# APPENDIX I Offsite Transportation of Spent Nuclear Fuel

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FIGURES



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# Appendix I Offsite Transportation of Spent Nuclear Fuel

# I-1 INTRODUCTION

This appendix summarizes the methods and results of analysis for determining impacts of spent nuclear fuel (SNF) transportation on public highways and rail syst boundaries of U.S. Department of Energy (DOE) sites (offsite). The impacts are pre include doses and health effects.

This appendix does not address the impacts of SNF transport within the bounda (onsite). Onsite transport impacts are addressed in site-specific Appendices A thr addresses offsite shipments of naval-type SNF stored at the Idaho Chemical Processi to storage locations at other sites as identified by certain alternatives. Transpo and prototypes to the equivalent expended core facility at the alternative sites ar Appendix D in Volume 1, along with transport of naval test specimens.

This appendix also includes the impacts of shipments of foreign research reac points of entry identified in the Implementation Plan for this EIS (Hampton Roads, South Carolina; Savannah, Georgia; Seattle-Tacoma, Washington; Portland, Oregon; an California) and the points of entry at the Military Ocean Terminal at Sunny Point, Galveston, Texas. The six points of entry identified in the Implementation Plan we following criteria: (a) adequacy of harbor and dock characteristics to satisfy the requirements, (b) availability of safe and secure lag storage, (c) adequacy of over from points of entry to the storage sites, (d) experience in safe and secure handli emergency preparedness status at the point of entry and nearby communities, and (f) proposed storage sites. The Military Ocean Terminal at Sunny Point, North Carolina was recently used for foreign research reactor SNF shipments. Galveston, Texas was entry because it was on the Gulf Coast and has container-handling experience. A fu points of entry, including these and other points of entry, is being evaluated in t Statement on a Proposed Nuclear Nonproliferation Policy Concerning Foreign Research

Nuclear Fuel,and no decision concerning the choice of points of entry will be made Programmatic Spent Nuclear Fuel Management and the Idaho National Engineering Labor Environmental Restoration and Waste Management Programs Environmental Impact Statem Environmental Impact Statement on a Proposed Nuclear Nonproliferation Policy Concer Research Reactor Spent Nuclear Fuel are completed. The ocean-going portion of fore SNF shipments and a detailed evaluation of point of entry activities are also not a but will be assessed in the Draft Environmental Impact Statement on a Proposed Nucl Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

The impacts of historical shipments of SNF to the Hanford Site, Idaho Nationa Laboratory, Savannah River Site, Oak Ridge Reservation, and the Nevada Test Site an transportation impacts are also discussed in this appendix. The historical impacts include shipments of naval SNF and test specimens.

# I-2 TRANSPORTATION REGULATIONS

The regulatory standards for packaging and transport of SNF are designed to a objectives:

- Protect persons and property from radiation emitted from packages durin specific limitations on the allowable radiation levels
- Provide proper containment of the SNF in the package (achieved by packa requirements based on performance-oriented packaging integrity tests an criteria)
- Prevent nuclear criticality (an unplanned nuclear chain reaction that m concentrating too much fissile material in one place)
- Provide physical protection against theft and sabotage during transit.

The U.S. Department of Transportation regulates the transportation of hazardo (including SNF) in interstate and intrastate commerce by land, air, and on navigabl 1979 Memorandum of Understanding with the U.S. Nuclear Regulatory Commission, the U Transportation specifically regulates the carriers of SNF and the conditions of tra handling and storage, and vehicle and driver requirements. The U.S. Department of regulates the labeling, classification, and marking of all SNF packages.

The U.S. Nuclear Regulatory Commission regulates the packaging and transport licensees, which includes commercial shippers of SNF. In addition, under an agreem Department of Transportation, the U.S. Nuclear Regulatory Commission sets the stand containing fissile materials and SNF.

The DOE, through its management directives, orders, and contractual agreement protection of public health and safety by imposing on its transportation activities those of the U.S. Department of Transportation and the U.S. Nuclear Regulatory Comm authority, granted by a 1973 Memorandum of Understanding between the U.S. Departmen and the Atomic Energy Commission, to certify DOE SNF packages. The DOE may design, certify its own SNF packages to be used by the DOE and its contractors if the packa safety to that provided in 10 CFR Part 71.

The U.S. Department of Transportation also has requirements that help to redu impacts. For example, there are requirements for drivers, routing, packaging, labe placarding. There are also requirements that specify the maximum dose rate associa material shipments, which help to reduce incident-free transportation doses.

The Federal Emergency Management Agency is responsible for establishing polic coordinating civil emergency management, planning, and interaction with Federal exe have emergency response functions in the event of a SNF transportation incident. T Management Agency coordinates Federal and state participation in developing emergen is responsible for the development of the interim Federal Radiological Emergency Re

Federal Radiological Emergency Response Plan is designed to coordinate Federal supp governments, upon request, during the event of a SNF transportation incident.

The Interstate Commerce Commission is responsible for the regulation of the e SNF transportation for land shipments. The Comission issues operating authorities monitors and approves freight rates.

Spent nuclear fuel is transported in Type B packages, which are designed and their radioactive contents in both normal and severe accident conditions.

Under normal conditions a cask must withstand:

- Hot [100F (38C)] and Cold [-40F (-40C)] temperatures
- External pressure changes from 3.5 to 20 pounds per square inch (24.5 t
- Normal vibration experienced during transportation
- Simulated rainfall of 2 inches (5 centimeters) per hour for 1 hour
- Free drop from 1 to 4 feet (0.3 to 1.2 meters), depending on the packag
- Compression loading (the greater of 5 times the weight of package or 1. pounds per square inch (12.75 kilopascal) times the vertical projecte package) applied uniformly to the top and bottom of the package for a period
- Impact of a 13-pound (6-kilogram) steel cylinder with rounded ends drop (1 meter) onto the most vulnerable surface of the cask.

Under accident conditions a cask must withstand:

- Free drop for 30 feet (9 meters) onto an unyielding surface in a way mo damage to the cask
- Free drop from 40 inches (1 meter) onto the end of a 6-inch-diameter (1 diameter) vertical steel bar
- Exposure for not less than 30 minutes to temperatures of 1475F (802C)
- Immersion in at least 50 feet (15 meters) of water for 8 hours and, for considerations, immersion in at least 3 feet (0.9 meters) of water for for which maximum leakage is expected.

Compliance with these requirements is demonstrated by using a combination of methods, computer modeling techniques, or full-scale or scale-model testing of cask

# I-3 SNF TRANSPORTATION MODES AND ROUTES

## I-3.1 SNF Transportation Routing Models

To assess incident-free and transportation accident impacts, route characteri each of the origins and destinations associated with SNF shipments. Each origin re generates or stores SNF that must be transported, and each destination represents a For offsite transport, representative highway and rail routes were analyzed using t HIGHWAY (Johnson et al. 1993a) and INTERLINE (Johnson et al. 1993b). The routes we conforming to current routing practices and applicable routing regulations and guid

characteristics include total shipment distance between each origin and destination in rural, suburban, and urban population density zones (see Table I-1). The HIGHWA routing computer codes are described below.

The HIGHWAY computer code predicts highway routes for transporting radioactiv the United States. The HIGHWAY database is a computerized road atlas that currentl approximately 240,000 miles of roads. A complete description of the Interstate Hig States highways, most of the principal state highways, and a number of local and co identified in the database. The HIGHWAY computer code calculates routes that maxim interstate highways. This feature allows the user to predict routes for transport conform to U.S. Department of Transportation regulations, as specified in 49 CFR Pa The routes calculated conform to applicable guidelines and regulations; therefore, could be used. However, they may not be the actual routes used in the future. The periodically to reflect current road conditions, and it has been benchmarked agains observations of commercial truck firms.

The INTERLINE computer code is designed to simulate routing of the United Sta The INTERLINE database consists of 94 separate subnetworks and represents various c companies in the United States. The database used by INTERLINE was originally base Administration data and reflected the United States railroad system in 1974. The d expanded and modified over the past two decades. The routes used for this study us assumptions in the INTERLINE computer code that simulate the selection process rail transport of radioactive material. Currently, there are no specific routing regula radioactive material by rail. INTERLINE is updated periodically to reflect current been benchmarked against reported mileage and observations of commercial rail firms

Table I-1. Transportation distances between facilities for spent nuclear fuel ship

| Route | | Miles |
|---|---|---|
| | Truck routes | |
| Idaho National Engineering Laboratory | Hanford Site | 599.0 |
| Idaho National Engineering Laboratory | Nevada Test Site | 712.0 |
| Idaho National Engineering Laboratory | Savannah River Site | 2311.0 |
| Idaho National Engineering Laboratory | Oak Ridge Reservation | 2048.0 |
| Idaho National Engineering Laboratory | Brookhaven National Laboratory | 2437.0 |
| Idaho National Engineering Laboratory | Argonne National Laboratory-East | 1582.0 |
| Idaho National Engineering Laboratory | Los Alamos National Laboratory | 1144.0 |
| Idaho National Engineering Laboratory | Sandia National Laboratories - Albuquerque | 1168.0 |
| Hanford Site | Nevada Test Site | 1128.0 |
| Hanford Site | Savannah River Site | 2727.0 |
| Hanford Site | Oak Ridge Reservation | 2464.0 |
| Hanford Site | Brookhaven National Laboratory | 2853.0 |
| Hanford Site | Argonne National Laboratory-East | 1998.0 |

| | | |
|---|---|---|
| Hanford Site | Los Alamos National Laboratory | 1560.0 |
| Hanford Site | Sandia National Laboratories - Albuquerque | 1584.0 |
| Nevada Test Site | Savannah River Site | 2414.0 |
| Nevada Test Site | Oak Ridge Reservation | 2151.0 |
| Nevada Test Site | Brookhaven National Laboratory | 2670.0 |
| Nevada Test Site | Argonne National Laboratory-East | 1815.0 |
| Nevada Test Site | Los Alamos National Laboratory | 997.0 |
| Nevada Test Site | Sandia National Laboratories - Albuquerque | 909.0 |
| Savannah River Site | Oak Ridge Reservation | 379.0 |
| Savannah River Site | Brookhaven National Laboratory | 897.0 |
| Savannah River Site | Argonne National Laboratory-East | 892.0 |
| Savannah River Site | Los Alamos National Laboratory | 1742.0 |
| Savannah River Site | Sandia National Laboratories - Albuquerque | 1644.0 |
| Savannah River Site | Lawrence Livermore National Laboratory | 2750.0 |
| Oak Ridge Reservation | Brookhaven National Laboratory | 821.0 |
| Oak Ridge Reservation | Argonne National Laboratory-East | 584.0 |
| Oak Ridge Reservation | Los Alamos National Laboratory | 1480.0 |
| Oak Ridge Reservation | Sandia National Laboratories - Albuquerque | 1382.0 |
| Idaho National Engineering Laboratory | Hanford Site | 658.0 |
| Idaho National Engineering Laboratory | Nevada Test Site | 756.0 |
| Idaho National Engineering Laboratory | Savannah River Site | 2407.0 |
| Idaho National Engineering Laboratory | Oak Ridge Reservation | 2055.0 |
| Idaho National Engineering Laboratory | Brookhaven National Laboratory | 2607.0 |
| Idaho National Engineering Laboratory | Argonne National Laboratory-East | 1655.0 |
| Idaho National Engineering Laboratory | Los Alamos National Laboratory | 1179.0 |
| Idaho National Engineering Laboratory | Sandia National Laboratories - Albuquerque | 1247.0 |
| Hanford Site | Nevada Test Site | 1302.0 |
| Hanford Site | Savannah River Site | 2953.0 |

| | | |
|---|---|---|
| Hanford Site | Oak Ridge Reservation | 2601.0 |
| Hanford Site | Brookhaven National Laboratory | 3153.0 |
| Hanford Site | Argonne National Laboratory-East | 2200.0 |
| Hanford Site | Los Alamos National Laboratory | 1725.0 |
| Hanford Site | Sandia National Laboratories - Albuquerque | 1793.0 |
| Nevada Test Site | Savannah River Site | 2839.0 |
| Nevada Test Site | Oak Ridge Reservation | 2487.0 |
| Nevada Test Site | Brookhaven National Laboratory | 3039.0 |
| Nevada Test Site | Argonne National Laboratory-East | 2348.0 |
| Nevada Test Site | Los Alamos National Laboratory | 1169.0 |
| Nevada Test Site | Sandia National Laboratories - Albuquerque | 1065.0 |
| Savannah River Site | Oak Ridge Reservation | 417.0 |
| Savannah River Site | Brookhaven National Laboratory | 1239.0 |
| Savannah River Site | Argonne National Laboratory-East | 976.0 |
| Savannah River Site | Los Alamos National Laboratory | 2252.0 |
| Savannah River Site | Sandia National Laboratories - Albuquerque | 2315.0 |
| Oak Ridge Reservation | Brookhaven National Laboratory | 1152.0 |
| Oak Ridge Reservation | Argonne National Laboratory-East | 648.0 |
| Oak Ridge Reservation | Los Alamos National Laboratory | 1686.0 |
| Oak Ridge Reservation | Sandia National Laboratories - Albuquerque | 1749.0 |
| Fort St. Vrain Nuclear Generating Station | Savannah River Site | 1636.0 |
| Fort St. Vrain Nuclear Generating Station | Hanford Site | 1108.0 |
| Fort St. Vrain Nuclear Generating Station | Idaho National Engineering Laboratory | 692.0 |
| Fort St. Vrain Nuclear Generating Station | Oak Ridge Reservation | 1372.0 |
| Fort St. Vrain Nuclear Generating Station | Nevada Test Site | 852.0 |
| Fort St. Vrain Nuclear Generating Station | Savannah River Site | 1853.0 |
| Fort St. Vrain Nuclear Generating Station | Hanford Site | 1218.0 |
| Fort St. Vrain Nuclear Generating Station | Idaho National Engineering Laboratory | 672.0 |

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|---|---|---|
| Fort St. Vrain Nuclear Generating Station | Oak Ridge Reservation | 1526.0 |
| Fort St. Vrain Nuclear Generating Station | Nevada Test Site | 1104.0 |
| Savannah River Site | Hampton Roads, VA | 505.0 |
| Savannah River Site | Seattle-Tacoma, WA | 2900.0 |
| Savannah River Site | Charleston, SC | 209.0 |
| Savannah River Site | Savannah, GA | 265.0 |
| Savannah River Site | Oakland, CA | 2791.0 |
| Savannah River Site | Portland, OR | 2849.0 |
| Savannah River Site | Military Ocean Terminal, Sunny Point, NC | 250.0 |
| Savannah River Site | Alexandria Bay, NY | 1012.0 |
| Savannah River Site | Galveston, TX | 1000.0 |
| Hanford Site | Hampton Roads, VA | 2903.0 |
| Hanford Site | Seattle-Tacoma, WA | 226.0 |
| Hanford Site | Charleston, SC | 2862.0 |
| Hanford Site | Savannah, GA | 2804.0 |
| Hanford Site | Oakland, CA | 875.0 |
| Hanford Site | Portland, OR | 236.0 |
| Hanford Site | Military Ocean Terminal, Sunny Point, NC | 2868.0 |
| Hanford Site | Alexandria Bay, NY | 2768.0 |
| Hanford Site | Galveston, TX | 2327.0 |
| Idaho National Engineering Laboratory | Hampton Roads, VA | 2487.0 |
| Idaho National Engineering Laboratory | Seattle-Tacoma, WA | 793.0 |
| Idaho National Engineering Laboratory | Charleston, SC | 2446.0 |
| Idaho National Engineering Laboratory | Savannah, GA | 2388.0 |
| Idaho National Engineering Laboratory | Oakland, CA | 963.0 |
| Idaho National Engineering Laboratory | Portland, OR | 721.0 |
| Idaho National Engineering Laboratory | Military Ocean Terminal, Sunny Point, NC | 2407.0 |

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|---|---|---|
| Idaho National Engineering Laboratory | Alexandria Bay, NY | 2352.0 |
| Idaho National Engineering Laboratory | Galveston, TX | 1911.0 |
| Oak Ridge Reservation | Hampton Roads, VA | 548.0 |
| Oak Ridge Reservation | Seattle-Tacoma, WA | 2636.0 |
| Oak Ridge Reservation | Charleston, SC | 408.0 |
| Oak Ridge Reservation | Savannah, GA | 456.0 |
| Oak Ridge Reservation | Oakland, CA | 2563.0 |
| Oak Ridge Reservation | Portland, OR | 2585.0 |
| Oak Ridge Reservation | Military Ocean Terminal, Sunny Point, NC | 496.0 |
| Oak Ridge Reservation | Alexandria Bay, NY | 927.0 |
| Oak Ridge Reservation | Galveston, TX | 963.0 |
| Nevada Test Site | Hampton Roads, VA | 2590.0 |
| Nevada Test Site | Seattle-Tacoma, WA | 1322.0 |
| Nevada Test Site | Charleston, SC | 2549.0 |
| Nevada Test Site | Savannah, GA | 2492.0 |
| Nevada Test Site | Oakland, CA | 719.0 |
| Nevada Test Site | Portland, OR | 1250.0 |
| Nevada Test Site | Military Ocean Terminal, Sunny Point, NC | 2457.0 |
| Nevada Test Site | Alexandria Bay, NY | 2619.0 |
| Nevada Test Site | Galveston, TX | 1862.0 |
| Savannah River Site | Hampton Roads, VA | 529.0 |
| Savannah River Site | Seattle-Tacoma, WA | 3123.0 |
| Savannah River Site | Charleston, SC | 140.0 |
| Savannah River Site | Savannah, GA | 114.0 |
| Savannah River Site | Oakland, CA | 3192.0 |
| Savannah River Site | Portland, OR | 3154.0 |
| Savannah River Site | Military Ocean Terminal, Sunny Point, NC | 382.0 |
| Savannah River Site | Alexandria Bay, NY | 1281.0 |
| Savannah River Site | Galveston, TX | 1174.0 |
| Hanford Site | Hampton Roads, VA | 3187.0 |
| Hanford Site | Seattle-Tacoma, WA | 416.0 |

| | | |
|---|---|---|
| Hanford Site | Charleston, SC | 3059.0 |
| Hanford Site | Savannah, GA | 3091.0 |
| Hanford Site | Oakland, CA | 986.0 |
| Hanford Site | Portland, OR | 239.0 |
| Hanford Site | Military Ocean Terminal, Sunny Point, NC | 3203.0 |
| Hanford Site | Alexandria Bay, NY | 2878.0 |
| Hanford Site | Galveston, TX | 2392.0 |
| Idaho National Engineering Laboratory | Hampton Roads, VA | 2641.0 |
| Idaho National Engineering Laboratory | Seattle-Tacoma, WA | 976.0 |
| Idaho National Engineering Laboratory | Charleston, SC | 2513.0 |
| Idaho National Engineering Laboratory | Savannah, GA | 2545.0 |
| Idaho National Engineering Laboratory | Oakland, CA | 1102.0 |
| Idaho National Engineering Laboratory | Portland, OR | 785.0 |
| Idaho National Engineering Laboratory | Military Ocean Terminal, Sunny Point, NC | 2657.0 |
| Idaho National Engineering Laboratory | Alexandria Bay, NY | 2332.0 |
| Idaho National Engineering Laboratory | Galveston, TX | 1846.0 |
| Oak Ridge Reservation | Hampton Roads, VA | 689.0 |
| Oak Ridge Reservation | Seattle-Tacoma, WA | 2795.0 |
| Oak Ridge Reservation | Charleston, SC | 581.0 |
| Oak Ridge Reservation | Savannah, GA | 587.0 |
| Oak Ridge Reservation | Oakland, CA | 2686.0 |
| Oak Ridge Reservation | Portland, OR | 2827.0 |
| Oak Ridge Reservation | Military Ocean Terminal, Sunny Point, NC | 542.0 |
| Oak Ridge Reservation | Alexandria Bay, NY | 972.0 |
| Oak Ridge Reservation | Galveston, TX | 1053.0 |
| Nevada Test Site | Hampton Roads, VA | 3073.0 |
| Nevada Test Site | Seattle-Tacoma, WA | 1620.0 |
| Nevada Test Site | Charleston, SC | 2945.0 |

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|---|---|---|
| Nevada Test Site | Savannah, GA | 2977.0 |
| Nevada Test Site | Oakland, CA | 860.0 |
| Nevada Test Site | Portland, OR | 1429.0 |
| Nevada Test Site | Military Ocean Terminal, Sunny Point, NC | 3089.0 |
| Nevada Test Site | Alexandria Bay, NC | 2763.0 |
| Nevada Test Site | Galveston, TX | 1955.0 |
| Savannah River Site | Cornell University | 896.0 |
| Savannah River Site | Georgia Institute of Technology | 197.0 |
| Savannah River Site | Idaho State University | 2248.0 |
| Savannah River Site | Iowa State University | 1175.0 |
| Savannah River Site | Kansas State University | 1121.0 |
| Savannah River Site | Manhattan College | 830.0 |
| Savannah River Site | Massachusetts Institute of Technology | 1040.0 |
| Savannah River Site | North Carolina State University | 318.0 |
| Savannah River Site | Ohio State University | 708.0 |
| Savannah River Site | Oregon State University | 2937.0 |
| Savannah River Site | Pennsylvania State University | 849.0 |
| Savannah River Site | Purdue University | 768.0 |
| Savannah River Site | Reed College | 2849.0 |
| Savannah River Site | Rensselaer Polytechnic Institute | 955.0 |
| Savannah River Site | Rhode Island Nuclear Science Center | 1009.0 |
| Savannah River Site | State University of New York - Buffalo | 1001.0 |
| Savannah River Site | Texas A&M University | 1099.0 |
| Savannah River Site | University of Arizona | 1926.0 |
| Savannah River Site | University of California - Irvine | 2406.0 |
| Savannah River Site | University of Florida | 496.0 |
| Savannah River Site | University of Illinois | 803.0 |
| Savannah River Site | University of Lowell | 1045.0 |
| Savannah River Site | University of Maryland | 589.0 |
| Savannah River Site | University of Michigan | 903.0 |
| Savannah River Site | University of Missouri - Columbia | 858.0 |
| Savannah River Site | University of Missouri - Rolla | 835.0 |

