) of steel only reduces neutron radiation by a factor of approximately 2. Therefore, a shield factor of 0.5 was conservatively used for neutron radiation. In order to incorporate this shielding into the RADTRAN 4 computer code, separate gamma and neutron radiation exposure calculations were performed.

Radiation Dose Decrease Due to Distance. The RADTRAN 4 computer code provides standard values for determining the gamma and neutron radiation dose decrease at increasing distance from the source. For gamma radiation, the RADTRAN 4 computer code uses the $1/x^2$ decrease due to distance. The RADTRAN 4 computer code also specifically calculates the decrease in neutron dose at increased distances. The adequacy of the RADTRAN 4 radiation dose decrease was evaluated. The gamma radiation decrease factor used by RADTRAN 4 was consistent with the results predicted for naval spent nuclear fuel. The RADTRAN 4 prediction for neutron radiation slightly overpredicts the decrease in dose at far distances for the shipping containers used for naval shipments. Using the same basic equation used by RADTRAN 4, a value of 2.0×10^{-10} was used for the RADTRAN 4 constant a_4 in lieu of 0. The value of 2.0×10^{-10} produces results which are slightly higher than the standard method and agree with measurements of neutron dose rates from naval spent nuclear fuel shipments.

Shipment Storage Time. Naval spent nuclear fuel is not stored while being shipped; therefore, there was no intermediate shipment storage time associated with any of the alternatives.

Standard RADTRAN 4 Computer Code Values Used. The following standard RADTRAN 4 computer code value was reviewed and determined to reflect the best estimate of current railroad industry practice:

- Number of inspections of the shipping container and railcar.

The following standard RADTRAN 4 computer code estimates of the populations that could be affected by the shipment of naval spent nuclear fuel were also used for the six alternatives:

- Number of people per vehicle sharing the transport route (on-link);
- Traffic count passing a specific point — rural, suburban, and urban zones;
- Average exposure distance when stopped; and
- Persons exposed while stopped.

B.5.2 Accident Risk

Accident during Transportation of Spent Nuclear Fuel. This section discusses the input parameters used to calculate the radiological impacts for accidents during transportation of naval spent nuclear fuel. The transportation distances, population densities, and the percentages of travel in each population density described in Section B.4 were also used for the accident analyses. Unless otherwise described in this section, the standard values provided by the RADTRAN 4 and RISKIND computer codes were used.

Accident Probability. The range of accidents analyzed produces effects at least as large as the effects of a hypothetical heavy-haul transportation accident at an intersection in a major city on a week day during rush hour or an extremely severe terrorist attack. Such an event would be expected to produce impacts which would be within the scope of the accidents analyzed for an urban population density. Severe hypothetical accidents have also been analyzed for the rural and suburban population densities.

The probability of a rail accident was obtained from "Longitudinal Review of State-Level Accident Statistics for Carriers of Interstate Freight" (Saricks and Kvitek 1994). The probabilities are provided both by state and a national average. The state-specific probabilities were used for the accident risk assessment. Past naval spent nuclear fuel shipments have traveled approximately 1.2 million miles (approximately 2 million km) by rail without an accident, which is consistent with the national average of 5.57×10^{-8} accident per kilometer.

Accident Severity Categories and Probabilities. In the "Shipping Container Response to Severe Highway and Railway Accident Conditions" (NRC 1987), often referred to as the "modal study," Lawrence Livermore National Laboratory categorized the potential damage to shipping containers according to the magnitude of the thermal and mechanical forces that could result from an accident. The structural and thermal forces were categorized into 20 regions. Given that an accident occurs, the probability that the accident would be in each region of the matrix was calculated for rail shipments. Table B.6 provides the probabilities for rail accidents by region in the matrix.

TABLE B.6 Accident Severity Probabilities for Rail Shipments

R(4,1) 1.8×10^{-9}	R(4,2) 3.3×10^{-13}	R(4,3) 2.1×10^{-13}	R(4,4) 1.6×10^{-13}	R(4,5) 3.5×10^{-14}
R(3,1) 5.5×10^{-4}	R(3,2) 1.0×10^{-7}	R(3,3) 6.3×10^{-9}	R(3,4) 5.2×10^{-8}	R(3,5) 5.3×10^{-8}
R(2,1) 2.7×10^{-3}	R(2,2) 5.0×10^{-7}	R(2,3) 3.3×10^{-7}	R(2,4) 2.5×10^{-7}	R(2,5) 1.1×10^{-8}
R(1,1) 9.9×10^{-1}	R(1,2) 1.2×10^{-3}	R(1,3) 8.0×10^{-4}	R(1,4) 6.1×10^{-4}	R(1,5) 1.2×10^{-4}

Structural Response (maximum strain on inner shell, %): S_3 (30), S_2 (2), S_1 (0.2)

T_1 (500) T_2 (600) T_3 (650) T_4 (1050)

Thermal Response (lead mid-thickness temperature, °F)

Naval Spent Nuclear Fuel Integrity Following an Accident. Detailed structural and thermal analyses were performed for the shipping containers used for naval spent nuclear fuel shipments up to an equivalent strain of 30% and mid-wall temperature of 1050°F. For these cases, the naval spent nuclear fuel would not be damaged. For the thermal and structural regions above 1050°F and 30% strain, the modal study defines the upper limits as unbounded. The naval spent nuclear fuel was postulated to be damaged, and the fraction of the fission products and the corrosion products that would be released to the container are presented in Table B.7.

Cask Release Fractions. The cask release fractions were derived based on the results presented in the modal study (NRC 1987) and the results of the structural and thermal analyses described above. Although naval spent nuclear fuel is stronger than the fuel types included in the study, the analysis of naval spent nuclear fuel used the release fractions for the category which included boiling water reactor and pressurized water reactor assemblies from the modal study (see Table B.7).

TABLE B.7 Fraction of Fission Products and Corrosion Products from Fuel that Are Available for Release from the Interior Cavity of a Container following an Accident

	Damage Fraction[a]					
Cask Response Region	Inert Gas	Iodine	Cesium	Ruthenium	Particulates	Corrosion Products
R(1,1)	0.0	0.0	0.0	0.0	0.0	0.0
R(1,2), R(1,3)	0.0	0.0	0.0	0.0	0.0	1.0
R(2,1), R(2,2), R(2,3)	0.0	0.0	0.0	0.0	0.0	1.0
R(1,4), R(2,4), R(3,4)	0.0	0.0	0.0	0.0	0.0	1.0
R(3,1), R(3,2), R(3,3)	0.0	0.0	0.0	0.0	0.0	1.0
R(1,5), R(2,5), R(3,5) R(4,5), R(4,1), R(4,2) R(4,3), R(4,4)	6.3×10^{-1}	4.3×10^{-2}	2.0×10^{-3}	4.8×10^{-4}	2.0×10^{-5}	1.0

[a] The damage fraction represents the fraction of the nuclide inventory released to the interior of the shipping container that would be available to be released through the damaged portion of the shipping container into the atmosphere following an accident of the given severity.

Analyses of the risks for hypothetical accidents for naval spent nuclear fuel used the following conditions:

- The fraction of fission and corrosion products released from naval spent nuclear fuel to the interior of the shipping container for the most likely but least severe accidents (lower left region R (1,1) of Table B.6) would be zero. This accounts for approximately 99.4% of all possible accidents.

- For the 0.6% of all accidents more severe than those in region R(1,1), 100% of the available corrosion products are assumed to be released to the interior of the shipping container.

- Based on analyses of accident conditions, accidents producing up to 30% strain and 1050°F mid-wall temperature (regions R(1,2), R(1,3), R(2,1), R(2,3), R(1,4), R(2,4), R(3,4), R(3,1), R(3,2), and R(3,3)) would not cause any damage to naval spent nuclear fuel and thus no fission products would be released from the fuel to the interior of the shipping container for accidents in these categories.

- For the most severe accidents, those accidents producing greater than 30% strain and 1050°F mid-wall temperature — regions R(1,5), R(2,5), R(3,5), R(4,5), R(4,1), R(4,2), R(4,3), and R(4,4) — 10% of the naval spent nuclear fuel might be damaged to the extent that fission products could be released from the fuel to the interior of the shipping container.

- The modal study states that experimental data show that only a fraction of the fission products released from damaged fuel to the interior of a container in an accident would be available to escape from the container due to the differing physical and chemical characteristics of the elements present. Approximately 63% of the fission products present in the form of noble gases, 4.3% of the iodine, 0.2% of the cesium, 0.048% of the ruthenium, and 0.002% of the solid fission products could be released to the interior of the container from the 10% of the fuel that might be damaged in an accident. The remainder would be contained by the fuel, cladding, or other materials.

- For all accidents other than the least severe accidents in region R(1,1), the damage to the shipping container might be great enough that 10% of the portion of the corrosion products or fission products released to the interior of the container could escape to the environment through the damaged area. The remainder would be trapped inside the container.

This means that there would be no release of radioactive material to the environment in about 99.4% of all accidents, potential for release of 10% of the corrosion products in about 0.6% of all accidents, and the possibility for release of 10% of the corrosion products and less than 1% of the fission products in a very small percentage of accidents (less than 0.02% of all accidents).

Table B.8 lists the amounts of radionuclides which could be released to the environment from a multi-purpose canister loaded with submarine or surface ship spent nuclear fuel assemblies. Each type of shipping container considered under the alternatives in this EIS contains different numbers of assemblies, and the relative release from each container type can be calculated by multiplying the data in this table by the appropriate relative capacity in Table B.1. This listing includes all radionuclides that would result in at least 99% of the possible exposure.

TABLE B.8 Radionuclides that Would Be Released from a Multi-Purpose Canister Shipment of Naval Spent Nuclear Fuel

Accidents Releasing Fission Products			Accidents Releasing Corrosion Products		
	Activity (Ci)			Activity (Ci)	
Nuclide	Surface Ship Assemblies	Submarine Assemblies	Nuclide	Surface Ship Assemblies	Submarine Assemblies
Tritium (H-3)	7.1×10^{-1}	6.2	Cobalt-58	2.6×10^{-9}	1.7×10^{-8}
Cesium-134	8.1×10^{-1}	1.5×10^{1}	Cobalt-60	6.1×10^{-1}	3.8×10^{-1}
Cesium-137	8.6×10^{-1}	8.2×10^{1}	Manganese-54	1.0×10^{-3}	1.0×10^{-3}
Strontium-90	8.5×10^{-1}	8.1×10^{-1}	Nickel-63	3.8×10^{-1}	2.2×10^{-1}
Ruthenium-106	1.2×10^{-1}	1.9×10^{-1}	Strontium-90[a]	4.6×10^{-4}	2.7×10^{-4}
Cerium-144	5.0×10^{-3}	4.4×10^{-2}	Iron-55	5.8×10^{-1}	3.9×10^{-1}
Plutonium-238	4.3×10^{-2}	4.3×10^{-2}			
Plutonium-241	1.2×10^{-2}	1.2×10^{-2}			
Curium-244	5.1×10^{-4}	5.1×10^{-4}			

[a] Strontium-90 is a fission product from trace elements in structural material that has plated out onto the fuel assembly along with activated corrosion products.

Plume Release Height. For the accident risk assessment, a ground level release was used. For the maximum consequence assessment, a plume release height of approximately 32.8 ft (10 m) was used.

Direct Exposure from a Damaged Shipping Container. A radiation level following the accident at the 10 CFR Part 71 regulatory limit of 1 rem at approximately 3.3 ft (1 m) from the container surface was used.

Food Transfer Factors. U.S. average food transfer factors were derived for the isotopes related to naval spent nuclear fuel in accordance with the methods described in the Nuclear Regulatory Commission’s Regulatory Guide 1.109 (NRC 1977).

Distance from the Accident Scene to the Maximally Exposed Individual. No shielding was accounted for as the plume passes for the calculation of the exposure to the maximum individual. This location was determined using RISKIND based on the atmospheric stability and plume release height used. The maximally exposed individual could be a member of the rail crew or the general population.

RISKIND Population Density. The standard national average for each population density from the RADTRAN 4 computer code was used for the RISKIND maximum consequences assessment (6 people per square kilometer for rural, 719 for suburban, and 3,861 for urban).

Radionuclide Inventory. The amounts of radionuclides that would be released from a multi-purpose canister shipment are provided in Table B.8 and factor in damage fractions and cask release fractions described above in this section. The radionuclides listed result in 99% of the exposure in all pathways. This inventory does not include the accident severity or the probability of occurrence. The amount of radionuclides that would be released from the other five alternative containers can be determined by applying the Table B.1 ratios.

B.6 Summary of Results

B.6.1 Incident-Free Risk

This section summarizes the results of the calculations for the radiological and nonradiological impacts of the incident-free transportation of naval spent nuclear fuel from INEL to a centralized interim storage site or a geologic repository location. Table B.9 shows the radiological impact on the general population, transportation workers (occupational), and the maximally exposed individual for one shipment of one cask. The projected number of fatalities from nonradiological sources for one shipment of one cask is provided for comparison purposes.

Table B.10 presents results for the predicted total number of shipments (see Table B.2) of each type of representative naval spent nuclear fuel and of special case waste in any of the six alternative containers. The results in this table were obtained by multiplying the corresponding entries in Table B.9 by the number of shipments (assuming three casks per shipment) for each type of container. The general population dose, occupational dose, and occupational maximally exposed individual are expected to affect the same individuals for all shipments.

If the number of shipments would be increased beyond the maximum for each alternative as a result of changing requirements, the risk would be calculated, as noted above, by multiplying the Table B.9 entry by the number of shipments.

All results are based on the most direct rail route. Using an alternate route could raise the risk by a factor of between 3 and 5. The increase is mainly due to the additional length of the route, and not because of population increase.

B.6.2 Accident Risk

This section summarizes the results of the calculations for radiological and nonradiological risks from accidents which could occur during shipments of naval spent nuclear fuel. The risks are provided for the general population in terms of exposure and estimated cancer fatalities. The risks are presented for 50% meteorological conditions, Pasquill Stability Class D.

Table B.11 provides the accident risk for one shipment of one container with its recommended cargo. The risk due to nonradiological sources is the same for each shipment regardless of the number or type of assemblies in the shipping container.

If the number of shipments would be increased beyond the maximum for each alternative as a result of changing requirements, the risk would be calculated, as noted above, by multiplying the Table B.11 entry by the number of shipments.

Because it is impossible to predict the specific location of a transportation accident, neutral weather conditions (Pasquill Stability Class D) were assumed. Since neutral meteorological conditions are the most frequently occurring atmospheric conditions in the United States, these conditions are most likely to be present in the event of a transportation accident.

TABLE B.9 Incident-Free Risk for One Shipment of One Cask

Alternative (Equipment)	General Population		Occupational Population		MEI, General Population[b]		MEI, Occupational		
	Collective Dose (person-rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities	Estimated Nonradiological Fatalities
Multi-Purpose Canister (125-ton MPC)	0.042	2.1×10^{-5}	0.030	1.2×10^{-5}	0.0037	1.9×10^{-6}	0.030	1.2×10^{-5}	4.3×10^{-6}
No-Action (standard M-140)	0.0042	2.1×10^{-6}	0.0037	1.5×10^{-6}	0.00038	1.9×10^{-7}	0.0037	1.5×10^{-6}	4.3×10^{-6}
Current Technology/Rail (high-capacity M-140)	0.0042	2.1×10^{-6}	0.0037	1.5×10^{-6}	0.00038	1.9×10^{-7}	0.0037	1.5×10^{-6}	4.3×10^{-6}
Transportable Storage Cask (NAC-STC)[a]	0.039	1.9×10^{-5}	0.029	1.2×10^{-5}	0.0035	1.7 x 10^{-6}	0.029	1.2×10^{-5}	4.3×10^{-6}
Dual-Purpose Canister (NUHOMS-MP187®)[a]	0.043	2.1×10^{-5}	0.031	1.2×10^{-5}	0.0038	1.9×10^{-6}	0.031	1.2×10^{-5}	4.3×10^{-6}
Small Multi-Purpose Canister (75-ton MPC)	0.042	2.1×10^{-5}	0.030	1.2×10^{-5}	0.0037	1.9×10^{-6}	0.030	1.2×10^{-5}	4.3×10^{-6}

[a] NAC-STC and NUHOMS-MP187® are representative casks for these alternatives.

[b] A person stopped next to a loaded transportation cask on a railcar is the maximally exposed individual (MEI); a resident living near the rail stop would receive a total exposure that is about a factor of 55 less (see Section B.3.1).

TABLE B.10 Incident-Free Risk for the Total Predicted Number of Shipments

		General Population		Occupational Population		MEI, General Population[c]		MEI, Occupational		
Alternative (Equipment)	Number of SNF and SCW Casks	Collective Dose (person-rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities	Estimated Nonradiological Fatalities[a]
Multi-Purpose Canister (125-ton MPC)	360	15.0	7.5×10^{-3}	10.9	4.4×10^{-3}	1.3	6.7×10^{-4}	10.9	4.4×10^{-3}	5.2×10^{-4}
No-Action (standard M-140)	480	2.0	1.0×10^{-3}	1.8	7.2×10^{-4}	0.18	9.0×10^{-5}	1.8	7.2×10^{-4}	6.9×10^{-4}
Current Technology/ Rail (high-capacity M-140)	380	1.6	8.0×10^{-4}	1.4	5.7×10^{-4}	0.14	7.1×10^{-5}	1.4	5.7×10^{-4}	5.5×10^{-4}
Transportable Storage Cask (NAC-STC)[b]	370	14.4	7.2×10^{-3}	10.8	4.3×10^{-3}	1.3	6.4×10^{-4}	10.8	4.3×10^{-3}	5.3×10^{-4}
Dual-Purpose Canister (NUHOMS-MP187®)[b]	345	14.8	7.4×10^{-3}	10.6	4.2×10^{-3}	1.3	6.6×10^{-4}	10.6	4.2×10^{-3}	5.0×10^{-4}
Small Multi-Purpose Canister (75-ton MPC)	585	24.3	1.2×10^{-2}	17.7	7.1×10^{-3}	2.2	1.1×10^{-3}	17.7	7.1×10^{-3}	8.4×10^{-4}

[a] The number of shipments assumes 3 casks per train or 3 casks per shipment.

[b] NAC-STC and NUHOMS-MP187® are representative casks for these alternatives.

[c] A person stopped next to a loaded transportation cask on a railcar is the maximally exposed individual (MEI); a resident living near the rail stop (Scenario 3) would receive a total exposure that is about a factor of 55 less (see Section B.3.1).

Notation: SNF = Spent Nuclear Fuel; SCW = special case waste

TABLE B.11 Accident Risk for One Shipment of One Container with the Estimated Cargo

Alternative/ Cask and Fuel Type	General Population Collective Dose (person-rem)	Latent Cancer Fatalities	Estimated Traffic Fatalities[a]
Multi-Purpose Canister (125-ton MPC with submarine assemblies)	1.7×10^{-5}	8.5×10^{-9}	4.5×10^{-4}
Multi-Purpose Canister (125-ton MPC with surface ship assemblies)	1.8×10^{-5}	8.9×10^{-9}	4.5×10^{-4}
No-Action (M-140 with submarine assemblies)	1.0×10^{-5}	5.1×10^{-9}	4.5×10^{-4}
No-Action (M-140 with surface ship assemblies)	1.0×10^{-5}	5.1×10^{-9}	4.5×10^{-4}
Current Technology/Rail (high-capacity M-140 with submarine assemblies)	1.1×10^{-5}	5.7×10^{-9}	4.5×10^{-4}
Current Technology/Rail (high-capacity M-140 with surface ship assemblies)	1.3×10^{-5}	6.4×10^{-9}	4.5×10^{-4}
Transportable Storage Cask (NAC-STC[b] with submarine assemblies)	2.1×10^{-5}	1.1×10^{-8}	4.5×10^{-4}
Transportable Storage Cask (NAC-STC[b] with surface ship assemblies)	1.1×10^{-5}	5.7×10^{-9}	4.5×10^{-4}
Dual-Purpose Canister (NUHOMS-MP187®[b] with submarine assemblies)	1.9×10^{-5}	9.7×10^{-9}	4.5×10^{-4}
Dual-Purpose Canister (NUHOMS-MP187®[b] with surface ship assemblies)	1.8×10^{-5}	8.9×10^{-9}	4.5×10^{-4}
Small Multi-Purpose Canister (75-ton MPC with submarine assemblies)	9.7×10^{-6}	4.8×10^{-9}	4.5×10^{-4}
Small Multi-Purpose Canisters (75-ton MPC with surface ship assemblies)	1.0×10^{-5}	5.1×10^{-9}	4.5×10^{-4}

[a] This assumes that shipment will be made via general freight and 3 out of 63 cars (the average length of a freight train) carry spent nuclear fuel.

[b] NAC-STC and NUHOMS-MP187® are representative casks for these alternatives.

Table B.12 provides the accident risk for the total number of shipments (assuming 3 casks per shipment) given in Table B.2. All results are based on the most direct rail route. Using an alternate route could raise the risk by a factor of between 3 and 5.

B.6.3 Maximum Consequences of Accidents

The accident risk calculations discussed in Section B.3 include the probability of occurrence. This section summarizes the consequences for the most severe reasonably foreseeable accident in either a rural, suburban, or urban population zone. The consequences (in terms of dose) to the maximally exposed individual (MEI) are also presented. In an accident situation, the transportation crew is considered to be part of the general population and could be the MEI for purposes of analyses. Separate calculations for the transportation crew are not necessary.

Table B.13 provides a summary of the maximum consequences of a severe hypothetical accident. All results are based on the most direct rail route. The maximum number of expected latent cancer fatalities ranges from approximately 0.3 to 5.5.

B.6.4 Transportation Air Quality

Table B.14 presents the total air pollutant emissions for each of the six alternatives over a 25-year shipment period. In addition, the total emissions for ozone, carbon monoxide, and particulate matter are detailed. The difference among the alternatives is based on the total number of shipments needed to transport the fuel.

Figures B.2, B.3, and B.4 are U.S. maps showing the nonattainment areas for ozone, carbon monoxide, and particulate matter, respectively.

Annual emissions are very small for each alternative, if one considers that the Table B.14 totals represent a 25-year shipment period within the 40-year period analyzed for this EIS. The emissions are below *de minimis* levels (*de minimis* refers to the emission levels below which the conformity regulations do not apply), thereby avoiding the need to address federal conformity issues involving emissions. Annual emissions would likely be less than the *de minimis* levels, and as such, a conformity evaluation for this federal action would not be required in any state.

The most-direct route and the two alternate routes each pass through nonattainment areas; however in each case, the levels due to rail transportation are extremely low and *de minimis*.

TABLE B.12 Accident Risk for the Total Number of Shipments of Each Container of Naval Nuclear Spent Fuel with the Recommended Cargo

Alternative/ Cask and Fuel Type	Number of Casks	General Population Collective Dose (person-rem)	Latent Cancer Fatalities	Estimated Traffic Fatalities[a]
Multi-Purpose Canister (125-ton MPC with submarine assemblies)	300	0.0051	2.5×10^{-6}	0.045
Multi-Purpose Canister (125-ton MPC with surface ship assemblies)	300	0.0053	2.7×10^{-6}	0.045
No-Action (M-140 with submarine assemblies)	425	0.0043	2.2×10^{-6}	0.064
No-Action (M-140 with surface ship assemblies)	425	0.0043	2.2×10^{-6}	0.064
Current Technology/Rail (high-capacity M-140 with submarine assemblies)	325	0.0037	1.8×10^{-6}	0.049
Current Technology/Rail (high-capacity M-140 with surface ship assemblies)	325	0.0041	2.1×10^{-6}	0.049
Transportable Storage Cask (NAC-STC[b] with submarine assemblies)	325	0.0068	3.4×10^{-6}	0.049
Transportable Storage Cask (NAC-STC[b] with surface ship assemblies)	325	0.0037	1.9×10^{-6}	0.049
Dual-Purpose Canister (NUHOMS-MP187®[b] with submarine assemblies)	300	0.0058	2.9×10^{-6}	0.045
Dual-Purpose Canister (NUHOMS-MP187®[b] with surface ship assemblies)	300	0.0053	$2.7 \text{ x } 10^{-6}$	0.045
Small Multi-Purpose Canister (75-ton MPC with submarine assemblies)	500	0.0048	$2.4 \text{ x } 10^{-6}$	0.076
Small Multi-Purpose Canister (75-ton MPC with surface ship assemblies)	500	0.0051	2.5×10^{-6}	0.076

[a] This assumes that shipment will be made via general freight and 3 out of 63 cars (the average length of a freight train) carry spent nuclear fuel.

[b] NAC-STC and NUHOMS-MP187® are representative casks for these alternatives.

TABLE B.13 Summary of Maximum Consequences of a Severe Hypothetical Accident

	MEI		Rural Population		Suburban Population		Urban Population	
Alternative/ Cask and Fuel Type	Dose (rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities
Multi-Purpose Canister (125-ton MPC with submarine assemblies)	7.1	0.0036	2600	1.3	1600	0.8	8800	4.4
Multi-Purpose Canister (125-ton MPC with surface ship assemblies)	6.9	0.0035	2200	1.1	1300	0.7	7100	3.6
No-Action (M-140 with submarine assemblies)	1.3	0.0006	840	0.42	10	0.0	51	0.03
No-Action (M-140 with surface ship assemblies)	1.2	0.0006	680	0.34	15	0.01	79	0.04
Current Technology/Rail (high-capacity M-140 with submarine assemblies)	1.5	0.0008	930	0.47	11	0.01	57	0.03
Current Technology/Rail (high-capacity M-140 with surface ship assemblies)	1.5	0.0008	840	0.42	18	0.01	98	0.05
Transportable Storage Cask (NAC-STC[a] with submarine assemblies)	8.8	0.0044	3200	1.6	2000	1.0	10900	5.5
Transportable Storage Cask (NAC-STC[a] with surface ship assemblies)	4.4	0.0022	1400	0.70	850	0.4	4600	2.3
Dual-Purpose Canister (NUHOMS-MP187®[a] with submarine assemblies)	8.1	0.0041	3000	1.5	1900	1.0	10100	5.1
Dual-Purpose Canister (NUHOMS-MP187®[a] with surface ship assemblies)	6.9	0.0035	2200	1.1	1300	0.7	7100	3.6
Small Multi-Purpose Canister (75-ton MPC with submarine assemblies)	4.1	0.0020	1500	0.74	3000	1.5	5000	2.5
Small Multi-Purpose Canister (75-ton MPC with surface ship assemblies)	3.9	0.0020	1300	0.62	2300	1.2	4100	2.1

[a] NAC-STC and NUHOMS-MP187® are representative casks for these alternatives.

TABLE B.14 Transportation Air Pollutant Emissions for Program Duration in Salt Lake City, Utah

		Vehicular Emissions (Tons) for Each Pollutant							
Alternative	Number of Naval SNF and SCW Shipments	Particulates	Sulfur Dioxides	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides	Aldehydes	Organic Acids	Total
Multi-Purpose Container	360	0.14	0.31	0.70	0.51	2.00	0.30	0.04	3.99
No-Action Alternative	480	0.18	0.41	0.94	0.68	2.66	0.40	0.05	5.31
Current Technology/Rail	380	0.14	0.32	0.74	0.54	2.11	0.31	0.04	4.21
Transportable Storage Cask	370	0.14	0.32	0.72	0.52	2.05	0.31	0.04	4.10
Dual Purpose Container	345	0.13	0.29	0.67	0.49	1.91	0.28	0.04	3.82
Small Multi-Purpose Container	585	0.22	0.50	1.14	0.82	3.25	0.48	0.06	6.48

Notation: SNF = Spent Nuclear Fuel; SCW = special case waste

TABLE B.15 Comparison of Alternate Transportation Routes

	Most Direct Route[a]	Eastern Route[b]	Western Route[c]
Total Distance of Route in miles (km)	860 (1400)	2500 (4100)	2300 (3600)
Percent Travel that is Urban	1.2%	1.2%	2.0%
Percent of Travel that is Suburban	5.8%	6.1%	7.9%
Percent of Travel that is Rural	93.0%	92.7%	90.1%
Average Population Density in Person/Square Mile (person/square kilometer)	130 (50)	160 (61)	240 (92)

[a] Route goes from INEL to Pocatello to Salt Lake City to Yucca Mountain
[b] Route goes from INEL to Pocatello to Denver to Albuquerque to Las Vegas to Yucca Mountain
[c] Route goes from INEL to Pocatello to Boise to Sacramento to Las Vegas to Yucca Mountain

