SECTION 5.0
ENVIRONMENTAL IMPACTS OF LOADING AND STORAGE AT INEL FACILITIES

TABLE OF CONTENTS

TABLES

TABLES (Cont)

FIGURES

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.

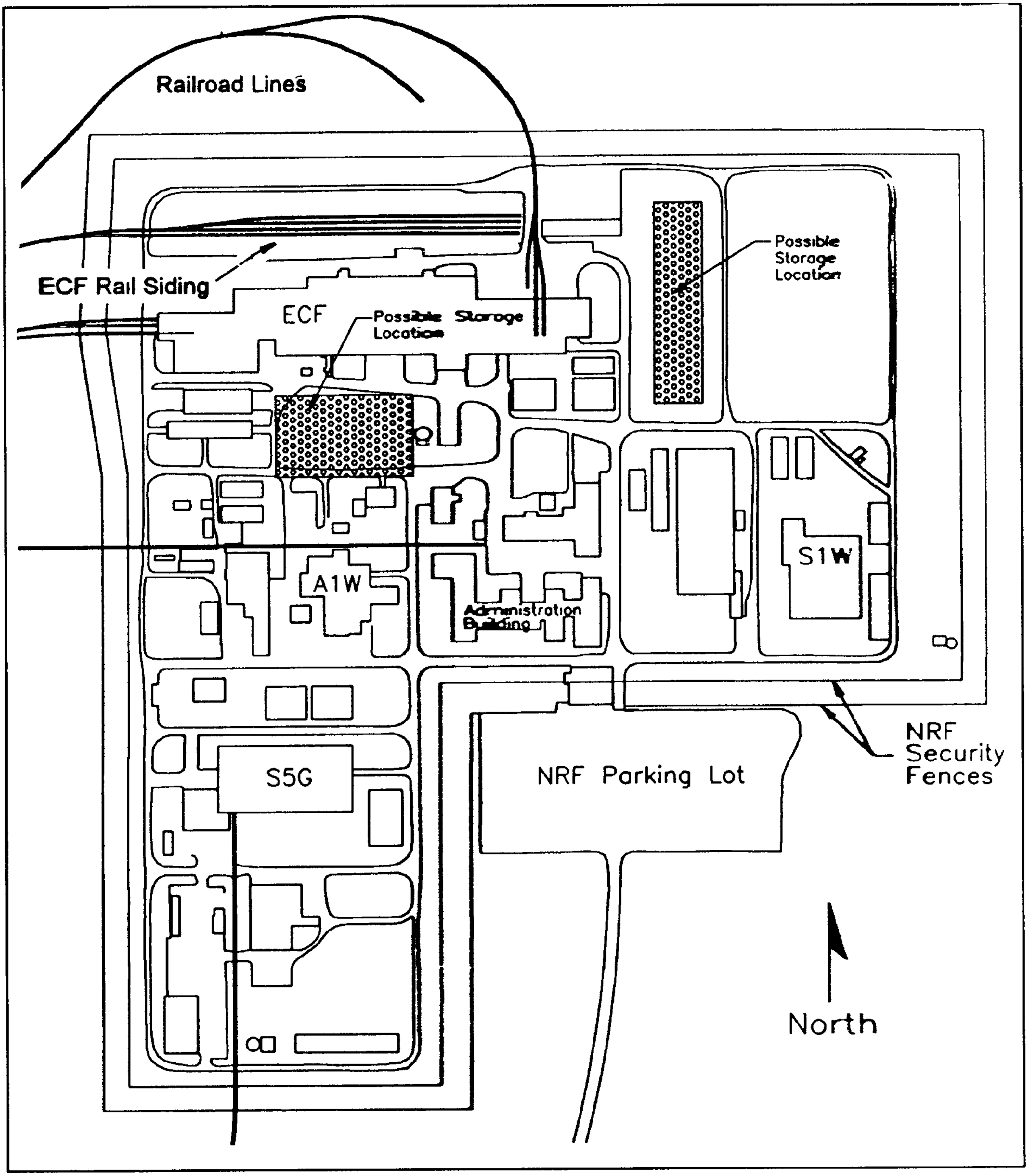