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|---|---|---|
| Savannah River Site | University of New Mexico | 1653.0 |
| Savannah River Site | University of Texas | 1169.0 |
| Savannah River Site | University of Utah | 2127.0 |
| Savannah River Site | University of Virginia | 478.0 |
| Savannah River Site | University of Wisconsin | 1038.0 |
| Savannah River Site | Washington State University | 2699.0 |
| Savannah River Site | Worcester Polytechnic Institute | 1002.0 |
| Savannah River Site | Cornell University | 1098.0 |
| Savannah River Site | Georgia Institute of Technology | 221.0 |
| Savannah River Site | Idaho State University | 2323.0 |
| Savannah River Site | Iowa State University | 1281.0 |
| Savannah River Site | Kansas State University | 1274.0 |
| Savannah River Site | Manhattan College | 1156.0 |
| Savannah River Site | Massachusetts Institute of Technology | 1223.0 |
| Savannah River Site | North Carolina State University | 385.0 |
| Savannah River Site | Ohio State University | 726.0 |
| Savannah River Site | Oregon State University | 3381.0 |
| Savannah River Site | Pennsylvania State University | 963.0 |
| Savannah River Site | Purdue University | 903.0 |
| Savannah River Site | Reed College | 3154.0 |
| Savannah River Site | Rensselaer Polytechnic Institute | 1044.0 |
| Savannah River Site | Rhode Island Nuclear Science Center | 1252.0 |
| Savannah River Site | State University of New York - Buffalo | 1051.0 |
| Savannah River Site | Texas A&M University | 1194.0 |
| Savannah River Site | University of Arizona | 2245.0 |
| Savannah River Site | University of California - Irvine | 3180.0 |
| Savannah River Site | University of Florida | 328.0 |
| Savannah River Site | University of Illinois | 1028.0 |
| Savannah River Site | University of Lowell | 1239.0 |
| Savannah River Site | University of Maryland | 669.0 |
| Savannah River Site | University of Michigan | 913.0 |
| Savannah River Site | University of Missouri - Columbia | 1011.0 |

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|---|---|---|
| Savannah River Site | University of Missouri - Rolla | 966.0 |
| Savannah River Site | University of New Mexico | 2315.0 |
| Savannah River Site | University of Texas | 1314.0 |
| Savannah River Site | University of Utah | 2378.0 |
| Savannah River Site | University of Virginia | 637.0 |
| Savannah River Site | University of Wisconsin | 1092.0 |
| Savannah River Site | Washington State University | 2864.0 |
| Savannah River Site | Worcester Polytechnic Institute | 1176.0 |
| Hanford Site | Cornell University | 2730.0 |
| Hanford Site | Georgia Institute of Technology | 2550.0 |
| Hanford Site | Idaho State University | 546.0 |
| Hanford Site | Iowa State University | 1703.0 |
| Hanford Site | Kansas State University | 1624.0 |
| Hanford Site | Manhattan College | 2786.0 |
| Hanford Site | Massachusetts Institute of Technology | 2986.0 |
| Hanford Site | North Carolina State University | 2862.0 |
| Hanford Site | Ohio State University | 2342.0 |
| Hanford Site | Oregon State University | 324.0 |
| Hanford Site | Pennsylvania State University | 2578.0 |
| Hanford Site | Purdue University | 2111.0 |
| Hanford Site | Reed College | 236.0 |
| Hanford Site | Rensselaer Polytechnic Institute | 2819.0 |
| Hanford Site | Rhode Island Nuclear Science Center | 2965.0 |
| Hanford Site | State University of New York - Buffalo | 2534.0 |
| Hanford Site | Texas A&M University | 2212.0 |
| Hanford Site | University of Arizona | 1699.0 |
| Hanford Site | University of California - Irvine | 1270.0 |
| Hanford Site | University of Florida | 2894.0 |
| Hanford Site | University of Illinois | 2033.0 |
| Hanford Site | University of Lowell | 2991.0 |
| Hanford Site | University of Maryland | 2753.0 |
| Hanford Site | University of Michigan | 2227.0 |

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|---|---|---|
| Hanford Site | University of Missouri - Columbia | 1870.0 |
| Hanford Site | University of Missouri - Rolla | 2082.0 |
| Hanford Site | University of New Mexico | 1593.0 |
| Hanford Site | University of Texas | 2216.0 |
| Hanford Site | University of Utah | 643.0 |
| Hanford Site | University of Virginia | 2757.0 |
| Hanford Site | University of Wisconsin | 1943.0 |
| Hanford Site | Washington State University | 361.0 |
| Hanford Site | Worcester Polytechnic Institute | 2948.0 |
| Hanford Site | Cornell University | 2842.0 |
| Hanford Site | Georgia Institute of Technology | 2732.0 |
| Hanford Site | Idaho State University | 602.0 |
| Hanford Site | Iowa State University | 1788.0 |
| Hanford Site | Kansas State University | 1743.0 |
| Hanford Site | Manhattan College | 3070.0 |
| Hanford Site | Massachusetts Institute of Technology | 3105.0 |
| Hanford Site | North Carolina State University | 3172.0 |
| Hanford Site | Ohio State University | 2482.0 |
| Hanford Site | Oregon State University | 340.0 |
| Hanford Site | Pennsylvania State University | 2760.0 |
| Hanford Site | Purdue University | 2359.0 |
| Hanford Site | Reed College | 239.0 |
| Hanford Site | Rensselaer Polytechnic Institute | 2934.0 |
| Hanford Site | Rhode Island Nuclear Science Center | 3166.0 |
| Hanford Site | State University of New York - Buffalo | 2637.0 |
| Hanford Site | Texas A&M University | 2954.0 |
| Hanford Site | University of Arizona | 1804.0 |
| Hanford Site | University of California - Irvine | 1528.0 |
| Hanford Site | University of Florida | 3138.0 |
| Hanford Site | University of Illinois | 2158.0 |
| Hanford Site | University of Lowell | 3095.0 |
| Hanford Site | University of Maryland | 2900.0 |

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|---|---|---|
| Hanford Site | University of Michigan | 2369.0 |
| Hanford Site | University of Missouri - Columbia | 1948.0 |
| Hanford Site | University of Missouri - Rolla | 2246.0 |
| Hanford Site | University of New Mexico | 1796.0 |
| Hanford Site | University of Texas | 2473.0 |
| Hanford Site | University of Utah | 774.0 |
| Hanford Site | University of Virginia | 2902.0 |
| Hanford Site | University of Wisconsin | 2210.0 |
| Hanford Site | Washington State University | 251.0 |
| Hanford Site | Worcester Polytechnic Institute | 3089.0 |
| Idaho National Engineering Laboratory | Cornell University | 2314.0 |
| Idaho National Engineering Laboratory | Georgia Institute of Technology | 2134.0 |
| Idaho National Engineering Laboratory | Idaho State University | 65.0 |
| Idaho National Engineering Laboratory | Iowa State University | 1287.0 |
| Idaho National Engineering Laboratory | Kansas State University | 1208.0 |
| Idaho National Engineering Laboratory | Manhattan College | 2370.0 |
| Idaho National Engineering Laboratory | Massachusetts Institute of Technology | 2570.0 |
| Idaho National Engineering Laboratory | North Carolina State University | 2446.0 |
| Idaho National Engineering Laboratory | Ohio State University | 1926.0 |
| Idaho National Engineering Laboratory | Oregon State University | 809.0 |
| Idaho National Engineering Laboratory | Pennsylvania State University | 2162.0 |
| Idaho National Engineering Laboratory | Purdue University | 1695.0 |
| Idaho National Engineering Laboratory | Reed College | 721.0 |
| Idaho National Engineering Laboratory | Rensselaer Polytechnic Institute | 2403.0 |
| Idaho National Engineering | Rhode Island Nuclear Science Center | 2549.0 |

| | | |
|---|---|---|
| Laboratory | | |
| Idaho National Engineering Laboratory | State University of New York - Buffalo | 2118.0 |
| Idaho National Engineering Laboratory | Texas A&M University | 1796.0 |
| Idaho National Engineering Laboratory | University of Arizona | 1301.0 |
| Idaho National Engineering Laboratory | University of California - Irvine | 942.0 |
| Idaho National Engineering Laboratory | University of Florida | 2478.0 |
| Idaho National Engineering Laboratory | University of Illinois | 1617.0 |
| Idaho National Engineering Laboratory | University of Lowell | 2575.0 |
| Idaho National Engineering Laboratory | University of Maryland | 2337.0 |
| Idaho National Engineering Laboratory | University of Michigan | 1811.0 |
| Idaho National Engineering Laboratory | University of Missouri - Columbia | 1454.0 |
| Idaho National Engineering Laboratory | University of Missouri - Rolla | 1666.0 |
| Idaho National Engineering Laboratory | University of New Mexico | 1177.0 |
| Idaho National Engineering Laboratory | University of Texas | 1800.0 |
| Idaho National Engineering Laboratory | University of Utah | 227.0 |
| Idaho National Engineering Laboratory | University of Virginia | 2341.0 |
| Idaho National Engineering Laboratory | University of Wisconsin | 1612.0 |
| Idaho National Engineering Laboratory | Washington State University | 652.0 |
| Idaho National Engineering Laboratory | Worcester Polytechnic Institute | 2532.0 |
| Idaho National Engineering Laboratory | Cornell University | 2296.0 |
| Idaho National Engineering Laboratory | Georgia Institute of Technology | 2186.0 |
| Idaho National Engineering Laboratory | Idaho State University | 56.0 |

| | | |
|---|---|---|
| Idaho National Engineering Laboratory | Iowa State University | 1242.0 |
| Idaho National Engineering Laboratory | Kansas State University | 1197.0 |
| Idaho National Engineering Laboratory | Manhattan College | 2524.0 |
| Idaho National Engineering Laboratory | Massachusetts Institute of Technology | 2559.0 |
| Idaho National Engineering Laboratory | North Carolina State University | 2626.0 |
| Idaho National Engineering Laboratory | Ohio State University | 1936.0 |
| Idaho National Engineering Laboratory | Oregon State University | 878.0 |
| Idaho National Engineering Laboratory | Pennsylvania State University | 2214.0 |
| Idaho National Engineering Laboratory | Purdue University | 1813.0 |
| Idaho National Engineering Laboratory | Reed College | 785.0 |
| Idaho National Engineering Laboratory | Rensselaer Polytechnic Institute | 2388.0 |
| Idaho National Engineering Laboratory | Rhode Island Nuclear Science Center | 2620.0 |
| Idaho National Engineering Laboratory | State University of New York - Buffalo | 2091.0 |
| Idaho National Engineering Laboratory | Texas A&M University | 1920.0 |
| Idaho National Engineering Laboratory | University of Arizona | 1376.0 |
| Idaho National Engineering Laboratory | University of California - Irvine | 982.0 |
| Idaho National Engineering Laboratory | University of Florida | 2592.0 |
| Idaho National Engineering Laboratory | University of Illinois | 1612.0 |
| Idaho National Engineering Laboratory | University of Lowell | 2549.0 |
| Idaho National Engineering Laboratory | University of Maryland | 2354.0 |
| Idaho National Engineering Laboratory | University of Michigan | 1823.0 |

| | | |
|---|---|---|
| Idaho National Engineering Laboratory | University of Missouri - Columbia | 1402.0 |
| Idaho National Engineering Laboratory | University of Missouri - Rolla | 1619.0 |
| Idaho National Engineering Laboratory | University of New Mexico | 1250.0 |
| Idaho National Engineering Laboratory | University of Texas | 1927.0 |
| Idaho National Engineering Laboratory | University of Utah | 228.0 |
| Idaho National Engineering Laboratory | University of Virginia | 2357.0 |
| Idaho National Engineering Laboratory | University of Wisconsin | 1664.0 |
| Idaho National Engineering Laboratory | Washington State University | 876.0 |
| Idaho National Engineering Laboratory | Worcester Polytechnic Institute | 2544.0 |
| Oak Ridge Reservation | Cornell University | 821.0 |
| Oak Ridge Reservation | Georgia Institute of Technology | 202.0 |
| Oak Ridge Reservation | Idaho State University | 1985.0 |
| Oak Ridge Reservation | Iowa State University | 900.0 |
| Oak Ridge Reservation | Kansas State University | 857.0 |
| Oak Ridge Reservation | Manhattan College | 754.0 |
| Oak Ridge Reservation | Massachusetts Institute of Technology | 965.0 |
| Oak Ridge Reservation | North Carolina State University | 408.0 |
| Oak Ridge Reservation | Ohio State University | 400.0 |
| Oak Ridge Reservation | Oregon State University | 2674.0 |
| Oak Ridge Reservation | Pennsylvania State University | 774.0 |
| Oak Ridge Reservation | Purdue University | 460.0 |
| Oak Ridge Reservation | Reed College | 2585.0 |
| Oak Ridge Reservation | Rensselaer Polytechnic Institute | 879.0 |
| Oak Ridge Reservation | Rhode Island Nuclear Science Center | 933.0 |
| Oak Ridge Reservation | State University of New York - Buffalo | 744.0 |
| Oak Ridge Reservation | Texas A&M University | 1004.0 |
| Oak Ridge Reservation | University of Arizona | 1782.0 |
| Oak Ridge Reservation | University of California - Irvine | 2209.0 |

| | | |
|---|---|---|
| Oak Ridge Reservation | University of Florida | 546.0 |
| Oak Ridge Reservation | University of Illinois | 516.0 |
| Oak Ridge Reservation | University of Lowell | 970.0 |
| Oak Ridge Reservation | University of Maryland | 537.0 |
| Oak Ridge Reservation | University of Michigan | 595.0 |
| Oak Ridge Reservation | University of Missouri - Columbia | 594.0 |
| Oak Ridge Reservation | University of Missouri - Rolla | 571.0 |
| Oak Ridge Reservation | University of New Mexico | 1391.0 |
| Oak Ridge Reservation | University of Texas | 1026.0 |
| Oak Ridge Reservation | University of Utah | 1864.0 |
| Oak Ridge Reservation | University of Virginia | 402.0 |
| Oak Ridge Reservation | University of Wisconsin | 730.0 |
| Oak Ridge Reservation | Washington State University | 2435.0 |
| Oak Ridge Reservation | Worcester Polytechnic Institute | 927.0 |
| Oak Ridge Reservation | Cornell University | 935.0 |
| Oak Ridge Reservation | Georgia Institute of Technology | 228.0 |
| Oak Ridge Reservation | Idaho State University | 1996.0 |
| Oak Ridge Reservation | Iowa State University | 954.0 |
| Oak Ridge Reservation | Kansas State University | 948.0 |
| Oak Ridge Reservation | Manhattan College | 1164.0 |
| Oak Ridge Reservation | Massachusetts Institute of Technology | 1199.0 |
| Oak Ridge Reservation | North Carolina State University | 511.0 |
| Oak Ridge Reservation | Ohio State University | 406.0 |
| Oak Ridge Reservation | Oregon State University | 3055.0 |
| Oak Ridge Reservation | Pennsylvania State University | 822.0 |
| Oak Ridge Reservation | Purdue University | 495.0 |
| Oak Ridge Reservation | Reed College | 2827.0 |
| Oak Ridge Reservation | Rensselaer Polytechnic Institute | 1028.0 |
| Oak Ridge Reservation | Rhode Island Nuclear Science Center | 1259.0 |
| Oak Ridge Reservation | State University of New York - Buffalo | 731.0 |
| Oak Ridge Reservation | Texas A&M University | 1013.0 |
| Oak Ridge Reservation | University of Arizona | 2103.0 |

| | | |
|---|---|---|
| Oak Ridge Reservation | University of California - Irvine | 2615.0 |
| Oak Ridge Reservation | University of Florida | 634.0 |
| Oak Ridge Reservation | University of Illinois | 592.0 |
| Oak Ridge Reservation | University of Lowell | 1189.0 |
| Oak Ridge Reservation | University of Maryland | 582.0 |
| Oak Ridge Reservation | University of Michigan | 591.0 |
| Oak Ridge Reservation | University of Missouri - Columbia | 695.0 |
| Oak Ridge Reservation | University of Missouri - Rolla | 640.0 |
| Oak Ridge Reservation | University of New Mexico | 1749.0 |
| Oak Ridge Reservation | University of Texas | 1045.0 |
| Oak Ridge Reservation | University of Utah | 2051.0 |
| Oak Ridge Reservation | University of Virginia | 451.0 |
| Oak Ridge Reservation | University of Wisconsin | 765.0 |
| Oak Ridge Reservation | Washington State University | 2536.0 |
| Oak Ridge Reservation | Worcester Polytechnic Institute | 1183.0 |
| Nevada Test Site | Cornell University | 2547.0 |
| Nevada Test Site | Georgia Institute of Technology | 2238.0 |
| Nevada Test Site | Idaho State University | 649.0 |
| Nevada Test Site | Iowa State University | 1520.0 |
| Nevada Test Site | Kansas State University | 1312.0 |
| Nevada Test Site | Manhattan College | 2603.0 |
| Nevada Test Site | Massachusetts Institute of Technology | 2802.0 |
| Nevada Test Site | North Carolina State University | 2549.0 |
| Nevada Test Site | Ohio State University | 2098.0 |
| Nevada Test Site | Oregon State University | 1245.0 |
| Nevada Test Site | Pennsylvania State University | 2395.0 |
| Nevada Test Site | Purdue University | 1928.0 |
| Nevada Test Site | Reed College | 1250.0 |
| Nevada Test Site | Rensselaer Polytechnic Institute | 2636.0 |
| Nevada Test Site | Rhode Island Nuclear Science Center | 2782.0 |
| Nevada Test Site | State University of New York - Buffalo | 2350.0 |
| Nevada Test Site | Texas A&M University | 1852.0 |

| | | |
|---|---|---|
| Nevada Test Site | University of Arizona | 723.0 |
| Nevada Test Site | University of California - Irvine | 364.0 |
| Nevada Test Site | University of Florida | 2582.0 |
| Nevada Test Site | University of Illinois | 1850.0 |
| Nevada Test Site | University of Lowell | 2808.0 |
| Nevada Test Site | University of Maryland | 2509.0 |
| Nevada Test Site | University of Michigan | 2044.0 |
| Nevada Test Site | University of Missouri - Columbia | 1557.0 |
| Nevada Test Site | University of Missouri - Rolla | 1769.0 |
| Nevada Test Site | University of New Mexico | 918.0 |
| Nevada Test Site | University of Texas | 1662.0 |
| Nevada Test Site | University of Utah | 487.0 |
| Nevada Test Site | University of Virginia | 2444.0 |
| Nevada Test Site | University of Wisconsin | 1857.0 |
| Nevada Test Site | Washington State University | 1286.0 |
| Nevada Test Site | Worcester Polytechnic Institute | 2765.0 |
| Nevada Test Site | Cornell University | 2727.0 |
| Nevada Test Site | Georgia Institute of Technology | 2618.0 |
| Nevada Test Site | Idaho State University | 700.0 |
| Nevada Test Site | Iowa State University | 1674.0 |
| Nevada Test Site | Kansas State University | 1628.0 |
| Nevada Test Site | Manhattan College | 2956.0 |
| Nevada Test Site | Massachusetts Institute of Technology | 2990.0 |
| Nevada Test Site | North Carolina State University | 3058.0 |
| Nevada Test Site | Ohio State University | 2367.0 |
| Nevada Test Site | Oregon State University | 1400.0 |
| Nevada Test Site | Pennsylvania State University | 2646.0 |
| Nevada Test Site | Purdue University | 2245.0 |
| Nevada Test Site | Reed College | 1429.0 |
| Nevada Test Site | Rensselaer Polytechnic Institute | 2820.0 |
| Nevada Test Site | Rhode Island Nuclear Science Center | 3051.0 |
| Nevada Test Site | State University of New York - Buffalo | 2522.0 |

| | | |
|---|---|---|
| Nevada Test Site | Texas A&M University | 1967.0 |
| Nevada Test Site | University of Arizona | 818.0 |
| Nevada Test Site | University of California -Irvine | 424.0 |
| Nevada Test Site | University of Florida | 3024.0 |
| Nevada Test Site | University of Illinois | 2044.0 |
| Nevada Test Site | University of Lowell | 2980.0 |
| Nevada Test Site | University of Maryland | 2786.0 |
| Nevada Test Site | University of Michigan | 2255.0 |
| Nevada Test Site | University of Missouri - Columbia | 1833.0 |
| Nevada Test Site | University of Missouri - Rolla | 2050.0 |
| Nevada Test Site | University of New Mexico | 1065.0 |
| Nevada Test Site | University of Texas | 2358.0 |
| Nevada Test Site | University of Utah | 528.0 |
| Nevada Test Site | University of Virginia | 2788.0 |
| Nevada Test Site | University of Wisconsin | 2096.0 |
| Nevada Test Site | Washington State University | 1520.0 |
| Nevada Test Site | Worcester Polytechnic Institute | 2975.0 |
| West Valley Demonstration Plant | Savannah River Site | 883.0 |
| West Valley Demonstration Plant | Hanford Site | 2556.0 |
| West Valley Demonstration Plant | Idaho National Engineering Laboratory | 2140.0 |
| West Valley Demonstration Plant | Oak Ridge Reservation | 766.0 |
| West Valley Demonstration Plant | Nevada Test Site | 2373.0 |
| Babcock & Wilcox | Savannah River Site | 455.0 |
| Babcock & Wilcox | Hanford Site | 2738.0 |
| Babcock & Wilcox | Idaho National Engineering Laboratory | 2322.0 |
| Babcock & Wilcox | Oak Ridge Reservation | 350.0 |
| Babcock & Wilcox | Nevada Test Site | 2491.0 |
| West Valley Demonstration Plant | Savannah River Site | 1217.0 |
| West Valley Demonstration | Hanford Site | 2654.0 |