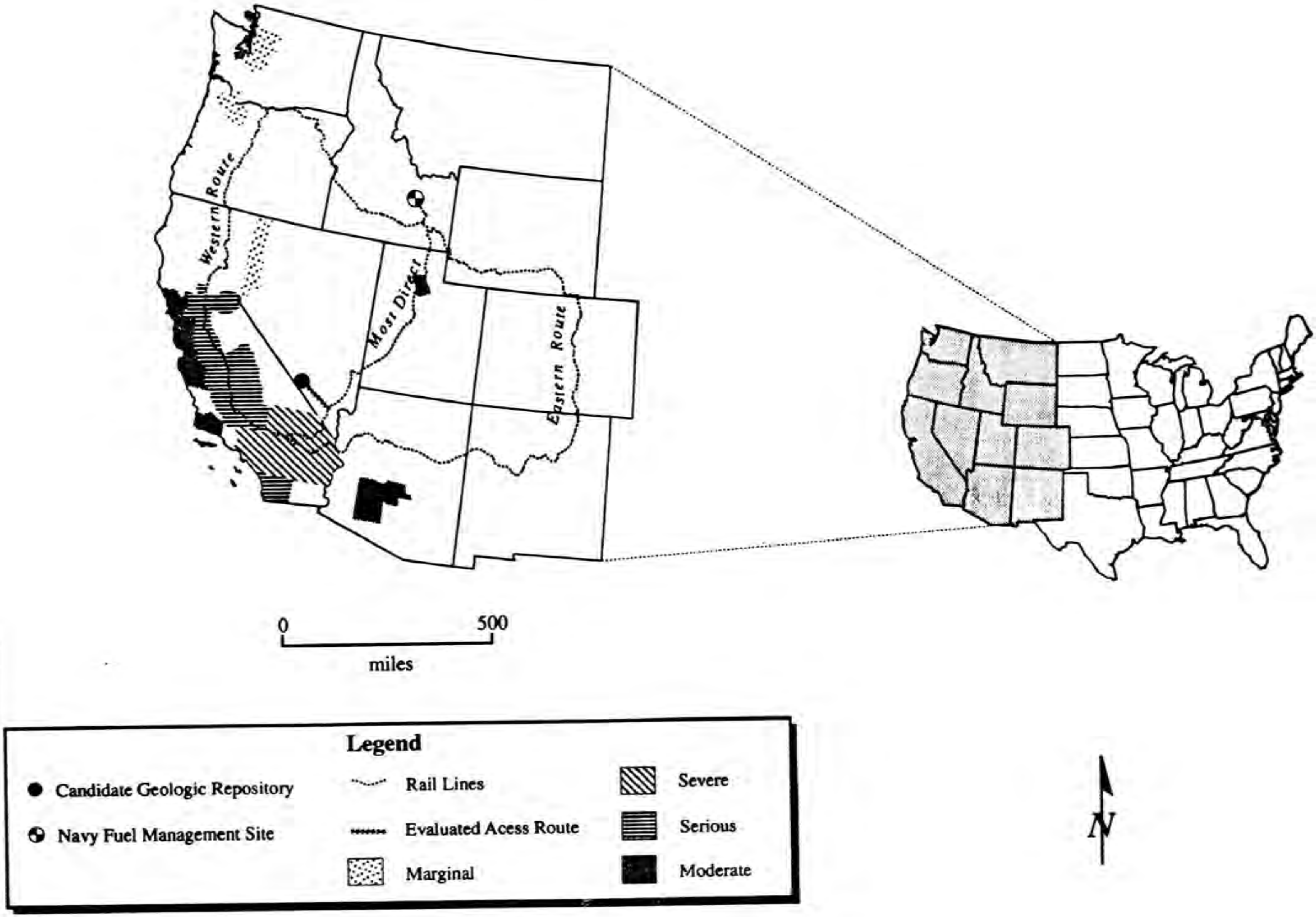

FIGURE B.2 Location of Ozone Nonattainment Areas

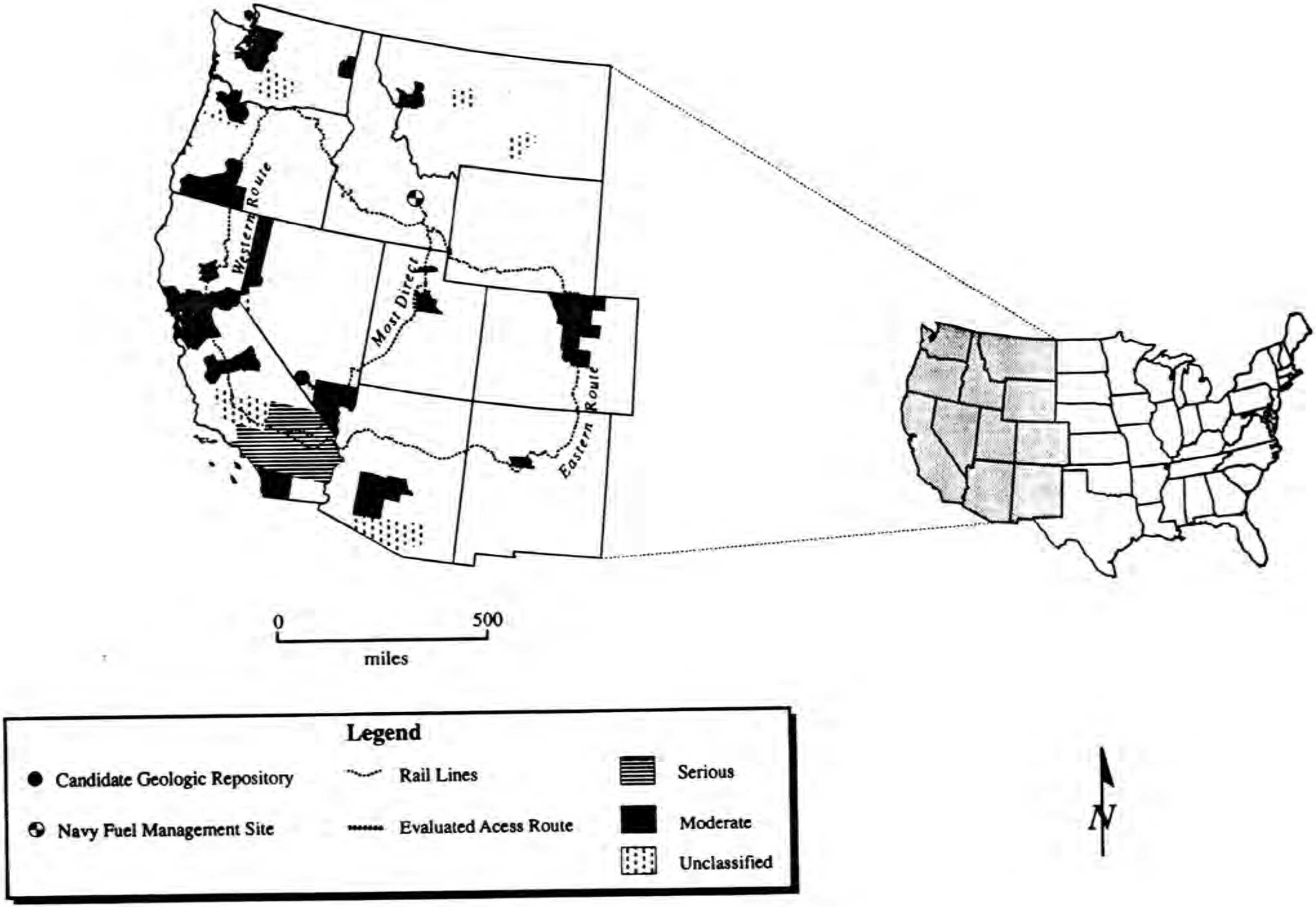

FIGURE B.3 Location of Carbon Monoxide Nonattainment Areas

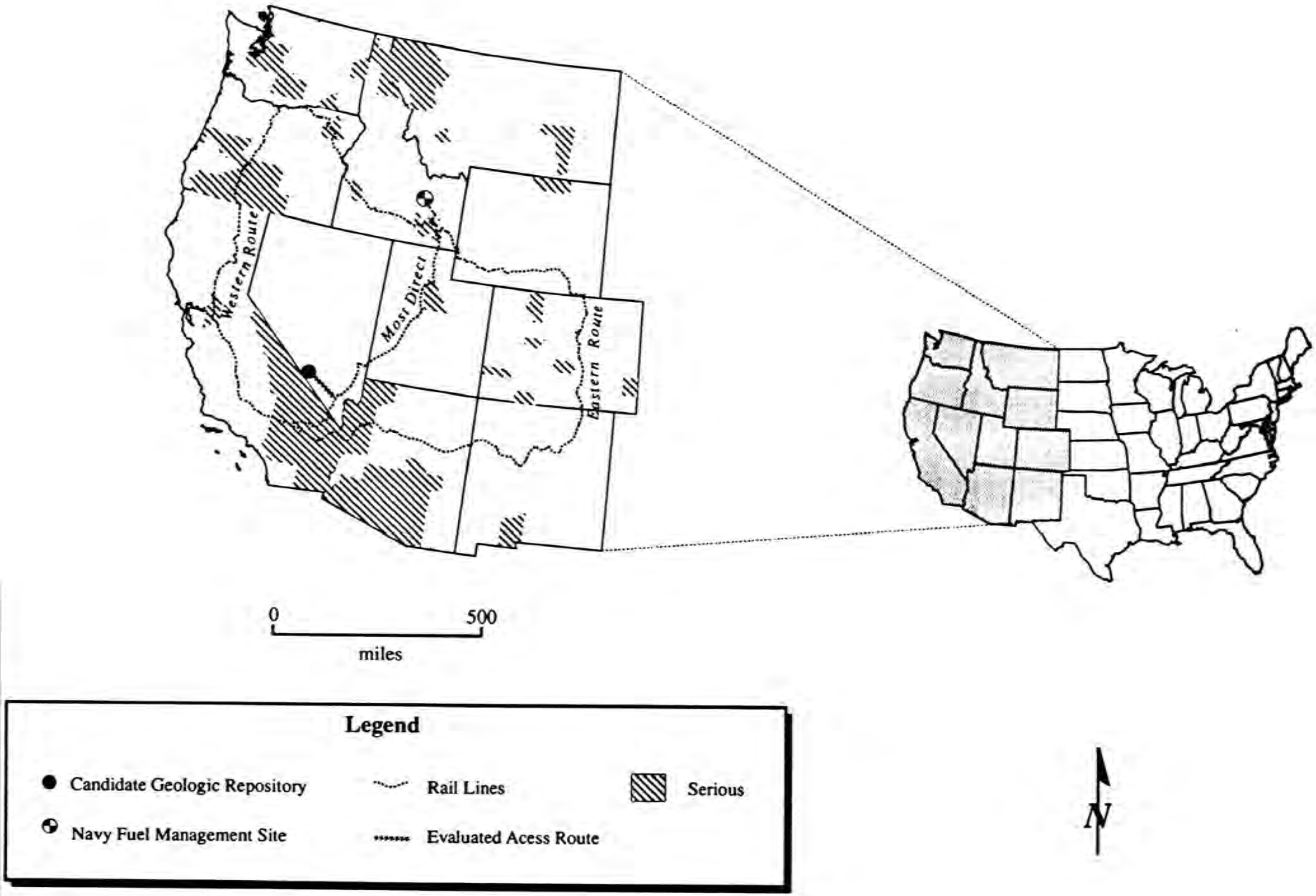

FIGURE B.4 Location of Particulate Matter Nonattainment Areas

APPENDIX C
SOCIOECONOMIC IMPACTS

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C. SOCIOECONOMIC IMPACTS

Six alternative hardware systems for standardizing the management of post-examination naval spent nuclear fuel are considered in this Environmental Impact Statement (EIS). These systems have been analyzed with regard to storing, transferring (moving on-site), transporting (moving off-site), and disposing of spent nuclear fuel. This appendix discusses the socioeconomic impacts associated with each of the following six alternatives:

- Multi-Purpose Canister,
- No-Action,
- Current Technology Supplemented by High-Capacity Rail Cask (Current Technology/Rail),
- Transportable Storage Cask,
- Dual-Purpose Canister, and
- Small Multi-Purpose Canister.

This appendix is organized in four sections. Because no (or very limited) migration of workers from other locations into the local area is expected to occur under any of the alternatives, no associated effects are expected, such as changes in demand for local housing, public services, or public finance. The analysis did not, therefore, include these topics in the assessment of socioeconomic impacts of manufacturing. Section C.1 describes the methodology used to assess potential impacts of manufacturing the necessary hardware components for each alternative in the representative manufacturing location. The results are presented as average annual impacts for output (the total value of goods and services produced locally), income (total wages, salaries, and property income), and employment (total person-years). Impacts are discussed in relative terms as a comparison of the absolute impacts of each technology with the local baseline, which in the near term includes the No-Action Alternative.[1] Section C.2 describes the potential impacts of storage and handling activities at the Idaho National Engineering Laboratory (INEL) associated with each alternative. Section C.3 describes the potential socioeconomic impacts anticipated to result from transporting naval spent nuclear fuel using any of the six alternative container systems. Finally, Section C.4 discusses the cumulative socioeconomic impacts involving activities considered in this EIS and other activities involving spent nuclear fuel.

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[1] The No-Action Alternative makes use of currently available technology. Until 1998, No Action would produce no socioeconomic impacts because it would represent a continuation of current activities. Once manufacturing commences in 1998, production of required equipment would begin — yielding associated impacts on output, income, and employment.

C.1 Impacts of Manufacturing Alternative Spent Nuclear Fuel Container Systems

Currently, no facility has been selected for fabricating the hardware associated with any alternative. As a result, the analysis of socioeconomic impacts associated with manufacturing the hardware associated with the storage, transportation, and disposal of spent nuclear fuel focused on a representative manufacturing location. Key characteristics for this representative location (e.g., local population, local employment, local income, and facility employment) were defined as averages of the same characteristics associated with each of five existing facilities that currently manufacture casks and canisters for the storage and transportation of spent nuclear fuel — thereby providing an empirical range of possible values from actual manufacturing settings. The analysis considered all major hardware components of each alternative. Note that because unit costs vary between the components used in the different alternatives, the overall cost of an alternative with more total components may be less than the overall cost of another alternative with fewer total components.

C.1.1 General Basis and Methodology

The assessment of socioeconomic impacts associated with fabrication activities was based on three elements. First, engineering cost data for existing and proposed spent nuclear fuel management systems provided information on the unit cost of each component used in existing and planned storage and transportation technology. Second, information on the management of naval spent nuclear fuel under each alternative was used to determine the number of units associated with each technology that would be manufactured annually. Finally, the Impact Analysis for Planning (IMPLAN) input-output computer program was used to estimate economic impacts in the county or counties surrounding existing manufacturing locations (Minnesota IMPLAN Group 1995).

Engineering cost data provided the main input to the economic input-output model. For each major component of a particular alternative, unit costs were obtained from vendors or estimated based on similar existing hardware (if such a component had never been manufactured before). These unit costs were then summed to produce an overall cost for each alternative, from which an annual average was calculated over the entire manufacturing period. The average annual cost for a particular alternative provided the average direct economic impacts for the representative manufacturing site, and in turn was used to estimate the secondary economic impacts for all other economic activities in the region containing the site. Note that because alternatives consist of different components with differing associated unit costs, the total cost of one alternative may exceed that of another with fewer total components, depending on the expense of the separate hardware elements comprising each alternative.

Input-output analysis was used to assess the economic impact of each alternative because this approach provides estimates on both the direct and secondary impacts of a particular activity on a local economy. Input-output analysis concerns the economic accounts of any given region and shows the flow of commodities to industries from producers and institutional consumers. The accounts also show consumption activities by workers, owners of capital, and imports from outside the region. Direct economic effects would occur as manufacturing facilities purchased materials, services, and labor required for each cask and canister system. Secondary effects would occur as the industries and households supplying those industries that are directly affected adjusted their production and spending behavior in response to increased incomes. Impacts were measured in terms of output, income, and employment.

The socioeconomic analysis used the IMPLAN input-output model to measure impacts of fabrication at the manufacturing sites. IMPLAN is a computer-based program that allows construction of input-output models for counties or combinations of counties for any location in the United States. The IMPLAN model contains 528 sectors representing industries in agriculture, mining, construction, manufacturing, wholesale and retail trade, utilities, finance, insurance and real estate, and consumer and business services. The model also includes information for each sector on employee compensation; proprietary and property income; personal consumption expenditures; federal, state, and local expenditures; inventory and capital formation; and imports and exports.

The assessment of socioeconomic impacts was limited to the estimation of the direct and secondary impacts of manufacturing activities. No assessment was made of the impacts of manufacturing activities on local jurisdictions. Such an analysis would include the estimation of impacts on county and municipal governments and on school district revenues and expenditures. Production of casks and canisters would likely take place at existing facilities alongside existing product lines. It is unlikely that there would be substantial migration of workers into the localities surrounding the manufacturing sites under any alternative, and, as a result, no significant change would be likely to occur in the disposition of local government or school district revenues and expenditures beyond those that would occur with fluctuations in baseline economic activity.

To perform the analysis, IMPLAN economic data for each of the counties in which five existing manufacturing facilities are located were used to estimate output, income, and employment multipliers for the sector manufacturing spent nuclear fuel storage and transportation components. Multipliers are used to calculate the secondary effects on an area economy in response to the introduction of direct effects. The multipliers estimated for each existing facility were then averaged to produce multipliers for a representative manufacturing location, with the composite multipliers used to analyze the impacts of each alternative.

C.1.2 Impacts

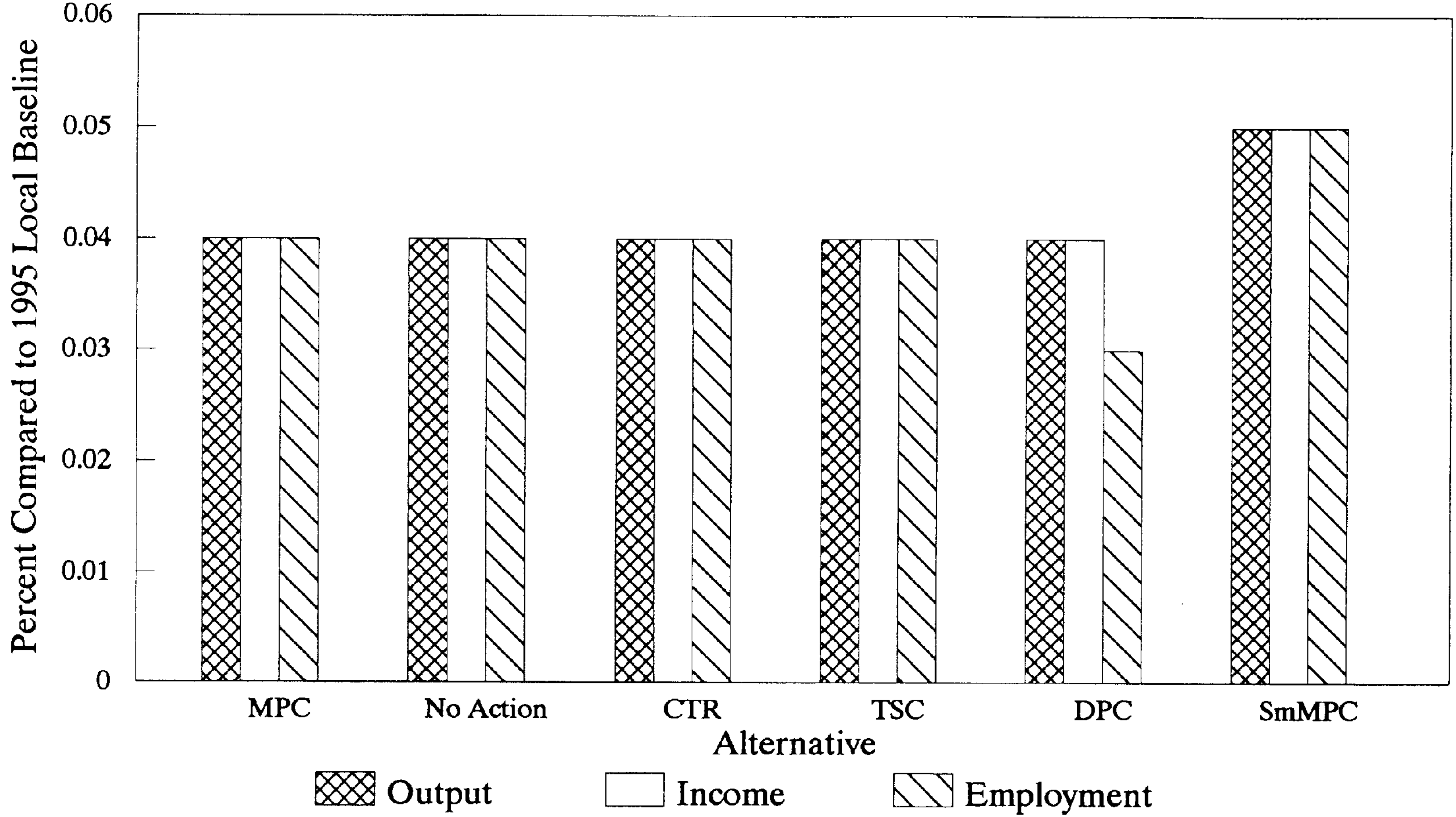
Table C.1 presents socioeconomic data and impacts on output, income, and employment for all six alternatives at the representative manufacturing location. The largest annual average impacts occur for the Small Multi-Purpose Canister Alternative, with average annual impacts on output, income, and employment projected at $15 million, $8 million, and 180 person-years, respectively. In contrast, the smallest average annual impacts are associated with the Dual-Purpose Alternative, projected at $10 million for output, $6 million for income, and 130 person-years for employment. Impacts of the remaining four alternatives lie between those extremes.

Figure C.1 enables a visual comparison of all alternatives in terms of their relative impact on output, income, and employment. As depicted in this figure, the projected impacts for an average year of manufacturing are relatively small for all container systems considered. On the basis of its socioeconomic characteristics, the representative socioeconomic setting considered should be able to accommodate all of these impacts without a need for additional workers moving into the area because the magnitude of the impacts is anticipated to be small. As a result, socioeconomic impacts are expected to be negligible for all alternatives.

TABLE C.1 Annual Average Impacts of Manufacturing Alternative Container Systems

Alternative	Output[a]		Income[a]		Employment	
	$\$10^6$	% impact[b]	$\$10^6$	% impact[b]	person-years	% impact[b]
Multi-Purpose Canister						
Annual average	11	0.04	6	0.04	140	0.04
No-Action						
Annual average	12	0.04	7	0.04	150	0.04
Current Technology/Rail						
Annual average	12	0.04	6	0.04	140	0.04
Transportable Storage Cask						
Annual average	12	0.04	7	0.04	150	0.04
Dual-Purpose Canister						
Annual average	10	0.04	6	0.04	130	0.03
Small Multi-Purpose Canister						
Annual average	15	0.05	8	0.05	180	0.05

[a] Output and income impacts are expressed as millions (10^6) of 1995 dollars.
[b] % impact refers to percent compared with the 1995 local baseline, rounded to the nearest 0.01%.



Notation: MPC = Multi-Purpose Canister; CTR = Current Technology/Rail; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister.

FIGURE C.1 Summary of Impacts of Manufacturing Hardware Components in the Representative Manufacturing Location

C.2 Storage and Handling Impacts of Alternative Container Systems at INEL

The analysis of socioeconomic impacts related to storage and handling of naval spent nuclear fuel focused on activities at INEL. Currently, all naval spent nuclear fuel is stored and handled at INEL, which already maintains the necessary equipment and personnel to conduct these activities under the No-Action Alternative. Socioeconomic impacts would occur under the remaining alternatives, differing slightly from those associated with No-Action because of changes in expenditures on labor and materials resulting from use of the different technologies. However, given the relatively small amount of spent nuclear fuel to be dealt with over a 40-year period and the minimal changes in staff and equipment that would be required compared with baseline conditions that already exist, these impacts would be negligible. Because of the small magnitude of anticipated socioeconomic impacts associated with the use of alternative technologies for storage and handing at INEL, no quantitative estimate of these effects was prepared.

C.3 Transportation Impacts

Socioeconomic impacts would be associated with the transportation of naval spent nuclear fuel to either interim storage or a repository. However, these impacts are anticipated to be negligible and geographically dispersed. Because loading and unloading naval spent nuclear fuel would also involve relatively small amounts of activity over 40 years, it would require few if any additional personnel to conduct these activities. Transportation costs themselves would also occur over a long time period, and be paid to the appropriate component(s) of the rail line finally selected (with the location of these components at the appropriate rail company offices, probably near neither INEL nor a repository). Moreover, on the basis of the expected annual number of shipments, the transportation of naval spent nuclear fuel would be small compared to the expenditures associated with the shipment of all other goods along the representative routes. As a result, naval spent nuclear fuel shipments would likely be made within the existing capacity of the transportation system, resulting in negligible socioeconomic impacts. Because of the small magnitude of anticipated socioeconomic impacts associated with the use of alternative technologies for transporting naval spent nuclear fuel, no quantitative estimate of these effects was prepared.

C.4 Cumulative Socioeconomic Impacts

The greatest socioeconomic impacts due to the fabrication of hardware required for the management of spent nuclear fuel would be that associated with civilian fuel. For the six alternatives considered in this EIS, the increased average annual output, income, and employment associated with the fabrication of container systems for naval spent nuclear fuel at a representative site would be less than 1% of that anticipated to accompany the production of similar container systems for civilian spent nuclear fuel at the same site. The average annual socioeconomic impacts due to manufacturing components for both naval and civilian spent nuclear fuel would, in turn, be less than 1% of the total annual economic activity in the region containing the representative fabrication site. The consequences of such effects would be slight increases in economic activity in the region surrounding a manufacturing facility. Any difficulties that might accompany these impacts, in the form of increased demand on public services or infrastructure, would be small to non-existent due to the limited increase in area population that they would generate.

Cumulative socioeconomic impacts associated with storage and handling would involve naval spent nuclear fuel, DOE-owned spent nuclear fuel, and civilian spent nuclear fuel. The last category of spent nuclear fuel is geographically dispersed across the United States at facilities that currently store it. Socioeconomic impacts would be similarly dispersed for the storage and handling of civilian spent nuclear fuel, and not geographically proximal to those resulting from the storage and handling of naval spent nuclear fuel. Storage and handling spent nuclear fuel at INEL is anticipated to result in small socioeconomic impacts, in the form of a less than 3% increase or decrease in demand for employment, depending on the approach taken to managing that fuel (DOE 1995, Volume 1, Chapter 5). Storage and handling activities associated with naval spent nuclear fuel at INEL would either help to dampen negative socioeconomic impacts or slightly increase the negligible positive impacts. In both scenarios, cumulative socioeconomic impacts at INEL are anticipated to remain negligible.

Cumulative impacts associated with the transportation of naval, DOE-owned, and civilian spent nuclear fuel are anticipated to be negligible. Loading activities would be geographically dispersed throughout the United States over 40 years at spent nuclear fuel storage sites and likely would involve existing equipment and personnel. Socioeconomic consequences associated with actual transportation of spent nuclear fuel similarly would be dispersed throughout the United States, focusing on the appropriate offices of the rail lines ultimately selected to carry the shipments. Even in the cumulative case, total expenditures required to ship spent nuclear fuel would be small compared with the cost of shipping all goods along rail routes. As a result, such shipments could likely be made within the existing capacity of the rail system, with neither additional allocation of resources nor noteworthy socioeconomic changes occurring along any of the representative routes considered. In any case, cumulative socioeconomic impacts due to the transportation of spent nuclear fuel are anticipated to be small and positive.

APPENDIX D
DESCRIPTION OF ALTERNATIVE CONTAINER SYSTEMS AND OPERATIONS

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FIGURES (Cont)

APPENDIX D

D. DESCRIPTION OF ALTERNATIVE CONTAINER SYSTEMS AND OPERATIONS

D.1 Introduction

This appendix describes the alternative container systems considered for the storage, transport, and disposal of naval spent nuclear fuel and the operations associated with their use. The alternatives chosen for analysis in this Environmental Impact Statement (EIS) are representative of families or classes of container types. Containers similar to all of the alternatives may become available in the future and might be selected.

The descriptions of the alternative container systems proposed for naval spent nuclear fuel management include the basic components of the containers and the routine operations for their use. The containers discussed are those that would be used after 1998 for naval spent nuclear fuel transfer and dry storage at Idaho National Engineering Laboratory (INEL), transportation between INEL and a repository or centralized interim storage site, and disposal. The spent nuclear fuel container systems could also be used for special case waste. The discussion includes generalized equipment and operations required at INEL and at a repository. Six alternative container systems are described:

- Multi-Purpose Canister Alternative — Section D.2,
- No-Action Alternative — Section D.3,
- Current Technology Supplemented by High-Capacity Rail Cask (Current Technology/Rail) Alternative — Section D.4,
- Transportable Storage Cask Alternative — Section D.5,
- Dual-Purpose Canister Alternative — Section D.6, and
- Small Multi-Purpose Canister Alternative — Section D.7.

D.2 Multi-Purpose Canister Alternative

D.2.1 Technology and Related Hardware

The basic components of the Multi-Purpose Canister Alternative include the canisters; specialized overpacks for storage, transportation, and disposal; and on-site transfer overpacks. At least one private manufacturer has announced intentions to produce a multi-purpose canister, but the environmental evaluation of the Multi-Purpose Canister Alternative presented in this EIS was based on the system described in a conceptual design report for a multi-purpose canister-based system (TRW Environmental Safety Systems, Inc.; TRW 1993) that was commissioned by DOE. Containers similar to the one used for analysis purposes for this alternative may become available in the future and may be selected. Figure D.1 illustrates the steps for loading, storing, transporting, and disposing of multi-purpose canisters.

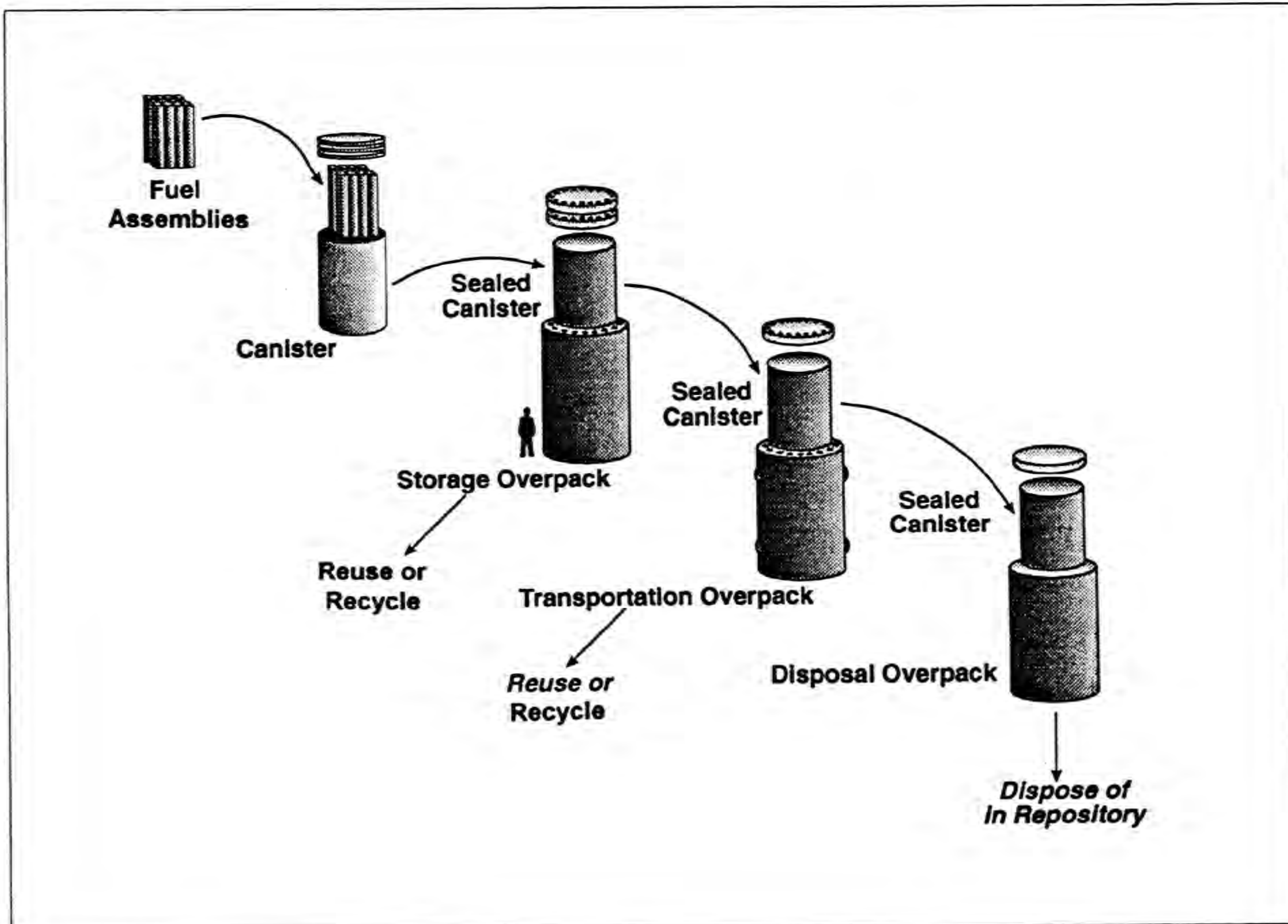

FIGURE D.1 Storage, Transport, and Disposal for the Multi-Purpose Canister System

Multi-Purpose Canister Equipment. Each multi-purpose canister would consist of a cylindrical stainless steel shell, with two lids at the top and a shield plug made of depleted uranium (or equivalent shielding material) between the lids. The shell is designed to provide structural support, heat transfer, and containment. Each canister would contain a fuel assembly basket, which is an internal rigid framework designed to maintain the arrangement of the naval spent nuclear fuel assemblies to provide criticality control. The multi-purpose canister itself is not designed to provide significant radiation shielding except for the shield plug at the top, which is included to provide protection for workers during closure operations. Radiation shielding of the sides and bottom of a multi-purpose canister would be provided by the separate specialized overpacks. All currently licensed or docketed canister-based systems use welded seals on the lid closure. The TRW conceptual design utilizes two lids on each canister that are welded to the shell wall. Other closure systems may also be used on the multi-purpose canister systems such as bolted lids. Bolted closures would require additional sampling and monitoring activities which would result in additional radiation exposure to perform these activities. If a different closure system were used, such as a bolted lid, it is expected that worker doses would be slightly different from those presented in the EIS. All other impacts would be expected to be similar.

Dry Storage Overpacks. For assessment purposes, the multi-purpose canisters were assumed to be stored in horizontal, reinforced-concrete storage overpacks or vaults. These storage overpacks represent a low-cost, reasonable storage option that has been demonstrated in practice. This system provides a conservative basis for assessment. The multi-purpose canister could also be stored in vertical, reinforced-concrete storage overpacks. The horizontal dry storage overpacks were assumed to be free-standing units that would be built as needed and placed on thick concrete pads constructed in accordance with commercial industry standards. The storage overpack, together with the multi-purpose canister, would be designed to meet the dry storage requirements specified in the *Code of Federal Regulations* (10 CFR Part 72). Multiple canisters could be stored in vaults built side by side. A representative horizontal dry storage system for canisters is illustrated in Figure D.2. A representative vertical dry storage system for canisters is illustrated in Figure D.3.