FIGURE 5.1 Possible Dry Storage Locations at Naval Reactors Facility

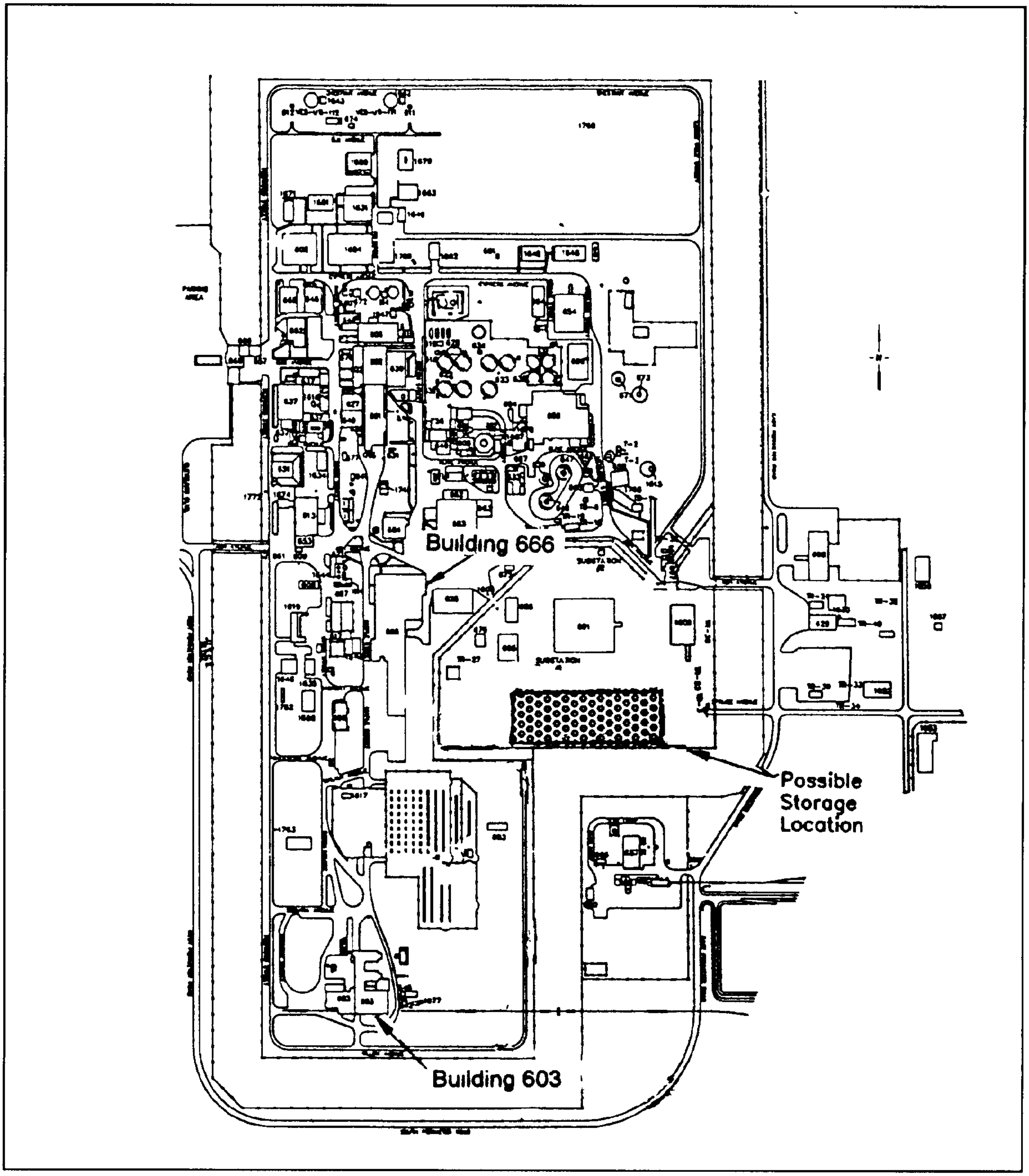

FIGURE 5.2 Possible Dry Storage Location at the Idaho Chemical Processing Plant

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.