| | | |
|---|---|---|
| Plant | | |
| West Valley Demonstration Plant | Idaho National Engineering Laboratory | 2108.0 |
| West Valley Demonstration Plant | Oak Ridge Reservation | 889.0 |
| West Valley Demonstration Plant | Nevada Test Site | 2554.0 |
| Babcock & Wilcox | Savannah River Site | 661.0 |
| Babcock & Wilcox | Hanford Site | 2879.0 |
| Babcock & Wilcox | Idaho National Engineering Laboratory | 2333.0 |
| Babcock & Wilcox | Oak Ridge Reservation | 386.0 |
| Babcock & Wilcox | Nevada Test Site | 2765.0 |
| Three Mile Island | Idaho National Engineering Laboratory | 2315.0 |
| Pleasanton, CA | Idaho National Engineering Laboratory | 969.0 |
| Pleasanton, CA | Hanford Site | 881.0 |
| Pleasanton, CA | Savannah River Site | 2768.0 |
| Pleasanton, CA | Oak Ridge Reservation | 2532.0 |
| Pleasanton, CA | Nevada Test Site | 687.0 |
| Gaithersburg, MD | Idaho National Engineering Laboratory | 2316.0 |
| Gaithersburg, MD | Hanford Site | 2732.0 |
| Gaithersburg, MD | Savannah River Site | 597.0 |
| Gaithersburg, MD | Oak Ridge Reservation | 536.0 |
| Gaithersburg, MD | Nevada Test Site | 2488.0 |
| San Ramon, CA | Idaho National Engineering Laboratory | 962.0 |
| San Ramon, CA | Hanford Site | 874.0 |
| San Ramon, CA | Savannah River Site | 2775.0 |
| San Ramon, CA | Oak Ridge Reservation | 2538.0 |
| San Ramon, CA | Nevada Test Site | 694.0 |
| Midland, MI | Idaho National Engineering Laboratory | 1902.0 |
| Midland, MI | Hanford Site | 2318.0 |
| Midland, MI | Savannah River Site | 1036.0 |
| Midland, MI | Oak Ridge Reservation | 719.0 |
| Midland, MI | Nevada Test Site | 2135.0 |
| San Diego, CA | Idaho National Engineering Laboratory | 976.0 |

| | | |
|---|---|---|
| San Diego, CA | Hanford Site | 1352.0 |
| San Diego, CA | Savannah River Site | 2345.0 |
| San Diego, CA | Oak Ridge Reservation | 2193.0 |
| San Diego, CA | Nevada Test Site | 398.0 |
| Denver, CO | Idaho National Engineering Laboratory | 717.0 |
| Denver, CO | Hanford Site | 1133.0 |
| Denver, CO | Savannah River Site | 1613.0 |
| Denver, CO | Oak Ridge Reservation | 1340.0 |
| Denver, CO | Nevada Test Site | 819.0 |
| McClellan AFB, CA | Idaho National Engineering Laboratory | 875.0 |
| McClellan AFB, CA | Hanford Site | 830.0 |
| McClellan AFB, CA | Savannah River Site | 2780.0 |
| McClellan AFB, CA | Oak Ridge Reservation | 2517.0 |
| McClellan AFB, CA | Nevada Test Site | 735.0 |
| Pleasanton, CA | Idaho National Engineering Laboratory | 965.0 |
| Pleasanton, CA | Hanford Site | 1002.0 |
| Pleasanton, CA | Savannah River Site | 3170.0 |
| Pleasanton, CA | Oak Ridge Reservation | 3029.0 |
| Pleasanton, CA | Nevada Test Site | 838.0 |
| Gaithersburg, MD | Idaho National Engineering Laboratory | 2335.0 |
| Gaithersburg, MD | Hanford Site | 2881.0 |
| Gaithersburg, MD | Savannah River Site | 659.0 |
| Gaithersburg, MD | Oak Ridge Reservation | 819.0 |
| Gaithersburg, MD | Nevada Test Site | 2767.0 |
| San Ramon, CA | Idaho National Engineering Laboratory | 965.0 |
| San Ramon, CA | Hanford Site | 1002.0 |
| San Ramon, CA | Savannah River Site | 3170.0 |
| San Ramon, CA | Oak Ridge Reservation | 3029.0 |
| San Ramon, CA | Nevada Test Site | 838.0 |
| Midland, MI | Idaho National Engineering Laboratory | 1961.0 |
| Midland, MI | Hanford Site | 2507.0 |
| Midland, MI | Savannah River Site | 996.0 |

| | | |
|---|---|---|
| Midland, MI | Oak Ridge Reservation | 645.0 |
| Midland, MI | Nevada Test Site | 2392.0 |
| San Diego, CA | Idaho National Engineering Laboratory | 1076.0 |
| San Diego, CA | Hanford Site | 1622.0 |
| San Diego, CA | Savannah River Site | 3274.0 |
| San Diego, CA | Oak Ridge Reservation | 2709.0 |
| San Diego, CA | Nevada Test Site | 518.0 |
| Denver, CO | Idaho National Engineering Laboratory | 708.0 |
| Denver, CO | Hanford Site | 1254.0 |
| Denver, CO | Savannah River Site | 2125.0 |
| Denver, CO | Oak Ridge Reservation | 1560.0 |
| Denver, CO | Nevada Test Site | 1140.0 |
| McClellan AFB, CA | Idaho National Engineering Laboratory | 853.0 |
| McClellan AFB, CA | Hanford Site | 890.0 |
| McClellan AFB, CA | Savannah River Site | 3160.0 |
| McClellan AFB, CA | Oak Ridge Reservation | 2747.0 |
| McClellan AFB, CA | Nevada Test Site | 827.0 |

## I-3.2 Spent Nuclear Fuel Shipments

In the transportation analyses, SNF was divided into a number of categories: DOE research, (c) foreign research reactor, (d) graphite, (e) N Reactor, (f) naval- Site production reactor, and (h) university research reactor. More details on thes Appendix J of Volume 1 of this EIS. The estimated number of SNF shipments are pres origin-destination pair, and transport mode for each alternative in Tables I-2 and Each shipment, whether by truck or rail, was assumed to consist of one shipping con of shipping container was variable, depending on the type of SNF and the transport this time, insufficient data exist to determine the transport mode for all shipment truck or rail shipments was based on either 100 percent transport by truck or 100 p bound potential impacts.

The shipments in this appendix include offsite transport of naval-type SNF st Chemical Processing Plant as of June 1995 to storage locations at other sites as id Transport of naval SNF from shipyards and prototypes to the equivalent Expended Cor alternative sites are addressed in Appendix D of Volume 1 of this EIS, along with t specimens.

This appendix also includes transport of foreign research reactor SNF from th identified in the Implementation Plan for this EIS (Hampton Roads, Virginia; Charle Savannah, Georgia; Seattle-Tacoma, Washington; Portland, Oregon; and Oakland, Calif identified in the alternatives. Impacts of shipments to the Military Ocean Termina Carolina, were analyzed because this terminal was recently used for foreign researc Impacts of shipments to Galveston, Texas, were analyzed because this point of entry

has container-handling experience. The ocean-going portion of foreign research re a detailed evaluation of point of entry activities are not assessed in this EIS, bu Environmental Impact Statement on a Proposed Nuclear Nonproliferation Policy Concer Research Reactor Spent Nuclear Fuel.

The No Action alternative considers only transport of naval SNF and test spec shipments are addressed in Appendix D of Volume 1 of this EIS. For the Decentraliz university research reactor, foreign research reactor, and non-DOE research reactor to the Idaho National Engineering Laboratory or the Savannah River Site.

For the 1992/1993 Planning Basis alternative, commercial, DOE research, and g be transported to the Idaho National Engineering Laboratory or the Savannah River S reactor, foreign research reactor, and non-DOE research reactor SNF would also cont the Idaho National Engineering Laboratory or the Savannah River Site.

For the Regionalization alternatives, SNF would be consolidated based on fuel More shipments of SNF would occur than for the 1992/1993 Planning Basis alternative would be transported. For the Regionalization by Fuel Type alternative, N-Reactor SNF, naval-type SNF, and Savannah River Site production reactor SNF and t transported. Generally, aluminum SNF would be transported to the Savannah River Si SNF would be transported to the Idaho National Engineering Laboratory. For the Reg Geography alternative, SNF from west of the Mississippi River would be transported Idaho National Engineering Laboratory, or the Nevada Test Site. SNF from east of t would be transported to the Savannah River Site or the Oak Ridge Reservation.

For the Centralization alternatives, all SNF would be transported to the Hanf National Engineering Laboratory, the Savannah River Site, the Oak Ridge Reservation Site. The primary difference between these alternatives, in terms of shipments, is SNF, naval-type SNF, and Savannah River Site production reactor SNF and targets. F Idaho National Engineering Laboratory, the Savannah River Site, the Oak Ridge Reser Test Site, N-Reactor SNF would be transported from the Hanford Site. For Centraliz Site, the Idaho National Engineering Laboratory, the Oak Ridge Reservation, or the Savannah River Site production reactor SNF and targets would be transported. For C Hanford Site, the Savannah River Site, the Oak Ridge Reservation, or the Nevada Tes would be transported from the Idaho National Engineering Laboratory. For Centraliz Reservation or the Nevada Test Site, N-Reactor SNF, naval-type SNF, and Savannah Ri reactor SNF and targets would be transported.

Table I-2. Spent nuclear fuel shipments for the Decentralization, 1992/1993 Planni alternatives.

| | | Decentralizati | | 1992/1993 Planning Basis | | Regionalization by Fuel Type | | Centralization | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | HS | | SRS |
| Origin | Destination | truck | rail | truck | rail | truck | rail | truck | rail | tru |
| Naval-Type | | | | | | | | | | |
| INEL | HS | | | | | | | 383 | 104 | |
| | NTS | | | | | | | | | |
| | ORR | | | | | | | | | |
| | SRS | | | | | | | | | 383 |
| Savannah River Production | | | | | | | | | | |
| SRS | HS | | | | | | | 484 | 97 | |
| | INEL | | | | | | | | | |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| ORR | SRS | | | | | 1 | 1 | | | |
| Hanford Production | | | | | | | | | | |
| HS | INEL | | | | | | | | | |
| | SRS | | | | | | | | | 119 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| ORR | INEL | | | | | 1 | 1 | | | |
| Graphite | | | | | | | | | | |
| FSV | HS | | | | | | | 244 | 35 | |
| | INEL | | | 244 | 35 | 244 | 35 | | | |
| | SRS | | | | | | | | | 244 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| INEL | HS | | | | | | | 162 | 23 | |
| | SRS | | | | | | | | | 162 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| Domestic non-DOE | | | | | | | | | | |
| AFRRI | HS | | | | | | | 3 | 3 | |
| | INEL | | | 3 | 3 | 3 | 3 | | | |
| | SRS | 3 | 3 | | | | | | | 3 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| USGS | HS | | | | | | | 6 | 6 | |
| | INEL | 6 | 6 | 6 | 6 | 6 | 6 | | | |
| | SRS | | | | | | | | | 6 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| Domestic non-DOE | | | | | | | | | | |
| NIST | HS | | | | | | | 185 | 185 | |
| | INEL | | | | | | | | | |
| | SRS | 185 | 185 | 185 | 185 | 18 | 185 | | | 185 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| USAF | HS | | | | | | | 3 | 3 | |
| | INEL | 3 | 3 | 3 | 3 | 3 | 3 | | | |
| | SRS | | | | | | | | | 3 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| DOW | HS | | | | | | | 3 | 3 | |
| | INEL | 3 | 3 | 3 | 3 | 3 | 3 | | | |
| | SRS | | | | | | | | | 3 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| GE | HS | | | | | | | 4 | 4 | |
| | INEL | 4 | 4 | 4 | 4 | | | | | |
| | SRS | | | | | 4 | 4 | | | 4 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| GA | HS | | | | | | | 8 | 8 | |
| | INEL | 8 | 8 | 8 | 8 | 8 | 8 | | | |
| | SRS | | | | | | | | | 8 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| AERO | HS | | | | | | | 3 | 3 | |
| | INEL | 3 | 3 | 3 | 3 | 3 | 3 | | | |
| | SRS | | | | | | | | | 3 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| Universities | | | | | | | | | | |
| Universiti | HS | | | | | | | 519 | 519 | |
| | INEL | 261 | 261 | 261 | 261 | 116 | 116 | | | |
| | SRS | 258 | 258 | 258 | 258 | 403 | 403 | | | 519 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| WVDP | HS | | | | | | | 83 | 4 | |
| | INEL | | | 83 | 4 | 83 | 4 | | | |
| | SRS | | | | | | | | | 83 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| B&W | HS | | | | | | | 2 | 2 | |
| | INEL | | | 2 | 2 | 2 | 2 | | | |
| | SRS | | | | | | | | | 2 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ORR | HS | | | | | | | 7 | 2 | |
| | INEL | | | | | 7 | 2 | | | |
| | SRS | | | | | | | | | 7 |
| | NTS | | | | | | | | | |
| SRS | HS | | | | | | | 27 | 5 | |
| | INEL | | | | | 27 | 5 | | | |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| HS | INEL | | | | | 6 | 2 | | | |
| | SRS | | | | | | | | | 6 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| Commercial | | | | | | | | | | |
| ANL-E | HS | | | | | | | 1 | 1 | |
| | INEL | | | | | 1 | 1 | | | |
| | SRS | | | | | | | | | 1 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| INEL | HS | | | | | | | 370 | 74 | |
| | SRS | | | | | | | | | 370 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| DOE Research | | | | | | | | | | |
| ORR | HS | | | | | | | 113 | 24 | |
| | INEL | | | | | 46 | 10 | | | |
| | SRS | | | 67 | 14 | 67 | 14 | | | 113 |
| | NTS | | | | | | | | | |
| BNL | HS | | | | | | | 71 | 14 | |
| | INEL | | | 35 | 7 | | | | | |
| | SRS | | | 35 | 7 | 71 | 14 | | | 71 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| SNL | HS | | | | | | | 27 | 6 | |
| | INEL | | | 12 | 3 | 12 | 3 | | | |
| | SRS | | | 15 | 3 | 15 | 3 | | | 27 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| LANL | HS | | | | | | | 17 | 4 | |
| | INEL | | | 17 | 4 | | | | | |
| | SRS | | | | | 17 | 4 | | | 17 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| ANL-E | HS | | | | | | | 10 | 2 | |
| | INEL | | | 10 | 2 | 10 | 2 | | | |
| | SRS | | | | | | | | | 10 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| HS | INEL | | | 5 | 1 | 518 | 39 | | | |
| | SRS | | | | | | | | | 518 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| INEL | HS | | | | | | | 1003 | 165 | |
| | SRS | | | | | 114 | 23 | | | 100 |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| SRS | HS | | | | | | | 353 | 71 | |
| | INEL | | | | | 94 | 19 | | | |
| | ORR | | | | | | | | | |
| | NTS | | | | | | | | | |
| Foreign Points of Entry | HS | | | | | | | 1008 | 1008 | |
| | SRS | 546 | 546 | 546 | 546 | 838 | 838 | | | 100 |
| | INEL | 462 | 462 | 462 | 462 | 170 | 170 | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | ORR | | | | | | | | |
| | NTS | | | | | | | | |
| | TOTAL | 1,742 | 1,742 | 2,267 | 1,824 | 3,078 | 1,926 | 5,099 | 2,375 | 5,9 |

Acronyms

AERO Aerotest San Ramon, CA
AFRRI Armed Forces Radiobiology Research Institute Bethesda, MD
ANL-E Argonne National Laboratory-East
B&W Babcock & Wilcox Company Lynchburg, VA
BNL Brookhaven National Laboratory
DOE Department of Energy
DOW Dow North America Midland, MI
FSV Fort St. Vrain Nuclear Generating Station
GA General Atomics San Diego, CA
GE General Electric Pleasanton, CA
HS Hanford Site
INEL Idaho National Engineering
LANL Los Al
NIST National Institute of
NTS Nevada Test Site
ORR Oak Ridge Reservation
SNL Sandia National Laboratories
SRS Savannah River Site
USAF United States Air
USGS United States Geological Sur
WVDP West Valley Demonstration P

Table I-3. Spent nuclear fuel shipments for the Regionalization
Regionalization by Geography

| Origin | Destination | HS and SRS truck | HS and SRS rail | INEL and SRS truck | INEL and SRS rail | NTS and SRS truck | NTS and SRS rail | HS and truck |
|---|---|---|---|---|---|---|---|---|
| Naval-Type | | | | | | | | |
| INEL | HS | 383 | 104 | | | | | 383 |
| | NTS | | | | | 383 | 104 | |
| | ORR | | | | | | | |
| | SRS | | | | | | | |
| Savannah River Production | | | | | | | | |
| SRS | HS | | | | | | | |
| | INEL | | | | | | | |
| | ORR | | | | | | | 484 |
| | NTS | | | | | | | |
| ORR | SRS | | | | | | | |
| Hanford Production | | | | | | | | |
| HS | INEL | | | 1192 | 605 | | | |
| | SRS | | | | | | | |
| | ORR | | | | | | | |
| | NTS | | | | | 1192 | 605 | |
| ORR | INEL | | | | | | | |
| Graphite | | | | | | | | |
| FSV | HS | 244 | 35 | | | | | 244 |
| | INEL | | | 244 | 35 | | | |
| | SRS | | | | | | | |
| | ORR | | | | | | | |
| | NTS | | | | | 244 | 35 | |
| INEL | HS | 162 | 23 | | | | | 162 |
| | SRS | | | | | | | |
| | ORR | | | | | | | |
| | NTS | | | | | 162 | 23 | |
| Domestic non-DOE | | | | | | | | |
| AFRRI | HS | | | | | | | |
| | INEL | | | | | | | |
| | SRS | 3 | 3 | 3 | 3 | 3 | 3 | |
| | ORR | | | | | | | 3 |
| | NTS | | | | | | | |
| USGS | HS | 6 | 6 | | | | | 6 |
| | INEL | | | 6 | 6 | | | |
| | SRS | | | | | | | |
| | ORR | | | | | | | |
| | NTS | | | | | 6 | 6 | |
| Domestic non-DOE | | | | | | | | |
| NIST | HS | | | | | | | |
| | INEL | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SRS | 185 | 185 | 185 | 185 | 185 | 185 | |
| | ORR | | | | | | | 185 |
| | NTS | | | | | | | |
| USAF | HS | 3 | 3 | | | | | 3 |
| | INEL | | | 3 | 3 | | | |
| | SRS | | | | | | | |
| | ORR | | | | | | | |
| | NTS | | | | | 3 | 3 | |
| DOW | HS | | | | | | | |
| | INEL | | | | | | | |
| | SRS | 3 | 3 | 3 | 3 | 3 | 3 | |
| | ORR | | | | | | | 3 |
| | NTS | | | | | | | |
| GE | HS | 4 | 4 | | | | | 4 |
| | INEL | | | 4 | 4 | | | |
| | SRS | | | | | | | |
| | ORR | | | | | | | |
| | NTS | | | | | 4 | 4 | |
| GA | HS | 8 | 8 | | | | | 8 |
| | INEL | | | 8 | 8 | | | |
| | SRS | | | | | | | |
| | ORR | | | | | | | |
| | NTS | | | | | 8 | 8 | |
| AERO | HS | 3 | 3 | | | | | 3 |
| | INEL | | | 3 | 3 | | | |
| | SRS | | | | | | | |
| | ORR | | | | | | | |
| | NTS | | | | | 3 | 3 | |
| Universities | | | | | | | | |
| Universiti | HS | 209 | 209 | | | | | 209 |
| | INEL | | | 209 | 209 | | | |
| | SRS | 310 | 310 | 310 | 310 | 310 | 310 | |
| | ORR | | | | | | | 310 |
| | NTS | | | | | 209 | 209 | |
| WVDP | HS | | | | | | | |
| | INEL | | | | | | | |
| | SRS | 83 | 4 | 83 | 4 | 83 | 4 | |
| | ORR | | | | | | | 83 |
| | NTS | | | | | | | |
| B&W | HS | | | | | | | |
| | INEL | | | | | | | |
| | SRS | 2 | 2 | 2 | 2 | 2 | 2 | |
| | ORR | | | | | | | 2 |
| | NTS | | | | | | | |
| ORR | HS | | | | | | | |
| | INEL | | | | | | | |
| | SRS | 7 | 2 | 7 | 2 | 7 | 2 | |
| | NTS | | | | | | | |
| SRS | HS | | | | | | | |
| | INEL | | | | | | | |
| | ORR | | | | | | | 27 |
| | NTS | | | | | | | |
| HS | INEL | | | 6 | 2 | | | |
| | SRS | | | | | | | |
| | ORR | | | | | | | |
| | NTS | | | | | 6 | 2 | |
| Commercial | | | | | | | | |
| ANL-E | HS | | | | | | | |
| | INEL | | | | | | | |
| | SRS | 1 | 1 | 1 | 1 | 1 | 1 | |
| | ORR | | | | | | | 1 |
| | NTS | | | | | | | |
| INEL | HS | 370 | 74 | | | | | 370 |
| | SRS | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ORR | | | | | | | |
| | NTS | | | | | 370 | 74 | |
| DOE Research | | | | | | | | |
| ORR | HS | | | | | | | |
| | INEL | | | | | | | |
| | SRS | 113 | 24 | 113 | 24 | 113 | 24 | |
| | NTS | | | | | | | |
| BNL | HS | | | | | | | |
| | INEL | | | | | | | |
| | SRS | 71 | 14 | 71 | 14 | 71 | 14 | |
| | ORR | | | | | | | 71 |
| | NTS | | | | | | | |
| SNL | HS | 27 | 6 | | | | | 27 |
| | INEL | | | 27 | 6 | | | |
| | SRS | | | | | | | |
| | ORR | | | | | | | |
| | NTS | | | | | 27 | 6 | |
| LANL | HS | 17 | 4 | | | | | 17 |
| | INEL | | | 17 | 4 | | | |
| | SRS | | | | | | | |
| | ORR | | | | | | | |
| | NTS | | | | | 17 | 4 | |
| ANL-E | HS | | | | | | | |
| | INEL | | | | | | | |
| | SRS | 10 | 2 | 10 | 2 | 10 | 2 | |
| | ORR | | | | | | | 10 |
| | NTS | | | | | | | |
| HS | INEL | | | 518 | 39 | | | |
| | SRS | | | | | | | |
| | ORR | | | | | | | |
| | NTS | | | | | 518 | 39 | |
| INEL | HS | 1003 | 165 | | | | | 1003 |
| | SRS | | | | | | | |
| | ORR | | | | | | | |
| | NTS | | | | | 1003 | 165 | |
| SRS | HS | | | | | | | |
| | INEL | | | | | | | |
| | ORR | | | | | | | 353 |
| | NTS | | | | | | | |
| Foreign Points of Entry | HS | 230 | 230 | | | | | 230 |
| | SRS | 778 | 778 | 778 | 778 | 778 | 778 | |
| | INEL | | | 230 | 230 | | | |
| | ORR | | | | | | | 778 |
| | NTS | | | | | | | |
| | TOTAL | 4,235 | 2,202 | 4,033 | 2,482 | 5,951 | 2,848 | 4,979 |

Acronyms

AERO Aerotest San Ramon, CA
AFRRI Armed Forces Radiobiology Research Institute Bethesda, MD
ANL-E Argonne National Laboratory-East
B&W Babcock & Wilcox Company Lynchburg, VA
BNL Brookhaven National Laboratory
DOE Department of Energy
DOW Dow North America Midland, MI
FSV Fort St. Vrain Nuclear Generating Station
GA General Atomics San Diego, CA
GE General Electric Pleasanton, CA
HS Hanford Site
INEL Idaho National Engineering Laborat
LANL Los Alamos N
NIST National Institute of Standa Gaithersburg, MD
NTS Nevada Test Site
ORR Oak Ridge Reservation
SNL Sandia National Laboratories
SRS Savannah River Site
USAF United States Air Force McClellan, CA
USGS United States Geological Survey D
WVDP West Valley Demonstration Project

# I-4 INCIDENT-FREE TRANSPORTATION RISKS FOR SPENT NUCLEAR FUEL

## I-4.1 Methodology

Radiological dose during normal, incident-free transportation of SNF results external radiation field that surrounds the shipping containers. The dose is a fun people exposed, their proximity to the containers, their length of time of exposure radiation field surrounding the containers.