Transportation Overpacks. Multi-purpose canisters would be transported by rail in heavily shielded transportation overpacks designed to meet the standards established by the U.S. Nuclear Regulatory Commission under 10 CFR Part 71. The overpacks would be designed and constructed to contain the radioactivity in naval spent nuclear fuel during severe accidents. The conceptual designs of the transportation overpacks are based on existing and demonstrated technology. The overpacks consist of concentric shells of stainless steel, with layers of lead and depleted uranium in between for gamma radiation shielding. Neutron shielding is also provided. For transportation, the overpacks would be bolted closed and fitted with lightweight impact limiters on each end for protection during possible accidents. Impact limiters would be made from crushable, lightweight materials such as wood and aluminum, designed to provide sufficient energy absorption to prevent damage to the canisters in severe accidents. The transportation overpacks would be reusable and were assumed to have a useful life of 40 years.

Transfer Overpacks. The heavily shielded on-site transfer overpacks would be used to load and transfer multi-purpose canisters between overpacks at INEL because multi-purpose canisters are not heavily shielded. On-site transfer overpacks are similar to transportation overpacks, except they do not need to meet the stringent testing criteria required for off-site transportation as specified in 10 CFR Part 71.

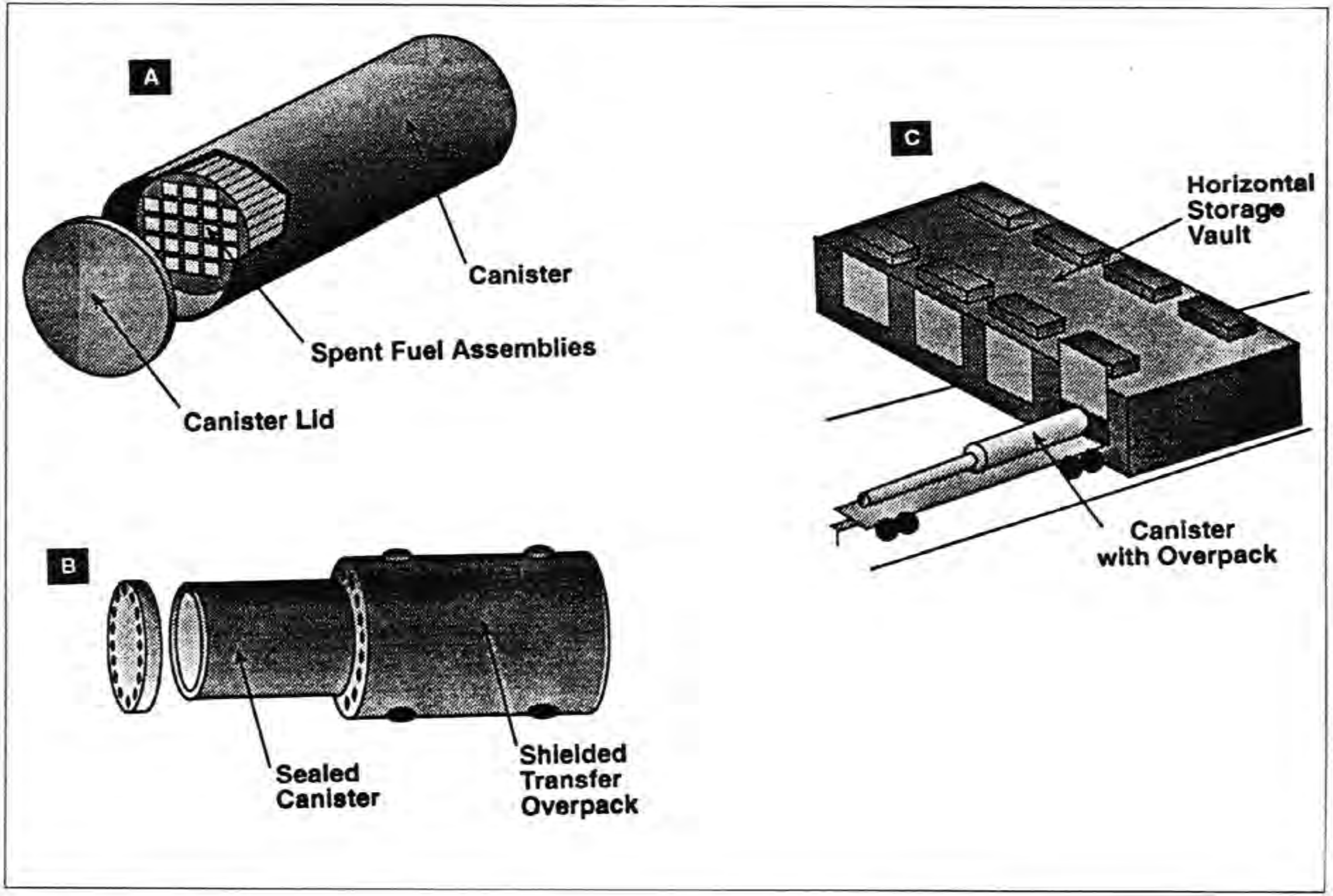

FIGURE D.2 Representative Canister-Based, Horizontal, Dry Storage System: (A) sealed canister with spent nuclear fuel basket; (B) sealed canister within an on-site, shielded transfer overpack; (C) sealed canister being placed in shielded, storage vault.

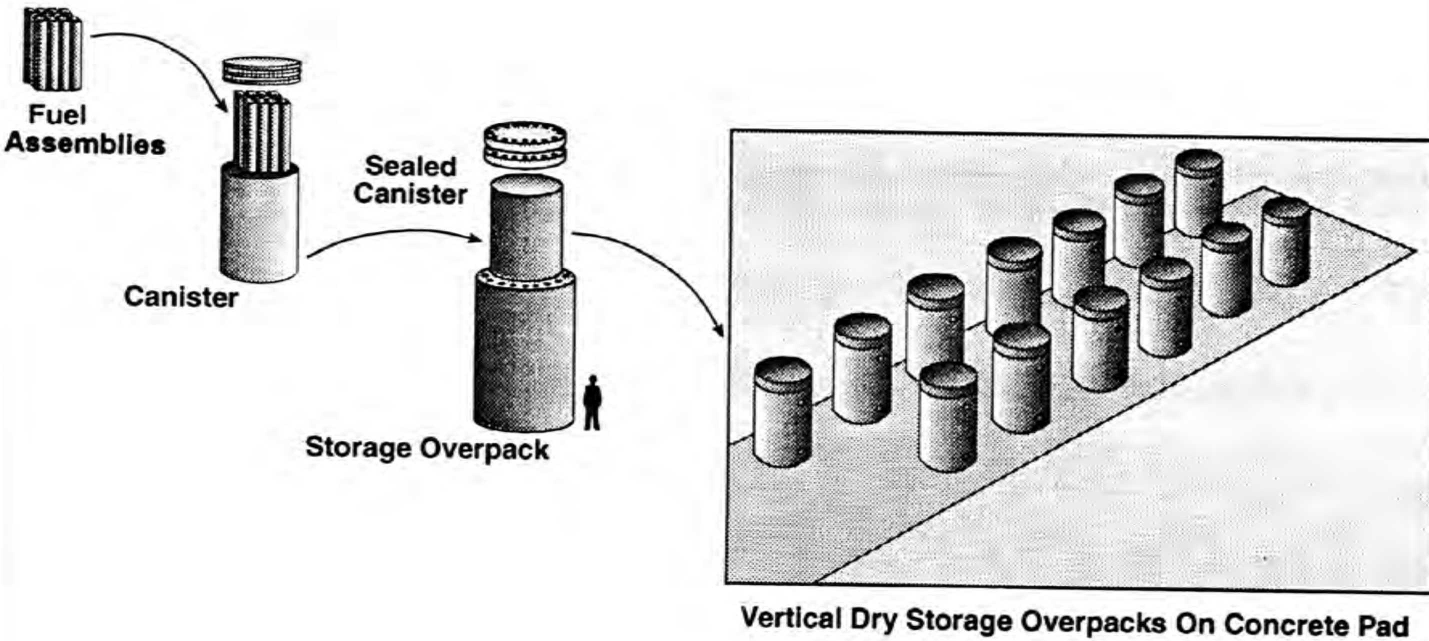

FIGURE D.3 Representative Vertical Dry Storage System for Multi-Purpose Canisters

Disposal Overpacks. Loaded multi-purpose canisters would be transferred to disposal containers (overpacks) at the surface facility of a repository. The disposal containers would be cylindrical overpacks constructed of highly corrosion-resistant metal alloys designed to meet 10 CFR Part 60 requirements. The disposal overpacks would have two lids that would be secured to the container shell by welding.

D.2.2 Handling, Storage, and Transportation Operations

Handling and storage operations associated with the Multi-Purpose-Canister Alternative would take place at INEL and the surface facility at a repository or centralized interim storage site. Multi-purpose canisters would be loaded at INEL for two purposes: (1) dry storage on-site or (2) direct shipment to a repository or centralized interim storage site. Multi-purpose canisters might be loaded either directly from a water pool or from a heavily shielded dry cell. The basic operations for loading a multi-purpose canister from a water pool or dry cell are shown schematically in Figures D.4 and D.5. The following is a general description of the procedures which may be used if this alternative were selected; it is intended to help the reader understand the process.

Prior to loading fuel from a water pool, an empty multi-purpose canister would be placed in an on-site transfer overpack with the lid of both the multi-purpose canister and the transfer overpack removed. The gap between the multi-purpose canister and transfer overpack would be filled with water and sealed with a temporary seal to prevent storage pool water from coming in contact with the clean outer surface of the multi-purpose canister. The transfer overpack containing the multi-purpose canister would then be filled with water, lowered into the pool by crane, and loaded with naval spent nuclear fuel assemblies.

After the multi-purpose canister had been filled with naval spent nuclear fuel assemblies, the end shield plug would be set in place and the transfer overpack removed from the water pool to a designated area for sealing. The multi-purpose canister closure would provide a high-integrity seal to contain radioactivity during storage and handling operation. After the canister is closed and sealed, the multi-purpose canister would be drained and vacuum dried, filled with an inert gas, and the access port would be sealed. The outer lid would then be welded. Although it is possible to design a multi-purpose canister with a bolted lid, it is anticipated that final design would feature welded lids, similar to the conceptual design. All currently licensed or docketed canister-based systems use welded seals. The transfer overpack lid would be bolted onto the transfer overpack, and the transfer overpack would be decontaminated for movement to either a storage overpack or transportation overpack.

Loading might also be accomplished in a dry cell facility, which would consist of shielded radiologically controlled areas with remotely operated equipment. The dry cell would provide a shielded barrier and radiological containment to load highly radioactive fuel into a canister. Fuel might also be removed from water pool storage and transferred to a dry cell for loading into canisters. Information about the proposed dry cell operations at the Expended Core Facility is contained in the Programmatic SNF and INEL EIS (DOE 1995, Volume I, Appendix D, Part B); information about the proposed Idaho Chemical Processing Plant dry cell facility is also included in the Programmatic SNF and INEL EIS (DOE 1995, Volume II, Part B).

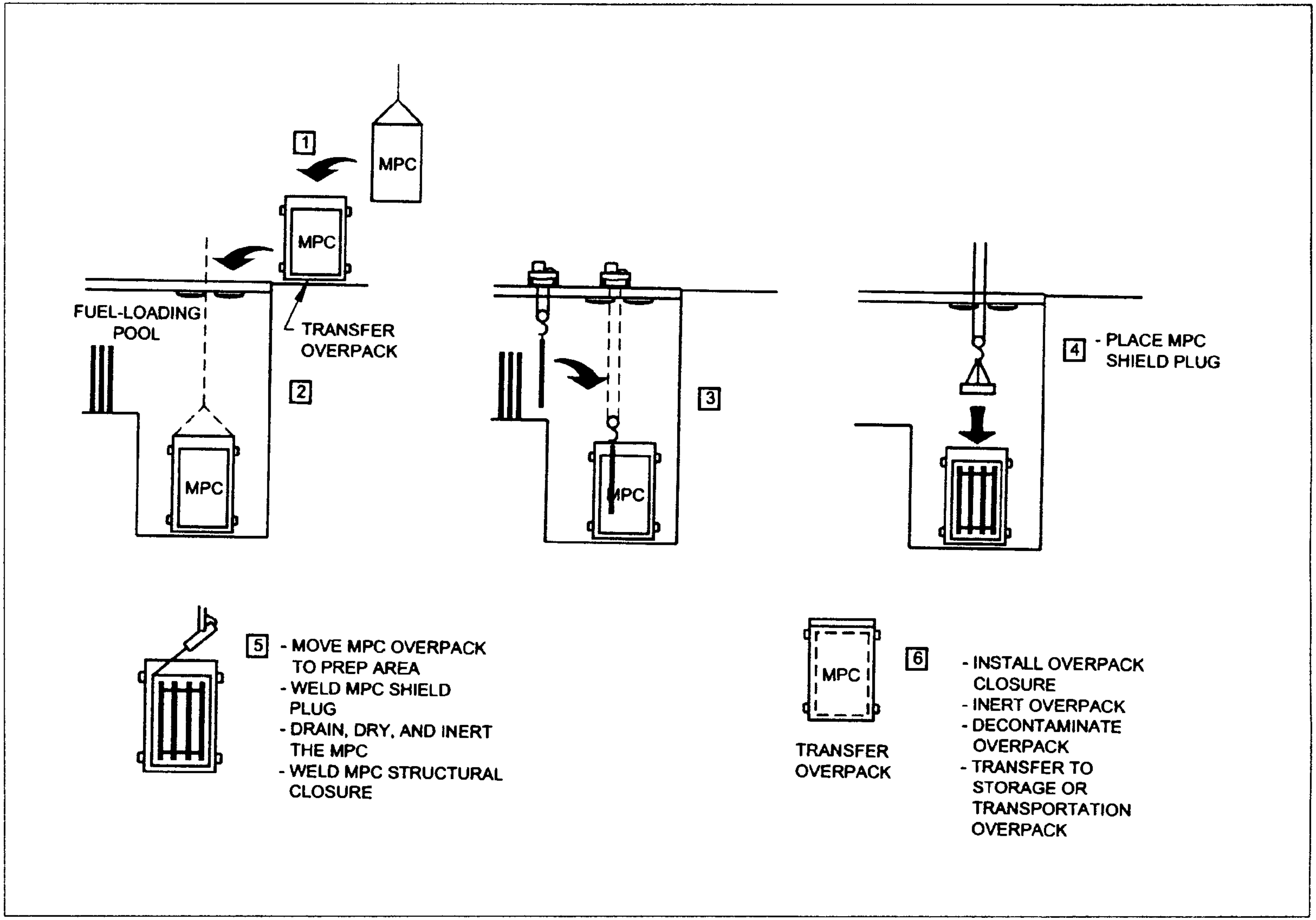

FIGURE D.4 Typical Operations for Loading a Multi-Purpose Canister (MPC) from a Pool (Source: Modified from DOE 1994)

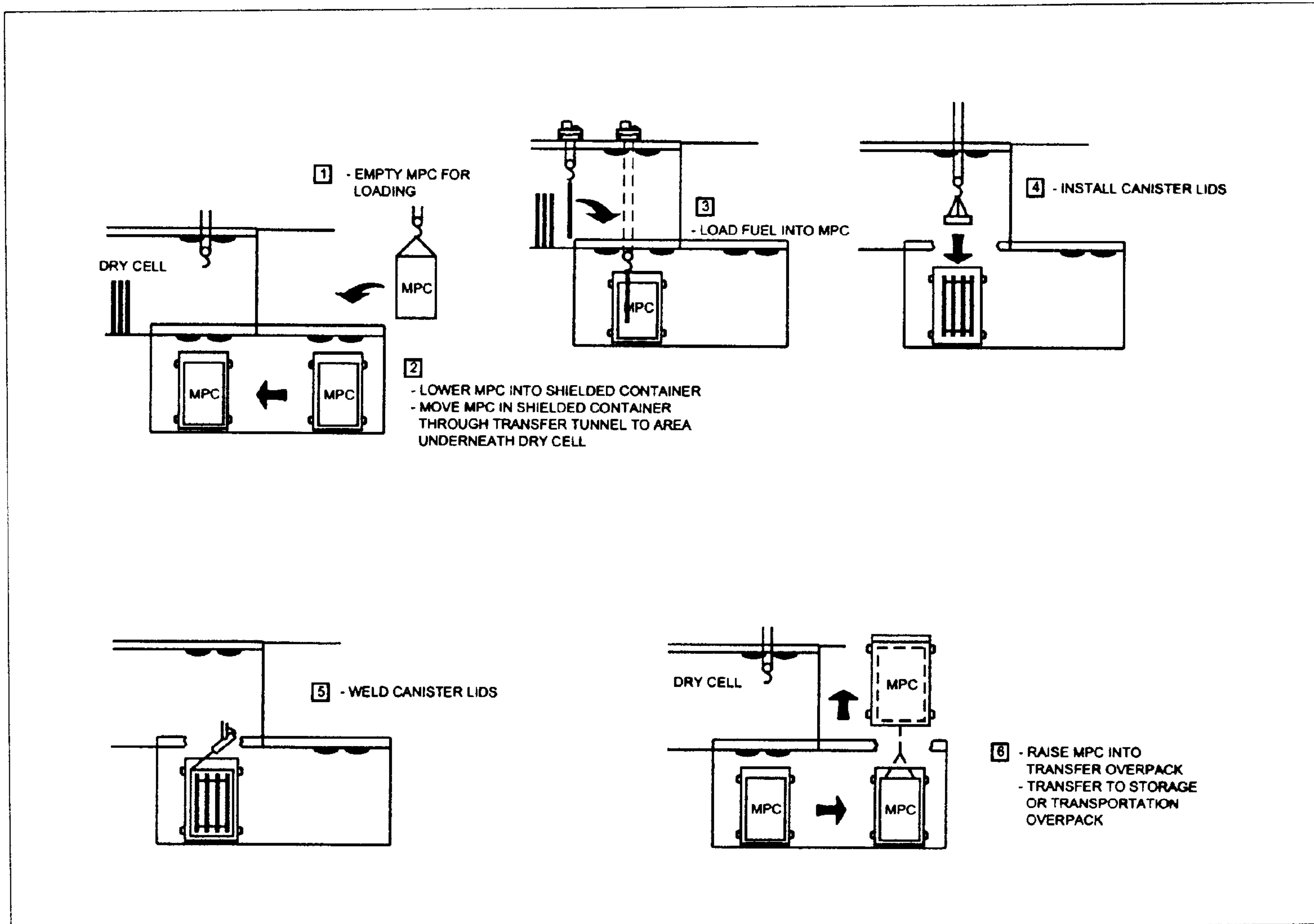

FIGURE D.5 Typical Operations for Loading a Multi-Purpose Canister (MPC) from a Dry Cell

If a dry cell were used, an empty canister would be loaded with naval spent nuclear fuel using fuel-handling equipment within the cell probably by lowering fuel assemblies into the multi-purpose canister through a hole in the bottom of the dry cell. Once the canister is filled, it would be closed and sealed. After the closure is complete, the canister would be inspected and tested for leaks. The loaded, sealed canister would be placed into a transfer overpack, which would be closed for movement to either a storage overpack or transportation overpack.

Once the transfer overpack would be loaded (in either a water pool or dry cell), an on-site transporter or heavy-haul truck would be used to transport the transfer overpack and its enclosed multi-purpose canister to an on-site storage location. Figure D.6 illustrates typical operations for horizontal dry storage of a multi-purpose canister. At the dry storage location, the multi-purpose canister would be transferred to its storage overpack, and the lid or door of the storage unit would be closed and secured, as appropriate, for security purposes. Once loaded in a storage overpack, the multi-purpose canister would require only occasional monitoring and maintenance. When the multi-purpose canister is prepared for off-site shipment, the storage overpack would be opened and the multi-purpose canister transferred from the storage overpack to the off-site transportation overpack. (This operation would be performed at the dry storage location or the multi-purpose canister would be returned to the location where it was loaded.) The lid would be bolted on the transportation overpack, the impact limiters installed, and the overpack would be readied for off-site shipment.

All shipments involving transportation of containers to a repository or centralized interim storage site would be made by train, using commercial rail lines. Heavy-haul transporters may be used for short portions of the trip. Dedicated trains might be used when appropriate. At a repository, loaded multi-purpose canisters would be transferred from transportation overpacks to disposal overpacks inside a shielded transfer room, and the disposal overpacks would be welded closed. The sealed waste package would then be prepared for movement to the underground disposal area.

For the Multi-Purpose Canister Alternative about 180 storage overpacks and 18 transportation overpacks would need to be managed at the end of the program. The scrap metal (including small amounts of lead) would be recycled, if possible. The concrete in the storage overpacks would be managed as non-radiological solid waste. These materials are not expected to be radiologically contaminated because the naval spent nuclear fuel would be contained within the multi-purpose canister. The canisters and the disposal overpacks would be disposed of with the naval spent nuclear fuel.

D.3 No-Action Alternative (Current Technology)

The No-Action Alternative is based on using existing technology at INEL to handle, store, and subsequently transport naval spent nuclear fuel to a geologic repository or centralized interim storage site using the M-140 transportation cask. Prior to shipment to a repository or centralized interim storage site, naval spent nuclear fuel would be stored at INEL in water pools or commercially available dry containers and then loaded into M-140 transportation casks. The loaded M-140 transportation casks would be shipped by rail to a repository or centralized interim storage site. At a repository, the naval spent nuclear fuel would be unloaded from the M-140 transportation casks and placed in a geologic repository's surface facilities for loading into disposal containers. Following unloading, the M-140 transportation casks would be returned to INEL for reuse. The M-140 trans-

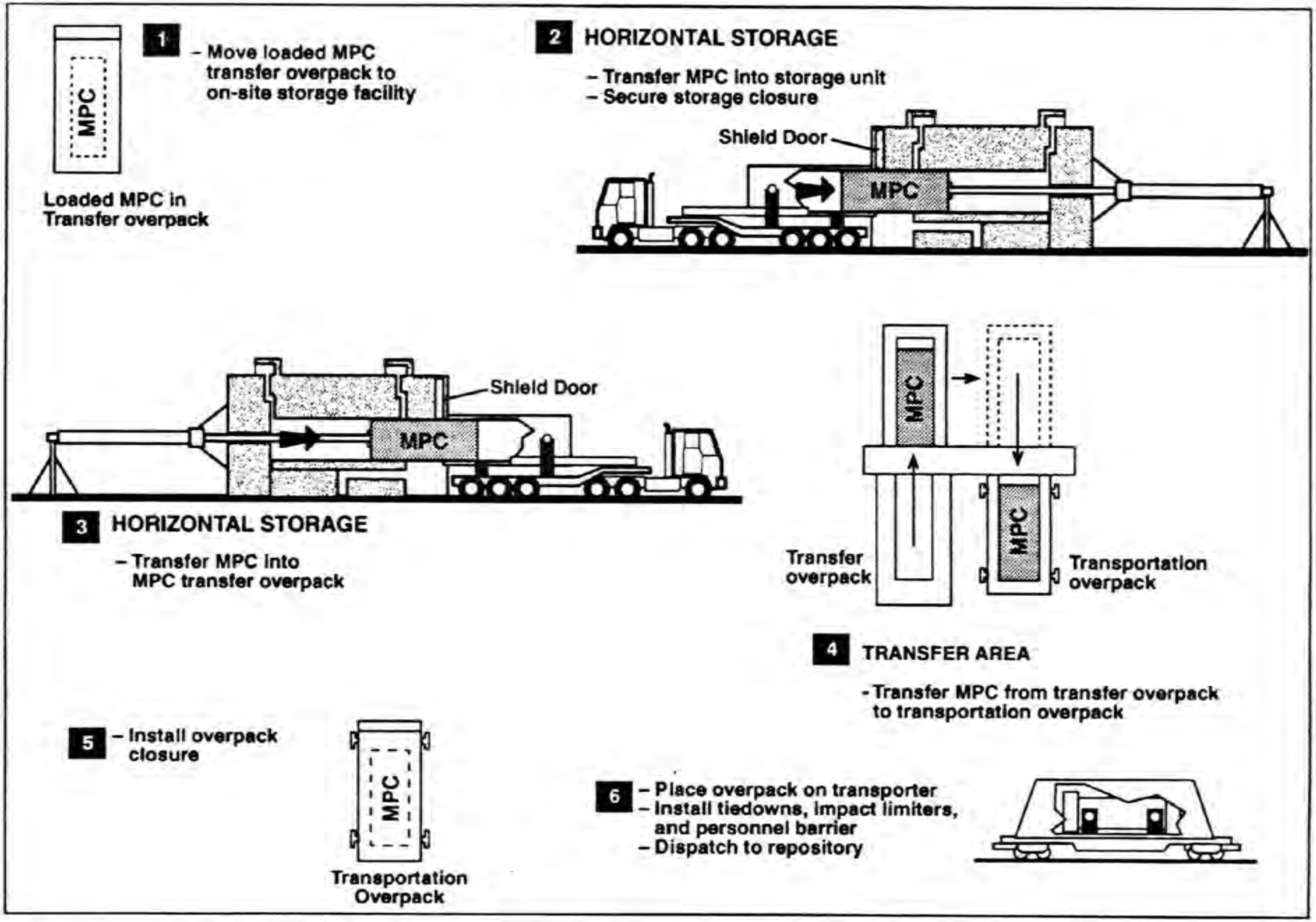

FIGURE D.6 Typical Operations for Loading a Multi-Purpose Canister (MPC) for Horizontal Dry Storage and Transfer to a Transportation Overpack (Source: Modified from DOE 1994)

portation cask used for naval spent nuclear fuel is unique to the Naval Nuclear Propulsion Programs. Figure D.7 shows the containers that would be required to load, store, transport, and dispose of naval spent nuclear fuel under the No-Action Alternative.

D.3.1 Technology and Related Hardware

M-140 Transportation Cask. The M-140 transportation cask is designed in accordance with U.S. Nuclear Regulatory Commission and U.S. Department of Transportation requirements and is used to transport naval spent nuclear fuel from naval sites to INEL. The M-140 transportation cask is a large stainless steel shipping container that is transported in the vertical position on a specially designed well-type railcar. The major components of the M-140 transportation cask include the shielded container, closure head, and protective dome. Internal basket assemblies are installed inside the container to hold the naval spent nuclear fuel assemblies in place and can be modified to accept different sized fuel assemblies. The container is shipped dry with the exception of a small amount of residual water. Cooling fins on the outside of the container are designed to dissipate the heat generated by the fuel.

The M-140 transportation cask and rail car weigh approximately 190 tons (approximately 172,000 kg) in the loaded condition. The existing M-140 transportation cask consists of a stainless steel container body, closure head, and a protective dome which fits over the closure head.

Dry Storage Under the No-Action Alternative. The two basic types of dry storage systems that could be chosen are (1) canister-based systems (see Figures D.2 and D.3) and (2) cask-based systems (see Figure D.8). The systems are similar to one another in that each unit is designed to hold a small number of spent nuclear fuel assemblies, shielding is provided by large amounts of concrete or steel, and cooling relies on the natural flow of air. The systems differ fundamentally in the manner in which shielding and structural support are provided. The canister-based system was selected as a representative design for EIS assessment purposes and is not intended to represent all of the currently available dry storage hardware designs.

Single-Purpose Dry Storage Canisters. For this EIS, the NUHOMS® Dry Spent Fuel Management System (VECTRA Fuel Services 1993) is considered representative of current technology for single-purpose dry storage canisters, because it is commonly used. However, it might not be the specific design selected.

Similar to multi-purpose canisters, the single-purpose dry storage canisters would consist of cylindrical stainless steel shells, a closure lid assembly, a fuel assembly basket, and a shield plug. The currently existing storage canisters have capacities that exceed those of multi-purpose canisters, primarily because the current single-purpose designs are not constrained by the same transportation and disposal requirements.

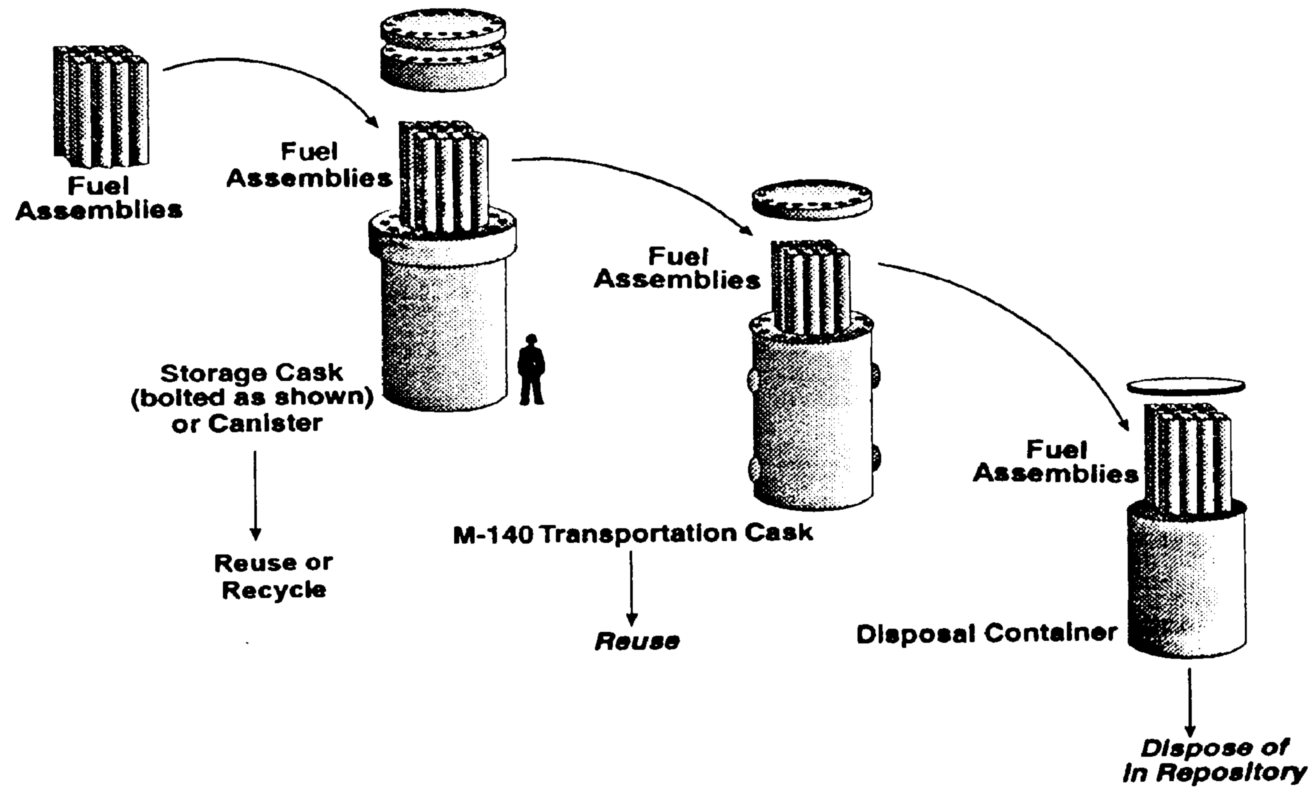

FIGURE D.7 Storage, Transport, and Disposal for the No-Action Alternative (Current Technology) System

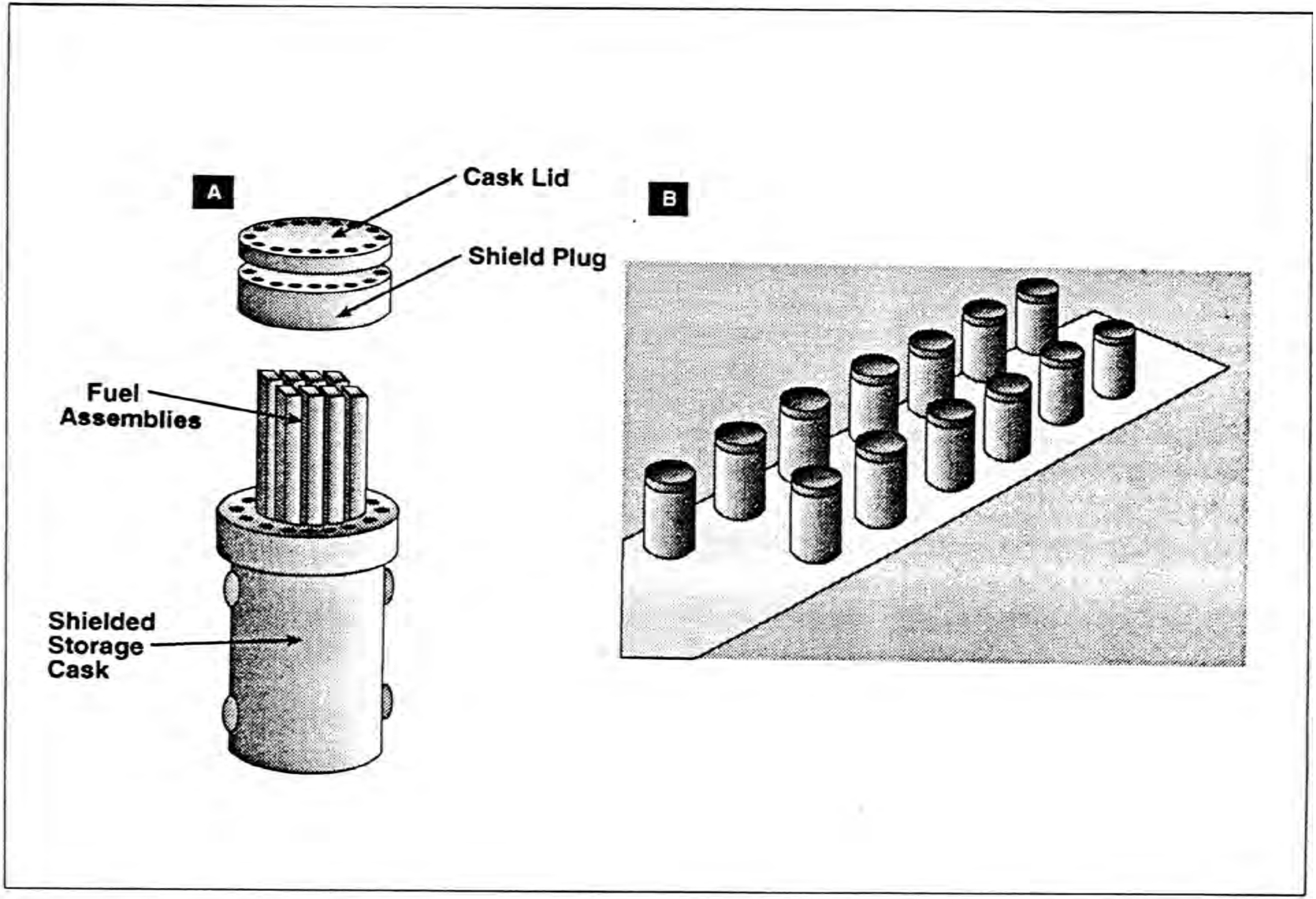

FIGURE D.8 Representative Cask-Based Dry Storage System: (A) shielded storage cask with bolted lid and spent fuel basket; (B) storage casks stored at an on-site storage facility.

The nontransportable single-purpose dry storage canisters would utilize transfer overpacks similar to those described in Section D.2.2 for the multi-purpose-canister system. In addition, dry storage was assumed to be provided in a manner similar to that described for the multi-purpose-canister system, using horizontal reinforced-concrete storage overpacks. The storage overpacks, together with the storage canister, would meet the dry storage requirements specified in 10 CFR Part 72.

Single-purpose canisters with welded closures were chosen as the representative single-purpose storage system for EIS evaluation because (1) recent trends indicate that commercial facilities are generally opting for welded systems, in part because they do not need to perform the sampling and inspections required by bolted closure systems; and (2) they generally result in slightly higher occupational doses than equivalent bolted systems, representing a conservative estimate of worker impacts for EIS purposes. Single-purpose dry storage cask systems with bolted closures are currently available and being used for dry storage at commercial facilities, and may be selected.

Disposal Containers. Naval spent nuclear fuel assemblies arriving at a repository in M-140 casks would be transferred to a large disposal container similar to the multi-purpose canister combined with its disposal overpack described in Section D.2.1.

D.3.2 Handling, Storage, and Transportation Operations

Under the No-Action Alternative, the Navy would obtain one of the commercially available storage systems designed to meet 10 CFR Part 72 for on-site dry storage. The system was assumed to be a nontransportable, sealed canister system, as described in Section D.3.1.

The basic loading procedures for single-purpose storage canisters would be similar to those described for the multi-purpose canister. However, at the time the naval spent nuclear fuel assemblies are prepared for off-site shipment, the sealed, nontransportable storage canisters would be repackaged. The canisters would be returned to the naval spent nuclear fuel water pool or dry cell where they would be opened. Fuel assemblies would be removed from the canisters using a fuel-handling machine, transferred to storage racks, and then loaded into M-140 casks. The M-140 casks would be bolted closed and prepared for shipment.

Naval spent nuclear fuel would be transferred directly to M-140 transportation casks from a water pool if it would be shipped directly to a repository or centralized interim storage site rather than placed in dry storage. The fuel-handling machine would be lowered into the water pool and the naval spent nuclear fuel would be lifted into the machine. The lower gate of the machine would be closed, and the loaded cask would be raised out of the water pool and moved into a position above an M-140 transportation cask. The fuel would then be lowered into the M-140 cask. Fuel-handling operations at the Expended Core Facility are described in the Programmatic SNF and INEL EIS (DOE 1995, Volume I, Appendix D, Part B). Loading at the Idaho Chemical Processing Plant would be handled in a similar way.

The M-140 casks loaded with naval spent nuclear fuel assemblies would be shipped directly to a repository or centralized interim storage site. All shipments would be made by train, using commercial rail lines. Dedicated trains might be used when appropriate. At a repository, all naval spent nuclear fuel assemblies arriving in M-140 transportation casks would be transferred inside shielded transfer cells into large disposal containers. The waste containers would be welded and decontaminated, as needed, before being moved underground for emplacement. Empty M-140 casks would be shipped back to INEL by rail for reuse.

For the No-Action Alternative about 255 storage overpacks, 255 storage containers and 28 casks would need to be managed at the end of the program. The concrete in the storage overpacks would be managed as non-radiological solid waste and the scrap metal recycled. The casks and storage containers would be reused or radiologically decontaminated prior to recycling. The disposal containers along with the naval spent nuclear fuel would be disposed of in the repository.

D.4 Current Technology Supplemented by High-Capacity Rail Cask

The hardware requirements for the Current Technology/Rail Alternative would be identical to those for the No-Action Alternative (Section D.3.1) but, under this alternative, the internal structure of the Navy's M-140 transportation cask would be modified to accommodate more naval spent nuclear fuel assemblies. Handling, storage, and transportation operations would also be the same, but fewer shipments would be required because of the increased capacity of the M-140 transportation casks.

For the Current Technology/Rail Alternative about 176 storage overpacks, 176 storage containers and 28 casks would need to be managed at the end of the program in the same manner described for the No-Action Alternative.

D.5 Transportable Storage Cask Alternative

D.5.1 Technology and Related Hardware

The hardware requirements for the Transportable Storage Cask Alternative would be similar to the Multi-Purpose Canister Alternative (Section D.2.1) except for a reliance on transportable storage casks instead of multi-purpose canisters. An existing, large transportable storage cask, having a capacity slightly greater than a large multi-purpose canister was used as an example in this EIS. The transportable storage cask design used in the assessment was based on the NAC International STC cask design (Danner 1994). The cask would be a cylindrical stainless steel cask incorporating lead as the primary gamma-shielding material. Unlike the canister-based systems, the basket would not be within a separate, sealed canister. The transportable storage cask design has a bolted closure. Containers similar to the one used for analysis purposes for this alternative may become available in the future and may be selected. The casks would be designed to meet the performance requirements specified in 10 CFR Part 72 and 10 CFR Part 71 for storage and transportation, respectively. A schematic diagram illustrating how transportable storage casks are loaded, stored, and transported is shown in Figure D.9.

D.5.2 Handling, Storage, and Transportation Operations

Handling, storage, and transportation operations for the Transportable Storage Cask Alternative would be similar to those described for the Multi-Purpose Canister Alternative (Section D.2.2), except transportable storage casks do not require separate, shielded overpacks. Under the Transportable Storage Cask Alternative, transportable storage casks would be loaded at INEL in a manner similar to canister-based storage systems. The cask would be placed in a water

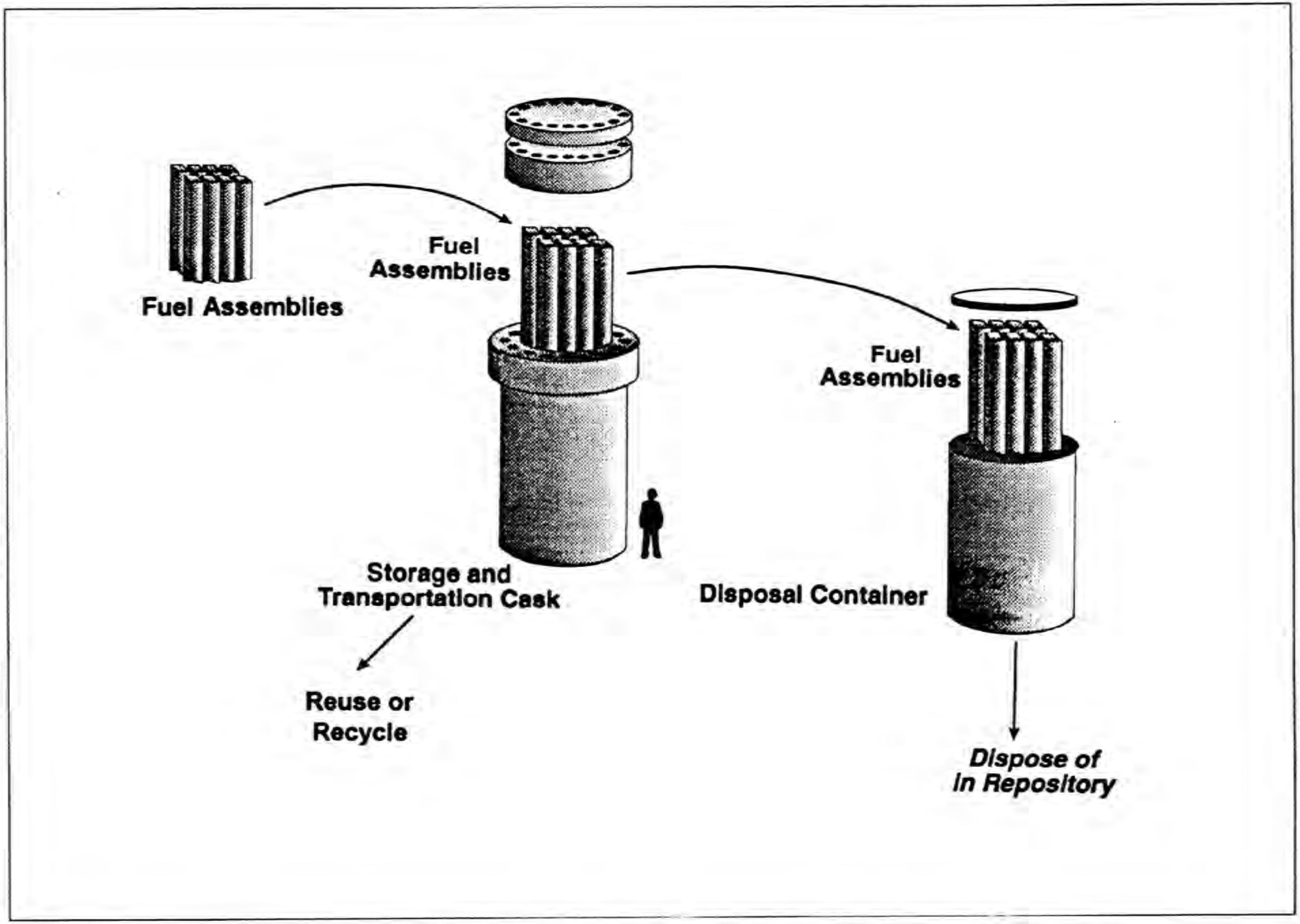

FIGURE D.9 Storage, Transport, and Disposal for the Transportable Storage Cask System pool or dry cell, and naval spent nuclear fuel assemblies would be transferred into the cask. The lid of the transportable storage cask would be sealed. The transportable storage cask would be decontaminated and moved to an on-site storage area. For shipment to a repository or centralized interim storage site, the cask would be placed on a railcar either at the dry storage location or returned to the location where it was loaded. Subsequently, it would be prepared for shipment to a repository or centralized interim storage site.

The Transportable Storage Cask Alternative would rely on rail transportation. All shipments to a repository or centralized interim storage site would be made by train, using commercial rail lines. Dedicated trains might be used when appropriate. At a repository, all naval spent nuclear fuel assemblies arriving in transportable storage casks would be transferred into large disposal containers within shielded transfer cells. The disposal containers would be decontaminated, as needed, before being moved underground for emplacement. The empty transportable storage casks would be shipped back to INEL by rail for reuse.

At the end of the program about 171 casks for the Transportable Storage Cask Alternative would be reused or radiologically decontaminated prior to recycling. It is expected from the cask design, which includes lead shielding material, that the lead would not be radiologically contaminated. The metal portions would be recycled following any radiological decontamination of surfaces. The disposal containers and naval spent nuclear fuel would be placed in a repository.

D.6 Dual-Purpose Canister Alternative

D.6.1 Technology and Related Hardware

The hardware requirements of the Dual-Purpose Canister Alternative would be similar to the Multi-Purpose Canister Alternative, except it was assumed that the dual-purpose canister would not be compatible with the disposal requirements specified in 10 CFR Part 60. Figure D.10 illustrates how dual-purpose canisters are loaded, stored, transported, and disposed of. For assessment purposes, the NUHOMS-MP187® (VECTRA Fuel Services 1993) was selected as an example design for a dual-purpose canister system. Containers similar to the one used for assessment purposes for this alternative may become available in the future and may be selected. The dual-purpose canister system would have a capacity slightly greater than that of the large multi-purpose canister. The canisters were assumed to be stored within horizontal concrete storage overpacks, as described for the Multi-Purpose Canister Alternative.

D.6.2 Handling, Storage, and Transportation Operations

Handling, storage, and transportation operations for the Dual-Purpose Canister Alternative would be similar to those described for the Multi-Purpose Canister Alternative (Section D.2.2). At INEL, dual-purpose canisters would be loaded from a water pool or dry cell in the manner described for multi-purpose canisters.

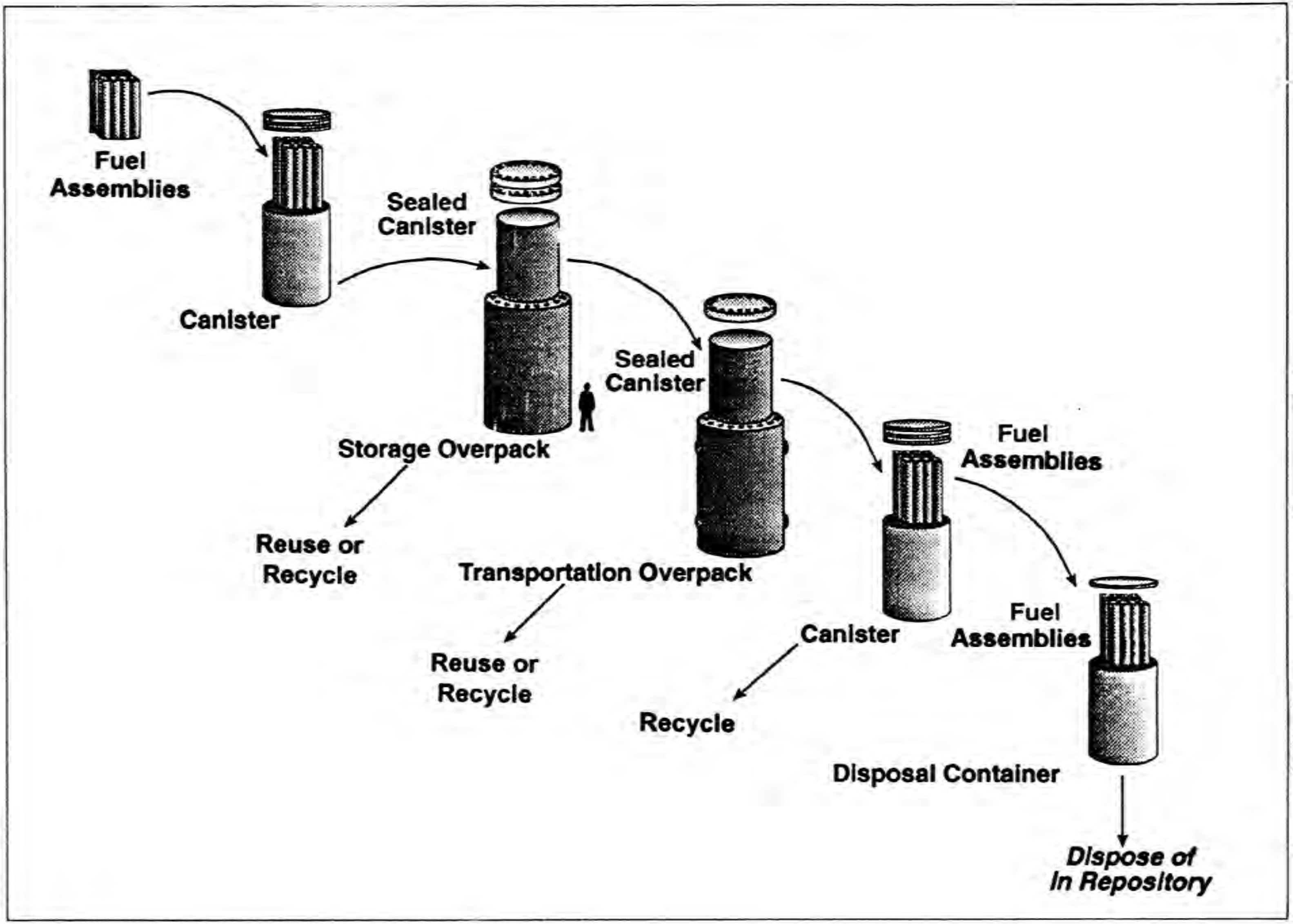

FIGURE D.10 Storage, Transport, and Disposal for the Dual-Purpose Canister System

The Dual-Purpose Canister Alternative would rely on rail transportation. All shipments to a repository or centralized interim storage site would be made by train, using commercial rail lines. Dedicated trains might be used when appropriate. At a repository, naval spent nuclear fuel assemblies arriving in dual-purpose canisters would be removed from the canisters and transferred into large disposal containers within shielded transfer cells. The disposal containers would be decontaminated, as needed, before being moved underground for emplacement. The empty dual-purpose canisters would be recycled or disposed of as low-level radioactive waste, as appropriate. The transportation overpack would be sent back to INEL for reuse.

At the end of the program about 345 canisters for the Dual-Purpose Canister Alternative would be reused or radiologically decontaminated prior to recycling. In addition 173 storage overpacks and 18 transportation overpacks would be prepared for recycling of metals including lead and disposal of the concrete as non-radiological solid waste. The disposal containers and naval spent nuclear fuel would be placed in a repository.

D.7 Small Multi-Purpose Canister Alternative

The Small Multi-Purpose Canister Alternative would be similar to the Multi-Purpose Canister Alternative (Section D.2), except that it would use a smaller, multi-purpose canister. This reduced capacity would limit the amount of fuel it could hold and would result in a greater number of handling operations at INEL and more shipments to the repository or centralized interim storage site. Although the smaller multi-purpose canisters would require more handling, handling operations may be accommodated better with smaller equipment (cranes, etc.). The small canisters would have lower thermal and radiation output which may also simplify handling operations and equipment.

For the Small Multi-Purpose Canister Alternative about 264 storage overpacks and 30 transportation overpacks would be managed at the end of the program in the same manner as the Multi-Purpose Alternative describes.

APPENDIX E
SPECIAL CASE LOW LEVEL WASTE

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E. SPECIAL CASE LOW-LEVEL WASTE

Naval spent nuclear fuel assemblies are disassembled at the Idaho National Engineering Laboratory (INEL) so that the fuel bearing areas can be inspected as part of the Navy's program for improvement of the fuel assemblies. With the disassembly of the assemblies, spent fuel bearing sections and non fuel-bearing low-level radioactive waste are created. The non fuel-bearing low-level radioactive waste can be further categorized into one of several classes. U.S. Nuclear Regulatory Commission regulations in 10 CFR Part 61 identify three classes of low-level waste, namely classes A, B, and C. Disposal of low-level radioactive waste in Classes A, B, or C is accomplished by land burial pursuant to DOE and Nuclear Regulatory Commission requirements.

There are also wastes with concentrations of certain short- and long-lived isotopes which are greater than those specified for Class C. These naval low-level wastes are classified as a type of special case waste. (Such wastes are classified as Greater Than Class C wastes when they are generated by the commercial sector.) Disposal of special case waste requires more stringent measures, including possibly burial in a geologic repository. This appendix covers the possible disposal of non fuel-bearing low-level radioactive waste that is classified as a special case waste by using the same dry storage and container options chosen for naval spent nuclear fuel.

E.1 Background

All naval fuel assemblies have metal structures (which contain no fuel) above and below the fuel region to facilitate coolant flow and maintain proper support and spacing within the reactor. These upper and lower non-fuel bearing structures must be removed at the Expended Core Facility to provide access to the fuel-bearing sections to permit inspection of the assembly. Removal of these structures also reduces the storage space ultimately required for spent fuel by approximately 50%.

The upper and lower non-fuel bearing structures removed during the preparation of fuel assemblies are evaluated using the waste classification criteria established by federal regulations in 10 CFR Part 61. These non-fuel bearing structures do not contain any fuel, or fission products from fuel, and therefore are not "spent nuclear fuel." They also do not contain transuranic elements or fission products and, thus, are not "trans waste" or "high-level waste", respectively. Therefore, the nature of the radioactivity in these non-fuel bearing structures (sometimes called "end boxes") causes them to be classified as low-level waste. This low-level waste is further classified based upon disposal requirements.

After removal from the spent fuel, those non-fuel bearing structures meeting the requirements for near-surface disposal (Classes A, B, or C) are shipped to the INEL Radioactive Waste Management Complex using a shielded cask, as identified in the Programmatic SNF and INEL EIS (DOE 1995). There the structures are disposed of in accordance with the Department of Energy (DOE) requirements for the appropriate class of low-level radioactive waste.

A portion of the non-fuel bearing structures may contain concentrations of certain short- and long-lived isotopes which are greater than those specified for Class C. Such wastes are regulated as not generally suitable for near-surface disposal. These wastes are classified as special case low-level radioactive waste.

Currently, about 35 cubic meters of special case low-level waste in material removed from above and below the fuel region of naval spent nuclear fuel assemblies over the years is being stored at the Naval Reactors Facility pending availability of an appropriate disposal facility, possibly licensed by the Nuclear Regulatory Commission, or a centralized interim storage site. In addition to the special case low-level waste already in storage, it is estimated that about 460 cubic meters special case waste will be removed from naval spent fuel assemblies to be shipped to the Expended Core Facility during the period from 1996 through 2035.

E.2 Characteristics of Special Case Waste

The non-fuel bearing metal structures removed from the upper and lower ends of naval spent nuclear fuel assemblies are principally made either of Inconel or of the same alloy of zirconium used for fuel cladding. They have been exposed to the same operating conditions as the fuel since they were physically attached to the fuel assemblies. However, these structures contain no nuclear fuel or fission products. They are radioactive because some neutrons from the reactions in the core have activated the atoms of the metal in the end structures. They are also radioactive because some of the radioactive corrosion products from the reactor have been deposited on their metal surfaces.

When each assembly is received at the Expended Core Facility at INEL, it is in exactly the same condition as at the time it was removed from a naval reactor. The top and bottom ends of each assembly have a mechanical support and extensions of fuel elements which do not contain any nuclear fuel. These ends are needed to allow for joining of individual elements into an assembly during manufacture, to direct the water flow into and out of the fuel region during reactor operation, and to support the assembly mechanically. These structures are often relatively bulky and must be removed before naval spent nuclear fuel can be examined because they obstruct visual access to the interior of the fuel assembly. Therefore, the extensions are cut off the fuel assembly at the Expended Core Facility as part of the preparations for examination of the assembly.

The end structures are made of solid metal. They are less radioactive than naval spent nuclear fuel assemblies and generate very little heat from radioactive decay. No liquid would be included in the storage or shipping containers used for this waste. The end structures are not hazardous waste under the Resource Conservation and Recovery Act because they contain no hazardous materials as designated under that Act. They are not explosive, reactive, corrosive, flammable, toxic, or combustible.

E.3 Dry Storage Options

This EIS describes several alternatives for the storage of naval spent nuclear fuel until such time as shipment to a permanent disposal repository or a centralized interim storage site can be made. This Appendix describes several alternatives for storage of special case waste until shipment to a permanent disposal repository or a centralized interim storage site. It is assumed for the purpose of this EIS that the special case low-level waste could be stored in the same alternative locations selected for storage of naval spent nuclear fuel using the same alternative storage systems. The number of special case waste containers was developed considering the internal cavity lengths and diameters associated with the various alternative container types. The number of container shipments that would be needed for special case waste is identified in Table E.1, and is seen to be about 15-20% of the number required for naval spent nuclear fuel. Therefore, the impacts from special case waste represent a small incremental increase in associated risks. The incremental increase in risk would be less than 20% because this waste contains no fission products and thus contains less radioactive material.

TABLE E.1 Estimated Number of Container Shipments Required for Special Case Low-Level Radioactive Waste Removed from Naval Spent Nuclear Fuel Assemblies

Alternative	Estimated Number of Container Shipments
Multi-Purpose Canister	60
No-Action	55
Current Technology/Rail	55
Transportable Storage Cask	45
Dual-Purpose Canister	45
Small Multi-Purpose Canister	85

In the Programmatic SNF and INEL EIS (DOE 1995; Volume 2, Part B, C.4.7.1), the DOE described a project for Greater Than Class C waste dedicated storage at the Idaho Chemical Processing Plant. The objective of that proposed project would be to provide for DOE receipt and storage of Greater Than Class C low-level waste sealed radiation sources from the commercial sector. Other Greater Than Class C low-level waste would be received on an as-needed basis. In May 1989, the Nuclear Regulatory Commission promulgated a rule that requires disposal of commercially generated low-level waste with concentrations of radioactivity Greater Than Class C waste in a deep geologic repository, unless disposal elsewhere is approved by the Nuclear Regulatory Commission. Although the DOE has identified that the project is designed to handle Greater Than Class C low-level waste from commercial sources, another alternative is to consider the possibility of using that facility for storage of naval program special case low-level waste until shipment to a centralized interim storage site or a repository for permanent disposal.

DOE has assigned the management responsibility for Greater Than Class C low-level waste to the INEL. The design basis for the Greater Than Class C waste Storage Facility would be an outdoor above-grade concrete lay-down pad on which appropriately shielded casks would be placed. For storage, the project would involve the expansion of an existing concrete pad, or the construction of a new concrete pad, and the procurement of numerous concrete storage casks. Existing grounds and facilities at the INEL could be modified and used for waste receiving and handling operations as described in the Programmatic SNF and INEL EIS (DOE 1995; Volume 2, Part B, C.4.7.1-4).

E.4 Candidate Containers for Special Case Waste

It is currently planned that the naval spent nuclear fuel assembly end structures which are classified as special case waste would be placed into the same type of container system selected for dry storage and shipment of naval spent nuclear fuel. The same type of containers would be used to simplify operations of INEL and repository facilities, and because current policy requires that spent nuclear fuel be placed into a geologic repository and special case waste may also be authorized for disposal in a geologic repository.

Placing the special case waste from the Expended Core Facility into containers designed to provide shielding for spent nuclear fuel, which is much more radioactive, means that the shielding in the container walls would reduce the radiation outside the containers to levels lower than those obtained with spent fuel. The containers used for storage and shipment of naval spent nuclear fuel would provide adequate structural strength even when loaded to full capacity with end structures removed from naval spent nuclear fuel. Therefore, the containers selected for dry storage and shipment of naval spent nuclear fuel would be adequate to provide protection for the environment and the public from the naval special case low-level radioactive waste.

E.5 Manufacturing Impacts of Containers for Special Case Waste

The impacts of manufacturing enough containers for the special case waste from naval spent nuclear fuel have been included in the manufacturing impacts presented in Chapter 4 and represent about 15-20% more of the same containers used for naval spent nuclear fuel that would be needed. This 15-20% increment is based on the relative volume of naval spent nuclear fuel to be shipped to a repository during the period considered in this EIS and the amount of special case waste existing in the same period. This percentage would be about the same for all alternative container systems considered. The internal structure of the containers for special case waste would be more simple than that for spent nuclear fuel. The containers for special case waste would need neither provisions to prevent nuclear chain reactions nor heat generated by radioactive decay.

E.6 Environmental Impacts During Dry Storage of Special Case Waste

The non-fuel bearing metal structures removed from the ends of naval spent nuclear fuel assemblies generate so little heat from radioactive decay that they do not need to be stored in water pools after removal from the assemblies. Since the space in the Expended Core Facility is more appropriately utilized for naval spent nuclear fuel examination operations and the cooling provided by the water is not needed, it would be desirable to move the end pieces to dry storage as soon as practical. The materials in the end structures from naval spent nuclear fuel can be stored in dry containers or in water pools indefinitely without deterioration.

The storage containers for this special case waste could be placed at the same storage location used for the naval spent nuclear fuel without any problems or difficulties. Using the same storage location would simplify operations associated with storage and preparation for shipment to a repository and avoid duplication of monitoring operations and heavy equipment.

Assuming the same distances from an array of containers to the boundary of the storage location, the radiation levels at the periphery of a storage location used for naval spent nuclear fuel would be increased by less than 15-20% if the special case waste were included because of the lower radiation levels contributed by each container of special case waste and because the containers near the edge of the array of storage containers would act as shielding for containers toward the center. Workers beyond the boundaries of the storage array would be limited to less than 100 millirem per year in accordance with federal regulations regardless of whether the special case waste was included or not. The radiation levels to which the general public might be exposed would be essentially unchanged because of the large distances from the storage site to the boundaries of the INEL and to the nearest points of unrestricted access.

Accidents involving storage containers filled with special case waste from naval spent nuclear fuel examinations would not be as severe as those for naval spent nuclear fuel because there would be less total radioactive material in a container of end structures and because there would be no fission products, which are generally more readily dispersed in air than are activation products bound up in solid metal.

Table E.2 tabulates the isotopes and the activities that could be released in an accident involving naval special case waste under dry storage conditions. Conditions used in developing the source term, are as follows:

- The amount of corrosion products is based on best estimate values.
- One percent of the original corrosion products might be released to the atmosphere due to thermal air currents.
- No filtration by HEPA filters is assumed.