Radiological impacts were determined for crew workers and the general populat incident-free transportation. For truck shipments, the crew were the drivers of th shipments, the crew were workers in close proximity to the shipping containers duri classification of railcars. The general population was persons within 800 meters ( railway (off-link), persons sharing the road or railway (on-link), and persons at s

Collective doses for the crew and general population were calculated using th computer code (Neuhauser and Kanipe 1992). SNF was assigned a dose rate of 14 mill meter (3.28 feet) from the shipping container. This dose rate yields a dose rate o meters (6.56 feet) from the vehicle, which is the regulatory maximum based on an ex Madsen et al. 1986). A dose rate of 1 millirem per hour at 1 meter (3.28 feet) was shipments, based on measured dose rates from previous naval SNF shipments. Three p zones (rural, suburban, and urban) were used. These zones correspond to mean popul 6,719, and 3,861 persons per square kilometer, respectively (Neuhauser and Kanipe 1

Calculating the collective doses is based on developing unit risk factors. U estimate of the impact from transporting one shipment of radioactive material over a given population density zone. The unit risk factors may be combined with routin transport distances in various population density zones, to determine the risk for shipment risk factor) between a given origin and destination. Cashwell et al. (198 explanation of the use of unit risk factors.

Unit risk factors were developed based on travel within rural, suburban, and using RADTRAN 4, using default data (see Neuhauser and Kanipe 1992). Table I-4 con factors for offsite truck and rail shipments of SNF. Table I-5 contains the unit r and rail shipments of naval-type SNF. Shipment risk factors were also developed fo combining the unit risk factors with routing information derived from the HIGHWAY a computer codes.

Table I-4. Incident-free unit risk factors for offsite truck and rail shipments of

| Mode | Exposure group | Unit risk factors (person-rem per kilometer | | |
|---|---|---|---|---|
| | | Rural | Suburban | Urba |
| Truck | | | | |
| | Occupational | 4.6 X 10^-5 | 1.0 X 10^-4 | 1.7 |
| | General population | | | |
| | Off-link(b) | 1.2 X 10^-7 | 1.6 X 10^-5 | 1.1 |
| | On-link(c) | 5.0 X 10^-6 | 1.5 X 10^-5 | 1.5 |
| | Stops | 1.2 X 10^-4 | 1.2 X 10^-4 | 1.2 |
| | General population total | 1.3 X 10^-4 | 1.5 X 10^-4 | 3.8 |
| Rail | | | | |
| | Occupationald | 1.0 X 10^-5 | 1.0 X 10^-5 | 1.0 |
| | General population | | | |

| | | | |
|---|---|---|---|
| Off-link(b) | 1.7 X 10^-7 | 3.3 X 10^-5 | 2.9 |
| On-link(c) | 6.6 X 10^-8 | 8.5 X 10^-7 | 2.4 |
| Stopse | 4.8 X 10^-6 | 4.8 X 10^-6 | 4.8 |
| General population total | 5.0 X 10^-6 | 3.8 X 10^-5 | 3.0 |

a. The methodology, equations, and data used to develop the unit risk factors are al. (1986) and Neuhauser and Kanipe (1992). Cashwell et al. (1986) contains a deta use of unit risk factors.
b. Off-link general population were persons within 800 meters (2,625 feet) of the
c. On-link general population were persons sharing the road or railway.
d. The nonlinear component of incident-free rail dose for crew workers because of classifications is 0.011 person-rem per shipment. Ostmeyer (1986) contains a detai rail exposure model.
e. The nonlinear component of incident-free rail dose for the general population b inspections and classifications is 0.0087 person-rem per shipment. Ostmeyer (1986) explanation of the rail exposure model.

Table I-5. Incident-free unit risk factors for truck and rail shipments of naval-t

| Mode | Exposure group | Unit risk factors (person-rem per kilometer) (a | | |
|---|---|---|---|---|
| | | Rural | Suburban | Urba |
| Truck | | | | |
| | Occupational | 1.5 X 10^-5 | 3.3 X 10^-5 | 5.4 |
| | General population | | | |
| | Off-link(b) | 8.8 X 10^-9 | 1.2 X 10^-6 | 7.7 |
| | On-link(c) | 3.6 X 10^-7 | 1.0 X 10^-6 | 1.1 |
| | Stops | 4.3 X 10^-6 | 4.3 X 10^-6 | 4.3 |
| | General population total | 4.7 X 10^-7 | 6.5 X 10^-6 | 2.3 |
| Rail | | | | |
| | Occupationald | 7.2 X 10^-7 | 7.2 X 10^-7 | 7.2 |
| | General population | | | |
| | Off-link(b) | 1.2 X 10^-8 | 2.3 X 10^-6 | 2.1 |
| | On-link(c) | 4.7 X 10^-9 | 6.1 X 10^-8 | 1.7 |
| | Stopse | 3.4 X 10^-7 | 3.4 X 10^-7 | 3.4 |
| | General population total | 3.6 X 10^-7 | 2.7 X 10^-6 | 2.1 |

a. The methodology, equations, and data used to develop the unit risk factors are al. (1986) and Neuhauser and Kanipe (1992). Cashwell et al. (1986) contains a deta use of unit risk factors.
b. Off-link general population were persons within 800 meters (2,625 feet) of the
c. On-link general population were persons sharing the road or railway.
d. The nonlinear component of incident-free rail dose for crew workers because of classifications is 0.00080 person-rem per shipment. Ostmeyer (1986) contains a det the rail exposure model.
e. The nonlinear component of incident-free rail dose for the general population b inspections and classifications is 0.00062 person-rem per shipment. Ostmeyer (1986 explanation of the rail exposure model.

Incident-free nonradiological fatalities were also estimated using unit risk factors account for the fatalities associated with exhaust emissions, but the dista impacts must be doubled to reflect the round trip distance because these impacts oc shipment contains radioactive material. Two sets of data were evaluated: (a) data Radiological Impacts of Transporting Radioactive Material (Rao et al. 1982), and (b Vehicle-Related Air Toxics Study (EPA 1993). In Rao et al. (1982), the nonradiolog trucks was 1.0 10-7 fatalities per kilometer and the nonradiological unit risk fa fatalities per kilometer. These unit risk factors are applicable only in urban are risk factor was calculated to be 7.2 10-11 fatalities per kilometer; this unit ris

areas (i.e., rural, suburban, and urban). Based on the routes analyzed in this EIS Rao et al. (1982) were found to overestimate impacts by about 20 to 30 times relati from EPA (1993). Therefore, the unit risk factors from Rao et al. (1982) were used estimate of the incident-free nonradiological fatalities presented in this EIS. It risk factors from Rao et al. (1982) account for all fatalities, not just cancer fat exposure to diesel exhaust emissions have been followed in occupationally exposed w are insufficient to make a correlation between the effects and the exposure experie Therefore, these impacts were not estimated in this EIS.

### I-4.1.1 Maximally Exposed Individual Exposure Scenarios

Maximum individual doses were calculated using the RISKIND computer code (Yua The maximum individual doses for the routine transport offsite were estimated for t well as members of the general population. For rail shipments, the three general p (a) a railyard worker working at a distance of 10 meters (32.8 feet) from the shipp (b) a resident living 30 meters (98.4 feet) from the rail line where the shipping c transported, and (c) a resident living 200 meters (656.2 feet) from a rail stop whe was sitting for 20 hours. For train shipments, the maximum exposed transportation in a railyard who spent a time- and distance-weighted average of 0.16 hours inspect repairing railcars (Wooden 1986).

For offsite truck shipments, the three scenarios for the general population w in traffic and located 1 meter (3.28 feet) away from the surface of the shipping co (b) a resident living 30 meters (98.4 feet) from the highway used to transport the service station worker working at a distance of 20 meters (65.6 feet) from the ship The hypothetical maximum exposed individual radiological doses were accumulated ove However, for the situation involving an individual caught in traffic next to a truc were calculated for only one event because it was considered unlikely that the same caught in traffic next to all containers for all shipments. For truck shipments, t transportation worker is the driver who was assumed to drive shipments for up to 2,

## I-4.2 Results of Calculations

This section summarizes the results of the incident-free transportation analy that occur outside the boundaries of U.S. Department of Energy sites (offsite). Th the impacts of SNF shipments within the boundaries of DOE sites (onsite). Onsite t addressed in site-specific Appendices A, B, C, D, and F of this EIS.

This section includes the impacts of offsite transport of naval-type SNF stor Processing Plant as of June 1995 to storage locations at other DOE sites, as identi Shipments of naval SNF and test specimens are addressed in Appendix D of Volume 1 o

### I-4.2.1 Impacts from the No Action Alternative

Under the No Action alternative, the only offsite transport of SNF involves s and test specimens. These shipments are addressed in Appendix D of Volume 1 of thi

### I-4.2.2 Impacts from the Decentralization Alternative

For the Decentralization alternative, the incident-free transportation of SNF

0.11 to 0.34 fatalities over the 40-year period 1995 through 2035 (see Table I-6 ). fatalities were the sum of the estimated number of radiation-related latent cancer number of nonradiological fatalities from vehicular emissions. A range of fataliti option of using truck or rail transport for SNF shipments.

The estimated number of radiation-related latent cancer fatalities for transp from 0.023 to 0.082. The estimated number of radiation-related latent cancer fatal population ranged from 0.041 to 0.24. The estimated number of nonradiological fata emissions ranged from 0.017 to 0.044.

### I-4.2.3 Impacts from the 1992/1993 Planning Basis Alternative

For the 1992/1993 Planning Basis alternative, the incident-free transportatio to result in total fatalities that ranged from 0.11 to 0.42 over the 40-year period Table I-7). These fatalities were the sum of the estimated number of radiation-rel and the estimated number of nonradiological

Table I-6. Cumulative doses and health effects from incident-free transportation o alternative (1995 to 2035).

| | Spent nuclear f | | | |
|---|---|---|---|---|
| | Universitya | | Foreignb | |
| | Truck | Rail | Truck | R |
| Occupational | | | | |
| Maximum individual dose (rem) | 48 | 1.8 | 93 | 3 |
| Collective dose (person-rem) | 59 | 16 | 130 | 3 |
| Estimated latent cancer fatalities | 0.024 | 0.0064 | 0.052 | 0 |
| General population | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | 1 |
| Collective dose (person-rem) | 140 | 29 | 310 | 4 |
| Estimated latent cancer fatalities | 0.070 | 0.015 | 0.16 | 0 |
| Estimated nonradiological fatalities | 0.0050 | 0.012 | 0.010 | 0 |

a. Maheras (1995a).

b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen fatalities.

Table I-7. Cumulative doses and health effects from incident-free transportation o Basis alternative (1995 to 2035).

| | Spent nuclear fuel type | | | | |
|---|---|---|---|---|---|
| | Universitya | | Foreignb | | |
| | Truck | Rail | Truck | Rail | Tr |
| Occupational | | | | | |
| Maximum individual dose (rem) | 37 | 1.8 | 71 | 3.4 | 52 |
| Collective dose (person-rem) | 59 | 16 | 130 | 37 | 66 |
| Estimated latent cancer fatalities | 0.024 | 0.0064 | 0.052 | 0.015 | 0. |
| General population | | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | 1.7 | 0. |

| | | | | | |
|---|---|---|---|---|---|
| Collective dose (person-rem) | 140 | 29 | 310 | 43 | 14 |
| Estimated latent cancer fatalities | 0.070 | 0.015 | 0.16 | 0.022 | 0. |
| Estimated nonradiological fatalities | 0.0050 | 0.012 | 0.010 | 0.027 | 0. |

a. Maheras (1995a).

b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen fatalities.

fatalities from vehicular emissions. Again, a range of fatalities occurred because or rail transport for SNF shipments.

The estimated number of radiation-related latent cancer fatalities for transp from 0.024 to 0.10. The estimated number of radiation-related latent cancer fatali population ranged from 0.043 to 0.30. The estimated number of nonradiological fata emissions ranged from 0.020 to 0.046.

## I-4.2.4 Impacts from the Regionalization Alternative

### I-4.2.4.1 Impacts from Regionalization by Fuel Type. For the Regionalization by Fuel

Type, the incident-free transportation of SNF was estimated to result in total fata to 0.58 over the 40-year period 1995 through 2035 (see Table I-8 ). These fataliti estimated number of radiation-related latent cancer fatalities and the estimated nu fatalities from vehicular emissions. The reason for a range of fatalities was beca truck or rail transport for SNF shipments.

The estimated number of radiation-related latent cancer fatalities for transp from 0.026 to 0.14. The estimated number of radiation-related latent cancer fatali population ranged from 0.053 to 0.41. The estimated number of nonradiological fata emissions ranged from 0.027 to 0.059.

### I-4.2.4.2 Impacts from Regionalization by Geography. For the six Regionalization by

Geography alternatives, the incident-free transportation of SNF was estimated to re ranged from 0.10 for regionalization at the Idaho National Engineering Laboratory a Reservation to 0.85 for regionalization at the Nevada Test Site and the Oak Ridge R 9 through I-14). These fatalities were over the 40-year period 1995 through 2035 a estimated number of radiation-related latent cancer fatalities and the estimated nu fatalities from vehicular emissions.

The reason for a range of fatalities was because of two factors: (a) the opt transport for SNF shipments, and (b) the six regionalization by geography alternati

For regionalization at the Idaho National Engineering Laboratory and Oak Ridg estimated number of radiation-related latent cancer fatalities for transportation w estimated number of radiation-related latent cancer fatalities for the general popu estimated number of nonradiological fatalities from vehicular emissions was 0.034.

For regionalization at the Nevada Test Site and the Oak Ridge Reservation, th radiation-related latent cancer fatalities for transportation workers was 0.20. Th

Table I-8. Cumulative doses and health effects from incident-free transportation o Fuel Type (1995 to 2035).

| | Spent nuclear fu | | | | |
|---|---|---|---|---|---|
| | Universitya | | Foreignb | | |
| | Truck | Rail | Truck | Rail | T |
| Occupational | | | | | |
| Maximum individual dose (rem) | 27 | 1.8 | 52 | 3.4 | 8 |
| Collective dose (person-rem) | 54 | 15 | 150 | 41 | 1 |
| Estimated latent cancer fatalities | 0.022 | 0.0060 | 0.060 | 0.016 | 0 |
| General population | | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | 1.7 | 0 |
| Collective dose (person-rem) | 120 | 33 | 350 | 54 | 3 |
| Estimated latent cancer fatalities | 0.060 | 0.017 | 0.18 | 0.027 | 0 |
| Estimated nonradiological fatalities | 0.0051 | 0.014 | 0.012 | 0.037 | 0 |

a. Maheras (1995a).

b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen fatalities.

Table I-9. Cumulative doses and health effects from incident-free transportation o by Geography at the Hanford Site and Savannah River Site (1995 to 2035).

| | Spent nuclear | | | | |
|---|---|---|---|---|---|
| | Universitya | | Foreignb | | |
| | Truck | Rail | Truck | Rail | |
| Occupational | | | | | |
| Maximum individual dose (rem) | 20 | 1.8 | 38 | 3.4 | 10 |
| Collective dose (person-rem) | 60 | 17 | 99 | 31 | 15 |
| Estimated latent cancer fatalities | 0.024 | 0.0068 | 0.040 | 0.012 | 0. |
| General population | | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | 1.7 | 1. |
| Collective dose (person-rem) | 140 | 30 | 230 | 44 | 33 |
| Estimated latent cancer fatalities | 0.070 | 0.015 | 0.012 | 0.022 | 0. |
| Estimated nonradiological fatalities | 0.0050 | 0.012 | 0.0076 | 0.031 | 0. |

a. Maheras (1995a).

b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen fatalities.

Table I-10. Cumulative doses and health effects from incident-free transportation by Geography at the Idaho National Engineering Laboratory and Savannah River Site (

Spent nuclear fu

| | Universitya | | Foreignb | | |
|---|---|---|---|---|---|
| | Truck | Rail | Truck | Rail | Tr |
| Occupational | | | | | |
| Maximum individual dose (rem) | 21 | 1.8 | 40 | | |
| Collective dose (person-rem) | 54 | 15 | 100 | | |
| Estimated latent cancer fatalities | 0.022 | 0.0060 | 0.040 | | |
| General population | | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | | |
| Collective dose (person-rem) | 120 | 28 | 230 | | |
| Estimated latent cancer fatalities | 0.060 | 0.014 | 0.12 | | |
| Estimated nonradiological fatalities | 0.0046 | 0.011 | 0.0081 | | |

a. Maheras (1995a).

b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research
River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen
fatalities.

Table I-11. Cumulative doses and health effects from incident-free transportation
by Geography at the Nevada Test Site and Savannah River Site (1995 to 2035).

| | Spent nuclear fue | | | |
|---|---|---|---|---|
| | Universitya | | Foreignb | |
| | Truck | Rail | Truck | Rail |
| Occupational | | | | |
| Maximum individual dose (rem) | 14 | 1.8 | 27 | 3.4 |
| Collective dose (person-rem) | 56 | 17 | 110 | 31 |
| Estimated latent cancer fatalities | 0.022 | 0.0068 | 0.044 | 0.012 |
| General population | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | 1.7 |
| Collective dose (person-rem) | 130 | 29 | 250 | 45 |
| Estimated latent cancer fatalities | 0.065 | 0.015 | 0.13 | 0.023 |
| Estimated nonradiological fatalities | 0.0053 | 0.012 | 0.0076 | 0.031 |

a. Maheras (1995a).

b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research
River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen
fatalities.

Table I-12. Cumulative doses and health effects from incident-free transportation
by Geography at the Hanford Site and Oak Ridge Reservation (1995 to 2035).

| | Spent nuclear fuel t | | | |
|---|---|---|---|---|
| | Universitya | | Foreignb | |

| | Truck | Rail | Truck | Rail | Tr |
|---|---|---|---|---|---|
| Occupational | | | | | |
| Maximum individual dose (rem) | 17 | 1.8 | 32 | 3.4 | 11 |
| Collective dose (person-rem) | 56 | 16 | 94 | 29 | 17 |
| Estimated latent cancer fatalities | 0.022 | 0.0064 | 0.038 | 0.012 | 0. |
| General population | | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | 1.7 | 1. |
| Collective dose (person-rem) | 130 | 26 | 220 | 33 | 39 |
| Estimated latent cancer fatalities | 0.065 | 0.013 | 0.11 | 0.017 | 0. |
| Estimated nonradiological fatalities | 0.0049 | 0.0087 | 0.0066 | 0.020 | 0. |

a. Maheras (1995a).

b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen fatalities.

Table I-13. Cumulative doses and health effects from incident-free transportation by Geography at the Idaho National Engineering Laboratory and Oak Ridge Reservation

| | Spent nuclear fuel ty | | | | |
|---|---|---|---|---|---|
| | Universitya | | Foreignb | | |
| | Truck | Rail | Truck | Rail | T |
| Occupational | | | | | |
| Maximum individual dose (rem) | 17 | 1.8 | 34 | 3.4 | 1 |
| Collective dose (person-rem) | 50 | 15 | 95 | 29 | 1 |
| Estimated latent cancer fatalitie | 0.020 | 0.0060 | 0.038 | 0.012 | 0 |
| General population | | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | 1.7 | 1 |
| Collective dose (person-rem) | 110 | 23 | 220 | 30 | 3 |
| Estimated latent cancer fatalitie | 0.055 | 0.012 | 0.11 | 0.015 | 0 |
| Estimated nonradiological fatalit | 0.0046 | 0.0077 | 0.0071 | 0.017 | 0 |

a. Maheras (1995a).
b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen fatalities.

Table I-14. Cumulative doses and health effects from incident-free transportation by Geography at the Nevada Test Site and Oak Ridge Reservation (1995 to 2035).

| | Spent nuclear fu | | | | |
|---|---|---|---|---|---|
| | Universitya | | Foreignb | | |
| | Truck | Rail | Truck | Rail | Tr |

| | | | | | |
|---|---|---|---|---|---|
| Occupational | | | | | |
| Maximum individual dose (rem) | 12 | 1.8 | 24 | 3.4 | 12 |
| Collective dose (person-rem) | 52 | 16 | 100 | 29 | 36 |
| Estimated latent cancer fatalities | 0.021 | 0.0064 | 0.040 | 0.012 | 0. |
| General population | | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | 1.7 | 2. |
| Collective dose (person-rem) | 120 | 25 | 240 | 33 | 84 |
| Estimated latent cancer fatalities | 0.060 | 0.013 | 0.12 | 0.017 | 0. |
| Estimated nonradiological fatalities | 0.0052 | 0.0083 | 0.0066 | 0.021 | 0. |

a. Maheras (1995a).

b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen fatalities.

number of radiation-related latent cancer fatalities for the general population was number of nonradiological fatalities from vehicular emissions was 0.054.