TABLE E.2 Radionuclide Amounts Potentially Released for a Wind-Driven Projectile Impact Accident Involving SCW in Dry Storage[a]

	Alternative/Curies			
Radionuclide	NAA or CTR	MPC	TSC or DPC	SmMPC
Cobalt-60	6.7×10^{-2}	6.1×10^{-2}	7.8×10^{-2}	4.2×10^{-2}
Iron-55	1.2×10^{-1}	1.1×10^{-1}	1.4×10^{-1}	7.7×10^{-2}
Cobalt-58	2.5×10^{-2}	2.3×10^{-2}	3.0×10^{-2}	1.6×10^{-2}
Manganese-54	4.2×10^{-3}	3.9×10^{-3}	4.9×10^{-3}	2.6×10^{-3}
Nickel-63	2.2×10^{-2}	2.0×10^{-2}	2.6×10^{-2}	1.4×10^{-2}

[a] Notation: SCW = special case waste; NAA = No-Action; CTR = Current Technology/Rail; MPC = Multi-Purpose Canister; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister

Compared to the radionuclide amounts tabulated on page A-36 of Appendix A, it is apparent that the consequences from an accident involving a container of naval spent nuclear fuel would be greater than those for a similar accident involving a container of naval special case low-level waste. Therefore, the accidents analyzed in Appendix A of this EIS for naval spent nuclear fuel in storage locations at INEL would produce consequences greater than could occur for the special case waste. Those consequences would not be exceeded by a similar accident for special case waste in storage.

E.7 Shipment of Special Case Waste to a Disposal Site or Centralized Interim Storage Site

Just as the use of the same container for naval spent nuclear fuel and special case waste from naval spent nuclear fuel examinations would simplify operations and procurement for storage systems, it would make operations and equipment needs for shipments to a geologic repository or a centralized interim storage site less complicated if such a site were authorized to receive special case waste. The requirements for shipment of naval spent nuclear fuel are as stringent or more stringent than those for the shipment of special case waste, so containers designed and certified for the shipment of naval spent nuclear fuel would be adequate for the naval special case waste as well.

The containers designed for shipment of naval spent nuclear fuel could also be used for shipment of special case waste from the Expended Core Facility because the radiation levels on the exterior of the containers for special case waste would be lower than those used for naval spent nuclear fuel. The same radiation levels have been used for shipping containers carrying both cargos in the analyses in this EIS to provide estimated effects that would not be exceeded. There would be less need for removal of heat generated by radioactive decay in the special case waste shipping containers than in containers loaded with naval spent nuclear fuel and there would be no concern with accidental uncontrolled nuclear chain reactions in containers of special case waste because they would contain no nuclear fuel.

Table E.3 tabulates the isotopes and the activities that could be released in a transportation accident involving a worst-case shipment of naval special case waste. Conditions used in developing the source term are as follows:

- To reflect the most severe accident conditions, 100% of the available corrosion products are assumed to be released to the interior of the container.

- It is assumed that damage to the shipping container might be great enough to allow 10% of the corrosion products to escape to the environment through the damaged area. The remainder would be trapped inside the container.

TABLE E.3 Radionuclide Amounts Potentially Released in an Accident Involving SCW During Transportation[a]

	Alternative/Curies			
Radionuclide	NAA or CTR	MPC	TSC or DPC	SmMPC
Cobalt-60	3.8×10^{-1}	3.5×10^{-1}	4.4×10^{-1}	2.3×10^{-1}
Iron-55	4.1×10^{-1}	3.8×10^{-1}	4.8×10^{-1}	2.6×10^{-1}
Cobalt-58	5.2×10^{-8}	4.8×10^{-8}	6.1×10^{-8}	3.2×10^{-8}
Manganese-54	1.3×10^{-3}	1.2×10^{-3}	1.5×10^{-3}	7.9×10^{-4}
Nickel-63	2.1×10^{-1}	1.9×10^{-1}	2.5×10^{-1}	1.3×10^{-1}
Strontium-90[b]	2.6×10^{-4}	2.4×10^{-4}	3.0×10^{-4}	1.6×10^{-4}

[a] Notation: SCW = special case waste; NAA = No-Action; CTR = Current Technology/Rail; MPC = Multi-Purpose Canister; TSC = Transportable Storage Cask; DPC = Dual-Purpose Canister; SmMPC = Small Multi-Purpose Canister

[b] Strontium-90 is a fission product from trace elements in structural material that has plated out onto the end boxes, along with activated corrosion products.

As in the case of accidents involving the storage of special case waste from the Expended Core Facility, accidents associated with shipping such waste to a geologic repository would have less impact than accidents involving naval spent nuclear fuel. As previously discussed, this is because the special case waste contains no fission products, and each container therefore contains less overall radioactive material than a container of naval spent nuclear fuel. The radiological doses that are shown in Appendix B and in Table 7.4 of this EIS have been calculated using the conservative assumption that a container of special case waste involved in an accident would release the same amount of radioactive material as a container of naval spent nuclear fuel involved in an accident. Therefore, the accidents analyzed in Appendix B of this EIS have been used to provide estimates of consequences which are greater than those that could occur for shipment of special case waste from the examination of naval spent nuclear fuel.

APPENDIX F
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F. FEASIBILITY OF LOCATING A SPENT NUCLEAR FUEL DRY STORAGE FACILITY ON THE INEL AT A SITE REMOVED FROM ABOVE THE SNAKE RIVER PLAIN AQUIFER

F.1 Background

The agreement between the State of Idaho and the federal government involving the shipment of additional spent nuclear fuel to the Idaho National Engineering Laboratory (INEL) includes a provision that all spent nuclear fuel at INEL will be transferred from wet storage to dry storage (U.S. District Court, 1995; Paragraph E.8). The agreement also states that "DOE shall, after consultation with the State of Idaho, determine the location of the dry storage facilities within the INEL, which shall, to the extent technically feasible, be at a point removed from above the Snake River Plain Aquifer." The purpose of this Appendix is to address locations at INEL that might be removed from above the Snake River Plain Aquifer and to compare them to locations that are over the Snake River Plain Aquifer. For purposes of this Appendix, storage of special case waste is considered with spent nuclear fuel. For perspective, a maximum of approximately 12 to 15 acres would be needed for the naval spent nuclear fuel dry storage and the special case waste storage structure, depending on the alternative.

In the search for a technically feasible location at a point removed from above the Snake River Plain Aquifer, this Appendix addresses significant considerations including the recharge to the Snake River Plain Aquifer, the magnitude of potential earthquakes, and topography of the area. This Appendix also discusses ecological resources, cultural resources, land use, air quality, aesthetics, waste management, public safety, and security.

F.2 Locations Considered

Figure F.1 shows the boundaries of the INEL imposed over a map of the Eastern Snake River Basin and the Eastern Snake River Plain (USGS 1992). As seen in Figure F.1, there are two relatively small portions of the INEL that do not appear to be within the outline of the Eastern Snake River Plain but they are still within the Eastern Snake River Basin. The area at the northern end of INEL will be referred to as the Birch Creek Area and the area on the west side of INEL will be referred to as the Lemhi Range Area.

Sites where naval spent nuclear fuel is currently examined or stored are also discussed in this Appendix. These sites are the Naval Reactors Facility and the Idaho Chemical Processing Plant. The locations of these two sites are shown in Figure F.2. Both of these sites are on the Snake River Plain and over the Snake River Plain Aquifer.

This EIS evaluated a range of representative locations on the INEL for a dry storage facility for naval spent nuclear fuel. Undisturbed areas on the INEL within the Eastern Snake River Plain were not evaluated, as they offer no significant environmental advantages over those areas where spent naval fuel is already stored. Establishment of a dry storage facility in currently undisturbed areas would require construction activities in support of the needed buildings and associated infrastructure, and would potentially disturb plants which are culturally important to the Shosone-Bannock tribes.

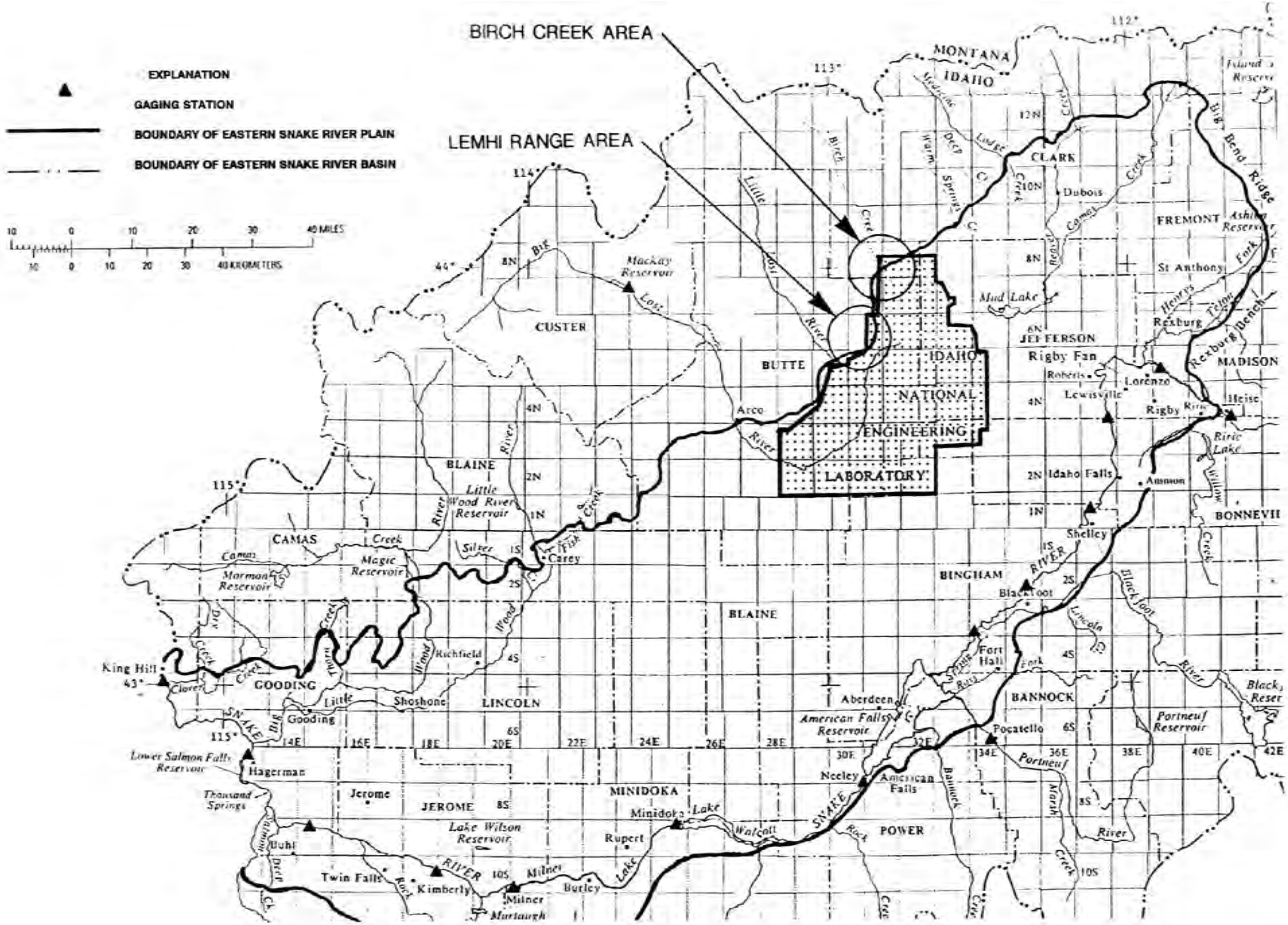

FIGURE F.1 Eastern Snake River Plain and the Northern Part of the Snake River Basin (USGS1992)

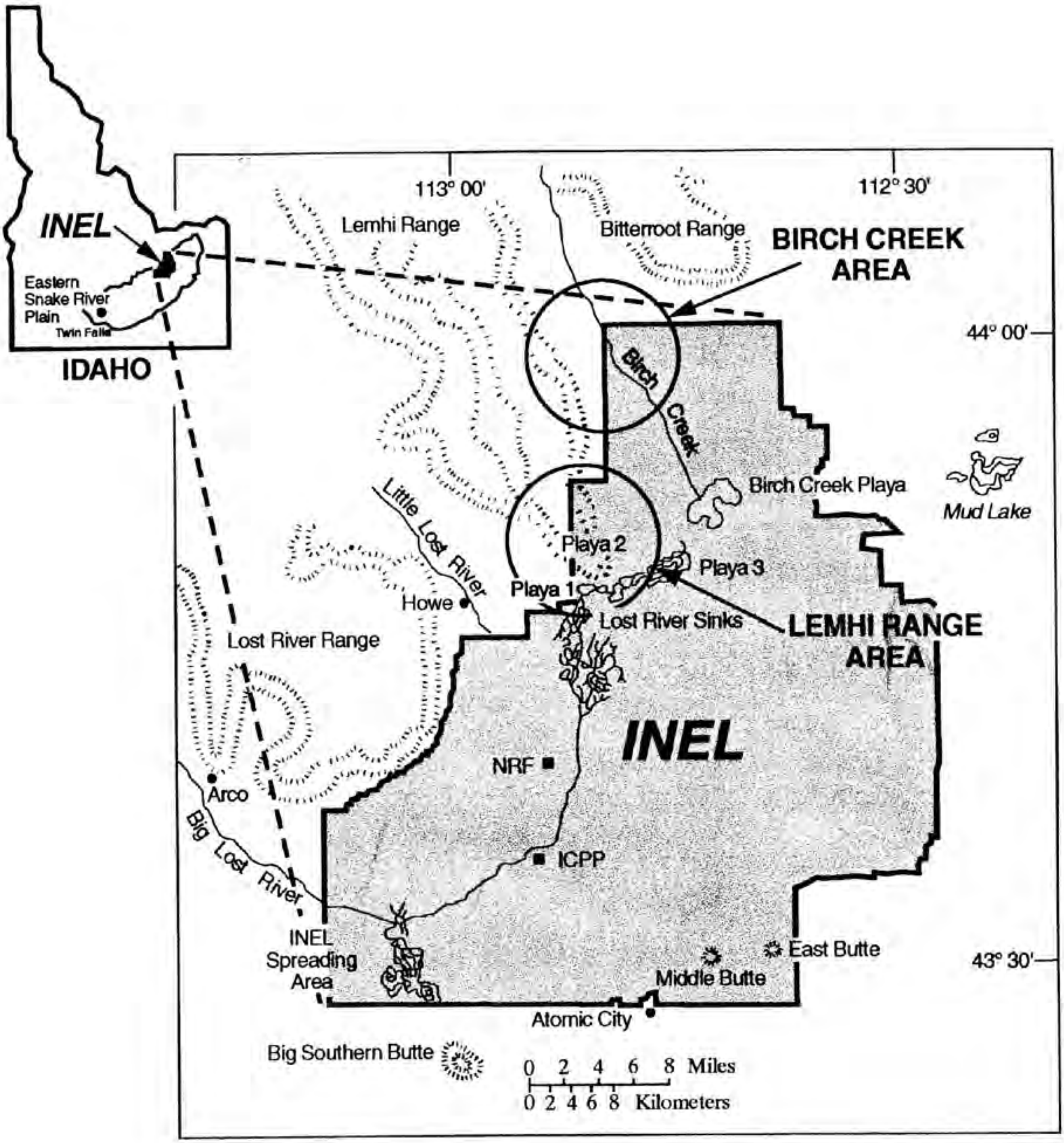

FIGURE F.2 INEL Site Showing Location of the Naval Reactors Facility (NRF) and the Idaho Chemical Processing Plant (ICPP)

F.3 Summary

This evaluation concluded that neither the Lemhi Range Area nor the Birch Creek Area are hydrologically removed from above the Snake River Plain Aquifer and therefore, do not meet the objective of the agreement between the State of Idaho and the federal government. In addition to not being hydrologically removed from above the Snake River Plain Aquifer, the Lemhi Range Area and the Birch Creek Area are not recommended for the following reasons.

- Because of the proximity to seismic faults, the Lemhi Range Area is not a technically feasible location and the Birch Creek Area is undesirable.

- From a topography and foundation perspective, the Eastern Snake River Plain is superior to the Lemhi Range Area.

- Both the Lemhi Range and Birch Creek Areas would increase the potential for impact on Native American cultural resources and sensitive species.

- Both the Lemhi Range and Birch Creek Areas would require the cancellation of some grazing permits.

- Transportation from the Naval Reactors Facility or Idaho Chemical Processing Plant to either the Lemhi Range and Birch Creek Areas would slightly increase risk.

- Construction costs for security, water supplies, electrical substations and other infrastructure would be increased.

- Construction of new highway or rail transportation routes would increase cost.

F.4 Construction Activities

In the development of a new dry storage location at a remote location of INEL, at least a road, power lines, a small office building, a parking lot, a weather-protected paved storage pad, a sanitary waste treatment facility, a well for water, and secured area would need to be constructed. The office building would be constructed to house security guards and radiological monitoring personnel. Graded and paved parking areas for post-examination naval spent nuclear fuel dry storage casks or concrete vaults would be constructed along with a simple weather protection structure. Approximately four miles of road would need to be built to provide access to a new dry storage facility at the Birch Creek Area or the Lemhi Range Area. If rail transport to the Birch Creek Area or Lemhi Range Area would be needed, then approximately 25 miles of track would be required to connect these areas to the Naval Reactors Facility. If it were necessary to build a rail line to the Lemhi Range Area it may be difficult to avoid seasonable wetlands and playas.

If a dry fuel storage facility were located at either the Naval Reactors Facility or the Idaho Chemical Processing Plant, the solid municipal and sanitary wastes generated in association with the facility would be accommodated within the existing waste management systems at those complexes with no increase in capacity. However, if one of the remote sites were selected, a new sanitary waste treatment facility, typically either a sanitation lagoon or water treatment plant, would be needed. The solid municipal wastes would be handled without increase in the capacity of the INEL system.

While this is not a major construction effort, there may be environmental consequences from the construction activities in areas of importance to ecological and cultural resources and impact on other resources such as air quality. The Naval Reactors Facility and the Idaho Chemical Processing Plant locations are in areas already dedicated to industrial use where much of the ground has been disturbed by construction, so a dry storage facility would not have a significant impact on the ecology or cultural resources.

F.5 Hydrology

The Eastern Snake River Basin is that tract of southern Idaho that gathers water originating as precipitation and discharges it via direct run off and subsurface flow to the Snake River (Figure F.1). The Eastern Snake River Plain consists of approximately 10,000 square miles of mostly level ground located within the east-central part of the Snake River Basin. Almost all of the INEL is located in the Eastern Snake River Plain. Based on Figure 1 (USGS 1992) two relatively small areas of the INEL, the Birch Creek Area and the Lemhi Range Area, appear to be outside the Eastern Snake River Plain but they are within the Snake River Basin.

The information presented in this section and Sections F.6 (Seismicity) and F.7 (Topography) is extracted from a report (Rizzo Associates 1996) prepared to assist in this evaluation.

F.5.1 Regional Aquifers

In discussing the Snake River Plain Aquifer, it is important to recognize the relationship of the aquifer to other aquifers in the Snake River Basin. The Snake River Basin includes at least four regional aquifers that are defined by the type of rock that forms each aquifer. Two of these aquifers contain most of the water that is in storage. The first is the Snake River Plain Aquifer which is the principal groundwater storage aquifer and water source for the Snake River Basin. The second is the Alluvial Aquifer which is also an important reservoir of water in the Snake River Basin. The Snake River Plain aquifer is located under the Eastern Snake River Plain (Figure F.1) and has essentially the same boundary as the Eastern Snake River Plain. The Eastern Snake River Plain is characterized by permeable basalt and sediments that control the recharge from precipitation on the Eastern Snake River Plain to the Snake River Plain aquifer. The Alluvial Aquifer is northwest of the Eastern Snake River Plain and is located in the valleys of the basin-and-range mountains (i.e., the Bitterroot Range, Lemhi Range, and Lost River Range shown in Figure F.2). The Alluvial Aquifer consists of unconsolidated sediment between the mountains. The Alluvial Aquifer discharges to the Snake River Plain Aquifer and is characterized by having a shallow water table. In the Birch Creek Area the boundary between the Alluvial Aquifer and the Snake River Plain Aquifer is poorly defined in part because the Alluvial Aquifer is interfingered with the Snake River Plain Aquifer.

All precipitation that falls in the Eastern Snake River Basin that does not evaporate or is not transpired flows into the Eastern Snake River Plain aquifer or is transported by rivers and streams or flows underground to the Snake River. The mountainous areas north-northwest of the Eastern Snake River Plain that feed the Alluvial Aquifer receive more precipitation than the Eastern Snake River Plain. These mountainous areas normally receive 20 to 30 inches of precipitation per year. The Eastern Snake River Plain receives from 8 to 10 inches of precipitation per year with a general recharge rate of less than 1 inch per year. Therefore, the recharge to the Snake River Plain Aquifer from the Alluvial Aquifer is significant.

F.5.2 Birch Creek Area Hydrology

In the Birch Creek Area the boundary between the Alluvial Aquifer and the Snake River Plain Aquifer is poorly defined in part because the Alluvial Aquifer is interfingered with the Snake River Plain Aquifer. The Alluvial Aquifer provides significant recharge to the Snake River Plain Aquifer and in the Birch Creek Area the Alluvial Aquifer is hydrologically connected to the Snake River Plain Aquifer. Therefore, the Birch Creek Area cannot be considered to be removed from above the Snake River Plain Aquifer. This conclusion was based on the Environmental Protection Agency (EPA) report on the Snake River Plain Aquifer as a Sole Source Aquifer (EPA 1990). This conclusion is consistent with the judgement of personnel in the United States Geological Survey field office for INEL (Rizzo Associates 1996).

F.5.3 Lemhi Range Area Hydrology

The Lemhi Range Area encompasses the southern extension of the Lemhi Mountain Range. The Lemhi Range Area contains many intermittent streams (erosion channels) due to its close proximity to the Lemhi Mountains. Even though this area is not over the aquifer, the run-off from this area drains to the Snake River Plain Aquifer and recharges the aquifer. Therefore, it cannot be considered to be hydrologically removed from above the Snake River Plain Aquifer. This conclusion is consistent with the judgement of personnel in the United States Geological Survey field office for INEL (Rizzo Associates 1996). In addition, the flatter sections of land on the western side of the Lemhi Range Area are adjacent to farm land on the INEL boundary. This farm land is down gradient with respect to surface water flow from the Lemhi Range Area. Also, there is a farmhouse and other farm buildings adjacent to the INEL boundary in this area.

F.5.4 Infiltration into the Eastern Snake River Plain

In the Eastern Snake River Plain, infiltration into the Snake River Plain aquifer is controlled by the texture and thickness of the sediment overlying the more permeable basalt. Fine-grained sediments are intercalated with basalt and greatly impede the vertical movement of water. The Eastern Snake River Plain can be divided into three types of recharge areas depending on the amount of sediment fill overlying the basalt (USGS 1992). Those areas of the Eastern Snake River Plain with soil cover greater than 40 inches (i.e., thick soil cover) recharge the aquifer at about one-third the rate of areas with thin soil cover (i.e., less than 40 inches) and about ten times less than areas of recent lava flows (i.e., minimal soil cover). At the Idaho Chemical Processing Plant the soil thickness is approximately 16 to 50 feet and at a Naval Reactors Facility seismic station the soil thickness is approximately 33 feet. Consequently, infiltration at the Naval Reactors Facility and the Idaho Chemical Processing Plant is much lower than areas with less than 40 inches of soil thickness. Also, under the conditions found at the Idaho Chemical Processing Plant and the Naval Reactors Facility, infiltrating water may be prevented from recharging the Snake River Plain aquifer for a long time (i.e., the water may become perched water).

At INEL, the water table elevation ranges from 200 feet below grade in the north part of the site, to about 900 feet below grade in the southeastern part. At the Naval Reactors Facility the water table is at a depth of approximately 370 feet below the surface and at the Idaho Chemical Processing Plant the water table is approximately 450 feet below the surface.

The Naval Reactors Facility and the Idaho Chemical Processing Plan sites are above the Snake River Plain Aquifer. However, the thick layers of soil at these locations, the low recharge rates, the great depth to the water table, and the lack of water associated with dry storage results in an extremely low probability that a dry storage facility at these sites could contaminate the Snake River Plain Aquifer.

F.5.5 Water Resources

Limited quantities of water would be required to support the operation of the dry storage facility. Water would be required for drinking, a sanitary system and possibly some equipment such as air conditioners. The water requirements would not be significant at any of the four locations. At the Birch Creek and Lemhi Range Areas it would be necessary to drill a new well and to build a system to handle the sanitary waste. The amount of water withdrawn from the well at the Birch Creek Area or the Lemhi Range Area is estimated to be approximately one to two million gallons per year. This is well within the allocation of INEL (DOE 1995).

F.6 Seismicity

The Eastern Snake River Plain is not seismic in nature; however, the adjacent basin-and-range structures (i.e., the Bitterroot Range, Lemhi Range and Lost River Range shown in Figure F.2) are characterized by seismic activity. Figure F.3 shows the faults in the vicinity of INEL which are sources of potential earthquakes. Consequently, many studies have been performed to predict earthquake magnitudes, and locations near INEL. In the earthquake scenarios that have been studied, the maximum predicted seismic event (Borah Peak-type event which was a 7.0 on the moment magnitude scale and a 7.3 on the surface magnitude scale) has been placed as close as tectonically possible to the facility being evaluated. This is standard practice in the nuclear industry. For the Naval Reactors Facility, the Idaho Chemical Processing Plant and the Lemhi Range Area, this seismic event is on the Lemhi Fault with the epicenter placed at Howe. As seen in Figure F.3 the Lemhi Fault is very close to the Lemhi Range Area and the Beaverhead Fault is very close to the Birch Creek Area which places these areas much closer to possible seismic epicenters than the Naval Reactors Facility or the Idaho Chemical Processing Plant.

The peak ground acceleration values predicted by calculations indicates that the Lemhi Range Area and the Birch Creek Area would have a much higher peak ground acceleration (i.e., seismic shaking) than the Idaho Chemical Processing Plant and the Naval Reactors Facility because the former are closer to the epicenters. This can be seen in Figure F.4 which shows a potential peak ground acceleration of approximately 0.4 g in the Lemhi Range and Birch Creek Areas compared to 0.24 g at the Naval Reactors Facility. This indicates that the magnitude of the peak ground acceleration at the Lemhi Range and Birch Creek Areas could be approximately 70% greater than at the Naval Reactors Facility. Because of the proximity of the Birch Creek Area to the Beaverhead Fault, the U.S. Nuclear Regulatory Commission would suggest looking elsewhere for a site.

The Lemhi Range Area is a zone where surface ruptures are associated with the fault movement, and therefore surface ruptures are a definite siting and design consideration. It is well known that surface rupture occurred with the Borah Peak Earthquake. Since the Lemhi Range Area is within one mile of known capable faults, a site in this zone would, in all probability, be prone to surface rupturing. Even if one could characterize the nature, direction, and magnitude of the rupture sufficient for design, civil structure designs are not yet able to accommodate a surface rupture.

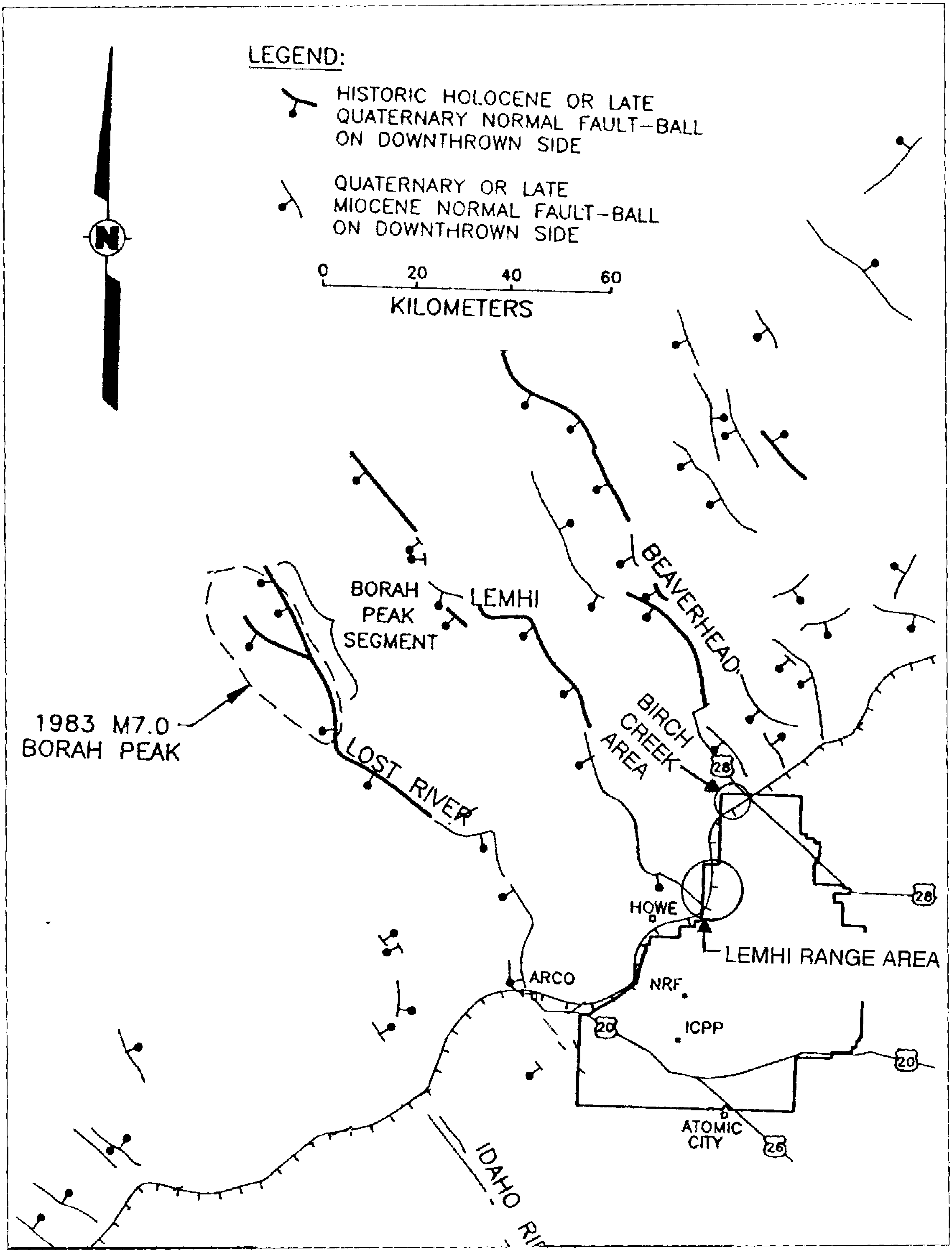

FIGURE F.3 Fault Locations

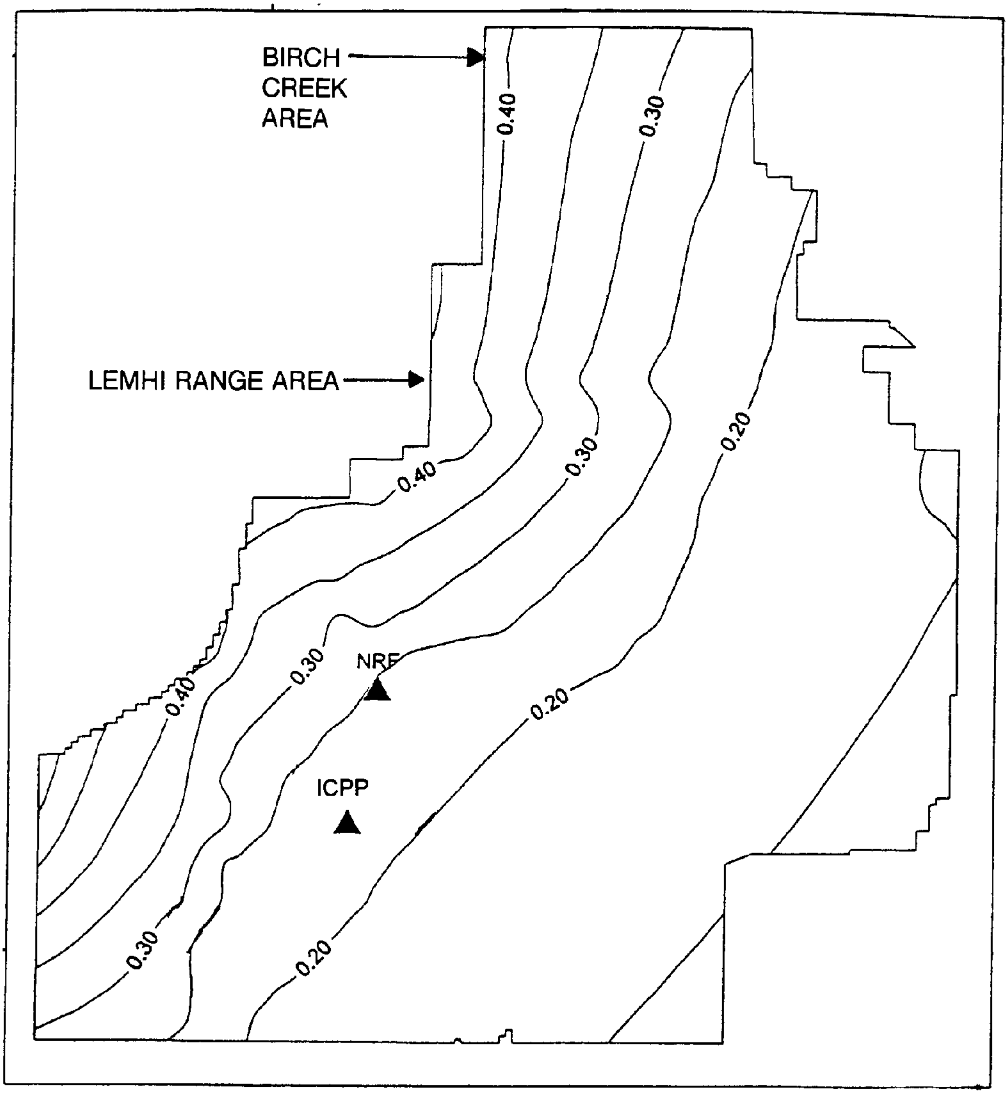

FIGURE F.4 Calculated INEL Seismic Peak Horizontal Ground Acceleration (g) Based on a 5,000 year return period

Based on seismic considerations, the Lemhi Range Area is not considered technically acceptable for a dry storage area. Also the Birch Creek Area would be a less desirable location for a dry storage facility than the Naval Reactors Facility or the Idaho Chemical Processing Plant relative to the magnitude of potential seismic ground motion.