## I-4.2.5 Impacts from the Centralization Alternatives

For the five Centralization alternatives, the incident-free transportation of estimated to result in total fatalities that ranged from 0.16 for centralization at 1.7 for centralization at the Savannah River Site (see Tables I-15 through I-19). the 40-year period 1995 through 2035 and were the sum of the estimated number of ra cancer fatalities and the estimated number of nonradiological fatalities from vehic

The reason for a range of fatalities was because of two factors: (a) the opt transport for SNF shipment and (b) the five Centralization options.

For centralization at the Oak Ridge Reservation, the estimated number of radi cancer fatalities for transportation workers was 0.042. The estimated number of ra cancer fatalities for the general population was 0.067. The estimated number of no from vehicular emissions was 0.055.

For centralization at the Savannah River Site, the estimated number of radiat fatalities for transportation workers was 0.42. The estimated number of radiation- fatalities for the general population was 1.2. The estimated number of nonradiolog vehicular emissions was 0.074.

## I-4.2.6 Impacts of Using Alternate Points of Entry for Foreign Research Reactor Spent

Nuclear Fuel Shipments

For incident-free transportation (radiological and vehicle-related), shipment Florida, and Wilmington, North Carolina, to the Hanford Site, Idaho National Engine Savannah River Site, Oak Ridge Reservation, and Nevada Test Site would yield lower shipments from Charleston, South Carolina, Galveston, Texas, Hampton Roads, Virgini Georgia, and the Military Ocean Terminal, Sunny Point, North Carolina, to these sam Table I-15. Cumulative doses and health effects from incident-free transportation the Hanford Site alternative (1995 to 2035).

| | Spent nuclear fuel t | |
|---|---|---|
| | Universitya | Foreignb |

| | Truck | Rail | Truck | Rail | Tr |
|---|---|---|---|---|---|
| Occupational | | | | | |
| Maximum individual dose (rem) | 16 | 1.8 | 32 | 3.4 | 11 |
| Collective dose (person-rem) | 100 | 26 | 220 | 56 | 43 |
| Estimated latent cancer fatalities | 0.040 | 0.010 | 0.088 | 0.022 | 0. |
| General population | | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | 1.7 | 1. |
| Collective dose (person-rem) | 250 | 38 | 560 | 56 | 99 |
| Estimated latent cancer fatalities | 0.13 | 0.019 | 0.28 | 0.028 | 0. |
| Estimated nonradiological fatalities | 0.0057 | 0.014 | 0.016 | 0.035 | 0. |

a. Maheras (1995a).

b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen fatalities.

Table I-16. Cumulative doses and health effects from incident-free transportation the Idaho National Engineering Laboratory alternative (1995 to 2035).

| | Spent nuclear fuel typ | | | | |
|---|---|---|---|---|---|
| | Universitya | | Foreignb | | |
| | Truck | Rail | Truck | Rail | Tru |
| Occupational | | | | | |
| Maximum individual dose (rem) | 17 | 1.8 | 33 | 3.4 | 11 |
| Collective dose (person-rem) | 86 | 22 | 190 | 49 | 38 |
| Estimated latent cancer fatalities | 0.034 | 0.0088 | 0.076 | 0.020 | 0. |
| General population | | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | 1.7 | 1. |
| Collective dose (person-rem) | 210 | 33 | 490 | 49 | 88 |
| Estimated latent cancer fatalities | 0.11 | 0.017 | 0.25 | 0.025 | 0. |
| Estimated nonradiological fatalities | 0.0049 | 0.012 | 0.015 | 0.031 | 0. |

a. Maheras (1995a).

b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen fatalities.

Table I-17. Cumulative doses and health effects from incident-free transportation at the Savannah River Site alternative (1995 to 2035).

| | Spent nuclear fuel | | | | |
|---|---|---|---|---|---|
| | Universitya | | Foreignb | | |
| | Truck | Rail | Truck | Rail | Tru |

| | | | | | |
|---|---|---|---|---|---|
| Occupational | | | | | |
| Maximum individual dose (rem) | 14 | 1.8 | 27 | 3.4 | 120 |
| Collective dose (person-rem) | 53 | 15 | 140 | 40 | 840 |
| Estimated latent cancer fatalities | 0.021 | 0.006 | 0.056 | 0.016 | 0.3 |
| General population | | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | 1.7 | 1.8 |
| Collective dose (person-rem) | 110 | 34 | 330 | 54 | 190 |
| Estimated latent cancer fatalities | 0.055 | 0.017 | 0.17 | 0.027 | 0.9 |
| Estimated nonradiological fatalities | 0.0050 | 0.014 | 0.012 | 0.037 | 0.0 |

a. Maheras (1995a).

b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen fatalities.

Table I-18. Cumulative doses and health effects from incident-free transportation the Oak Ridge Reservation alternative (1995 to 2035).

| | Spent nuclear fuel type | | | | |
|---|---|---|---|---|---|
| | Universitya | | Foreignb | | |
| | Truck | Rail | Truck | Rail | T |
| Occupational | | | | | |
| Maximum individual dose (rem) | 12 | 1.8 | 24 | 3.4 | 1 |
| Collective dose (person-rem) | 42 | 13 | 130 | 36 | 7 |
| Estimated latent cancer fatalities | 0.017 | 0.0052 | 0.052 | 0.014 | 0 |
| General population | | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | 1.7 | 2 |
| Collective dose (person-rem) | 91 | 25 | 310 | 39 | 1 |
| Estimated latent cancer fatalities | 0.046 | 0.013 | 0.16 | 0.02 | 0 |
| Estimated nonradiological fatalities | 0.0042 | 0.0091 | 0.0097 | 0.023 | 0 |

a. Maheras (1995a).

b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen fatalities.

Table I-19. Cumulative doses and health effects from incident-free transportation Nevada Test Site alternative (1995 to 2035).

| | Spent nuclear fuel type | | | | |
|---|---|---|---|---|---|
| | Universitya | | Foreignb | | |
| | Truck | Rail | Truck | Rail | Tr |
| Occupational | | | | | |
| Maximum individual dose (rem) | 12 | 1.8 | 24 | 3.4 | |
| Collective dose (person-rem) | 94 | 25 | 230 | 54 | |

| | | | | |
|---|---|---|---|---|
| Estimated latent cancer fatalities | 0.038 | 0.010 | 0.092 | 0.022 |
| General population | | | | |
| Maximum individual dose (rem) | 0.21 | 0.87 | 0.41 | 1.7 |
| Collective dose (person-rem) | 230 | 37 | 540 | 56 |
| Estimated latent cancer fatalities | 0.12 | 0.019 | 0.27 | 0.028 |
| Estimated nonradiological fatalities | 0.0066 | 0.013 | 0.016 | 0.037 |

a. Maheras (1995a).

b. Maheras (1995b).

c. Maheras (1995c).

d. DOE SNF includes special-case commercial, DOE research, other domestic research River production reactor SNF (see Tables I-2, I-3).

e. Occupational incident-free nonradiological fatalities are included with the gen fatalities.

# I-5 SPENT NUCLEAR FUEL TRANSPORTATION ACCIDENT RISKS AND MAXIMUM REASONABLY FORESEEABLE CONSEQUENCES

## I-5.1 Methodology

The offsite SNF transportation accident analysis considers the impacts of acc transportation of SNF by truck or rail. SNF is transported in specially designed c Department of Transportation and U.S. Nuclear Regulatory Commission Type B packagin 10 CFR Part 71 (CFR 1994b).

Under accident conditions, impacts to human health and the environment may re and dispersal of radioactive material. Because of the rigorous design specificatio the U.S. Nuclear Regulatory Commission has estimated that casks will withstand 99.4 accidents without sustaining damage sufficient to breach the cask (Fischer et al. 1 accidents that could potentially breach the cask are represented by a spectrum of a radioactive release conditions. Accident analysis methodology has been developed b Regulatory Commission for calculating the probabilities and consequences from this accidents, but it is not possible to predict where along the shipping route such ac

To provide DOE and the public a reasonable assessment of SNF transportation a types of analyses were performed. First, an accident risk assessment was performed the probabilities and consequences of a spectrum of accident severities using metho U.S. Nuclear Regulatory Commission (Fischer et al. 1987). The accident risk assess information for accident rates and population densities. For the spectrum of accid analysis, accident consequences in terms of collective dose to the population withi were multiplied by the accident probabilities to yield dose risk using the RADTRAN Second, to represent the maximum reasonably foreseeable impacts to individuals and accident occur, radiological consequences were calculated for an accident of maximu severity in each population zone. An accident is considered reasonably foreseeable

occurrence is greater than 1 10-7 per year. The accident consequence assessment f individuals and population groups was performed using the RISKIND computer code.

An important variable in the assessment of impacts from SNF transportation ac SNF. A wide range of SNF types exists within the DOE complex with significant diff material content, fuel material design, cladding design, reactor operating history, history. These differences among SNF types translate into different radioactive ma characteristics under accident conditions. To account for the variation in SNF typ for the following representative SNF types: (a) naval reactor fuels, (b) Savannah fuels, (c) Hanford N-Reactor fuels, (d) graphite fuels, (e) special-case commercial research/test reactor fuels, (g) DOE research/test reactor fuels, (h) foreign resea DOE research reactor fuels.

The impacts for specific alternatives were calculated in units of dose (perso and destination pair associated with each representative SNF type. The impacts are health risks in terms of latent cancer fatalities in exposed populations. The hea used were derived from International Commission on Radiological Protection Publicat

### I-5.1.1 Accident Rates

For calculating accident shipment-risk factors, state-level accident rates we provided in Saricks and Kvitek (1994) for rail and heavy combination trucks. For t separate accident rates were used for rural, suburban, and urban population density average accident rate was used for each state for rail transportation. For truck t risks were based on state-level rates for interstate highways in urban and rural ar 1994). Accident fatality risks for rail transportation were calculated using a nat 10-8 fatalities per rail-kilometer (Cashwell et al. 1986).

### I-5.1.2 Accident Severity Categories and Conditional Probabilities

Accident severity categories for potential SNF transportation accidents are d Nuclear Regulatory Commission report commonly referred to as the Modal Study (Fisch Modal Study classification scheme for both truck and rail transportation is shown i described as a function of the magnitudes of the mechanical forces (impact) and the a cask may be subjected during an accident. Because all accidents can be described independent of the specific accident sequence. In other words, any sequence of eve accident in which a cask is subjected to forces within a certain range of values is severity category associated with that range. The accident severity scheme is desi reasonably foreseeable transportation accidents, including accidents with low proba consequences and those with high probability but low consequences.

The severity category matrix represents a set of scenarios defined by a combi and thermal forces. A conditional probability is assigned in each category as show example, Category R(1,1) accidents are the least severe but most frequent, whereas accidents are very severe but very infrequent. To determine the expected frequency the conditional probability in each category was multiplied by the baseline acciden density zone has a distinct baseline accident rate and distribution

Figure I-1. Matrix of cask response regions for combined mechanical and thermal

Figure I-2. Fraction of truck and rail accidents expected within each severity c

of accident severities related to differences in average vehicle velocity, traffic including rural, suburban, or urban location.

For the accident risk assessment, accident risk was generically defined as th accident multiplied by the probability of the occurrence of that accident, an appro methodology suggested by the existing RADTRAN computer code. Accident unit-risk fa calculated using the RADTRAN 4 computer code, then summed over the accident conditi and route characteristics for the origin and destination pairs to yield risk per sh accident risk factors take into account the entire spectrum of reasonably foreseeab including low probability accidents that have high consequences and high probabilit consequences.

For the maximum reasonably foreseeable accident consequence assessment, the d for populations and individuals assuming the most severe accident scenario with a p

1 X 10^-7 per year. In terms of the radioactivity released to the environment, the foreseeable accident is represented by eight accident severity categories [R(4,1) t through R(3,5)]. Each of the eight most severe accident categories result in the s radioactive material, but the conditional probabilities of occurrence vary. Theref consequence assessment is based on a maximum reasonably foreseeable release of radi conditional probability that is the sum of the conditional probabilities of the eig categories. Accidents of this severity are extremely rare, occurring approximately 10,000 rail accidents involving a SNF shipment.

### I-5.1.3 Atmospheric Conditions

Because it is impossible to predict the specific location of an offsite trans atmospheric conditions were selected for the risk and consequence assessments. For assessment, neutral weather conditions (Pasquill Stability Class D) were assumed. conditions are typified by moderate windspeeds, vertical mixing within the atmosphe of atmospheric contaminants. Because neutral meteorological conditions compose the occurring atmospheric stability condition in the United States, these conditions ar in the event of an accident involving a SNF shipment. On the basis of observations Service surface meteorological stations at over 300 locations in the United States, neutral conditions (Pasquill Class C and D) occur 50 percent of the time, while sta F) and unstable (Pasquill Class A and B) conditions occur 33 percent and 17 percent (Doty et al. 1976). The neutral category predominates in all seasons, but most fre (nearly 60 percent of the observations). For the accident consequence assessment, both neutral (Class D with 4 meters per second windspeed) and stable (Class F with windspeed) atmospheric conditions. Stable weather conditions are typified by low w vertical mixing within the atmosphere, and poor dispersion of atmospheric contamina meteorology in combination with windspeeds of 1 meter per second generally occur no the time. Results calculated for neutral conditions represent the most likely cons stable conditions represent a worst-case weather situation.

### I-5.1.4 Population Density Zones

Three population density zones (rural, suburban, and urban) were used for the assessment. These zones respectively correspond to mean population densities of 6, per square kilometer. The three population density zones are based on an aggregati density zones provided in the HIGHWAY and INTERLINE output. For calculating, popul information was generated at the state level and used as RADTRAN input for the orig

### I-5.1.5 Exposure Pathways

Radiological doses were calculated for an individual located near the scene o populations within 50 miles (80 kilometers) of the accident. Rural, suburban, and were assessed. Dose calculations considered a variety of exposure pathways, includ exposure (cloudshine) from the passing cloud, ingestion from contaminated crops, di (groundshine) from radioactivity deposited on the ground, and inhalation of resuspe from the ground.

### I-5.1.6 Health Risk Conversion Factors

The health risk conversion factors used to estimate expected latent cancer fa exposures were derived from International Commission on Radiological Protection Pub 1991): 5.0 10-4 and 4.0 10-4 latent fatal cancer cases per person-rem for membe

workers, respectively.

## I-5.2 Spent Nuclear Fuel Characterization and

Radioactive Release Characteristics

### I-5.2.1 Characterization of Representative Spent Nuclear Fuel Types

Shipments of naval reactor SNF are addressed in Appendix D of Volume 1 of thi exception of naval-type SNF that has been transferred from the U.S. Navy to the DOE storage at the Idaho National Engineering Laboratory Idaho Chemical Processing Plan data for naval-type SNF were derived from Appendix D of Volume 1 of this EIS.

Savannah River Site production reactor SNF was assumed to include both the sp to power the production reactors, as well as the quantities of irradiated plutonium storage at the Savannah River Site. Spent driver fuel stored at the Savannah River tritium and plutonium production. Analysis of these two fuel types showed that typ SNF contains a higher fission product and transuranic inventory than plutonium prod the characteristics of typical irradiated plutonium target material also showed tha would be bounded by the inventory in spent tritium production driver fuel. Therefo both spent driver fuel and irradiated plutonium target material at the Savannah Riv have the characteristics of spent tritium production driver fuel. Table I-20 shows developed to represent Savannah River Site production reactor SNF based on publishe 1991; WSRC 1990).

Characterization data for Hanford N-Reactor SNF were based on Mark IA fuel ir average burnup of 3,000 megawatt-days per metric ton uranium and assuming a 10-year removal from the reactor. The 10-year cooling time is conservative because the Han operated in 1987 and SNF of this type is expected to be at least 10 years old by th begin. Table I-21 shows the radionuclide inventory used to represent Hanford N-Rea

Most of the graphite SNF under the responsibility of the DOE is from the Fort owned by Public Service of Colorado. Some Fort St. Vrain SNF is already in storage Engineering Laboratory, but most SNF is still in storage at the Fort St. Vrain site DOE facility. In addition to the Fort St. Vrain SNF, smaller amounts of other grap storage at the Idaho National Engineering Laboratory. Characteristics for graphite on Fort St. Vrain SNF. Table I-22 shows the radionuclide inventory used to represe based on six Fort St. Vrain fuel blocks irradiated to an average burnup of 70,000 m ton uranium and assuming a cooling time of 1,600 days (Block 1993). The 1,600-day cooling time is conservative because the Fort St. Vrain reactor was shut down in Au will not be made before June 1995.

SNF from various commercial reactors is currently in storage at various DOE s Idaho National Engineering Laboratory. Special-case commercial SNF currently in st National Engineering Laboratory includes core debris from the damaged Three Mile Is Commercial SNF includes both boiling water reactor and pressurized water reactor SN reactor SNF was chosen as most representative because it is most prevalent and typi levels of radioactivity (Fischer et al. 1987). Table I-23 shows the radionuclide i commercial SNF based on one pressurized water reactor fuel assembly irradiated to a 33,000 megawatt-days per metric ton uranium and assuming a cooling time of 10 years The 10-year cooling time is conservative because the majority of special-case comme storage at DOE sites will be at least 10 years old by June 1995.

Table I-20. Radionuclide inventory for representative Savannah River Site producti fuel.(a)

| Isotope | Inventory (curie) |
|---|---|
| H-3 | $1.21 \times 10^1$ |
| Kr-85 | $2.62 \times 10^2$ |

| | |
|---|---|
| Sr-90 | 3.21 X 10^3 |
| Y-90 | 3.21 X 10^3 |
| Ru-106 | 7.64 X 10^0 |
| Rh-106 | 7.64 X 10^0 |
| Cs-134 | 1.48 X 10^2 |
| Cs-137 | 3.18 X 10^3 |
| Ba-137m | 3.01 X 10^3 |
| Ce-144 | 1.51 X 10^1 |
| Pr-144 | 1.51 X 10^1 |
| Pm-147 | 1.07 X 10^2 |
| Pu-238 | 6.84 X 10^1 |
| Pu-239 | 7.69 X 10^-1 |
| Pu-240 | 5.23 X 10^-1 |
| Pu-241 | 9.52 X 10^1 |
| Am-241 | 1.97 X 10^0 |

a. Inventory based on one fuel assembly from a tritium producing charge, 10 years

Table I-21. Radionuclide inventory for representative Hanford N-Reactor spent nucl

| Isotope | Inventory (curie per metric ton uranium) |
|---|---|
| H-3 | 3.09 X 10^1 |
| Kr-85 | 5.89 X 10^2 |
| Sr-90 | 6.80 X 10^3 |
| Y-90 | 6.80 X 10^3 |
| Ru-106 | 5.56 X 10^1 |
| Sb-125 | 1.26 X 10^2 |
| Cs-134 | 1.49 X 10^2 |
| Cs-137 | 8.39 X 10^3 |
| Ba-137m | 7.94 X 10^3 |
| Ce-144 | 3.24 X 10^1 |
| Pm-147 | 2.24 X 10^3 |
| Pu-238 | 5.06 X 10^1 |
| Pu-239 | 1.10 X 10^2 |
| Pu-240 | 5.97 X 10^1 |
| Pu-241 | 4.47 X 10^3 |
| Am-241 | 9.33 X 10^1 |

a. Inventory based on Mark IA N-Reactor fuel, 10 years cooling out of reactor, ave megawatt-days per metric ton uranium.

Table I-22. Radionuclide inventory for representative graphite reactor spent nucle

| Isotope | Inventory (curie) |
|---|---|
| Kr-85 | 2.35 X 10^3 |
| Sr-90 | 1.57 X 10^4 |
| Rh-106 | 5.94 X 10^2 |
| Ru-106 | 5.94 X 10^2 |
| Sb-125 | 3.36 X 10^2 |
| Cs-134 | 7.45 X 10^3 |
| Cs-137 | 1.65 X 10^4 |
| Ce-144 | 3.77 X 10^3 |
| Pr-144 | 3.77 X 10^3 |
| Pm-147 | 6.32 X 10^3 |
| Sm-151 | 5.4 X 10^1 |
| Eu-154 | 9.48 X 10^2 |
| Eu-155 | 1.38 X 10^2 |
| U-232 | 1.8 X 10^1 |
| U-233 | 2.4 X 10^1 |
| Pu-238 | 4.20 X 10^2 |

| | |
|---|---|
| Pu-241 | 3.06 X 10^2 |

a. Inventory based on six Fort St. Vrain fuel blocks, 1600 days cooling out of rea
70,000 megawatt-days per metric ton uranium.

Table I-23. Radionuclide inventory for representative special-case commercial spen

| Isotope | Inventory (curie) |
|---|---|
| Co-60 | 6.28 X 10^2 |
| Kr-85 | 2.23 X 10^3 |
| Sr-90 | 2.75 X 10^4 |
| Y-90 | 2.73 X 10^4 |
| Ru-106 | 2.52 X 10^2 |
| I-129 | 1.48 X 10^-2 |
| Cs-134 | 4.85 X 10^3 |
| Cs-137 | 3.85 X 10^4 |
| Ba-137m | 3.62 X 10^4 |
| Ce-144 | 9.01 X 10^1 |
| Pu-238 | 1.36 X 10^3 |
| Pu-239 | 1.67 X 10^2 |
| Pu-240 | 2.06 X 10^2 |
| Pu-241 | 4.32 X 10^4 |
| Am-241 | 9.66 X 10^2 |
| Cm-244 | 6.90 X 10^2 |

a. Inventory based on one pressurized water reactor fuel assembly, 10 years coolin
burnup 33,000 megawatt-days per metric ton uranium.

Domestic university research and test reactors represent a variety of reactor
High-enriched training, research, and isotope reactor (TRIGA) SNF was chosen as rep
university reactor SNF because it is one of the largest groups of university SNF to
it is a rod-type fuel that would be expected to have the highest release of fission
accident conditions. The radionuclide inventory of high-enriched TRIGA fuel was ca
ORIGEN2 computer code (Croff 1980) assuming a 17-year reactor operating cycle based
Texas A&M University TRIGA reactor. To facilitate the modeling of accident consequ
radionuclide inventory generated by the ORIGEN2 program was truncated to eliminate
dose. The radionuclides eliminated accounted for less than 1 percent of the total
available in Enyeart (1995). Table I-24 shows the radionuclide inventory represent
research and test reactor SNF based on 19 TRIGA fuel rods irradiated to an average
and assuming a cooling time of 1 year.

DOE research and test reactors are also represented by a variety of reactor t
Experimental Breeder Reactor-II Mark-V SNF was chosen as representative of DOE rese
reactors because the reactor at the Idaho National Engineering Laboratory is one of
test reactors still operating. Mark-V fuel is the current generation of Experiment
types. The high plutonium content of Mark-V fuel increases the relative hazard of
compared to other DOE SNF types. The radionuclide inventory of the Mark-V fuel was
ORIGEN2 computer code assuming a typical Experimental Breeder Reactor-II operating
the modeling of accident consequences, the radionuclide inventory generated by the
truncated to eliminate minor contributors to dose. The radionuclides eliminated ac
percent of the total dose. Additional details are available in Enyeart (1995). Ta
radionuclide inventory representative of DOE research and test reactor SNF based on
assembly irradiated to a burnup of 7.88 percent and assuming a cooling time of 1 ye

Foreign research and test reactors use a number of different fuel designs. D
characteristics of foreign research reactor SNF types in a separate EIS on a Propos
Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. Ba
a shipment of 40 TRIGA-type SNF elements was determined to result in the highest po
radioactivity in the event of an accident. To provide a bounding analysis for this
SNF was selected as representative of all foreign research reactor SNF. To facilit
consequences, the radionuclide inventory generated by the ORIGEN2 program was trunc
minor contributors to dose. The radionuclides eliminated accounted for less than 1
The radionuclide inventory of a single shipping cask, shown in Table I-26, is based
period of 3 years, with a burnup of 31 grams of uranium-235 per fuel element, follo

of 1 year.

Table I-24. Radionuclide inventory for representative university research/test rea

| Isotope | Inventory (curie) | Isotope | Inventory (curie) |
|---|---|---|---|
| H-3 | 3.25 X 10^0 | Cs-137 | 9.72 X 10^2 |
| Kr-85 | 8.60 X 10^1 | Ba-137M | 9.20 X 10^2 |
| Sr-89 | 4.28 X 10^1 | Ce-141 | 3.86 X 10^0 |
| Sr-90 | 9.30 X 10^2 | Ce-144 | 1.47 X 10^3 |
| Y-90 | 9.30 X 10^2 | Pr-144 | 1.47 X 10^3 |
| Y-91 | 9.77 X 10^1 | Pm-147 | 8.81 X 10^2 |
| Zr-95 | 1.48 X 10^2 | U-235 | 4.00 X 10^- |
| Nb-95 | 3.20 X 10^2 | U-236 | 5.50 X 10^- |
| Ru-103 | 7.47 X 10^0 | Pu-238 | 1.00 X 10^0 |
| Rh-103m | 6.74 X 10^0 | Pu-239 | 1.57 X 10^- |
| Ru-106 | 1.36 X 10^2 | Pu-240 | 6.70 X 10^- |
| Te-125m | 4.11 X 10^0 | Pu-241 | 5.88 X 10^0 |
| Te-127 | 2.08 X 10^0 | Am-241 | 4.57 X 10^- |
| Te-127m | 2.12 X 10^0 | Cm-242 | 1.81 X 10^- |
| Cs-134 | 1.10 X 10^2 | | |

a. Inventory based on 19 TRIGA fuel rods (70 percent enrichment; 122 g/rod uranium life), 1 year cooling out of reactor, 20.2 percent average burnup.

Table I-25. Radionuclide inventory for representative DOE research/test reactor sp

| Isotope | Inventory (curie per assembly) | Isotope | Inventory (curie per a |
|---|---|---|---|
| H-3 | 7.98 X 10^0 | Te-127 | 3.32 X 10^1 |
| Mn-54 | 7.48 X 10^2 | Te-129m | 1.14 X 10^0 |
| Fe-55 | 6.12 X 10^2 | Cs-134 | 9.15 X 10^1 |
| Co-58 | 1.25 X 10^2 | Cs-137 | 1.04 X 10^3 |
| Co-60 | 3.55 X 10^0 | Ba-137m | 9.80 X 10^2 |
| Kr-85 | 9.75 X 10^1 | Ce-141 | 1.49 X 10^1 |
| Sr-89 | 1.45 X 10^2 | Ce-144 | 7.76 X 10^3 |
| Sr-90 | 7.23 X 10^2 | Pr-144m | 1.11 X 10^2 |
| Y-90 | 7.23 X 10^2 | Pr-144 | 7.76 X 10^3 |
| Y-91 | 3.67 X 10^2 | Pm-147 | 2.65 X 10^3 |
| Zr-95 | 7.00 X 10^2 | Sm-151 | 2.91 X 10^1 |
| Nb-95 | 1.52 X 10^3 | Eu-155 | 1.00 X 10^2 |
| Ru-103 | 4.88 X 10^1 | U-235 | 2.90 X 10^- |
| Rh-103m | 4.40 X 10^1 | U-236 | 3.34 X 10^- |
| Ru-106 | 3.65 X 10^3 | Pu-238 | 1.48 X 10^0 |
| Rh-106 | 3.65 X 10^3 | Pu-239 | 4.05 X 10^1 |
| Sn-123 | 2.48 X 10^1 | Pu-240 | 3.61 X 10^1 |
| Sb-125 | 1.21 X 10^2 | Pu-241 | 1.39 X 10^3 |
| Te-125m | 2.96 X 10^1 | Am-241 | 4.74 X 10^0 |
| Te-127m | 3.37 X 10^1 | | |

a. Inventory based on EBR-II Mark-V fuel, 1 year cooling out of reactor, total bur days.

Table I-26. Radionuclide inventory for representative foreign research/test reacto

| Isotope | Inventory (curie) | Isotope | Inventory (curie) |
|---|---|---|---|
| H-3 | 1.31 X 10^1 | Ce-141 | 6.97 X 10^2 |
| Kr-85 | 3.63 X 10^2 | Ce-144 | 2.55 X 10^4 |
| Sr-89 | 2.75 X 10^3 | Pr-144 | 2.55 X 10^4 |
| Sr-90 | 3.16 X 10^3 | Pm-147 | 7.02 X 10^3 |

| | | | |
|---|---|---|---|
| Y-90 | 3.16 X 10^3 | Pm-148m | 4.68 X 10^1 |
| Y-91 | 4.56 X 10^3 | Eu-154 | 4.18 X 10^1 |
| Zr-95 | 6.48 X 10^3 | Eu-155 | 2.27 X 10^1 |
| Nb-95 | 1.28 X 10^4 | U-234 | 1.81 X 10^- |
| Ru-103 | 8.44 X 10^2 | U-235 | 7.91 X 10^- |
| Rh-103m | 8.44 X 10^2 | U-238 | 6.51 X 10^- |
| Ru-106 | 2.54 X 10^3 | Pu-238 | 3.03 X 10^0 |
| Rh-106m | 2.54 X 10^3 | Pu-239 | 5.50 X 10^- |
| Sn-123 | 2.71 X 10^1 | Pu-240 | 2.09 X 10^0 |
| Sb-125 | 1.19 X 10^2 | Pu-241 | 2.13 X 10^2 |
| Te-125m | 2.87 X 10^1 | Am-241 | 4.07 X 10^- |
| Te-127m | 5.57 X 10^1 | Am-242m | 9.00 X 10^- |
| Te-129m | 2.31 X 10^1 | Am-243 | 4.38 X 10^- |
| Cs-134 | 1.16 X 10^3 | Cm-244 | 7.14 X 10^- |
| Cs-137 | 3.19 X 10^3 | Cm-242 | 5.25 X 10^0 |

a. Inventory based on 40 foreign TRIGA fuel elements, 1 year cooling out of reacto
31 grams uranium-235 per fuel element.

Non-DOE research reactor types are generally similar to domestic university researc
Therefore, TRIGA reactor SNF was also chosen as representative of non-DOE research

## I-5.2.2 Radioactive Release Characteristics

Radiological consequences were calculated by assigning cask release fractions severity category for each chemically and physically distinct radioisotope. The re the fraction of the radioactivity in the cask that could be released from the cask Release fractions vary according to SNF type and the physical/chemical properties o solid radionuclides in SNF are nonvolatile and are, therefore, relatively nondisper radionuclides, such as krypton-85, are relatively easy to release if the fuel cladd compromised.

Representative cask release fractions were developed for each of the represen U.S. Nuclear Regulatory Commission Modal Study developed release fractions for comm water reactor SNF. The Modal Study release fractions, shown in Table I-27, are bas judgment and are conservative for most SNF types. For this analysis, the release f the Modal Study were applied only to commercial pressurized-water reactor SNF and T which are rod-type fuels. Because of the significant differences in fuel designs a appropriate fuel-specific release characterization data, less conservative release other representative SNF types.

Release fractions for aluminum fuels (aluminum alloy fuel, aluminum cladding) laboratory measurements of release fractions from aluminum fuels at high temperatur and the U.S. Nuclear Regulatory Commission Modal Study (Fischer et al. 1987). Beca melting point of aluminum compared to metals used in other metallic fuels, the alum fractions are considered bounding for metallic fuels (that is, Savannah River Produ Reactor, and EBR-II Mark V SNF). Release fractions for the aluminum and other meta listed in Table I-28.

Release fractions for graphite fuels, specifically Fort St. Vrain SNF, were b analyses. Fort St. Vrain fuel is in the form of carbide particles, encased within ceramic coating. Stress analysis tests have shown that the fuel particles can with of those that might be encountered in severe accidents. Thermal diffusion across t extreme temperature conditions is the only significant mechanism for release of fis Fort St. Vrain fuel. Fuel particles that have failed during reactor operation (les inventory) are vulnerable to vaporization and impact-induced releases of particulat products would have been released within the extreme thermal environment of the ope 29 summarizes the release fractions applied to Fort St. Vrain SNF, assuming 1 perce reactor operations.

Table I-27. Release fractions for transportation accidents involving special-case research reactor spent nuclear fuel types for the U.S. Nuclear Regulatory Commissio

| | Release fractiona |
|---|---|

| Cask response region | Inert gas | Iodine | Cesium | Ruthenium | |
|---|---|---|---|---|---|
| R(1,1) | 0.0 | 0.0 | 0.0 | 0.0 | |
| R(1,2),R(1,3) | 9.9 10-3 | 7.5 10-5 | 6.0 10-6 | 8.1 10-7 | 6.0 |
| R(2,1),R(2,2),R(2,3) | 3.3 10-2 | 2.5 10-4 | 2.0 10-5 | 2.7 10-6 | 2.0 |
| R(1,4),R(2,4),R(3,4) | 3.9 10-1 | 4.3 10-3 | 2.0 10-4 | 4.8 10-5 | 2.0 |
| R(3,1),R(3,2),R(3,3) | 3.3 10-1 | 2.5 10-3 | 2.0 10-4 | 2.7 10-5 | 2.0 |
| 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 |

a. U.S. Nuclear Regulatory Commission Modal Study (Fischer et al. 1987).

Table I-28. Release fractions for transportation accidents involving aluminum and for the U.S. Nuclear Regulatory Commission Modal Study cask response regions.

| | Release fraction[b] | | | |
|---|---|---|---|---|
| Cask response region | Inert gas | Iodine | Cesium | Ruthenium |
| R(1,1) | 0.0 | 0.0 | 0.0 | 0.0 |
| R(1,2),R(1,3) | 9.9 10^-3 | 1.1 10^-7 | 3.0 10^-8 | 4.1 10^-9 |
| R(2,1),R(2,2),R(2,3) | 3.3 10^-2 | 3.5 10^-7 | 1.0 10^-7 | 1.4 10^-8 |
| R(1,4),R(2,4),R(3,4) | 3.9 10^-1 | 6.0 10^-6 | 1.0 10^-6 | 2.4 10^-7 |
| R(3,1),R(3,2),R(3,3) | 3.3 10^-1 | 3.5 10^-6 | 1.0 10^-6 | 1.4 10^-7 |
| R(1,5),R(2,5),R(3,5) (4,5),R(4,1),R(4,2), R(4,3),R(4,4) | 6.3 10^-1 | 6.0 10^-5 | 1.0 10^-5 | 2.4 10^-6 |

a. These release fractions are applicable to the following SNF types:
 1. N Reactor
 2. Savannah River Site production reactor
 3. DOE research/test reactor

b. Derived from Shibata et al. (1984) and U.S. Nuclear Regulatory Commission Modal

Table I-29. Release fractions for transportation accidents involving graphite spen Commission Modal Study cask response regions.

| | Release fraction | | | | |
|---|---|---|---|---|---|
| Cask response region | Inert gas[a] | Strontium, cerium[b] | Antimony[c] | Cesium[b] | |
| R(1,1) | 0.0 | 0.0 | 0.0 | 0.0 | |
| R(1,2),R(1,3),R(1,4),R (2,1),R(2,2),R(2,3),R(2 ,4),R(3,1),R(3,2),R ),R(3,4),R(4,1),R(4,2), R(4,3),R(4,4) | 5.3 10^-3 | 3.7 10^-7 | 1.0 10^-6 | 2.4 10^-7 | 7. |
| R(1,5),R(2,5),R(3,5 (4,5) | 1.2 10^-2 | 5.0 10^-6 | 1.0 10^-6 | 9.1 10^-6 | 7. |

a. Thermally induced, from NUREG/CR-0722, Table 40, all fuel (Lorenz et al. 1980).

b. Empirical data from the Fort St. Vrain Final Safety Analysis Report, Rev. 8, Ta

c. Thermally induced semivolatiles from incore failed fuel; 1 percent fuel failure from Lorenz et al. (1980).

d. Impact induced nonvolatiles, 1 percent incore failed fuel, 5 percent respirable Wilmot (1981).

## I-5.3 Results of Calculations

### I-5.3.1 Impacts from the No Action Alternative

There are no offsite shipments of DOE, university, foreign, or non-DOE resear this alternative. Consequently, there are no transportation accident impacts. The fuel shipments made under the No Action alternative are covered in Appendix D of Vo

### I-5.3.2 Impacts from the Decentralization Alternative

The SNF shipments included under this alternative are those of domestic unive non-DOE research reactor SNF to the Idaho National Engineering Laboratory and Savan Naval fuel shipments made under different options of the Decentralization alternati Appendix D of Volume 1 of this EIS. Shipments are expected to be made by truck, bu also assessed transportation by rail. The same shipping cask was assumed to be use shipments, and a single shipping cask was assumed for each shipment.

The cumulative accident risk for transportation by truck was calculated to be fatality and 0.15 traffic fatality. The cumulative accident risk measures the tota accidents over the entire shipment campaign (1995 to 2035). The cumulative acciden by rail was calculated to be 0.0003 latent cancer fatality and 0.21 traffic fatalit transportation accident risks for the Decentralization alternative.

As shown in Table I-31, the maximum reasonably foreseeable transportation acc probability of occurrence of about 1.6 10-7 per year for a suburban population zon (neutral) weather conditions, the total population dose is estimated to be about 14 be expected to result in less than one latent cancer fatality in the exposed popula same population would be expected to experience about 100,000 latent fatal cancers probability of this accident occurring in an urban population zone, or occurring un conditions in any population zone, is less than 1 10-7 per year.

### I-5.3.3 Impacts from the 1992/1993 Planning Basis Alternative

This alternative includes the transport of five types of SNF. It assumes tha currently in storage in Colorado is transported to the Idaho National Engineering L special-case commercial SNF currently stored at West Valley is transported to the I Engineering Laboratory. DOE research and test reactor SNF is transported to either Engineering Laboratory or Savannah River Site, with most going to the

Table I-30. SNF transportation accident risks for the Decentralization alternative

| Transport mode | Dose risk (person-rem) | Latent cancer fatalities(a |
|---|---|---|
| Truck | 1.7 | 0.0009 |
| Rail | 0.57 | 0.0003 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac impact.

Table I-31. Health effects from maximum reasonably foreseeable offsite SNF transpo

the Decentralization alternative (1995 to 2035).

Alternative: Decentralization
Maximum reasonably foreseeable accident: University research reactor SNF shipment
Population zone: Suburbana
Maximum reasonably foreseeable accident probability: 1.6 10-7 per year with neutr
1 X 10^-7 per year with stable meteorology

| Doses and health effects | Transport mode | Population | | Maximum exposed ind |
|---|---|---|---|---|
| | | Neutral(b) | Stable(c) | Neutral(b) |
| Dose | Rail | 14 person-rem | (e) | 0.032 rem |
| Latent cancer fatalities(d) | Rail | 0.007 | (e) | 1.6 X 10^-5 |

a. The maximum reasonably foreseeable accident occurs in a suburban population zon occurring in an urban population zone is less than 1 10-7 per year. In a rural po approximately 9 percent of the suburban population dose.

b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t radiation dose; for the maximally exposed individual, results express the probabili radiation dose. Fatal cancer risk factor: 5 10-4 fatal cancers per person-rem (I

e. Consequences not developed for accidents with probabilities less than 1 10-7 p

Idaho National Engineering Laboratory. Shipments of university, foreign, and non-D SNF are split between the Idaho National Engineering Laboratory and the Savannah Ri could be by truck or rail, so the analysis addresses the two extremes of all shipme by rail.

The cumulative accident risk for transportation by truck was calculated to be fatality and 0.19 traffic fatality. The cumulative accident risk measures the to accidents over the entire shipment campaign (1995 to 2035). The cumulative acciden by rail was calculated to be 0.0003 latent cancer fatality and 0.22 traffic fatalit transportation accident risks for the 1992/1993 Planning Basis alternative.

The maximum reasonably foreseeable transportation accident involves a rail sh commercial SNF. The accident has a probability of occurrence of about 2.0 X 10^-7 population zone. Under normal (neutral) weather conditions, the total population d about 13,000 person-rem (average dose of 26 millirem per person), which could resul latent fatal cancers in the exposed population. For comparison, the same populatio experience about 100,000 latent fatal cancers from other causes. The probability o an urban population zone, or occurring under stable weather conditions in any popul X 10^-7 per year. Table I-33 summarizes the doses and health effects from the maxi foreseeable consequence assessment.

### I.5.3.4 Impacts from the Regionalization Alternative

This alternative includes Regionalization 4A (by fuel type) and Regionalizati Under Regionalization by Fuel Type, the same SNF types are transported as in the 19 alternative with differences occurring in the destinations of some SNF based on fue test reactor SNF is transported to either the Idaho National Engineering Laboratory Site, with most SNF going to the Idaho National Engineering Laboratory. Graphite-t commercial SNF is transported to the Idaho National Engineering Laboratory. As wit Planning Basis alternative, shipments could be by truck or rail, and the analysis e either of two extremes: all shipments by truck or all shipments by rail.

Under Regionalization by Fuel Type, the cumulative accident risk for transpor calculated to be 0.0010 latent cancer fatality and 0.26 traffic fatality. The cumu the total impact of transportation accidents over the entire shipment campaign (199 cumulative accident risk for transportation by rail was calculated to be 0.0003 lat

Table I-32. SNF transportation accident risks for the 1992/1993 Planning Basis alt (1995 to 2035).

| Transport mode | Dose risk (person-rem) | Latent cancer fatalitiesa |
|---|---|---|
| Truck | 1.9 | 0.0009 |
| Rail | 0.61 | 0.0003 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac

Table I-33. Health effects from maximum reasonably foreseeable offsite SNF transpo the 1992/1993 Planning Basis alternative (1995 to 2035).

Alternative: 1992/1993 Planning Basis
Maximum reasonably foreseeable accident: Special-case commercial SNF shipment by r
Population zone: Suburbana
Maximum reasonably foreseeable accident probability: 2.0 10-7 per year with neutr
1.0 X 10^-7 per year with stable meteorology

| Doses and health effects | Transport mode | Population | | Maximum |
|---|---|---|---|---|
| | | Neutral(b) | Stable(c) | Neutral(b) |
| Dose | Rail | 13,000 person-rem(e) | | 54 rem |
| Latent cancer fatalities(d) | Rail | 7 | (e) | 0.027 |

a. The maximum reasonably foreseeable accident occurs in a suburban population zon the accident occurring in an urban population zone is less than 1 X 10^-7 per year. zone, the dose would be approximately 3 percent of the suburban population dose.

b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu dispersion of radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t a result of the radiation dose; for the maximally exposed individual, results expre contracting fatal cancer as a result of the radiation dose. Fatal cancer risk fact per person-rem (ICRP 1991).

e. Consequences not developed for accidents with probabilities less than 1 X 10^-7

cancer fatality and 0.25 traffic fatality. Table I-34 summarizes the transportatio Regionalization by Fuel Type.

As in the 1992/1993 Planning Basis alternative, the maximum reasonably forese accident involves a rail shipment of special-case commercial SNF. The accident has occurrence of about 2.8 10-7 per year for a suburban population zone. The consequ (neutral) weather conditions are the same as those described under the 1992/1993 Pl Table I-35 summarizes the doses and health effects from the maximum reasonably fore assessment.

The maximum reasonably foreseeable accident under stable weather conditions h than 1 X 10^-7 per year for all population zones except rural. A total population estimated for the rural population zone (average dose of 2 rem per person), which c two latent fatal cancers in the exposed population. For comparison, the same popul

to experience about 350 latent fatal cancers from other causes.

The Regionalization by Geography alternative contains six separate alternativ transportation impacts of each option have been analyzed for comparison. Under thi SNF types are transported as under the 1992/1993 Planning Basis alternative with di the destinations of the SNF based on geographical considerations. Non-Navy SNF ori United States locations or points of entry would be transported to the Idaho Nation Hanford Site, or the Nevada Test Site. Non-Navy SNF originating from eastern Unite points of entry would be transported to the Savannah River Site or the Oak Ridge Re would not be split on an east-west basis because the Navy would operate a facility at only one of the DOE sites.