F.7 Topography

The Eastern Snake River Plain is characterized by having low local topographic relief (i.e., it is relatively level). This is true for the Naval Reactors Facility and the Idaho Chemical Processing Plant locations, which would make these sites suitable for a dry storage facility. The Birch Creek Area at the northwest corner of INEL includes land which is also level enough to lend itself to the construction of the necessary paved areas and buildings required for a dry storage facility.

The Lemhi Range Area encompasses the southern extension of the Lemhi Mountain Range. As a result most of this area is characterized by steep slopes. The slopes in the Lemhi Range Area have slopes of between 4 and 30%. The lower reaches of this area that are relatively flat are comprised of several consolidated alluvial fans with local erosion channels. Some areas have the potential for problems with foundation bearing capacity and/or excessive settling. From a topographical and foundation perspective, the Eastern Snake River Plain is superior to the Lemhi Range Area.

F.8 Cultural Impacts

Cultural resource surveys have been conducted within the INEL site and at the INEL site borders. A detailed discussion of cultural resources at INEL is provided in the Programmatic SNF and INEL EIS (DOE 1995 in Volume 2, Part A, Section 4.4) and the pertinent results are summarized here. The site surveys along with a predictive model indicate that there may be cultural resources of special significance to Native Americans at the Birch Creek Area and the Lemhi Range Area. The Lemhi Range Area is known to contain many significant resource sites near the spur of the Lemhi Range that intersects the Snake River Plain. Rocks in this area contain deposits which are sources of tool grade stones, and tool working sites have been identified near this area. The Birch Creek Area, particularly near the Birch Creek channel, is expected to have the highest chance of containing cultural resource sites. This preliminary review indicates that the development of either of the two remote dry storage locations on the INEL site could impact Native American cultural resources.

Vegetation occurring within the Lemhi Range and Birch Creek Areas includes plants which are used by the Shoshone-Bannock tribes, as shown in Table F.1, originally published in the Programmatic SNF and INEL EIS (DOE 1995). Some disturbance of these plants could occur if a dry storage facility were to be located at either the Lemhi Range or Birch Creek Areas. (It should be noted that transportation and other activities related to the management of naval spent nuclear fuel, whether at the Expended Core Facility or the Idaho Chemical Processing Plant, will not disturb these plants.)

TABLE F.1 Plants used by the Shoshone-Bannock that are located on or near the Idaho National Engineering Laboratory site.

Plant family	Type of use	Location on INEL site	Abundance
Desert parsley	Medicine, food	Scattered	Common
Milkweed	Food, tools	Roadsides	Scattered, uncommon
Sagebrush	Medicine, tools	Throughout	Common, abundant
Balsamroot	Food, medicine	Around buttes	Common but scattered
Thistle	Food	Scattered throughout	Common but scattered
Gumweed	Medicine	Disturbed areas	Common
Sunflower	Medicine, food	Roadside	Common
Dandelion	Food, medicine	Throughout	Common
Beggar's ticks	Food	Disturbed areas throughout	Common, abundant
Tansymustard	Food, medicine	Disturbed areas	Common
Cactus	Food	Throughout	Common, abundant
Honeysuckle	Food, tools	Big Southern Butte	Common on butte
Goosefoot	Food	Throughout	Common, abundant
Russian Thistle	Food	Disturbed areas throughout	Common, abundant
Dogwood	Food, medicine, tools	Webb Springs, Birch Creek	Common where found
Juniper	Medicine, tools, food	Throughout	Common to abundant
Gooseberry	Food	Scattered throughout	Common
Mentha arvensis	Medicine	Big Lost River	Uncommon
Wild onion	Food, medicine, dye	Throughout	Common
Calochortus spp.	Food	Buttes	Common
Fireweed	Food	Throughout	Common
Pine	Food, tools, medicine	Big Southern Butte	Common on butte
Douglas fir	Medicine	Big Southern Butte	Common on butte
Plantain	Medicine, food	Throughout	Uncommon
Wildrye	Food, tools	Throughout	Common, abundant
Indian ricegrass	Food	Throughout	Common, abundant
Bluegrass	Food, medicine	Throughout	Common, abundant
Serviceberry	Food, tools, medicine	Buttes	Common where found
Chokecherry	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 in moist areas	Common
Coyote tobacco	Smoking, medicine	Big Lost River, Webb Springs	Uncommon
Cattail	Food, tools	Sinks, outflow from facilities	Uncommon

The Naval Reactors Facility and the Idaho Chemical Processing Plant location would be within existing industrial complexes where much of the ground has already been disturbed so construction at these locations would not be expected to uncover new cultural sites. In addition the area not disturbed has been extensively surveyed and a dry storage facility would not interfere with cultural sites.

F.9 Ecological Impacts

Ecological resource surveys have been conducted within the INEL site. A detailed discussion of ecological resources at INEL is provided in the Programmatic SNF and INEL EIS (DOE 1995 Volume 2, Part A, Section 4.9). Surveys pertaining to the biotic resources on the INEL indicate that although no federal endangered species have been identified, federal candidate Category 2 ferruginous hawk nests have been observed primarily in juniper woodlands, such as those occurring in the Lemhi Range Area. The Lemhi Range Area contains many trails that criss-cross the area, and indicates that the area is the habitat for a variety of animals (Taylor 1994). Construction and industrial activities in these areas could disturb these species.

The vegetation in the Birch Creek Area is primarily grassland, in the Lemhi Range Area it is primarily Juniper trees with some grass and around the Naval Reactors Facility and the Idaho Chemical Processing Plant the vegetation is sagebrush and grass. No endangered plant species were identified on federal or state listed as potentially occurring on the INEL site. However, eight plant species identified by other federal agencies and the Idaho Native Plant Society as sensitive, rare, or unique are known to occur on the INEL site. The merging of the foothills and the plains in the Lemhi Range Area provides a potential habitat for several sensitive plant species found on the INEL (Taylor 1994).

This preliminary review of ecological resources indicates that there may be impacts resulting from the potential development of either the Birch Creek Area or the Lemhi Range Area. The Naval Reactors Facility and the Idaho Chemical Processing Plant locations are in areas already dedicated to industrial use where much of the ground has been disturbed by construction, so a dry storage facility would not impact sensitive, rare or unique species.

F.10 Land Usage

Both the Naval Reactors Facility and the Idaho Chemical Processing Plant are areas already developed and dedicated to industrial use; therefore, constructing a dry storage facility at these areas would not require a change in the land use. However, both the Birch Creek Area and the Lemhi Range Area are currently under grazing permits. The construction of a dry storage facility at either of these locations would require the cancellation of grazing permits on approximately 30 acres[1] of land, representing a change in land use. This change is contrary to the long-term plans to reduce the area removed from public use at INEL.

F.11 Air Quality

Construction of a covered storage pad, office buildings, and possibly roads would result in construction-related airborne emission of fugitive dust typical of excavation activities. This dust could be controlled within local requirements. The amount of dust would be similar for the Naval Reactor Facilities and the Idaho Chemical Processing Plant with a slightly larger impact at the Birch Creek Area and the Lemhi Range Area due to the need for road and railroad access and an administrative building.

After construction the dry storage facility should have no impact on the air quality at any of the locations. Additional information on air quality is found in Chapter 5, Section 5.2.

F.12 Aesthetics and Scenic Values

The dry storage facility would consist of buildings with relatively low profiles. The building would be consistent with those structures that already exist at the Naval Reactors Facility and the Idaho Chemical Processing Plant. These facilities are not highly visible from public highways as would probably be the case in the Birch Creek Area. In the Lemhi Range Area the dry storage area would be visible from state highway 33, but because of the low building profile there should be no significant impact on the view.

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[1] The actual storage structures would occupy approximately 12 to 15 acres but a new site would require approximately 30 acres.

F.13 Public Health and Safety

F.13.1 Radiation Exposure

The radiological impacts of normal operations at a dry storage facility at the Naval Reactors Facility, the Idaho Chemical Processing Plant, the Birch Creek Area, or the Lemhi Range Area would all be extremely small. However, at the Birch Creek Area and the Lemhi Range Area the dry storage facility would be closer to the site boundary (approximately 1 mile) and, therefore, the maximally exposed off-site individual could receive a slightly larger radiation dose. Under accident conditions the maximally exposed off-site individual could also receive a slightly larger dose if the dry storage facility were located at the Birch Creek Area or the Lemhi Range Area rather than at the Naval Reactors Facility or the Idaho Chemical Processing Plant. However, the collective general population dose would be approximately the same for the sites that are being considered due to the differences in distances to concentrations of population.

The details of radiological evaluation associated with normal and accident conditions are discussed in Appendix A. The radiological implication associated with transportation to the sites are addressed in Appendix B.

F.13.2 Effects on Security

The storage of spent nuclear fuel requires a trained guard force to protect the material from potential terrorist attack and sabotage. At INEL this force consists of the guards at the individual facilities and a central response team that can respond quickly to assist against an attack on an individual facility. The construction of a dry storage facility at a remote site in the Birch Creek Area or the Lemhi Range Area would require the addition of another facility specific guard force. In case of a terrorist attack a small four person helicopter is available to the central response team but the main body of the central response team travels by road. Therefore, in case of a terrorist attack at the Birch Creek Area it would require approximately 30 minutes longer for the main body of the central response team to reach the dry storage facility than it would for the team to reach the Naval Reactors Facility or the Idaho Chemical Processing Plant. At the Lemhi Range Area an additional 20-25 minutes would be added to the response time of the main body of the central response team. In case of a terrorist attack this delay could significantly affect the possibility of successfully dealing with the attack.

F.14 Other Areas of Impact

The potential impacts of increased energy consumption, noise, traffic and transportation have been evaluated for a dry storage facility at all four sites being considered. At the Naval Reactors Facility and the Idaho Chemical Processing Plant there would be essentially no increase over the current operations. Existing administrative buildings, roads, parking lots, and bus service currently exist and ten to twelve additional employees would be not have a significant impact. Also this small number of additional people would not significantly increase the heating, cooling, and lighting requirements for the existing administrative facilities.

Impacts would be somewhat larger with the Lemhi Range Area or Birch Creek Area, because lighting and heating and cooling for the new administrative buildings would be needed as well as lighting for the security area. Similarly, people would be traveling to work at locations remote from the existing facilities at INEL. These impacts would still not be large because the maximum number of employees at a remote dry storage facility would be expected to be less than approximately 50. There would be limited activity at a dry storage facility so most of the effects on the environment would result from workers providing maintenance and security services to the facility.

APPENDIX G

G. ABBREVIATIONS AND ACRONYMS

The following is a list of abbreviations and acronyms used in this Environmental Impact Statement. Some acronyms used only in tables are defined in those tables. See also the Section H Glossary beginning on the next page.

AEC	Atomic Energy Commission
CAA	Clean Air Act
CFR	Code of Federal Regulations
CTR	Current Technology/Rail Alternative
cfs	cubic feet per second
Ci	curies
cms	cubic meters per second
DOD	Department of Defense
DOE	Department of Energy
DPC	dual-purpose canister
ECF	Expended Core Facility
EDE	effective dose equivalent
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERPG	Emergency Response Planning Guideline
ha	hectare
HEPA	high-efficiency particulate air
ICPP	Idaho Chemical Processing Plant
ICRP	International Commission on Radiological Protection
INEL	Idaho National Engineering Laboratory
km	kilometer
MEI	maximally (or maximum) exposed individual
mgd	million gallons per day
MPC	multi-purpose canister
mph	miles per hour
MWh	megawatt hours
NAA	No-Action alternative
NAAQS	National Ambient Air Quality Standards
NAC-STC	Nuclear Assurance Corporation - Transportable Storage Cask
NEA	Nuclear Energy Agency
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NNPP	Naval Nuclear Propulsion Program
NPA	nearest public access individual
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NRF	Naval Reactors Facility
OSHA	Occupational Safety and Health Administration
PWR	pressurized water reactor
RCRA	Resource Conservation and Recovery Act

SCW	special case waste
SmMPC	small multi-purpose canister
TSC	transportable storage cask
VOC	volatile organic compound

APPENDIX H

H. GLOSSARY

activation	The process of making a material radioactive by exposing the material to neutrons, protons, or other nuclear particles.
activity	A measure of the rate at which a material is emitting nuclear radiation. Activity is usually measured in terms of the number of nuclear disintegrations which occur in a quantity of the material over a period of time. The standard unit of activity is the curie (Ci), which is equal to 37 billion (3.7×10^{10}) disintegrations per second.
airborne emissions	Radioactivity in the form of radioactive particles, gases, or both that is transported by air.
alpha particle	A type of radiation consisting of a positively charged particle which is indistinguishable from a helium atom nucleus, consisting of two protons and two neutrons. Alpha radiation is not very penetrating and is easily shielded, for example by a sheet of paper or the outermost layer of skin.
annual dose	The dose (for an individual in rem) or collective dose (for a population in person-rem) received in one year.
annual risk of latent cancer fatalities	The probability of occurrence per year multiplied by the number of latent fatal cancers for an individual or a group.
aquifer	A water-bearing layer of permeable rock, sand, or gravel located beneath the surface of the earth which is capable of yielding water to a well or spring.
archaeological areas	Areas of or relating to the scientific study of material remains, such as fossil relics, artifacts, or monuments of past human life and activities.
average individual	An individual who could consume items or occupy areas at rates which would be typical for the population of interest.
base flood	A flood which has a 1-percent probability of occurrence in any given year. Also referred to as a 100-year flood.
beta particle	A type of radiation consisting of a high speed electron or positron. Beta particles are moderately penetrating and are stopped by materials such as a thick pad of paper or a thin sheet of metal.
biota	The plant and animal life of a region.
cairn	A mound of stones erected as a landmark or memorial.

H. GLOSSARY (Cont.)

canister	A thin-walled, unshielded metal container used to hold fuel assemblies. Canisters are used in combination with specialized “overpacks” that provide shielding and structural support for transportation or storage purposes. (Overpacks are sometimes referred to as casks.)
cask	A heavily shielded, typically robust metal or concrete container for shipping or dry storage of spent nuclear fuel assemblies.
cladding	A metal casing that surrounds the nuclear fuel.
collective dose	The population dose. The summation of the radiation dose equivalent received by all individuals in a population group. Generally it is calculated by multiplying the average dose times the number of individuals in a group. Units of dose are presented in person-rem.
collocated workers	A population of workers who are housed at facility area located some distance from the reference facility area.
consequence	The product of dose (for an individual) or collective dose (for a population) and a risk factor for health detriment. For latent cancer fatalities, the units which are used to present consequence are probability of a latent cancer fatality (for an individual) and estimated number of latent cancer fatalities (for a population).
container shipments	A single loaded container (canister or cask) that is shipped to a repository. Several casks or canisters (each is a container shipment) may be shipped together in the same train, so the number of trains will likely be smaller than the number of container shipments. For reusable casks, such as the M-140 transportation cask, each reuse is counted as a container shipment.
containments	Devices designed to limit the spread of radioactive contamination to an area as close as possible to the source, and to prevent contaminating other material. A containment may be as complex as an engineered tent or as simple as a plastic bag.
core	The central portion of a nuclear reactor containing the nuclear fuel.
corrosion	The process denoting the destruction of metal by chemical or electrochemical action.
corrosion products	The substances produced by corrosion of a metal. Rust is a common corrosion product resulting from the corrosion of iron.

criteria pollutants	The six pollutants for which National Ambient Air Quality Standards have been promulgated: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter 10 microns or smaller, and sulfur dioxide.
critical organ	The limiting organ for evaluating exposure to ionizing radiation. A critical organ is determined by the following criteria: (1) the organ that accumulates the greatest concentration of a radioactive material, (2) the necessity of the organ to the well being of the entire body, (3) the organ most damaged by the entry of a radionuclide into the body, and (4) the organ damaged by the lowest exposure. Usually, criterion (1) is the determining factor for choosing the critical organ.
criticality	A nuclear chain reaction producing radioactive fission products.
cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
curie (Ci)	The curie is the common unit used for expressing the magnitude of radioactive decay in a sample containing radioactive material. Specifically, the curie is that amount of radioactivity equal to 3.7×10^{10} (37 billion) disintegrations per second. This unit does not give any indication of the radiological hazard associated with the disintegration.
defueling	Removal of all nuclear fuel from a nuclear-powered ship or a land-based reactor.
de minimis	The emission rate or air quality concentration of a pollutant below which a particular air regulation would not apply.
design basis accidents	Accidents that are postulated for the purpose of establishing functional requirements for safety significant structures, systems, components and equipment (DOE Order 0421.3 or 5480.23). A postulated accident believed to have the most severe expected impacts on a facility; used as the basis for safety analysis and protection by structural design.
diffusion	The process of spreading out or scattering from regions of higher concentration to regions of lower concentration.
dispersion	The process of scattering or distributing over a large region.

H. GLOSSARY (Cont.)

disposal container	A cylindrical container constructed of highly corrosion-resistant metal alloys that will be loaded with spent nuclear fuel assemblies, sealed, and disposed of in an underground repository. Loaded and sealed disposal containers are called "waste packages."
dose	A measure of the amount of energy from all types of ionizing radiation absorbed by tissue for an individual. Units of dose are "rem".
dose rate	The amount of radiation dose delivered in a unit amount of time; for example, in rems per hour.
dose rate conversion factor	A factor which converts the exposure to a given radiation level to the dose that an individual could receive. This factor is usually expressed in rems per hour per curie per cubic meter (or square meter).
dry storage (of spent nuclear fuel)	The storage of spent nuclear fuel assemblies in environments where the fuel is not immersed in water for purposes of cooling and/or shielding. Dry storage systems typically consist of metal or concrete cylindrical containers that can hold from several up to approximately 70 fuel assemblies.
dual-purpose container systems	A spent nuclear fuel container system can be designed for purposes of storage *or* transportation *or* disposal (single-purpose); storage *and* transportation (dual-purpose); or storage, transportation, *and* disposal (multi-purpose).
element	A chemical substance that cannot be divided into simpler substances by chemical means. A substance whose atoms all have the same atomic number.
endangered species	A species or subspecies which is in danger of extinction throughout all or a significant portion of its range.
environmental consequences	Changes to the environment resulting from the effects of specific impacts or activities, such as radiation, radioactive materials, transportation, etc.
Expended Core Facility (ECF)	A large laboratory facility, located at the Naval Reactors Facility in Idaho, consisting of water pools and shielded cells used to receive, examine, and ship naval spent nuclear fuel and irradiated test specimen assemblies. Naval spent nuclear fuel is prepared at the Expended Core Facility for shipment to the Idaho Chemical Processing Plant for storage..

H. GLOSSARY (Cont.)

exposure, external	The subjecting of the outside of the body of an organism to ionizing radiation.
exposure, internal	The subjecting of the inside of the body of an organism to ionizing radiation.
exposure, occupational	The subjecting of an individual to ionizing radiation in the course of employment.
exposure, radiation	The subjecting of a material or organism to ionizing radiation.
fissile	A material whose nucleus is capable of being split (fissioned) by neutrons of all energies.
fission	The splitting of a heavy nucleus into two approximately equal parts which is accompanied by the release of a relatively large amount of energy and generally one or more neutrons.
fission products	During operation of a nuclear reactor, heat is produced by the fission (splitting) of "heavy" atoms, such as uranium, plutonium, or thorium. The residue left after the splitting of these "heavy" atoms is a series of intermediate weight atoms generally termed "fission products." Because of the nature of the fission process, many fission products are unstable and, hence, radioactive.
floodplain/wetlands assessment	An evaluation which consists of a description of a proposed action, a discussion of its effects on the floodplain/wetlands, and a consideration of alternatives.
footprint	The area affected by release of radioactive material.
fuel	Fissionable material used or usable to produce energy in a nuclear reactor. Fuel may also refer to a mixture, such as natural uranium, in which only part of the atoms are readily fissionable. (See also *spent nuclear fuel*.)
fugitive dust	The dust released from activities associated with an alternative such as construction, manufacturing, or transportation.

H. GLOSSARY (Cont.)

gamma ray	High-energy, short wavelength electromagnetic radiation. Gamma radiation frequently accompanies beta particle emissions. Gamma rays are very penetrating and are stopped most effectively by dense materials such as lead or uranium. They are essentially similar to x-rays but are usually more energetic and originate from the nucleus. Cobalt-60 is an example of a radionuclide that emits gamma rays.
geology	The study of the origin, history, materials, and structure of the earth.
Greater Than Class C waste	As defined by 10 CFR Part 61.55, a class of low-level waste generated by the commercial sector that exceeds U.S. Nuclear Regulatory Commission concentration limits for Class C low-level wastes, as specified in 10 CFR Part 61, and is not generally acceptable for near-surface disposal. This classification is based on the concentrations of curies per cubic meter of specified radionuclides.
groundwater	Water that exists or flows beneath the earth's surface in the zone of saturation between saturated soil and rock.
half-life, biological	The time required for a biological system, such as an organ or tissue in an organism, to clear by natural (non-radioactive) processes, half the amount of a substance that has entered it.
half-life, radioactive	The time required for half of the atoms of a radioactive material to decay to another nuclear form.
hazardous wastes	Excess chemical material that is dangerous to human health; see Resource Conservation and Recovery Act.
health detriment	The sum of all fatal cancers, a fraction of the non-fatal cancers proportional to the severity of the cancer types, and all genetic defects associated with a particular exposure.
high-efficiency particulate air (HEPA) filter	A ventilation system device that can separate a particle the size of 0.3 micron from the air into a filter medium at an efficiency of at least 99.97%.
hydrology	The study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.
incident-free operations	Routine, day-to-day operations without accidents or other unexpected or unusual occurrences. Synonymous and interchangeable with normal operations.

H. GLOSSARY (Cont.)

input-output analysis	A method used to assess the economic impact of alternatives by measuring both the direct and secondary impacts of an activity on a local economy.
intercalated	The existence of one or more layers between other layers.
ion	An atom or molecule which has acquired an electrical charge by gaining or losing electrons.
ionizing radiation	Any radiation which displaces electrons from atoms or molecules, thereby producing ions. Examples include alpha, beta, and gamma radiation. Exposure to ionizing radiation may produce skin or tissue damage.
irradiate	To expose to radiation.
isotope	One of two or more nuclides which have the same number of protons but have different numbers of neutrons in their nuclei. Therefore, the isotopes of an element have the same atomic number but different atomic weights. Isotopes of an element usually have very nearly the same chemical properties but somewhat different physical properties.
latent cancer fatality	The unit for the health detriment of fatal cancer, after a period of time, for an individual as a result of radiation dose. The product of dose in rem and the health effects conversion factor for fatal cancer for an individual (general public or worker).
latent cancer fatalities	The unit for the health detriment of fatal cancers, after a period of time, in a population as a result of collective dose. The product of collective dose in person-rem and the health effects conversion factor for fatal cancers for a population (general public or workers).
long-lived radioactivity	Radioactive nuclides which decay slowly, therefore having relatively long half-lives.
M-130 transportation cask	A naval spent nuclear fuel shipping container which is certified per 10 CFR Part 71 requirements, used for ship and rail transportation.
M-140 transportation cask	A naval spent nuclear fuel shipping container which is certified per 10 CFR Part 71 requirements and is used solely for rail transportation.

H. GLOSSARY (Cont.)

maximally exposed individual (MEI)	A theoretical individual who receives the highest radiation dose from the facility or activity in question, particularly for transportation; or a theoretical individual located at the point on the DOE site or shipyard boundary nearest to the facility or activity in question.
maximum consequence	The same as greatest consequence.
maximum foreseeable facility accident	The hypothetical accident with an annual probability of occurrence of 1×10^{-7} or greater, which is postulated to occur during naval spent nuclear fuel loading, storage, or unloading operations which results in the most severe consequences.
maximum individual	An individual who could consume items or occupy areas at rates which would be at a maximum for the population of interest.
meteorology	The study of historical data concerning (1) weather stability and (2) wind patterns and speeds for a particular area used in analyses of airborne contamination accidents. In this EIS, 50% meteorology represents the average meteorological conditions. The 95% conditions represents the meteorological condition that would produce environmental effects more severe than all but the most unlikely conditions.
mil	A unit of length equal to one-thousandth (1×10^{-3}) of an inch.
millirem (mrem)	A special unit for measuring dose equivalents which is equal to one-thousandth (1×10^{-3}) of a rem.
mixing layer	The layer of air above the ground through which relatively vigorous vertical mixing occurs.
monitoring, environmental	The periodic or continuous determination of the amount of radioactivity or radioactive contamination present in a region.
multi-purpose container systems	A spent nuclear fuel container system can be designed for purposes of storage *or* transportation *or* disposal (single-purpose); storage *and* transportation (dual-purpose); or storage, transportation, *and* disposal (multi-purpose).
Naval Nuclear Propulsion Program	A joint program of the Department of Energy and the Department of the Navy which has as its objective the design and development of improved naval nuclear propulsion plants having high reliability, maximum simplicity, and optimum fuel life for installation in ships ranging in size from small submarines to large combatant surface ships. The program is frequently referred to as the Naval Reactors Program.

H. GLOSSARY (Cont.)

nearest public access individual (NPA)	A theoretical motorist stranded on a public highway which crosses a federal reservation where spent nuclear fuel operations are conducted.
neutron	An uncharged particle with a mass slightly greater than that of a proton, found in the nucleus of every atom heavier than hydrogen. Neutrons sustain the fission chain reaction in a nuclear reactor.
nuclear fuel	See fuel.
nuclear reactor	A device in which nuclear fission is initiated and controlled to produce heat which is then used to generate power.
nuclear reactor accident	An accident which results in release of fission products from the nuclear fuel.
nonradiological risk	Risks from chemical or physical hazards.
normal operations	All normal conditions and those abnormal conditions that frequency estimation techniques indicate occur with a frequency greater than 0.1 events per year.
nuclide	An atomic form of an element which is distinguished by its atomic number, atomic weight, and the energy state of its nucleus. These characteristics determine the other properties of the element, including its radioactivity.
organ	A group of tissues which together perform one or more definitive functions in a living body.
overpack	Specialized devices used in combination with canisters to provide shielding and structural support for transportation and storage purposes.
particulate	Pertaining to a very small piece or part of a material.
pathway	The route or course along which radionuclides from spent nuclear fuel could reach anyone.
perched	Unconfined ground water separated from an underlying main body of groundwater by an unsaturated zone.
photon	An individual unit of electromagnetic energy, generally regarded as a discrete particle, having zero mass, no electric charge, and an indefinitely long lifetime.

pool storage (of spent nuclear fuel)	The temporary or interim storage of spent nuclear fuel assemblies in racks at the bottom of deep, water-filled basins. See also water pools.
probable maximum flood	The largest flood for which there is any reasonable expectancy in a specific area. The probable maximum flood is normally several times larger than the largest flood of record.
Programmatic SNF and INEL EIS	The Department of Energy *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement*.
prototype plants	Land-based naval nuclear reactor plants that are typical of a first design for a naval warship and are used to test equipment and the nuclear fuel prior to use on a shipboard nuclear plant. Prototype plants are also used to train naval officers and enlisted personnel as propulsion plant operators by giving them extensive watchstanding experience and a thorough knowledge of all propulsion plant systems and their operating requirements.
rad	The special unit of absorbed dose. One rad is equal to an absorbed dose of 100 ergs/gram.
radiation	The emission and propagation of energy through matter or space by means of electromagnetic disturbances which display both wave-like and particle-like behavior. In this context, the "particles" are known as photons. The term has been extended to include streams of fast-moving particles such as alpha and beta particles, free neutrons, and cosmic radiations. Nuclear radiation is that which is emitted from atomic nuclei in various nuclear reactions and includes alpha, beta, and gamma radiation and neutrons.
radiation, external	Radiation from a source outside the body that penetrates the skin.
radiation, internal	Radiation when the source of radiation is within the body as a result of deposition of radioelements in body tissues.
radiation field	A region where radiation is present.
radiation level	The measured amount of radiation in a region.

H. GLOSSARY (Cont.)

radioactive contamination	The deposition of radioactive material in any place where it may harm persons, invalidate experiments, or make products or equipment unsuitable or unsafe for some specific use. The presence of unwanted radioactive matter.
radioactive decay	The process of spontaneous transformation of a radioactive nuclide to a different nuclide or different energy state of the same nuclide. Radioactive decay involves the emission of alpha particles, beta particles, or gamma rays from the nuclei of the atoms. If a radioactive nuclide is transformed to a stable nuclide, the process results in a decrease of the number of original radioactive atoms. Radioactive decay is also referred to as radioactive disintegration.
radioactive waste	Equipment and materials which are radioactive and for which there is no further use. Radioactive wastes are generally classified as high-level waste (those resulting from reprocessing reactor fuel or the used reactor fuel itself), low-level waste, or low-level waste containing transuranic elements or uranium-233.
radioactivity	The process of spontaneous decay or disintegration of an unstable nucleus of an atom; usually accompanied by the emission of ionizing radiation.
radiological consequences	The changes to the environment or the health of a person(s) as a result of the effects of radiation exposure or radioactive materials.
radionuclides	Atoms that exhibit radioactive properties. Standard practice for naming radionuclides is to use the name or atomic symbol of an element followed by its atomic weight (e.g., cobalt-60 or Co-60, a radionuclide of cobalt).
reactor years	The total number of years that all reactors in the Naval Nuclear Propulsion Program have been in service.
rem	A unit of measure used to indicate the amount of radiation exposure a person receives (an acronym for roentgen equivalent man).

H. GLOSSARY (Cont.)

Resource Conservation and Recovery Act (RCRA)	A Federal law addressing the management of waste. Subtitle C of the law addresses hazardous waste rules under which a waste must either be "listed" on one of the U.S. Environmental Protection Agency's hazardous waste lists or meet one of that agency's four hazardous characteristics of ignitability, corrosivity, reactivity, or toxicity, as measured using the toxicity characteristic leachate procedure. Cradle-to-grave management of wastes classified as RCRA hazardous wastes must meet stringent guidelines for environmental protection as required by the law. These guidelines include regulation of transport, treatment, storage, and disposal of RCRA defined hazardous waste. Subtitle D of the law addresses the management of nonhazardous, nonradioactive, solid waste.
risk	The product of the probability of occurrence per year of an event and the consequence. For normal operations, the probability per year of the event is equal to one; therefore, the risk is equal to the consequences. For accidents, the probability per year of an event is less than one; therefore, the risk is less than the consequence. See consequence.
risk factor	Numerical estimate of the severity of harm associated with exposure to a particular risk agent.
sediment	Particles of organic or inorganic origin that accumulate in loose form, after being previously suspended in water (or other liquid).
seismicity	The quality or state of shaking or vibrating caused by an earthquake.
shipment	See container shipment.
shipping container	A specially designed large container used to transport spent nuclear fuel on a railcar. Shipping container designs are certified by the Department of Energy and the Department of Transportation for the shipment of spent nuclear fuel.
single-purpose container systems	A spent nuclear fuel container system can be designed for purposes of storage *or* transportation *or* disposal (single-purpose); storage *and* transportation (dual-purpose); or storage, transportation, *and* disposal (multi-purpose).
socioeconomics	The welfare of human beings as related to the production, distribution, and consumption of goods and services.
source	Radiation producing equipment or materials.

H. GLOSSARY (Cont.)

source shielding	Materials used to prevent or reduce the passage of particles of radiation from the source.
special case waste	Waste that is owned or generated by the DOE that does not fit into typical management plans developed for the major radioactive waste types. The naval special case waste addressed in this EIS is low-level radioactive waste that contains concentrations of certain short- and long-lived isotopes which requires disposal by more stringent measures than land burial.
spent nuclear fuel	Fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing. Spent nuclear fuel is usually removed because of chemical, physical, or nuclear changes that make the fuel no longer efficient (in other words, "spent") for production of heat but not because of the complete depletion of fissionable material. Upon refueling or defueling, naval spent nuclear fuel is shipped for temporary storage at INEL.
threatened species	Any species or subspecies which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
total risk of latent cancer fatalities	The probability of occurrence per year times the latent cancer fatalities multiplied by the number of years (in this EIS, 25 or 40 years).
total latent cancer fatalities	The estimated latent cancer fatalities for a population over a prescribed period (25 or 40 years for this EIS).
toxic	Relating to substances (natural as well as man-made chemicals) that may cause harm or injury to one or more of the body's tissues or organs if the amount received is sufficient and the conditions by which harm or injury occurs are present.
uranium	[Symbol U] A natural radioactive element with the atomic number 92 and, as found in natural ores, an average atomic weight of approximately 238. The two principal natural isotopes are uranium-235 (0.7 percent of natural uranium) and uranium-238 (99.3 percent of natural uranium). Natural uranium also includes a minute amount of uranium-234.

H. GLOSSARY (Cont.)

water pools	Deep pools of water that are used to inspect and hold spent nuclear fuel assemblies. Storage racks are located below the water surface to support and position the fuel assemblies in place for handling and to prevent the formation of a critical mass.
wetlands	Those areas which are covered by water with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflow, mud flats, and natural ponds.

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APPENDIX J
DISTRIBUTION

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J. DISTRIBUTION

J.1 Department of the Navy/Department of Energy Officials and Agencies (Names are listed alphabetically in columns.)

Capt. Dale E. Baugh
Commanding Officer
Puget Sound Naval Shipyard
Bremerton, WA

Rear Admiral Richard Buchanan
Regional Environmental Coordinator
Regions I and II
Groton, CT

Rear Admiral Robert Cole
Regional Environmental Coordinator
Region III
Norfolk, VA

Rear Admiral Kevin Delaney
Regional Environmental Coordinator
Region IV
Jacksonville, FL

Melinda d'Ouville
U.S. Department of Energy
Yucca Mountain Project Office
Las Vegas, NV

Wendy Dixon
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Yucca Mountain Project Office
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Regional Environmental Coordinator
Region X
Silverdale, WA

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Honolulu, HI

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The Honorable Herbert H. Bateman
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Newport News, VA

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Idaho Falls, ID

Leland Roy Mink
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Idaho Department of Water Resources
Boise, ID

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Governor of Nevada
Carson City, NV

Linda Murakami
National Conference of State Legislatures
Denver, CO

The Honorable Bruce Newcomb
Idaho House of Representatives
Burley, ID

Kenneth Niles
Oregon/Hanford Transport Safety Analyst
Oregon Department of Energy
Salem, OR

The Honorable Laird Noh
Idaho Senate
Kimberly, ID

Michael Pitlock
Nevada Public Service Commission
Carson City, NV

Robert Quillin
Department of Public Health and Environment
Radiation Control Division
Denver, CO

Phillip Rassier
Idaho Department of Water Resources
Boise, ID

The Honorable Diana Richman
Idaho House of Representatives
Sugar City, ID

The Honorable Roy Romer
Governor of Colorado
Denver, CO

Ronald Ross
Western Governors' Association
Denver, CO

Charles Rountree
Idaho Department of Transportation
Boise, ID

Cheryl Runyon
National Conference of State Legislatures
Denver, CO

David Rydalch
Idaho Water Resource Board
St. Anthony, ID

Jeffrey Schrade
Office of the Governor
Boise, ID

E. G. Schwartz
Idaho State Police
Pocatello, ID

Robert Sobba, Director
Idaho State Police
Meridian, ID

The Honorable Shiela Sorenson
Idaho Senate
Boise, ID

Roger Stanley
Washington State Department of Ecology
Olympia, WA

Dennis Stein
Nevada Development Authority
Las Vegas, NV

Joseph Strolin
Nevada Agency of Nuclear Projects
Carson City, NV

The Honorable W. Clinton Stennett
Idaho Senate
Ketchum, ID

Terrence Strong
Department of Health
Division of Radiological Protection
Olympia, WA

The Honorable Bruce L. Sweeney
Idaho Senate
Lewiston, ID

The Honorable Fife Symington
Governor of Arizona
Phoenix, AZ

John Talbott
Wyoming Game and Fish Department
Cheyenne, WY

Dale Towell
Idaho Department of Fish and Game
Boise, ID

Kathleen Trever
Natural Resource Division
Office of the Attorney General
Boise, ID

The Honorable Jerry T. Twiggs
Idaho Senate
Blackfoot, ID

Katy Walton
Caltrans, District 9
Bishop, CA

Donald Watts
Idaho State Historic Preservation
Boise, ID

Chris J. Wentz
Energy, Minerals, and Natural Resources
Department
Santa Fe, NM

J. DISTRIBUTION (Cont.)

Steven West
State of Idaho
Boise, ID

The Honorable R. Clair Wetherell
Idaho Senate
Mountain Home, ID

The Honorable Peter Wilson
Governor of California
Sacramento, CA

Suzanne Winters, Ph.D.
Governor's Office of Planning and Budget
Salt Lake City, UT

Robert Yohe
Idaho State Historical Society
Boise, ID

J.4 Tribes and Tribal Organizations (Names are listed alphabetically in columns.)

Kenneth A. Anderson
Las Vegas Paiute Tribe
Las Vegas, NV

Cheryl Andreas
Big Pine Indian Tribe
of the Owens Valley
Big Pine, CA

Martin J. Antone, Sr.
Ak Chin Indian Community Council
Maricopa, AZ

Richard Arnold
Pahrump Paiute Indian Tribe
Pahrump, NV

Darryl Bahe
Benton Paiute Indian Tribe
Benton, CA

Rose Marie Bahe
Benton Paiute Reservation
Benton, CA

Velma Bahe
Kootenai Tribal Council
Bonners Ferry, ID

Brian Barry
Yakima Indian Nation
Bend, OR

Lawrence Bear
Skull Valley General Council
Grantsville, UT

Leon Bear
Skull Valley Goshute
Fort Duchesne, UT

James Birchim
Yomba Tribal Council
Austin, NV

Heidi Blackeye
Citizen Alert Native American Program
Reno, NV

Corrina Bow
Paiute Indian Tribes of Utah
Cedar City, UT

Robert Boyt
Las Vegas Indian Center
Las Vegas, NV

Allan E. Brady
Yomba Shoshone Tribe
Austin, NV

Gloria Bullets-Benson
Kaibab Paiute Tribal Council
Fredonia, AZ

William Burke
Umatilla Tribe
Pendleton, OR

Irene Buttons
Lone Pine Paiute-Shoshone Tribe
Lone Pine, CA

Darlene G. Byrd
Lovelock Tribal Council
Lovelock, NV

Milton Campbell
California Indians for Cultural
and Environmental Protection
Santa Ysabel, CA

Wendell Chino
Mescalero Apache Tribe
Mescalero, NM

Donald (Cowlitz) Cloquet
Las Vegas Indian Center
Las Vegas, NV

Ernestine Coble
Fort McDermitt Paiute-Shoshone Tribe
McDermitt, NV

Anita Collins
Walker River Paiute Tribe
Schurz, NV

Betty L. Cornelius
Colorado River Indian Tribes
Parker, AZ

Daryl Crawford
Inter-Tribal Council of Nevada, Inc.
Reno, NV

Wilson Crutcher
Fort McDermitt Tribal Council
McDermitt, NV

Rose Davis
Western Shoshone National Council
Las Vegas, NV

Leon B. Duran
Laguna Pueblo
Laguna, NM

Daniel Eddy, Jr.
Colorado River Tribal Council
Parker, AZ

Kenneth W. Esplin
Bureau of Indian Affairs,
Southern Paiute Field Station
St. George, UT

Pauline Estevez
Timbisha Shoshone Tribe
Death Valley, CA

The Honorable Delbert Farmer, Chairman
Shoshone-Bannock Tribes
Fort Hall, ID

Robert Fulkerson
Citizen Alert Native American Program
Reno, NV

Ivan Garcia
Santo Domingo Pueblo
Santo Domingo, NM

Dan Gargan
Affiliated Tribes of Northwest Indians
Portland, OR

Arcadio Gastelum
Pascua Yaqui Tribal Council
Tucson, AZ

Worley George
Northwestern Band of Shoshone Nation
Blackfoot, ID

Davis Gonzales
Elko Band Council of the Te-Moak Tribe
of Western Shoshone Indians
Elko, NV

Johnny Gordon
Chemehuevi Indian Tribe
Havasu Lake, CA

Boyd Graham
Duckwater Shoshone Tribal Council
Duckwater, NV

Delbert Havatone
Hualapai Tribal Council
Peach Springs, AZ

Charles Hayes
Nez Perce Tribe
Lapwai, ID

Jose A. Herrera
Cochiti Pueblo
Cochiti, NM

Robert Holden
National Congress of American Indians
Washington, DC

J. DISTRIBUTION (Cont.)

Florine Maine Hooper
Te-Moak Western Shoshone
Battle Mountain, NV

Colburn Hunter
Pyramid Lake Paiute Tribe
Sutcliffe, NV

Indian Voices
Las Vegas, NV

Michael Jackson, Sr.
Quechan Tribal Council
Yuma, AZ

Alvin R. James
Pyramid Lake Paiute Tribal Council
Nixon, NV

Evelyn James
San Juan Southern Paiute Council
Tuba City, AZ

Jeri Johnson
Tonto Apache Tribal Council
Payson, AZ

M. Kevin Jones
Washoe Tribe of Nevada and California
Gardnerville, NV

Roy Kennedy
Timbisha Shoshone Tribe
Death Valley, CA

Stillman Knight, Jr.
South Fork Band Council of the
Te-Moak Tribe of Western Shoshone
Lee, NV

A. David Lester
Council of Energy Resource Tribes
Denver, CO

Sylvester Listo
Tohono O'odham Council
Sells, AZ

Ronnie Lupe
White Mountain Apache Tribal Council
Whiteriver , AZ

Cynthia Lynch
Pahrump Paiute Indian Tribe
Pahrump, NV

Patricia Madueno
Fort Mojave Tribal Council
Needles, CA

Ivan Makil
Salt River Pima-Maricopa
Indian Community Council
Scottsdale, AZ

Dale S. Malotte
Tribal Council of the Te-Moak
Western Tribe
Elko, NV

Lindsey Manning
Shoshone Paiute Business Council
Owyhee, NV

Diana Martinez
San Pasqual Band of Mission Indians
Valley Center , CA

Arlan Melendez
Nevada Indian Environmental Coalition
Reno, NV

Rosalyn Mike
Moapa Business Council
Moapa, NV

Kenneth R. Miller
Menominee Indian Tribe of Wisconsin
Herald, CA

Lalovi Miller
Moapa Paiute Indian Tribe
Moapa, NV

Vernon Miller
Fort Independence Indian Tribe
Independence, CA

Alfreda Mitre
Las Vegas Paiute Tribal Council
Las Vegas, NV

Bertha Moose
Big Pine Indian Tribe
Big Pine, CA

Calvin Myers
Moapa Tribal Council
Moapa, NV

Nevada Indian Commission
Reno, NV

Nolee Olson
Affiliated Tribes of Northwest Indians
Portland, OR

Clinton Pattea
Mohave-Apache Community Council
Fountain Hills, AZ

Stanley Paytiamo
Pueblo of Acoma
Acomita, NM

Harlen Pete
Goshute Business Council
Ibapah, UT

Ardith Peyope
Shoshone-Bannock Library
Fort Hall, ID

James Phoenix
Pyramid Lake Indian Tribe
Nixon, NV

Stewart Pike
Uintah and Ouray Tribal
Business Committee
Fort Duchesne, UT

McKay R. Pikyavit
Paiute Tribe of Utah
Kanosh, UT

Myron Pino
Pueblo of Zia
Zia Pueblo, NM

David L. Platerio
Native American Consultant
Elko, NV

Donna Powaukee
Nez Perce Tribe
Lapwai, ID

Danny Quintana
Skull Valley Goshute Tribe
Dugway, UT

Rose W. Robinson
National Congress of American Indians
Washington, DC

Michael L. Romero
Pueblo of San Felipe
San Felipe Pueblo, NM

William Rosse, Sr.
Environmental Protection Committee of
Western Shoshone National Council
Austin, NV

Robert Sam
Summit Lake Paiute Council
Winnemucca, NV

J. Gilbert Sanchez
San Ildefonso Pueblo
Santa Fe, NM

Gevene E. Savala
Kaibab Band of Southern Paiutes
Glendale, AZ

Ferrell Secakuku
Hopi Tribal Council
Kykotsmovi, AZ

Alex Shepherd
Tribal Council of Paiute
Indian Tribe of Utah
Cedar City, UT

Wayne Sinyella
Havasupai Tribal Council
Supai, AZ

Kevin Siua
Los Coyotes Cahuilla Indian Reservation
Banning, CA

Beverley Slack
Skull Valley Band of Goshute Indians
Salt Lake City, UT

Theodore Smith, Sr.
Yavapai-Apache Community Council
Camp Verde, AZ

Paul Snooks
Battle Mountain Band Council of the
Te-Moak Tribe of Western Shoshone Indians
Battle Mountain, NV

J. DISTRIBUTION (Cont.)

Peter Soto
Cocopah Tribal Council
Somerton, AZ

R. Srivasova, Ph.D
Navajo Community College
Shiprock, NM

Stacy L. Stahl
Yerington Paiute Tribal Council
Yerington, NV

Raymond Stanley
San Carlos Tribal Council
San Carlos, AZ

Jacqueline Steele
Stewart Community Council
of the Washoe Tribe
Carson City, NV

Ernest Stensgar
Coeur d'Alene Tribal Council
Plummer, ID

Bruce Stevens
Wells Indian Colony Band Council
of the Te-Moak Tribe of
Western Shoshone Indians
Wells, NV

Mary V. Thomas
Gila River Indian Community Council
Sacaton, AZ

Robert Tom
Moapa Indian Reservation
Moapa, NV

Kim Townsend
Duckwater Shoshone Tribe
Duckwater, NV

Tribal Counsel
Shoshone Bannock
Tribal Attorney
Ft. Hall, ID

Roger Turner
Shoshone-Bannock Tribes
Fort Hall, ID

Peggy Vega
Bishop Paiute-Shoshone Tribe
Bishop, CA

Nancy Vucinich
Pyramid Lake Paiute Tribe
Sutcliffe, NV

A. Brian Wallace
Washoe Tribal Council
Gardnerville, NV

Stanley Waquie
Natural Resource Director
Jemez Pueblo, NM

Glen Wasson
Winnemucca Indian Western Bands
of the Western Shoshones
Reno, NV

Glenn Wasson
Winnemucca Indian Colony
Susanville, CA

Western Shoshone National Council
Indian Springs, NV

Richard Wilder
Fort Independence Reservation
Independence, CA

Samuel L. Winder
National Tribal Environmental Council
Albuquerque, NM

Mervin Wright, Jr.
Pyramid Lake Paiute Tribe
Nixon, NV

Kathy Wyatt
Dresslerville Community Council
of the Washoe Tribe
Gardnerville, NV

Sandra J. Yonge
Lone Pine Reservation
Lone Pine, CA

Diana Yupe
Shoshone Bannock Tribe
Cultural Resources
Ft. Hall, ID

Davis Zuniga
Reno-Sparks Indian Colony
Sparks, NV

J.5 Local Officials (Names are listed alphabetically in columns.)

Lee Allen
Box Elder County Commissioner
Brigham City, UT

The Honorable Peter Angstadt
Mayor
Pocatello, ID

The Honorable Dale Arave
Bingham County Board of Commissioners
Blackfoot, ID

The Honorable Bruce Ard
Mayor
Ammon, ID

City of Arimo, City Council
Arimo, ID

Gerald Armstrong
City of Boise
Boise, ID

Bannock County Commissioner
Pocatello, ID

Bannock County, Highway Department
Pocatello, ID

The Honorable Frank Bauman
Mayor
Burley, ID

Beaver County Commissioner
Beaver, UT

Dennis A. Bechtel
Clark County Dept. of
Comprehensive Planning
Las Vegas, NV

The Honorable Gregory S. Bell
Mayor
Farmington, UT

Bingham County Commissioner
Blackfoot, ID

Bingham County, City of Blackfoot
Blackfoot, ID

Bonneville County
Superintendent of County Roads
Idaho Falls, ID

Bonneville County Commissioner
Idaho Falls, ID

Les Bradshaw
Nye County Nuclear Waste Repository Project
Office
Tonopah, NV

The Honorable Dell Braegger
Mayor
Willard, UT

Butte City Council
Butte, ID

Cache County Commissioner
Logan, UT

The Honorable Robert Campbell
City of Clayton
Clayton, ID

Daniel G. Chadwick
Idaho Association of Counties
Boise, ID

The Honorable Darla D. Clark
Mayor
Logan, UT

The Honorable Brent Coles
Mayor
Boise, ID

The Honorable Deedee Corradini
Mayor
Salt Lake City, UT

J. DISTRIBUTION (Cont.)

Peter Cummings
City of Las Vegas
Las Vegas, NV

The Honorable John R. Cushing
Mayor
Bountiful, UT

Davis County Commissioner
Farmington, UT

The Honorable Clark N. Davis
Mayor
Brigham City, UT

City of Declo, Declo City Council
Declo, ID

Russell DiBartolo
Clark County Nuclear Waste Division
Las Vegas, NV

Barry E. DuVal
Mayor
Newport News, VA

Gary Fedor
Esmeralda County Citizens
Advisory Council
Dyer, NV

Leonard J. Fiorenzi
Yucca Mountain Information Office
Eureka County
Eureka, NV

Ilene Foley
Mayor
Portsmouth, NH

Michael Franzoia
Mayor
Elko, NV

S. David Freeman
Sacramento Municipal Utility District
Sacramento, CA

The Honorable Winston Goering
Mayor
Nampa, ID

The Honorable Jeffrey Gooding
Mayor
Twin Falls, ID

June Green
Esmeralda County Citizen's Advisory Council
Goldfield, NV

Sandra Green
Eureka County Yucca Mountain
Information Office
Eureka, NV

Robert Groesbeck
City of Henderson
Henderson, NV

The Honorable Neldon E. Hamblin
Mayor
Clearfield, UT

The Honorable Karen Hansen
Mayor
Iona, ID

Roger Hardwick
Clark County Nevada
Las Vegas, NV

Jeremy Harris
Mayor
Honolulu, HI

Richard B. Holmes
Clark County
Las Vegas, NV

Anne Hausrath
Boise City Council
Boise, ID

The Honorable Ralph Haycock
Mayor
Hyrum, UT

Mason R. Hayes
Esmeralda Citizens Advisory Council
Goldfield, NV

Delores S. Herrera
San Jose Community Awareness Council
Albuquerque, NM

The Honorable Russell Hirst
Mayor
Lewistown, UT

Delwin D. Hock
Public Service Co. of Colorado
Denver, CO

Juanita D. Hoffman
Nuclear Waste Repository Oversight Program
Esmeralda County Commission
Goldfield, NV

Lynn Horton
Mayor
Bremerton, WA

Iron County Commissioner
Parowan, UT

Jefferson County
Rigby, ID

Abbie Johnson
Nuclear and Waste Advisor
Eureka County
Carson City, NV

The Honorable Art Johnson
Mayor
Kaysville, UT

Sheri Johnson
Carson Colony Community Council
Carson City, NV

The Honorable Clare A. Jones
Mayor
North Salt Lake, UT

The Honorable Janis L. Jones
Mayor
Las Vegas, NV

Kevin Jones
Woodfords Community Council
Marleeville, CA

Juab County Commissioner
Nephi, UT

Alan F. Kalt
Churchill County Administration Office
Nuclear Waste Project Office,
Yucca Mountain Office
Fallon, NV

Thomas Katsilometes
Bannock County Board of Commissioners
Pocatello, ID

Mary Kincaid
Councilwoman for the
City of North Las Vegas
Las Vegas, NV

The Honorable Jerome Larrabee
Mayor
Woods Cross, UT

The Honorable JoAnn Levy
Mayor
Sun Valley, ID

Lincoln County Commissioner
Pioche, NV

Clifford Long
Board of Commissioners
Idaho Falls, ID

Eric Lundgaard
Mayor
Boulder City, NV

The Honorable Paul Lyman
Mayor
Richfield, UT

Madison County
Rexburg, ID

Florindo Mariani
White Pine County
Nuclear Waste Project Office
Ely, NV

Bernadette Markussun
Carson Colony Community Council
Carson City, NV

The Honorable Ruth Maughn
Mayor
Wellsville, UT

Philip McCarthy
Town Manager
Kittery, ME

Shirley McGeoghegan
City of Lewiston
Lewiston, ID

J. DISTRIBUTION (Cont.)

The Honorable Glen Mecham
Mayor
Ogden, UT

Brad Mettam
County of Inyo Planning Department,
Yucca Mountain Repository Office
Independence, CA

The Honorable Linda Milam
Mayor
Idaho Falls, ID

Millard County Commissioner
Fillmore, UT

The Honorable Gordon Miller
Mayor
Smithfield, UT

Mary Ann Mix
Hailey City Council
Hailey, ID

Morgan County Commissioner
Morgan, UT

The Honorable Linda Morgan
Mayor
Atomic City, ID

Gary Nelson
Community Council - Salt Lake County
Kearns, UT

The Honorable Glade Nielsen
Mayor
Roy, UT

Nye County Commissioner
Tonopah, NV

Ted O'Neil
Fire Chief
May, ID

The Honorable Kip Panter
Mayor
Richmond, UT

The Honorable Grant Pendleton
Mayor
Tooele, UT

The Honorable Lynn Pett
Mayor
Murray, UT

The Honorable Kevin Phillips
Mayor
Caliente, NV

Jason Pitts
Lincoln County Nuclear Waste Project Office
Pioche, NV

Piute County Commissioner
Junction, UT

Vernon Poe
Mineral County Office of Nuclear Projects
Hawthorne, NV

The Honorable R. Scott Reese
Mayor
Blackfoot, ID

James T. Regan
Churchill County Commission
Fallon, NV

Stanley Rice
Yavapai-Prescott Board of Directors
Prescott, AZ

Rigby City Council
Rigby, ID

Glen Van Roeckle
City of Caliente
Caliente, NV

Fred Rose
Idaho Falls Center For Higher Educ.
Idaho Falls, ID

Salt Lake County Commissioner
Salt Lake City, UT

San Pete County Commissioner
Manti, UT

Grant Sawyer
Nevada Commission on Nuclear Projects
Las Vegas, NV

James Seastrand
City of North Las Vegas
N. Las Vegas, NV

Sevier County Commissioner
Richfield, UT

Town of Shelley Police Department
Shelley, ID

The Honorable Harold Shirley
Mayor
Cedar City, UT

Fred Sica
Idaho Falls Chamber of Commerce
Idaho Falls, ID

The Honorable Harold Sims
Mayor
Bonners Ferry, ID

Robert Singleton
Boundary County School District 101
Bonners Ferry, ID

The Honorable Jerry Stevenson
Mayor
Layton, UT

Marvin Teixeira
Mayor
Carson City, NV

Loretta Tingle
White Line County
Ely, NV

E. von Tiesenhausen
Clark County Comp. Planning, NWD
Las Vegas, NV

The Honorable Priscilla Todd
Mayor
Centerville, UT

Tooele County Commissioner
Tooele, UT

Utah County Commissioner
Parowan, UT

The Honorable Paul Walker
Board of County Commissioners
Rigby, ID

Washington County Commissioner
Saint George, UT

The Honorable Gloria O. Webb
Mayor
Portsmouth, VA

Weber County Commissioner
Ogden, UT

White Bird City Council
White Bird, ID

Janice Williams
Nye County
Tonopah, NV

Raymond Williams
Lander County Commission
Battle Mountain, NV

Steven Wills
School District 411
Twin Falls, ID

The Honorable Mary Wiseman
Mayor
Millford, UT

Buck Wong
North Las Vegas Chamber of Commerce
Las Vegas, NV

Bruce Woodbury
Transportation Commissioner
Las Vegas, NV

The Honorable Gerald Wright
Mayor
West Valley City, UT

The Honorable Paul Wynn
Mayor
Ashton, ID

J. DISTRIBUTION (Cont.)

J.6 Organizations (Names are listed alphabetically in columns.)

Robert S. Aiken
Pinnacle West Capital Corp.
Washington, DC

Bruce Allen
Snake River Alliance
Ketchum, ID

The Honorable Duane S. Allen
Laborers' International Union
Arco, ID

Dr. Carl A. Anderson
Board on Radioactive Waste Management
National Academy of Sciences
Washington, DC

Charles Ariss
Idaho Environmental
Boise, ID

Anna Aurilio
U.S. Public Interest Research Group
Washington, DC

Dr. Donald H. Baepler, Ph.D.
University of Nevada, Las Vegas
Harry Reid Center for
Environmental Studies
Las Vegas, NV

Walter Bak
VECTRA Technologies, Inc.
San Jose, CA

Phillip Bayne
Nuclear Energy Institute
Washington, DC

Stacy Beem
United We Stand
Boise, ID

Katrina Berman
League of Women Voters
Moscow, ID

Neil Blue
General Atomics
San Diego, CA

Tracy Boucher
Boise Peace Quilt Project
Boise, ID

Marcia W. Brady
Boise Peace Quilt Project
Eagle, ID

Chris Brown
Campaign for Nevada's Future
Las Vegas, NV

Paula Brown
Nevada Nuclear Waste Study Committee
Las Vegas, NV

Thomas C. Burton
Fallon Business Council
Fallon, NV

Lane Butler
BE Corporation
Sandia Park, NM

Nilak Butler
Greenpeace
San Francisco, CA

Frank Caine
Southern Nevada Central Labor Council
Las Vegas, NV

Drew Caputo
Natural Resources Defense Council
Washington, DC

Ronald Carey
International Brotherhood of Teamsters
Washington, DC

Jerome Charles
Ely Colony Council
Ely, NV

Edward Chew
Snake River Audubon Society
Idaho Falls, ID

Paul C. Childress
B&W Nuclear Environmental Service, Inc.
Lynchburg, VA

Albert G. Cohen
Southern California Ecumenical Council
Los Angeles, CA

Sandra Covi
Union Pacific Railroad
Pocatello, ID

William Craig
Utah Radiation Ctrl.
Salt Lake City, UT

Dr. Edmund Crouch
Cambridge Environmental, Inc.
Cambridge, MA

Steven Crumley
Carpenters Local 808
Idaho Falls, ID

Edward M. Davis
NAC International
Norcross, GA

Dale Decesere
Western Interstate Energy Board
Denver, CO

Robert Deegan
Sierra Club
Virginia Beach, VA

Dr. Jane Delgado
National Coalition of Hispanic Health
and Human Service Organizations
Washington, DC

Thomas W. Doering
Framatome Technologies
Las Vegas, NV

Richard D. Dresser
Roy F. Weston, Inc.
Washington, DC

Lee Duplessis
Chereb and Shadow Wings Security
Idaho Falls, ID

Blake Early
Sierra Club
Washington, DC

Maureen Eldredge
Military Production Network
Washington, DC

Jean Elle
League of Women Voters
Pocatello, ID

Fermco
Cincinnati, OH

Amy Fitzgerald
Local Oversight Committee
Oak Ridge, TN

Khalif Ford
Molten Metal Technology
Waltham, MA

Foster Wheeler Energy Corporation
Clinton, NJ

Jennifer Friedman
Power Reactor and
Nuclear Development Corp.
Washington, DC

George Freund
Coalition 21
Idaho Falls, ID

Robert Fronczak
Association of American Railroads
Washington, DC

Brian Gardunia
Students for Environmental Action
Boise, ID

Dorothy Gayton
League of Women Voters
Las Vegas, NV

Martin Gelfand
Safe Energy Communication Council
Washington, DC

General Nuclear Systems, Inc.
Columbia, SC

Mary Ellen Giampaoli
Las Vegas, NV

J. DISTRIBUTION (Cont.)

Governmental Dynamics
Arlington, VA

Liz Hanbury
Ridolfi Engineering
Seattle, WA

Donald Hancock
National Campaign for
Radioactive Waste Safety
Albuquerque , NM

Gertrude Hanson
Can We
Coeur D'alene, ID

John Haslam
I.U.O.B #12
Las Vegas, NV

Donald W. Hiatt
Ohio Citizens for Responsible Energy, Inc.
East Ely, NV

James Hobbs
Sierra Nuclear Corp.
Roswell, GA

Carolyn Hondo
FOCUS on Peace and Justice
Burley, ID

Frederik Jackson
Tetra Tech
Falls Church, VA

Richard and Elisabeth Jay
Boise Peace Quilt Project
Boise, ID

Andrea Jennetta
Nuclear Assurance Corp.
Washington, DC

Theodore Jensen
IBEW L.U. #449
Pocatello, ID

William Joyce
Halliburton NUS Corporation
Gaithersburg, MD

Ralph E. Keller
Precision Components Corporation
York, PA

John H. Kessler
Electric Power Research Institute
Palo Alto, CA

Elizabeth Kraft
National League of Women Voters
Education Fund
Washington, DC

Al Krause
Painters Local 764
Pocatello, ID

Bernice Kring
Grandmothers for Peace
Sacramento, CA

Olga Krueger
NWPO/NARUC
Washington, DC

Donn Larsen
Laborers' International Local #155
Idaho Falls, ID

Nicholas Lenssen
Worldwatch Institute
Washington, DC

Rodney Livingston
C.E.C.
Washington, DC

Jane Lorentzen
Cure Communities United
Old Frontenac, MN

Stuart Loseke
Hanford Downwinder
Boise, ID

Scott Ludwig
Oak Ridge National Laboratory
Oak Ridge, TN

S. A. Macy
E. R. Johnson Associates, Inc.
Fairfax, VA

William Magavern
Critical Mass Energy Project of Public Citizen
Washington, DC

Michael Mariotte
Nuclear Information and Resource Service
Washington, DC

Miguel Manrique
VECTRA Technologies, Inc.
San Raman, CA

Regis Matzie
ABB Combustion Engineering
Washington, DC

R. D. Maynard
Operating Engineers, Local #370
Pocatello, ID

Robert McClone
Teamsters #631
Las Vegas, NV

Brian Meacham
Utah Peace Test
Salt Lake City, UT

Fred Miller
NWCC
Washington, DC

Richard Moore
Southwest Network for Environmental
and Economic Justice
Albuquerque, NM