Cumulative accident risks for transportation by truck range from 0.0009 laten 0.21 traffic fatality for Regionalization at the Idaho National Engineering Laborat Site, to 0.0011 latent cancer fatality and 0.39 traffic fatality for Regionalizatio the Oak Ridge Reservation. Cumulative accident risks for transportation by rail ra cancer fatality and 0.21 traffic fatality for Regionalization at the Idaho National the Oak Ridge Reservation to 0.0003 latent cancer fatality and 0.30 traffic fatalit Nevada Test Site and the Savannah River Site.

As in Regionalization by Fuel Type, the maximum reasonably foreseeable transp involves a rail shipment of special-case commercial SNF. The consequences of the m foreseeable accident are the same for each of the six Regionalization by Geography maximum reasonably foreseeable accident under neutral weather conditions occurs in zone because the accident probability for an urban

Table I-34. SNF transportation accident risks for Regionalization by Fuel Type (19

| Transport mode | Dose risk (person-rem) | Latent cancer fatalities(a) |
|---|---|---|
| Truck | 2.0 | 0.0010 |
| Rail | 0.65 | 0.0003 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac physical impact.

Table I-35. Health effects from maximum reasonably foreseeable offsite SNF transpo Regionalization by Fuel Type (1995 to 2035).

Alternative: Regionalization by Fuel Type
Maximum reasonably foreseeable accident: Special-case commercial SNF shipment by r
Population zone: Suburban (neutral) and rural (stable)a
Maximum reasonably foreseeable accident probability: 2.8 X 10^-7 per year with neu 1.1 X 10^-7 per year with stable meteorology

| Doses and health effects | Transport mode | Population | | Maximum e |
|---|---|---|---|---|
| | | Neutral(b) | Stable(c) | Neutral(b) |
| Dose | Rail | 13,000 person-rem | 3,500 person-rem | 54 rem |
| Latent cancer fatalities(d) | Rail | 7 | 2 | 0.027 |

a. The maximum reasonably foreseeable accident occurs in a suburban population zon conditions. The accident probability is less than 1 X 10^-7 per year under stable except in a rural population zone. For urban population zones, the accident probab X 10^-7 per year for both neutral and stable weather conditions.

b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu dispersion of radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t

a result of the radiation dose; for the maximally exposed individual, results expre contracting fatal cancer as a result of the radiation dose. Fatal cancer risk fact cancers per person-rem (ICRP 1991).

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population zone is less than 1 10-7 per year. The total population dose is estima person-rem (average dose of 26 millirem per person), which could result in an estim cancers in the exposed population. For comparison, the same population would be ex about 100,000 latent fatal cancers from other causes.

The probability of the maximum reasonably foreseeable transportation accident among the six Regionalization by Geography alternatives. The maximum reasonably fo a suburban population zone has an estimated probability of occurrence ranging from for Regionalization at the Hanford Site and Savannah River Site, to about 3.7 X 10^ Regionalization at the Nevada Test Site and Savannah River Site. The maximum reaso accident in a rural population zone has an estimated probability of occurrence rang per year for Regionalization at the Hanford Site and Savannah River Site, to about Regionalization at the Nevada Test Site and Oak Ridge Reservation.

Tables I-36 through I-47 summarize the doses and health effects from the acci and the maximum reasonably foreseeable consequence assessment for each of the Regio Geography alternatives.

## I-5.3.5 Impacts from the Centralization Alternatives

The impacts from centralization at the Hanford Site, Idaho National Engineeri Savannah River Site, Oak Ridge Reservation, and the Nevada Test Site are presented

### I-5.3.5.1 Centralization at the Hanford Site. Under this alternative, SNF currently stored at

other DOE sites, Fort St. Vrain, university, foreign, and non-DOE research reactors to the Hanford Site. The analysis evaluates impacts assuming either all shipments by rail.

The cumulative accident risk for transportation by truck was calculated to be fatality and 0.57 traffic fatality. The cumulative accident risk measures the tota accidents over the entire shipment campaign (1995 to 2035). The cumulative acciden by rail was calculated to be 0.0013 latent cancer fatality and 0.52 traffic fatalit transportation accident risks for the Centralization at the Hanford Site alternativ

As in the 1992/1993 Planning Basis and Regionalization alternatives, the maxi foreseeable transportation accident involves a rail shipment of special-case commer has a probability of occurrence of about 5.1 10-7 per year under neutral (normal) X 10^-7 per year under stable (worst-case) weather conditions. The consequences ar described under the Regionalization by Geography alternative. Table I-49

Table I-36. SNF transportation accident risks for Regionalization by Geography (Id Engineering Laboratory and Savannah River Site) (1995 to 2035).

| Transport mode | Dose risk (person-rem) | Latent cancer fatalities(a |
|---|---|---|
| Truck | 1.7 | 0.0009 |
| Rail | 0.59 | 0.0003 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac physical impact.

Table I-37. Health effects from maximum reasonably foreseeable offsite SNF transpo Regionalization by Geography (Idaho National Engineering Laboratory and Savannah Ri 2035).

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Alternative: Regionalization by Geography (INEL & SRS)

Maximum reasonably foreseeable accident: Special-case commercial SNF shipment by r
Population zone: Suburban (neutral) and rural (stable)(a)
Maximum reasonably foreseeable accident probability: 3.0 X 10^-7 per year with neu
10^-7 per year with stable meteorology

| Doses and health effects | Transport mode | Population(a) | | Maximum |
|---|---|---|---|---|
| | | Neutral(b) | Stable(c) | Neutral(b) |
| Dose | Rail | 13,000 person-rem | 3,500 person-rem | 54 rem |
| Latent cancer fatalitiesd | Rail | 7 | 2 | 0.027 |

a. The maximum reasonably foreseeable accident occurs in a suburban population zon conditions. The accident probability is less than 1 10-7 per year under stable we except in a rural population zone. For urban population zones, the accident probab 10^-7 per year for both neutral and stable weather conditions.

b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu dispersion of radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t as a result of the radiation dose; for the maximally exposed individual, results ex of contracting fatal cancer as a result of the radiation dose. Fatal cancer risk f cancers per person-rem (ICRP 1991).

Table I-38. SNF transportation accident risks for Regionalization by Geography (Id Engineering Laboratory and Oak Ridge Reservation) (1995 to 2035).

| Transport mode | Dose risk (person-rem) | Latent cancer fatalities(a) |
|---|---|---|
| Truck | 1.8 | 0.0009 |
| Rail | 0.40 | 0.0002 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac physical impact.

Table I-39. Health effects from maximum reasonably foreseeable offsite SNF transpo Regionalization by Geography (Idaho National Engineering Laboratory and Oak Ridge R 2035).

Alternative: Regionalization by Geography (INEL & ORR)
Maximum reasonably foreseeable accident: Special-case commercial SNF shipment by r
Population zone: Suburban (neutral) and rural (stable)a
Maximum reasonably foreseeable accident probability: 3.0 X 10^-7 per year with neu
10^-7 per year with stable meteorology

| Doses and health effects | Transport mode | Population(a) | | Maximum |
|---|---|---|---|---|
| | | Neutral(b) | Stable(c) | Neutral(b |
| Dose | Rail | 13,000 person-rem | 3,500 person-rem | 54 rem |
| Latent cancer fatalities(d) | Rail | 7 | 2 | 0.027 |

a. The maximum reasonably foreseeable accident occurs in a suburban population zon conditions. The accident probability is less than 1 X 10^-7 per year under stable

except in a rural population zone. For urban population zones, the accident probab per year for both neutral and stable weather conditions.

b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu dispersion of radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t a result of the radiation dose; for the maximally exposed individual, results expre contracting fatal cancer as a result of the radiation dose. Fatal cancer risk fact per person-rem (ICRP 1991).

Table I-40. SNF transportation accident risks for Regionalization by Geography (Ha Savannah River Site) (1995 to 2035).

| Transport mode | Dose risk (person-rem) | Latent cancer fatalities(a) |
|---|---|---|
| Truck | 1.8 | 0.0009 |
| Rail | 0.62 | 0.0003 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac physical impact.

Table I-41. Health effects from maximum reasonably foreseeable offsite SNF transpo Regionalization by Geography (Hanford Site and Savannah River Site) (1995 to 2035).

Alternative: Regionalization by Geography (HS & SRS)
Maximum reasonably foreseeable accident: Special-case commercial SNF shipment by r
Population zone: Suburban (neutral) and rural (stable)a
Maximum reasonably foreseeable accident probability: 2.7 10-7 per year with neutr 10^-7 per year with stable meteorology

| Doses and health effects | Transport mode | Population(a) | | Maximum |
|---|---|---|---|---|
| | | Neutral(b) | Stable(c) | Neutral(b) |
| Dose | Rail | 13,000 person-rem | 3,500 person-rem | 54 rem |
| Latent cancer fatalitiesd | Rail | 7 | 2 | 0.027 |

a. The maximum reasonably foreseeable accident occurs in a suburban population zon conditions. The accident probability is less than 1 10-7 per year under stable we except in a rural population zone. For urban population zones, the accident probab per year for both neutral and stable weather conditions.
b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu dispersion of radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t a result of the radiation dose; for the maximally exposed individual, results expre contracting fatal cancer as a result of the radiation dose. Fatal cancer risk fact per person-rem (ICRP 1991).

Table I-42. SNF transportation accident risks for Regionalization by Geography (Ha Ridge Reservation) (1995 to 2035).

| Transport mode | Dose risk (person-rem) | Latent cancer fatalities(a) |
|---|---|---|

| | | |
|---|---|---|
| Truck | 1.9 | 0.0009 |
| Rail | 0.43 | 0.0002 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac physical impact.

Table I-43. Health effects from maximum reasonably foreseeable offsite SNF transpo Regionalization by Geography (Hanford Site and Oak Ridge Reservation) (1995 to 2035

Alternative: Regionalization by Geography (HS & ORR)
Maximum reasonably foreseeable accident: Special-case commercial SNF shipment by r
Population zone: Suburban (neutral) and rural (stable)a
Maximum reasonably foreseeable accident probability: 2.7 10-7 per year with neutr 10^-7 per year with stable meteorology

| Doses and health effects | Transport mode | Population(a) | | Max |
|---|---|---|---|---|
| | | Neutral(b) | Stable(c) | Neutral(b) |
| Dose | Rail | 13,000 person-rem | 3,500 person-rem | 54 rem |
| Latent cancer fatalitiesd | Rail | 7 | 2 | 0.027 |

a. The maximum reasonably foreseeable accident occurs in a suburban population zon conditions. The accident probability is less than 1 X 10^-7 per year under stable a rural population zone. For urban population zones, the accident probability is l for both neutral and stable weather conditions.

b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu dispersion of radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t result of the radiation dose; for the maximally exposed individual, results express fatal cancer as a result of the radiation dose. Fatal cancer risk factor: 5 X 10^ (ICRP 1991).

Table I-44. SNF transportation accident risks for Regionalization by Geography (Ne Savannah River Site) (1995 to 2035).

| Transport mode | Dose risk (person-rem) | Latent cancer fatalities(a |
|---|---|---|
| Truck | 2.0 | 0.0010 |
| Rail | 0.61 | 0.0003 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac physical impact.

Table I-45. Health effects from maximum reasonably foreseeable offsite SNF transpo Regionalization by Geography (Nevada Test Site and Savannah River Site) (1995 to 20

Alternative: Regionalization by Geography (NTS & SRS)
Maximum reasonably foreseeable accident: Special-case commercial SNF shipment by r
Population zone: Suburban (neutral) and rural (stable)a
Maximum reasonably foreseeable accident probability: 3.7 X 10^-7 per year with neu per year with stable meteorology

| Doses and health effects | Transport mode | Population (a) | | Maxim |
|---|---|---|---|---|
| | | Neutral (b) | Stable (c) | Neutral (b) |
| Dose | Rail | 13,000 person-rem | 3,500 person-rem | 54 rem |
| Latent cancer fatalitiesd | Rail | 7 | 2 | 0.027 |

a. The maximum reasonably foreseeable accident occurs in a suburban population zon conditions. The accident probability is less than 1 10-7 per year under stable we except in a rural population zone. For urban population zones, the accident probab per year for both neutral and stable weather conditions.
b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu dispersion of radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t as a result of the radiation dose; for the maximally exposed individual, results ex contracting fatal cancer as a result of the radiation dose. Fatal cancer risk fact cancers per person-rem (ICRP 1991).

Table I-46. SNF transportation accident risks for Regionalization by Geography (Ne Ridge Reservation) (1995 to 2035).

| Transport mode | Dose risk (person-rem) | Latent cancer fatalities (a) |
|---|---|---|
| Truck | 2.1 | 0.0011 |
| Rail | 0.42 | 0.0002 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac impact.

Table I-47. Health effects from maximum reasonably foreseeable offsite SNF transpo Regionalization by Geography (Nevada Test Site and Oak Ridge Reservation) (1995 to

Alternative: Regionalization by Geography (NTS & ORR)
Maximum reasonably foreseeable accident: Special-case commercial SNF shipment by r
Population zone: Suburban (neutral) and rural (stable) (a)
Maximum reasonably foreseeable accident probability: 3.6 X 10^-7 per year with neu per year with stable meteorology

| Doses and health effects | Transport mode | Population (a) | | Maximum e |
|---|---|---|---|---|
| | | Neutral (b) | Stable (c) | Neutral (b |
| Dose | Rail | 13,000 person-rem | 3,500 person-rem | 54 rem |
| Latent cancer fatalitiesd | Rail | 7 | 2 | 0.027 |

a. The maximum reasonably foreseeable accident occurs in a suburban population zon conditions. The accident probability is less than 1 X 10^-7 per year under stable in a rural population zone. For urban population zones, the accident probability i year for both neutral and stable weather conditions.

b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu

dispersion of radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t a result of the radiation dose; for the maximally exposed individual, results expre contracting fatal cancer as a result of the radiation dose. Fatal cancer risk fact per person-rem (ICRP 1991).

Table I-48. SNF transportation accident risks for the Centralization at the Hanfor 2035).

| Transport mode | Dose risk (person-rem) | Latent cancer fatalities(a) |
|---|---|---|
| Truck | 9.9 | 0.0050 |
| Rail | 2.5 | 0.0013 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac impact.

Table I-49. Health effects from maximum reasonably foreseeable offsite SNF transpo the Centralization at the Hanford Site alternative (1995 to 2035).

Alternative: Centralization at the Hanford Site
Maximum reasonably foreseeable accident: Special-case commercial SNF shipment by r
Population zone: Suburban (neutral) and Rural (stable)a
Maximum reasonably foreseeable accident probability: 5.1 X 10^-7 per year with neu per year with stable meteorology

| Doses and health effects | Transport mode | Population(a) | | Maximum |
|---|---|---|---|---|
| | | Neutral(b) | Stable(c) | Neutral(b) |
| Dose | Rail | 13,000 person-rem | 3,500 person-rem | 54 rem |
| Latent cancer fatalitiesd | Rail | 7 | 2 | 0.027 |

a. The maximum reasonably foreseeable accident occurs in a suburban population zon conditions. The accident probability is less than 1 X 10^-7 per year under stable in a rural population zone. For urban population zones, the accident probability i year for both neutral and stable weather conditions.

b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu dispersion of radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t a result of the radiation dose; for the maximally exposed individual, results expre contracting fatal cancer as a result of the radiation dose. Fatal cancer risk fact per person-rem (ICRP 1991).
summarizes the doses and health effects from the maximum reasonably foreseeable con

**I-5.3.5.2 Centralization at the Idaho National Engineering Laboratory. Under this**

alternative, all SNF currently stored at other DOE sites, Fort St. Vrain, and unive research reactors is eventually transported to the Idaho National Engineering Labor evaluates impacts assuming either all shipments by truck or all shipments by rail.
The cumulative accident risk for transportation by truck was calculated to be fatality and 0.49 traffic fatality. The cumulative accident risk measures the tota accidents over the entire shipment campaign (1995 to 2035). The cumulative acciden

by rail was calculated to be 0.0012 latent cancer fatality and 0.44 traffic fatalit transportation accident risks for the Centralization at the Idaho National Engineer

As in the 1992/1993 Planning Basis and Regionalization 4A and 4B alternatives reasonably foreseeable transportation accident involves a rail shipment of special-accident has a probability of occurring of about 4.7 X 10^-7 per year under neutral and about 3.3 X 10^-7 per year under stable (worst-case) weather conditions. The c as those described under Regionalization by Geography alternative. Table I-51 summ health effects from the maximum reasonably foreseeable consequence assessment.

**I-5.3.5.3 Centralization at Savannah River Site. Under this alternative, SNF currently stored**

at other DOE sites, Fort St. Vrain, university, foreign, and non-DOE research react transported to the Savannah River Site. The analysis evaluates impacts assuming ei truck or all shipments by rail.

The cumulative accident risk for transportation by truck was calculated to be fatality and 0.84 traffic fatality. The cumulative accident risk measures the tota accidents over the entire shipment campaign (1995 to 2035). The cumulative acciden by rail was calculated to be 0.0004 latent cancer fatality and 0.49 traffic fatalit transportation accident risks for the Centralization at Savannah River Site alterna

As in the 1992/1993 Planning Basis and Regionalization alternatives, the maxi foreseeable transportation accident involves a rail shipment of special-case commer reasonably foreseeable accident under neutral (normal) weather conditions occurs in and has a probability of occurrence of about 1.7 X 10^-7 per year. A total populat rem was estimated (average dose of 27 millirem per person), which

Table I-50. SNF transportation accident risks for the Centralization at the Idaho Laboratory alternative (1995 to 2035).

| Transport mode | Dose risk (person-rem) | Latent cancer fatalities(a) |
|---|---|---|
| Truck | 9.5 | 0.0048 |
| Rail | 2.4 | 0.0012 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac impact.

Table I-51. Health effects from maximum reasonably foreseeable offsite SNF transpo the Centralization at the Idaho National Engineering Laboratory alternative (1995 t

Alternative: Centralization at the Idaho National Engineering Laboratory
Maximum reasonably foreseeable accident: Special-case commercial SNF shipment by r
Population zone: Suburban (neutral) and rural (stable)a
Maximum reasonably foreseeable accident probability: 4.7 X 10^-7 per year with neu per year with stable meteorology

| Doses and health effects | Transport mode | Population(a) | | Maxim |
|---|---|---|---|---|
| | | Neutral(b) | Stable(c) | Neutral(b) |
| Dose | Rail | 13,000 person-rem | 3,500 person-rem | 54 rem |
| Latent cancer facilitiesd | Rail | 7 | 2 | 0.027 |

a. The maximum reasonably foreseeable accident occurs in a suburban population zon conditions. The accident probability is less than 1 X 10^-7 per year under stable in a rural population zone. For urban population zones, the accident probability i year for both neutral and stable weather conditions.

b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu dispersion of radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t result of the radiation dose; for the maximally exposed individual, results express contracting fatal cancer as a result of the radiation dose. Fatal cancer risk fact per person-rem (ICRP 1991).

could result in an estimated 36 latent cancer fatalities. For comparison, the same expected to experience about 540,000 latent cancer fatalities from other causes.

The maximum reasonably foreseeable accident under stable (worst-case) weather in a suburban population zone and has a probability of occurring of about 1.2 10- population dose of 110,000 person-rem was estimated (average dose of 0.53 rem per p result in an estimated 55 latent cancer fatalities. For comparison, the same popul experience about 42,000 latent cancer fatalities from other causes.

Table I-53 summarizes the doses and health effects from the maximum reasonabl consequence assessment.

**I-5.3.5.4 Centralization at Oak Ridge Reservation. Under this alternative, SNF currently**

stored at other DOE sites, Fort St. Vrain, university, foreign, and non-DOE researc transported to the Oak Ridge Reservation. The analysis evaluates impacts assuming truck or all shipments by rail.

The cumulative accident risk for transportation by truck was calculated to be fatality and 0.78 traffic fatality. The cumulative accident risk measures the tota accidents over the entire shipment campaign (1995 to 2035). The cumulative acciden by rail was calculated to be 0.0003 latent cancer fatality and 0.43 traffic fatalit transportation accident risks for the Centralization at Oak Ridge Reservation alter

As in the 1992/1993 Planning Basis and Regionalization alternatives, the maxi foreseeable transportation accident involves a rail shipment of special-case commer reasonably foreseeable accident under neutral (normal) weather conditions occurs in and has a probability of occurring of about 1.1 10-7 per year. The accident conse those described for the urban zone accident under the Centralization at Savannah Ri

The maximum reasonably foreseeable accident under stable (worst-case) weather in a rural population zone and has a probability of occurring of about 5.7 10-7 pe consequences are the same as those described for the rural zone accident under the Geography alternative.

Table I-55 summarizes the doses and health effects from the maximum reasonabl consequence assessment.

Table I-52. SNF transportation accident risks for the Centralization at the Savann (1995 to 2035).

| Transport mode | Dose Risk (person-rem) | Latent cancer fatalities(a) |
|---|---|---|
| Truck | 3.1 | 0.0016 |
| Rail | 0.80 | 0.0004 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac physical impact.

Table I-53. Health effects from maximum reasonably foreseeable offsite SNF transpo the Centralization at the Savannah River Site alternative (1995 to 2035).

Alternative: Centralization at the Savannah River Site
Maximum reasonably foreseeable accident: Special-case commercial SNF shipment by r
Population zone: Urban (neutral) and Suburban (stable)a
Maximum reasonably foreseeable accident probability: 1.7 X 10^-7 per year with neu per year with stable meteorology

| Doses and health effects | Transport mode | Population(a) | | Ma |
|---|---|---|---|---|
| | | Neutral(b) | Stable(c) | Neutral(b) |
| Dose | Rail | 72,000 person-rem | 110,000 person-rem | 54 rem |
| Latent cancer fatalitiesd | Rail | 36 | 55 | 0.027 |

a. The maximum reasonably foreseeable accident occurs in an urban population zone conditions. The probability of the accident in an urban zone under stable weather 1 X 10^-7 per year. The maximum reasonably foreseeable accident for stable weather a suburban population zone.

b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu dispersion of radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t as a result of the radiation dose; for the maximally exposed individual, results ex of contracting fatal cancer as a result of the radiation dose. Fatal cancer risk f cancers per person-rem (ICRP 1991).