Timothy Muller
Westinghouse
Sunnyvale, CA

John Nash
Tetra Tech
Falls Church, VA

Richard Nielsen
Citizen Alert
Las Vegas, NV

Daniel Nix
Western Interstate Energy Board
Denver, CO

John O'Connor
Farm Management Inc.
Buhl, ID

Mary Olson
NIRS
Washington, DC

Janice Owens
Nuclear Waste Program Office
National Association of
Regulatory Utility Commissioners
Washington, DC

Packing Technology, Inc.
Westinghouse Electric Corporation
Pittsburgh, PA

James A. Palmer
Newport News Nuclear
Newport News, VA

John Patterson
NAC International
Aiken, SC

Steven Paulson
Friends of the Clearwater
Moscow, ID

Charles Pennington
Holtec International
Cherry Hill, NJ

William D. Peterson
P & A Engineers
Holladay, UT

John Petring
Ogden Environmental - Inter. Branch
Fairfax, VA

James Poles
TRW
Washington, DC

Thomas Powers
B&W Nuclear Environmental Services, Inc.
Lynchburg, VA

Laurel Pumphrey
Boise Peace Quilt Project
Boise, ID

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Donley, ID

Robert Pottenger
Boise, ID

Roderick and Martha Potter
Ketchum, ID

Dorothy Powell
Winnemucca, NV

Mark Powell
Springfield, ID

Richard H. Powell
Olean, NY

Sylvia Pratt
Newkirk, OK

Jo Price
Boise, ID

Jay Pride
Oak Ridge, TN

Jane Pritchett
Moscow, ID

David Proctor
Boise, ID

Laird Proctor
Boise, ID

Dennis J. and Margo Proksa
Pocatello, ID

Virginia Proutsos
Mc Gill, NV

Jamie Prowse
Orchard Park, NY

W. J. Quapp
Idaho Falls, ID

Vickie Quinley
Jerome, ID

Phillip Ramsey
Arco, ID

Richard Rasplicka
Carlin, NV

Ms. Reale
Pocatello, ID

Marvin H. Relaford
Ely, NV

Lois Remple
Pueblo, CO

Mary Susan Rhea
Ely, NV

S.E. Rhodes
Pocatello, ID

Joann Rice
Boise, ID

Matthew Richards PhD
San Diego, CA

Kermit and Janet Richardson
Arco, ID

Virginia Ridgway
Goldfield, NV

Mark Rinehart
Boise, ID

Dr. Donald Robertson
Ely, NV

Charles Robinson
Moscow, ID

Pamela Rocca
Boise, ID

Hal Rogers
Carson City, NV

Kris Rogers
Ketchum, ID

Deborah Rohlman
Silver Peak, NV

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Leon Ross
Ely, NV

Harold Rothstein
New York, NY

Margaret E. Rowe
Ruth, NV

Jim Rudolph
Boise, ID

Jay T. Ryan, Esq.
Washington, DC

Robert L. Ryder
Ely, NV

Mark Sabolik
Salt Lake City, UT

Dr. Joseph Saccoman
El Cajon, CA

John I. Sackett
Argonne National Laboratory West
Idaho Falls, ID

Peggy Salaets
Nampa, ID

Diana Salisbury
Sardinia, OH

Lewis Sandberg
Ely, NV

James E. Sanders
Idaho Falls, ID

Leah W. Sattgast
Buhl, ID

Wendy Savkranz
Rigby, ID

Leslie Scarborough
Hailey, ID

D. Kate Schalck
Moscow, ID

Peggy Scherbinske
Blackfoot, ID

Bruce L. Schmalz
Idaho Falls, ID

Barry Schrock
Las Vegas, NV

Frank Schumacher
East Ely, NV

Thomas Seaman
Moscow, ID

Eric Seedorff
Ely, NV

Joseph C. Sener
Boise, ID

Angela Sewall
Boise, ID

Joyce Shadduck
Dyer, NV

William Sherrerd
Sun Valley, ID

JoAnn Sherwin
Portsmouth, OH

Diana Y. Shipley
Pocatello, ID

Edward Shokal
Hagerman, ID

Cornelia Shotwell
Twin Falls, ID

Evelyn Shotwell
Hagerman, ID

Jeanne Shreeve
Moscow, ID

Taggart Siegel
Ketchum, ID

Karyn Sieger
Council, ID

Carta Sierra
Pocatello, ID

Joseph Signorelli
Gaithersburg, MD

Hugo Simens
San Ramon, CA

Lynn Sims
Portland, OR

Emma L. Sirhall
Boise, ID

Vic Skaar
Las Vegas, NV

Charles Slade
Vancouver, BC
Canada

Cyril M. Slansky
Idaho Falls, ID

David M. Slaughter, Ph.D.
University of Utah
Salt Lake City, UT

B. Slifer
Filer, ID

Ellen Smith
Oak Ridge National Laboratory
Oak Ridge, TN

Jack L. Smith
Idaho State University
Pocatello, ID

Linn Smith
Las Vegas, NV

Matthew Smith
Twin Falls, ID

Steven Smith
Takoma Park, MD

Vicki Smith
Hailey, ID

W. A. Smith
Vallejo, CA

Richard Snell
Phoenix, AZ

Harold and Laurie Snyder
Ely, NV

Linda Soderquist
Pocatello, ID

Robert W. Sower
Caldwell, ID

Debra A. Spitzer
Sun Valley, ID

Nancy Springman
Idaho Falls, ID

Lila A. Stanger
Idaho Falls, ID

Carrie L. Stauffer
Ketchum, ID

Jack B. Stauffer
Evergreen, CO

William C. and Patricia Stauffer
Howe, ID

Merlin Steady
Pocatello, ID

James Steckel
Rockville, MD

Veronica Steffens
Buhl, ID

Jean Steiner
East Ely, NV

James Steinke
Newport News, VA

James R. Steinfort
Boise State University
Boise, ID

Alan Stephens
Idaho State University
Idaho Falls, ID

Rita Stetzel
Carlin, NV

Danny Stevens
Las Vegas, NV

J. DISTRIBUTION (Cont.)

Gary Stone
Kimberly, ID

L. George and Sheila Stonhill
Arco, ID

Mary Stori
Twin Falls, ID

Raz Stowe
Idaho State University
Pocatello, ID

David T. Stowell
Goldfield, NV

Elizabeth Stratten
Pocatello, ID

Mary Strawser
Twin Falls, ID

Jack Streeter
Streeter Real Estate
Mountain Home, ID

Tye Strong
Boise, ID

The Honorable La Vinna Stroud
Leadore, ID

Dean C. Stubbs
Ely, NV

Daniel Suciu
Idaho Falls, ID

Debbie Suhr
Twin Falls, ID

Dale L. Summers
Atomic City, ID

Arthur Sutherland
Salt Lake City, UT

Michael Sutton
Pocatello, ID

Pamela Swenson
King Hill, ID

Edward S. Syrajala
Centerville, MA

John Tanner
Idaho Falls, ID

Deborah Tate
Pocatello, ID

Larry L. Taylor
Idaho Falls, ID

Marlese Teasley
Twin Falls, ID

Thomas Teitge
Hailey, ID

Meryle Teusher
Twin Falls, ID

Joanna C. Tewell
Idaho Falls, ID

Rev. G. W. Thallheimer, Jr.
Crescent Valley, NV

Timothy Thomas
Sun Valley, ID

Eugenie Throckmorton
Las Vegas, NV

Kent Tingey
Pocatello, ID

Verna L. Tippett
Boise, ID

Bernice C. Tom
Ely, NV

Mark Torf
Boise, ID

Zell Towersap
Fort Hall, ID

William L. Towne
Ely, NV

James Townley
McCall, ID

Todd Trigsted
Genesee, ID

Charles H. Trost
Pocatello, ID

Robert Trout
Idaho Falls, ID

Hawley Troxell
Boise, ID

Scott Tschirgi
Boise, ID

Michael Dale Tschopp
Beowawe, NV

Kaye and Roger Turner
Pocatello, ID

Margaret Tweedy
Ely, NV

Nancy Tyler
Boise, ID

Alfred J. Unioni, Ph.D.
Idaho Falls, ID

Vader
Boise, ID

Robert Vanevery
Ketchum, ID

Stephen C. Vanzandt
Twin Falls, ID

Mark Vegwert
Ketchum, ID

Desi Vella
Campo, CA

Jonnie Vlades
Jerome, ID

Paul G. Voilleque
Idaho Falls, ID

M. Wade
Pocatello, ID

Marshall Wade
Eastern Idaho Technical College
Idaho Falls, ID

Robert Wadkins
Idaho Falls, ID

Paul Wagner
Hailey, ID

Amy Walker
Bliss, ID

Rebecca and John Wamsley
Las Vegas, NV

Jack R. Wananda
Goldfield, NV

Fred Wanzenried
Twin Falls, ID

Priscilla Ward
Ely, NV

Jeffrey Warren
Boise, ID

James Washburn
Caldwell, ID

Jackson L. and Carole Watson
Boise, ID

Kelley Watson
Hailey, ID

Matthew Weatherley-White
Boise, ID

Stephen Weeg
Pocatello, ID

Matthew Wells
Hailey, ID

Dr. William R. Wells, Ph.D.
University of Nevada, Las Vegas
Las Vegas, NV

Robert and Wendy Werth
Sun Valley, ID

Marylou Weston
Las Vegas, NV

Glen E. Westover
Ely, NV

J. DISTRIBUTION (Cont.)

Charles E. White
Idaho Falls, ID

Sue White
Ketchum, ID

Judith E. Widener
Buhl, ID

G.D.V. Wiebe, Ph. D.
Sparks, NV

Thomas Wierman
Idaho Falls, ID

Richard E. Wiethorn
Hailey, ID

Debbie Wilcox
Las Vegas, NV

Edna Wiler
Idaho Falls, ID

Douglas Williams
St. Anthony, ID

Kent Williams
Madison Middle School
Rexburg, ID

Theresa E. Williams
Hailey, ID

Xenia Williams
Jerome, Id

Bruce Willis
Hailey, ID

Lucille N. Wilson
Eureka, NV

Jan Wimberly
Buhl, ID

Charles Winder
Boise, ID

Dr. Bertram Wolfe
San Diego, CA

Louis Wonenberg
McGill, NV

Margaret A. Wood
East Ely, NV

Wade Woodland
Meridian, ID

Tal Worley
Idaho Falls, ID

Catherine Wright
Buhl, ID

Creed Wright
Twin Falls, ID

Kevin Wright
Coeur d'Alene, ID

Linda Wright
San Francisco, CA

Carol Yeatman
Carson City, NV

Diana G. Young
Ketchum, ID

Richard Young
Ketchum, ID

Norman C. Young
Boise, ID

Josephine Zakula
McGill, NV

Lawrence Zale
Las Vegas, NV

Abe Zeitoun
Gaithersburg, MD

Paul Zelus
Idaho State University
Pocatello, ID

William Zuercher
Payette, ID

J.10 Public Reading Rooms (Names are listed alphabetically in columns.)

Albuquerque Bernalillo County Library
Albuquerque, NM

Boise Public Library
Boise, ID

DOE Coordination and Information Center
Las Vegas, NV

DOE Freedom of Information Reading Room
Washington, DC

DOE Public Reading Room
Idaho Falls, ID

Denver Public Library
Denver, CO

Deschutes County Library
Bend, OR

Flagstaff Public Library
Flagstaff, AZ

Idaho Falls Public Library
Idaho Falls, ID

Laramie County Library
Cheyenne, WY

Pocatello Public Library
Pocatello, ID

Sacramento Library - Central Office
Sacramento, CA

Salt Lake City Public Library
Salt Lake City, UT

Shoshone-Bannock Library
Fort Hall, ID

J.11 Individuals Receiving Summary Only (Names are listed alphabetically in columns.)

The Honorable David J. Adair
Mayor
Gooding, ID

Adams County Commissioner
Brighton, CO

The Honorable Charles Aguilar
Mayor
Bernalillo, NM

Albany County Commissioner
Laramie, WY

The Honorable John Alexander
Idaho House of Representatives
Pocatello, ID

The Honorable Dwinelle Allredd
Mayor
Rupert, ID

The Honorable Jeffrey Alltus
Idaho House of Representatives
Coeur d'Alene, ID

The Honorable Carol Anderson
Mayor
Kingman, AZ

The Honorable John Anderson
Idaho Senate, District 15
Boise, ID

The Honorable Curtis Andre
Mayor
Turlock, CA

J. DISTRIBUTION (Cont.)

James Andreason
Butte County Commissioner
Howe, ID

The Honorable Steven Antone
Idaho House of Representatives
Rupert, ID

The Honorable Joseph Apache
Mayor
Raton, NM

Apache County Commissioner
Saint Johns, AZ

Arapahoe County Commissioner
Littleton, CO

The Honorable Samuel Armentrout
Mayor
Madera, CA

The Honorable Phillip Baker
Mayor
Teton, ID

Baker County Commissioner
Baker, OR

The Honorable Lenore H. Barrett
Idaho House of Representatives
Challis, ID

The Honorable David Baumann
Idaho House of Representatives
Boise, ID

The Honorable Chris Bavasi
Mayor
Flagstaff, AZ

Lira Behrens
Inside Energy
Washington, DC

John Belgini
KUPI Radio
Idaho Falls, ID

The Honorable Maxine Bell
Idaho House of Representatives
Jerome, ID

The Honorable Jesse Berain
Idaho House of Representatives
Boise, ID

Bernalillo County Commissioner
Albuquerque, NM

The Honorable Richard Bernasconi
Mayor
Merced, CA

The Honorable David Bivens
Idaho House of Representatives
Meridian, ID

The Honorable Max C. Black
Idaho House of Representatives
Boise, ID

The Honorable Peter Black
Idaho House of Representatives
Pocatello, ID

The Honorable Ronald Black
Idaho House of Representatives
Twin Falls, ID

Sheriff of Blackfoot
Blackfoot, ID

The Honorable Clyde Boatright
Idaho Senate, District 2
Rathdrum, ID

The Honorable James Boles
Mayor
Winslow, AZ

Boulder County Commissioner
Boulder, CO

The Honorable Niles Boyle
Mayor
Rexburg, ID

The Honorable Rhett Bradford
Mayor
Irwin, ID

The Honorable Sue Briggs
Mayor
Union, OR

The Honorable Frank C. Bruneel
Idaho House of Representatives
Lewiston, ID

Marcie Buford
Mayor
Hanford, CA

The Honorable Harrold R. Bunderson
Idaho Senate, District 14
Meridian, ID

Thomas Burns
Mayor
Englewood, CO

The Honorable A. W. Burton
City of Sugar City
Sugar City, ID

Butte County Commissioner
Oroville, CA

The Honorable Donald Cadwallader
Mayor
Easton, CO

The Honorable Dean L. Cameron
Idaho Senate, District 24
Rupert, ID

Carbon County Commissioner
Rawlins, WY

The Honorable James Carooll
Mayor
Kemmerer, WY

The Honorable Calder Chapman
Mayor
Williams, AZ

The Honorable Martin Chavez
Mayor
Albuquerque, NM

The Honorable Judith Christian
Mayor
Fountain, CO

The Honorable James Christiansen
Idaho House of Representatives
Aberdeen, ID

Cibola County Commissioner
Grants, NM

The Honorable William Clark
Mayor
Porterville, CA

Dennis W. Close
Boise, ID

Coconino County Commissioner
Flagstaff, AZ

The Honorable I.W. Coffman
Mayor
Hannah, WY

Colfax County Commissioner
Raton, NM

The Honorable Robert Corrie
Mayor
Meridian, ID

The Honorable Donald Cotant
Mayor
Chubbuck, ID

The Honorable Ronald Crane
Idaho House of Representatives
Caldwell, ID

The Honorable Jesse Cromwell
Mayor
Swan Valley, ID

The Honorable Jay D. Crook
Mayor
Walsenburg, CO

Crook County Commissioner
Prineville, OR

The Honorable Gordon F. Crow
Idaho Senate, District 3
Hayden, ID

The Honorable Daniel Cruz
Mayor
Springer, NM

The Honorable Charles D. Cuddy
Idaho House of Representatives
Orofino, ID

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The Honorable Donald DaFoe
Mayor
Delta, UT

The Honorable Judi Danielson
Idaho Senate, District 8
Council, ID

The Honorable Joan Darrah
Mayor
Stockton, CA

The Honorable Denton Darrington
Idaho Senate, District 25
Declo, ID

The Honorable Richard Davey
Mayor
Ririe, ID

The Honorable Madeline Davidson
Mayor
Riverbank, CA

Deschutes County Commissioner
Bend, OR

The Honorable Dennis Diver
Mayor
Oroville, CA

The Honorable Thomas Dorr
Idaho House of Representatives
Post Falls, ID

Douglas County Commissioner
Castle Rock, CO

City of Downey
Downey, ID

The Honorable Velma Dustin
Mayor
Driggs, ID

The Honorable Garn Dye
Mayor
Mackay, ID

The Honorable Theodore Edwards
Mayor
Spencer, ID

The Honorable Lovetta Eisele
Mayor
Lewiston, ID

El Paso County Commissioner
Colorado Springs, CO

The Honorable Milton Erhart
Idaho House of Representatives
Boise, ID

The Honorable Donald Eriacho
Governor
Zuni, NM

The Honorable Daniel Etter
Mayor
Mountain Home, ID

The Honorable Henry Fernandez
Mayor
Fowler, CA

The Honorable Frances Field
Idaho House of Representatives
Grand View, ID

City of Filer
Filer, ID

Firth City Council
City of Firth
Firth, ID

The Honorable Millie L. Flandro
Idaho House of Representatives
Pocatello, ID

Fresno County Board of Supervisors
Fresno, CA

The Honorable Rex Furness
Idaho Senate, District 26
Rigby, ID

The Honorable George Galanis
Mayor
Gallup, NM

The Honorable Ralph Garcia
Mayor
Selma, CA

Ley Garnett
KRFA-FM
Moscow, ID

The Honorable Robert C. Geddes
Idaho House of Representatives
Preston, ID

The Honorable Robert L. Geddes
Idaho Senate, District 32
Soda Springs, ID

The Honorable Alex Georgieff
Mayor
Los Alamos, NM

Daniel Gildow
Portland General Electric
Trojan Nuclear Plant
Rainier, OR

Gilliam County Commissioner
Condon, OR

The Honorable Tony Gora
Mayor
Galt, CA

The Honorable Celia R. Gould
Idaho House of Representatives
Buhl, ID

The Honorable Dallas Greenfield
Mayor
Evans, CO

The Honorable Lawrence Griffith
Mayor
Baker City, OR

The Honorable Kathleen W. Gurnsey
Idaho House of Representatives
Boise, ID

City of Hagerman
Hagerman, ID

The Honorable Nile Hall
Mayor
Rigby, ID

City of Hamer
Hamer City Council
Hamer, ID

The Honorable John D. Hansen
Idaho Senate, District 29
Idaho Falls, ID

The Honorable Kirk Hansen
Mayor
Soda Springs, ID

The Honorable Reed Hansen
Idaho House of Representatives
Idaho Falls, ID

Kenneth L. Harrison
Portland General Electric Co.
Portland, OR

The Honorable A. J. Hassell
Mayor
Coeur d'Alene, ID

The Honorable Stanley Hawkins
Idaho Senate, District 28
Ucon, ID

The Honorable Pat Hearne
Mayor
Yuba City, CA

Elaine Hiruo
McGraw Hill Nuclear Pubs
Washington, DC

The Honorable Dennis Hjelm
Mayor
Basalt, ID

The Honorable Charles Hoff
Mayor
Ault, CO

The Honorable Elaine Hofman
Idaho House of Representatives
Pocatello, ID

Mary Holland
Governmental Dynamics Inc.
Arlington, VA

The Honorable Gary Homyak
Mayor
Platterville, CO

The Honorable Twila Hornbeck
Idaho House of Representatives
Grangeville, ID

Huerfano County Commissioner
Walsenburg, CO

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Controller
City of Idaho Falls
Idaho Falls, ID

The Honorable Cecil D. Ingram
Idaho Senate, District 16
Boise, ID

The Honorable Grant R. Ipsen
Idaho Senate, District 17
Boise, ID

The Honorable Robert Isaac
Mayor
Colorado Springs, CO

The Honorable Wendy Jaquet
Idaho House of Representatives
Ketchum, ID

The Honorable Debbie Jaramillo
Mayor
Santa Fe, NM

Jefferson County Commissioner
Golden, CO

Jefferson County Commissioner
Madras, OR

The Honorable Colleen Johnson
Mayor
La Grande, OR

The Honorable Albert M. Johnson
Idaho House of Representatives
Pocatello, ID

The Honorable Daniel Jones
Mayor
Castle Rock, CO

The Honorable Charles Jones
Mayor
Arco, ID

The Honorable Douglas Jones
Idaho House of Representatives
Filer, ID

The Honorable June E. Judd
Idaho House of Representatives
St. Maries, ID

The Honorable Fay Kastelic
Mayor
Pueblo, CO

Karyn Kauffman
Mayor
Gilcrest, CO

The Honorable Hilde Kellog
Idaho House of Representatives
Post Falls, ID

The Honorable Todd Kellstrom
Mayor
Klamath Falls, OR

The Honorable James D. Kempton
Idaho House of Representatives
Albion, ID

The Honorable David E. Kerrick
Idaho Senate, District 10
Caldwell, ID

Kerne County Commissioner
Bakersfield, CA

The Honorable Robbi King
Idaho House of Representatives
Glenns Ferry, ID

Kings County Commissioner
Hanford, CA

The Honorable Paul Kjellander
Idaho House of Representatives
Boise, ID

Klamath County Commissioner
Klamath Falls, OR

Amy Kleiner
Press Secretary, Governor's Office
Boise, ID

The Honorable Joseph Krenowica
Mayor
Madras, OR

The Honorable John LaFordge
Mayor
Emmett, ID

The Honorable George Lane
Mayor
Montpelier, ID

The Honorable Richard Lang
Mayor
Modesto, CA

Laramie County Commissioner
Cheyenne, WY

Larimer County Commissioner
Fort Collins, CO

The Honorable Rex Larsen
City of Rexburg
Rexburg, ID

The Honorable Allan F. Larsen
Idaho House of Representatives
Blackfoot, ID

Las Animas County Commissioner
Trinidad, CO

The Honorable Robert R. Lee
Idaho Senate, District 27
Rexburg, ID

Lincoln County Commissioner
Kemmerer, WY

The Honorable Golden Linford
Idaho House of Representatives
Rexburg, ID

The Honorable Thomas Loertscher
Idaho House of Representatives
Iona, ID

The Honorable Loren Lounsbury
Roberts, ID

The Honorable Newt Lowe
Mayor
Lava Hot Springs, ID

The Honorable James R. Lucas
Idaho House of Representatives
Moscow, ID

The Honorable Terrance Lucero
Mayor
Brighton, CO

Scott Maas
Lassen County Commissioner
Susanville, CA

Madera County Commissioner
Madera, CA

Malheur County Commissioner
Vale, OR

William Manwill
Bonneville County, Roads and Bridges Dept.
Idaho Falls, ID

The Honorable Anthony Martiniez, Jr.
Mayor
Las Vegas, NM

The Honorable James E. McCue
Mayor
Payette, ID

The Honorable Leo McGhee
Mayor
Glenns Ferry, ID

Kevin McKee
Boise, ID

The Honorable Sylvia McKeeth
Idaho House of Representatives
Boise, ID

McKinley County Commissioner
Gallup, NM

The Honorable Paul McNamara
Mayor
Marysville, CA

Merced County Commissioner
Merced, CA

The Honorable Richard Mester
Mayor
Holbrook, AZ

The Honorable Wayne R. Meyer
Idaho House of Representatives
Rathdrum, ID

Carl Miller
Idaho Business Review
Boise, ID

The Honorable Maynard M. Miller
Idaho House of Representatives
Moscow, ID

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Modoc County Commissioner
Alturas, CA

Mohave County Commissioner
Kingman, AZ

Mora County Commissioner
Mora, NM

Morrow County Commissioner
Heppner, OR

The Honorable Max C. Mortensen
Idaho House of Representatives
St. Anthony, ID

The Honorable William Morton
Mayor
Greeley, CO

The Honorable Manjit S. Nagi
Mayor
Livingston, CA

Navajo County Commissioner
Holbrook, AZ

The Honorable Daniel Neu
Mayor
American Falls, ID

The Honorable Paul Oblock
Mayor
Rock Springs, WY

Jeff Olnhausen
Atomic Energy Clearinghouse
Arlington, VA

The Honorable Kirk Olsen
Mayor
Victor, ID

The Honorable Patricia A. Hauff Olsen
Salmon, ID

The Honorable Sherri Owens
Mayor
Macks Inn, ID

The Honorable Leo Pando
Mayor
Cheyenne, WY

The Honorable Roy Parker
Mayor
St. Anthony, ID

The Honorable Atwell J. Parry
Idaho Senate, District 11
Melba, ID

The Honorable James Patterson
Mayor
Fresno, CA

The Honorable Lin Pearson
Mayor
Moore, ID

The Honorable Carol A. Pietsch
Idaho House of Representatives
Sandpoint, ID

The Honorable Donald Pischner
Idaho House of Representatives
Coeur d'Alene, ID

The Honorable Linda Pistoresi
Mayor
Chowchilla, CA

Placer County Commissioner
Auburn, CA

Plumas County Commissioner
Quincy, CA

The Honorable Horace Pomeroy
Idaho House of Representatives
Boise, ID

The Honorable Robert Price
Mayor
Bakersfield, CA

Pueblo County Commissioner
Pueblo, CO

The Honorable John Rachford
Mayor
Corcoran, CA

The Honorable Jay Radford
Mayor
Ucon, ID

The Honorable Robert E. Ramig
Mayor
Pendleton, OR

The Honorable Mary Lou Reed
Idaho Senate, District 4
Coeur d'Alene, ID

The Honorable Sue Reents
Idaho Senate, District 19
Boise, ID

Rexburg City Council
Rexburg, ID

The Honorable Dennis Reynolds
Mayor
Littleton, CO

The Honorable Dorthy L. Reynolds
Idaho House of Representatives
Caldwell, ID

The Honorable Melvin M. Richardson
Idaho Senate, District 30
Idaho Falls, ID

The Honorable Timothy Ridinger
Idaho House of Representatives
Shoshone, ID

The Honorable James E. Risch
Senator
Boise, ID

The Honorable Kenneth L. Robison
Idaho House of Representatives
Boise, ID

The Honorable Patricia Romanko
Mayor
Parma, ID

The Honorable James Rose
Mayor
Laramie, WY

The Honorable William T. Sali
Idaho House of Representatives
Meridian, ID

Sandoval County Commissioner
Bernaillo, NM

San Joaquin County Commissioner
Stockton, CA

San Miguel County Commissioner
Las Vegas, NM

The Honorable John Sandy
Idaho Senate, District 22
Hagerman, ID

Santa Fe County Commissioner
Santa Fe, NM

The Honorable Tess Santiago
Mayor
Delano, CA

The Honorable Gordon Satterburg
Mayor
Kingsburg, CA

The Honorable Valeriano Saucedo
Mayor
Lindsay, CA

The Honorable Harry Sayre
Mayor
Trinidad, CO

The Honorable Robert E. Schaefer
Idaho House of Representatives
Nampa, ID

The Honorable Gary J. Schroeder
Idaho Senate, District 5
Moscow, ID

The Honorable Patricia Schueler
Mayor
Rawlins, WY

The Honorable Joseph Serna
Mayor
Sacramento, CA

The Honorable Dwight E. Sheffler
Sandpoint, ID

Sherman County Commissioner
Moro, OR

The Honorable Marlin Sibell
Mayor
Monument, CO

The Honorable Michael Simpson
Idaho House of Representatives
Blackfoot, ID

Siskiyou County Commissioner
Yreka, CA

The Honorable Philip Smith
Mayor
Tehachapi, CA

The Honorable Kendall Smith
Mayor
Tetonia, ID

The Honorable William Snodgrass
Mayor
Grants, NM

Stanislaus County Commissioner
Modesto, CA

Stanley City Council
Stanley, ID

The Honorable Ralph J. Steele
Idaho House of Representatives
Idaho Falls, ID

The Honorable Steven Stenkamp
Mayor
Bend, OR

The Honorable Donald Stephens
Mayor
Weiser, ID

The Honorable James Stoicheff
Idaho House of Representatives
Sandpoint, ID

The Honorable Ruby R. Stone
Idaho House of Representatives
Boise, ID

The Honorable Mark Stubbs
Idaho House of Representatives
Twin Falls, ID

Sutter County Commissioner
Yuba City, CA

The Honorable Gertrude Sutton
Idaho House of Representatives
Midvale, ID

Sweetwater County Commissioner
Green River, WY

The Honorable Paul E. Tauer
Mayor
Aurora, CO

The Honorable W. O. Taylor
Idaho House of Representatives
Nampa, ID

The Honorable Jerry C. Thackery
Mayor
Redmond, OR

The Honorable J. L. Thorne
Idaho Senate
Nampa, ID

The Honorable Fred Tilman
Idaho House of Representatives
Boise, ID

The Honorable John H. Tippets
Idaho House of Representatives
Montpelier, ID

The Honorable Timothy Tucker
Idaho Senate, District 1
Porthill, ID

Tulare County Commissioner
Visalia, CA

Darrel Turner
Consumer Power Co.
Charlevoix, MI

Marcia Turoci
Board of Supervisors
San Bernadino, CA

Umatilla County Commissioner
Pendleton, OR

Union County Commissioner
La Grande, OR

Valencia County Commissioner
Los Lunas, NM

The Honorable Todd M. Vallie
Mayor
Prineville, OR

The Honorable Marvin G. Vandenberg
Idaho House of Representatives
Coeur d'Alene, ID

The Honorable Mac Wagoner
Mayor
Dubois, ID

The Honorable Gary Wardell
Mayor
La Salle, CO

The Honorable David Warner
Mayor
Lodi, CA

Wasco County Commissioner
The Dalles, OR

The Honorable Willington Webb
Mayor
Denver, CO

Jenny Weil
Radioactive Exchange
Washington, DC

Weld County Commissioner
Greeley, CO

The Honorable Mal Wessel
Mayor
Barstow, CA

The Honorable "Moon" Wheeler
Idaho Senate, District 35
American Falls, ID

The Honorable Lin Whitworth
Idaho Senate, District 33
Inkom, ID

The Honorable Donald Wilde
Mayor
Terreton, ID

The Honorable Gayle Ann Wilde
Idaho House of Representatives
McCall, ID

The Honorable Dale Williamson
Mayor
New Plymouth, ID

The Honorable Richard Winder
Mayor
Caldwell, ID

The Honorable Richard Wolfe
Mayor
Fort Lupton, CO

Jeannine Wood
Secretary, Idaho Senate
Boise, ID

The Honorable JoAn E. Wood
Idaho House of Representatives
Rigby, ID

Price Worrell
Idaho Falls, ID

Yavapi County Commissioner
Prescott, AZ

Yolo County Commissioner
Woodland, CA

Yuba County Commissioner
Marysville, CA

Elaine Ziemba
Northern States Power Company
Washington, DC