Table I-54. SNF transportation accident risks for the Centralization at the Oak Ri alternative (1995 to 2035).

| Transport mode | Dose Risk (person-rem) | Latent cancer fatalities(a) |
|---|---|---|
| Truck | 2.8 | 0.0014 |
| Rail | 0.52 | 0.0003 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac physical impact.

Table I-55. Health effects from maximum reasonably foreseeable offsite SNF transpo the Centralization at the Oak Ridge Reservation alternative (1995 to 2035).

Alternative: Centralization at the Oak Ridge Reservation
Maximum reasonably foreseeable accident: Special-case commercial SNF shipment by r
Population zone: Urban (neutral) and rural (stable)a
Maximum reasonably foreseeable accident probability: 1.1 X 10^-7 per year with neu per year with stable meteorology

| Doses and health effects | Transport mode | Population(a) | | Maximum |
|---|---|---|---|---|
| | | Neutral(b) | Stable(c) | Neutral(b) |
| Dose | Rail | 72,000 person-rem | 3,500 person-rem | 54 rem |
| Latent cancer fatalities(d) | Rail | 36 | 2 | 0.027 |

a. The maximum reasonably foreseeable accident occurs in an urban population zone conditions. The accident probability under stable weather conditions is less than in a rural population zone.

b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu

dispersion of radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t a result of the radiation dose; for the maximally exposed individual, results expre contracting fatal cancer as a result of the radiation dose. Fatal cancer risk fact per person-rem (ICRP 1991).

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**I-5.3.5.5 Centralization at Nevada Test Site. Under this alternative, SNF currently**

stored at other DOE sites, Fort St. Vrain, university, foreign, and non-DOE researc transported to the Nevada Test Site. The analysis evaluates impacts assuming eithe or all shipments by rail.

The cumulative accident risk for transportation by truck was calculated to be fatality and 0.72 traffic fatality. The cumulative accident risk measures the tota accidents over the entire shipment campaign (1995 to 2035). The cumulative acciden by rail was calculated to be 0.0012 latent cancer fatality and 0.58 traffic fatalit transportation accident risks for the Centralization at Nevada Test Site alternativ

As in the 1992/1993 Planning Basis and Regionalization alternatives, the maxi foreseeable transportation accident involves a rail shipment of special-case commer has a probability of occurring of about 1.0 10-7 per year under neutral (normal) w suburban population zone and about 5.0 10-7 per year under stable (worst-case) wea rural population zone. The consequences are the same as those described under the Geography alternative. Table I-57 summarizes the doses and health effects from the foreseeable consequence assessment.

## I-5.3.6 Impacts of Using Alternate Points of Entry for Foreign Research Reactor Spent

Nuclear Fuel Shipments

For transportation accident risks (radiological and vehicle-related), shipmen Florida, to the Hanford Site, Idaho National Engineering Laboratory, Savannah River Reservation, and Nevada Test Site would yield lower impacts than shipments from Cha Carolina, Galveston, Texas, Hampton Roads, Virginia, Savannah, Georgia, and the Mil Sunny Point, North Carolina, to these same sites. Shipments from Wilmington, North Savannah River Site and Oak Ridge Reservation would also yield lower impacts than s Charleston, South Carolina, Galveston, Texas, Hampton Roads, Virginia, Savannah, Ge Military Ocean Terminal Sunny Point, North Carolina, to these same sites. Shipment Wilmington, North Carolina, to the Hanford Site, Idaho National Engineering Laborat Site would yield slightly higher impacts (about 6 percent) than shipments from Char Galveston, Texas, Hampton Roads, Virginia, Savannah, Georgia, and the Military Ocea Point, North Carolina, to these same sites.

Table I-56. SNF transportation accident risks for the Centralization at the Nevada (1995 to 2035).

| Transport mode | Dose Risk (person-rem) | Latent cancer fatalities(a) |
|---|---|---|
| Truck | 10.0 | 0.0050 |
| Rail | 2.4 | 0.0012 |

a. Estimated number of latent fatal cancers as a result of radiation dose from tra

b. Estimated number of fatalities from nonradiological effect of transportation ac physical impact.

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Table I-57. Health effects from maximum reasonably foreseeable offsite SNF transpo the Centralization at the Nevada Test Site alternative (1995 to 2035).

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Alternative: Centralization at the Nevada Test Site

Maximum reasonably foreseeable accident: Special-case commercial SNF shipment by r
Population zone: Urban (neutral) and Rural (stable)a
Maximum reasonably foreseeable accident probability: 1.0 X 10^-7 per year with neu
10^-7 per year with stable meteorology

| Doses and health effects | Transport mode | Population(a) | | Maximum ex |
|---|---|---|---|---|
| | | Neutral(b) | Stable(c) | Neutral(b) |
| Dose | Rail | 72,000 person-rem | 3,500 person-rem | 54 rem |
| Latent cancer fatalitiesd | Rail | 36 | 2 | 0.027 |

a. The maximum reasonably foreseeable accident occurs in an urban population zone conditions. The accident probability is less than 1 X 10^-7 per year under stable in a rural population zone.

b. Neutral meteorological conditions occur greater than 50 percent of the time.

c. Stable meteorological conditions occur less than 5 percent of the time and resu dispersion of radioactivity released to the atmosphere.

d. Results expressed as the estimated number of latent fatal cancers expected in t as a result of the radiation dose; for the maximally exposed individual, results ex contracting fatal cancer as a result of the radiation dose. Fatal cancer risk fact cancers per person-rem (ICRP 1991).

# I-6 POTENTIAL MITIGATION MEASURES

The possible impacts from transportation associated with the alternatives cou number of different ways. For example, the routes used for truck shipments could b Department of Transportation routing guidelines. These guidelines are designed to impacts associated with transportation. The guidelines consider as primary factors from incident-free transport, (b) the risk to general population from an accidental material, and (c) the economic risk from an accidental release of radioactive mater as secondary factors (a) emergency response effectiveness, (b) evacuation capabilit facilities such as schools or hospitals, and (d) traffic fatalities and injuries un of the cargo.

Impact mitigation is also provided through the use of approved shipping conta containing large amounts of radioactivity, such as SNF, Type B containers will be u designed to withstand normal transport conditions and hypothetical accident conditi

If an accident did occur, Federal, state, local, and Tribal authorities are t response. For example, the Shoshone-Bannock Tribes, the State of Idaho, Bingham Co Memorial Hospital, Bannock Regional Medical Center, Pocatello Regional Medical Cent Company, Intermountain Gas Company, and the U.S. Department of Energy participated cooperative Transportation Accident Exercise held in Idaho in 1992 (TRANSAX '92).

The U.S. Environmental Protection Agency has developed protective action guid protective actions that are designed to limit doses in the event of a nuclear incid actions also mitigates the impacts of transportation accidents involving radioactiv

# I-7 SPENT NUCLEAR FUEL TRANSPORTATION BY BARGE

As an alternative to truck or rail transport of SNF, barge transport of 71 SN Brookhaven National Laboratory, located on Long Island, New York, to the Savannah R evaluated. This section summarizes the impacts from transporting the 71 shipments National Laboratory to the Savannah River Site.

## I-7.1 Transportation Routes

Several routing options were evaluated for the barge shipments from Brookhave Laboratory to the Savannah River Site:

- Truck transport from Brookhaven National Laboratory to the Shoreham, Ne Port Jefferson, New York. Shoreham and Port Jefferson are both located near Brookhaven National Laboratory.
- Barge transport from Shoreham or Port Jefferson, New York, to Hampton R the Military Ocean Terminal, Sunny Point, North Carolina; Charleston, S Savannah, Georgia; or directly to the Savannah River Site.
- Truck transport from Hampton Roads, Virginia; the Military Ocean Termin North Carolina; Charleston, South Carolina; or Savannah, Georgia to the Site.

The HIGHWAY computer code (Johnson et al. 1993a) was used to estimate the tru INTERLINE computer code (Johnson et al. 1993b) was used to estimate the barge route barge routes are summarized in Pippen (1995).

## I-7.2 Incident-Free Transportation

Incident-free transportation assessments were conducted for barge shipments f National Laboratory to the Savannah River Site and included transport by truck, tra intermodal transfers (e.g., truck to barge and barge to truck transfers). The meth the radiological and nonradiological impacts of these shipments are discussed in Pi

For barge shipments using the Shoreham, New York, dock as a point of departur the cumulative number of total fatalities (radiological plus nonradiological fatali 0.0092. The lower number of fatalities was estimated when the barge shipments were Savannah River Site. The larger number of fatalities was estimated when the barge from Brookhaven National Laboratory to Shoreham, New York, to Hampton Roads, Virgin Savannah River Site.

For barge shipments using Port Jefferson, New York, as a point of departure f cumulative number of total fatalities (radiological plus nonradiological fatalities 0.0093. The lower number of fatalities was estimated when the barge shipments were Savannah River Site. The larger number of fatalities was estimated when the barge from Brookhaven National Laboratory to Port Jefferson to Hampton Roads, Virginia, t Site.

### I-7.3 Transportation Accidents

Transportation accident assessments were conducted for barge shipments from B Laboratory to the Savannah River Site. These assessments included evaluations of a radiological risks and traffic fatalities) and accident consequences. The methods the accident risks and consequences of these shipments are discussed in Pippen (199

For barge shipments using the Shoreham, New York, dock as a point of departur the cumulative accident risk (radiological plus nonradiological fatalities) ranged lower number of fatalities was estimated when the barge shipments were made directl Site. The larger number of fatalities was estimated when the barge shipments were National Laboratory to Shoreham, New York, to Hampton Roads, Virginia, to the Savan

For barge shipments using Port Jefferson, New York, as a point of departure f cumulative accident risk (radiological plus nonradiological fatalities) ranged from lower number of fatalities was estimated when the barge shipments were made directl Site. The larger number of fatalities was estimated when the barge shipments were National Laboratory to Shoreham, New York, to Hampton Roads, Virginia, to the Savan

The consequences of the maximum reasonably foreseeable accident for barge shi than the consequences of the maximum reasonably foreseeable accident for truck ship Section I-5. This was because the barge routes are further from populations than t

# I-8 TRANSPORTATION IMPACTS OF FOREIGN PROCESSING OF SPENT NUCLEAR FUEL CURRENTLY LOCATED AT THE HANFORD SITE

This section summarizes the transportation impacts of processing the Hanford at a foreign processing facility. The detailed assessment of this transportation o of the foreign processing option and the methods and assumptions used in the analys Volume 1, Appendix A, Attachment B of this EIS.

## I-8.1 Radiological Dose to Workers

This subsection describes expected radiological consequences to workers durin Reactor SNF currently stored at the Hanford Site. The transportation analysis incl Hanford Site to representative West and East Coast points of entry (Portland, Orego and Norfolk, Virginia) followed by overseas transport to a representative commercia the United Kingdom. Overland shipment by barge, truck, or rail was considered as a of entry.

### I-8.1.1 Worker Dose from Shipment Preparation Activities at the Hanford Site

Packaging of the K Basin fuel for overseas shipment was estimated to result i approximately 140 person-rem (5.5 10-2 latent cancer fatalities) over a period of However, if stabilization of the fuel before transport were necessary, an additiona accumulated by onsite workers over a 4-year period, resulting in 7.0 10-2 latent c Consequences of fuel-handling accidents of the K basins are addressed in Volume 1,

### I.8.1.2 Worker Doses from Transportation

Collective worker impacts from incident-free transportation were estimated to 1.3 X 10^-3 latent cancer fatalities for barge transportation between the Hanford S Portland, Oregon, to 4.3 X 10^-2 latent cancer fatalities for the option of transpo Hanford Site and the point of entry at Norfolk, Virginia. These impacts account fo the Hanford Site as well as the return transport of high-level waste, plutonium oxi

Radiological consequences to workers from activities at the point of entry fo United Kingdom were evaluated based on commercial experience during the last 9 mont consequences for loading and unloading 408 casks during shipment from the United St Kingdom were estimated to be approximately 1.2 person-rem to all workers over the e campaign. An additional two fuel-handling activities per cask at the Hanford Site process facility would approximately double that estimate, resulting in a collectiv and a potential for 9.8 X 10^-4 latent cancer fatalities for all shipments. The ma worker, assuming that worker was involved in handling all 408 casks at one point in would be approximately 0.4 rem over 5 years.

The consequences to a nearby worker were evaluated for accidents at, or on th representative points of entry considered in the overland transportation analysis. entry at Newark, New Jersey, was included in this part of the analysis because of i population (it is adjacent to New York City) whereas the other points of entry are population centers. The consequences of the maximum reasonably foreseeable acciden per year) to a worker at a distance of 100 meters (328 feet) ranged from 1.7 rem (6 fatalities) at Seattle/Tacoma, Washington, to 2.1 rem (8.4 10-4 latent cancer fata or Norfolk, Virginia. The corresponding total risks from accidents of all severity shipments were 8.0 x 10^-9 latent cancer fatalities at Seattle/Tacoma to 1.0 10-8 Norfolk or Portland.

Radiological consequences were estimated for workers as a result of normal tr accidents during overseas shipments of SNF from the Hanford Site to the United King impact of routine (incident-free) marine transport of SNF would be potential radiol members of the ships used to carry the casks. While at sea, the crew dose would be individuals who may enter the ship's hold during transit and receive external radia packaged fuel. The consequences to crew members would depend on the duration of th spent inspecting each cask. Assuming surface dose rates at the regulatory limit, t inspection crew from all SNF shipments could range from 2.4 to 12 person-rem, depen Return shipments of high-level waste, uranium, and plutonium would result in lower doses to individual crew members would be within administrative control and regulat workers. Actual commercial experience indicates that worker consequences could be bounding estimates.

The consequences of accidents during ocean transit would likely be similar to workers who are near the scene of an accident. Individuals in the immediate vicini probably not survive an accident severe enough to release radioactive materials fro Effects on the ocean environment would not be expected to be discernable because of airborne release.

The frequency of accidents on the open ocean was estimated to be 4.6 X 10^-5 voyage of approximately 20 days to transport SNF from foreign research reactors to frequency of accidents for overseas shipment of SNF and process materials via ships would likely be within a factor of 2 or 3 of this estimate.

## I-8.2 Consequences to Members of the Public

This subsection describes expected consequences to the public from activities N-Reactor SNF to the United Kingdom.

## I-8.2.1 Public Impacts from Shipment Preparation Activities at the Hanford Site

Activities at the Hanford Site before and during preparation for shipment of result in generally small consequences to the public, as discussed in Volume 1, App Removal and packaging of SNF at the K Basins was estimated to result in offsite con to those observed during initial segregation of the fuel, or less than 3 X 10^-7 re latent cancer fatalities) to the maximally exposed offsite individual. The risk fr handling of N-Reactor fuel at the K Basins is presented in Volume 1, Appendix A, of

## I-8.2.2 Public Impacts from Transportation Activities

Members of the public exposed to radiation during transportation include pers railroad, or waterway with the shipment; persons residing near these transport link intermediate stops along the route (such as refueling stops and stops at rail class

Public impacts from incident-free transportation include radiological impacts well as nonradiological impacts from vehicle emissions. Radiological impacts from transportation were estimated to range from 2.1 X 10^-4 latent cancer fatalities fo between the Hanford Site and the point of entry at Portland, Oregon, to 1.3 X 10^-1 the option of transport by truck between the Hanford Site and the point of entry at Nonradiological impacts from incident-free transportation were estimated to range f cancer fatalities for the option of truck transport from the Hanford Site to the po Seattle/Tacoma, Washington, to 1.6 X 10^-2 latent cancer fatalities for the option Hanford Site to the point of entry at Norfolk, Virginia.

Public impacts from potential transportation accidents include radiological r materials that could be released to the environment as well as nonradiological risk accidents (i.e., vehicle collisions). Cumulative radiological transportation accid latent cancer fatalities for the option of rail transport between the Hanford Site Seattle/Tacoma, Washington, to 4.2 X 10^-5 latent cancer fatalities for either truc Hanford Site and the point of entry at Norfolk, Virginia. Traffic accident risks r for the option of truck transport between the Hanford Site and the point of entry a Washington, to 1.3 X 10^-1 fatalities for the option of truck transport between the entry at Norfolk, Virginia.

The maximum reasonably foreseeable transportation accident involves a return level waste transported by rail from the point of entry at Seattle/Tacoma, Washingt this accident were to occur in an urban population zone, it could result in an esti fatality within the affected population. The probability of this accident is about

Normal port activities during transport of N-Reactor SNF are not expected to for members of the public other than point of entry workers. The consequences to t during point of entry transit were estimated using the same assumptions as for work highest risk to the public from point of entry activities was estimated to result f Under stable atmospheric dispersion conditions, the maximum risk to the public was 5 latent cancer fatalities. The maximum foreseeable accident resulted in an estima fatalities in the population within 80 kilometers (50 miles) of Newark, New Jersey. of this accident was 2.2 X 10^-7 for 17 overseas shipments of SNF.

There is not expected to be any dose to members of the public or marine life free ocean transport of N-Reactor SNF to the United Kingdom. The effects of losing estimated to be comparable to those evaluated for transporting foreign research rea States based on similar shipping inventories of long-lived radionuclides per cask. individual for a cask lost in coastal waters was expected to be 11 millirem per yea place until all its contents dispersed. The corresponding consequences to marine b year for fish, 0.32 millirad per year for crustaceans, and 13 millirad per year for resulting from loss of a cask in the deep ocean would be many orders of magnitude l for coastal waters.

# I-9 HISTORICAL SPENT NUCLEAR FUEL TRANSPORTATION ACCIDENTS

Transportation incidents for 1949 through 1970 were surveyed using summary re the U.S. Atomic Energy Agency (AEC 1957, Patterson and DeFatta 1962, Patterson and 1966, McCluggage 1971). In these summary reports, incidents are classified into si extent of radioactive material release (Patterson and DeFatta 1962) and accidents a differentiated. For 1949 through 1970, there were 14 incidents involving irradiate packages approximating a Type B shipping cask were breached as a result of these in 1971). Two representative incidents are summarized below.

On November 15, 1960, a tractor-trailer carrying 7 steel-jacketed lead casks fuel elements was involved in an accident with a station wagon. The station wagon demolished and the driver killed. The tractor was badly damaged and the driver suf abrasions. The irradiated fuel elements were undisturbed. This incident was class release, which means that no radioactive material was released and there was no los package.

In another case (June 2-6, 1960), leakage of contaminated cooling water from consisting of irradiated fuel elements and some ruptured elements in aluminum cans of three railroad yards. This incident was classified as a Class IV radiation rele radioactive material was released to the ground or trafficway with no runoff or aer no injuries associated with this incident.

Spent nuclear fuel transportation accidents for 1971 through 1993 were survey the Radioactive Materials Incident Report database. This database contains informa materials transportation incidents and accidents from the U.S. Department of Transp Regulatory Commission, U.S. Department of Energy, state radiation control offices, radioactive materials transportation incidents and accidents (Cashwell and McClure Materials Incident Report database contains information on transportation accidents reported incidents; this discussion is limited to transportation accidents involvin

Between 1971 and 1993, there were seven transportation accidents involving SN accidents involved rail shipments, and four of these accidents involved truck shipm were summarized in Cashwell and McClure (1992). Only one of these accidents result damage to the SNF cask. On December 8, 1971, a truck transporting a SNF element in cask on U.S. Highway 25 in Tennessee swerved to avoid a head-on collision with anot forced off the road. The driver of the truck was killed by the impact and the SNF ditch. The DOE Radiological Assistance Team from Oak Ridge, Tennessee, arrived and that the structural integrity of the cask was intact and there was no release of co

# I-10 CUMULATIVE IMPACTS OF TRANSPORTATION

## I-10.1 Radiological Impacts

The cumulative impacts of the transportation of SNF consist of impacts from ( of SNF to the Hanford Site, Savannah River Site, Idaho National Engineering Laborat Reservation, and the Nevada Test Site; (b) the alternatives evaluated in this EIS; foreseeable actions that include transportation of radioactive material; and (d) ge transportation that is not related to a particular action. The discussion of cumul concentrates on the cumulative impacts of offsite transportation, because offsite t potential doses to a greater portion of the general population than does onsite tra dose to the general population and workers is the measure used to quantify cumulati impacts. This measure of impact was chosen because it can be directly related to l a cancer risk coefficient and because of the difficulty in identifying a maximally shipments throughout the United States spanning the period 1943 through 2035 (93 ye

Collective doses from historical shipments of SNF to the Hanford Site, Savann Ridge Reservation, and the Nevada Test Site were summarized in Jones and Maheras (1 1994d). Data for these shipments were available for 1971 through 1993 and were lin to the start of operations at each site because data before 1971 were not available Oak Ridge Reservation, the start of operations was 1943; for the Savannah River Sit was 1953; and for the Nevada Test Site, the start of operations was 1951. The resu summarized in Table I-58.

The historical shipments of SNF to the Idaho National Engineering Laboratory shipments of naval SNF and test specimens from 1957 through 1995 (see Attachment A Volume 1 of this EIS). Extrapolation of naval shipments was not necessary because accounted for all shipments. Historical SNF also consisted of shipments of other D National Engineering Laboratory besides naval shipments, such as research reactor S commercial SNF (Maheras 1994). Data for these shipments were available for 1973 th linearly extrapolated back to 1953, the start of operations at the Idaho Chemical P data for 1953 through 1972 were not available. The results of these analyses are a 58.

There are considerable uncertainties in these historical estimates of collect population densities and transportation routes used in the dose assessments were ba 1990 and the United States highway and rail system as it existed in 1993.

Table I-58. Cumulative transportation-related radiological collective doses and la to 2035).

| Category | Collective occupational dose (person-rem) |
|---|---|
| Historical spent nuclear fuel | |
| Hanford Site (1943 to 1993) | 52 |
| Savannah River Site (1953 to 1993) | 50 |
| Idaho National Engineering Laboratory (1953 to 1993) | |
| DOE spent nuclear fuel | 56 |
| Naval spent nuclear fuel | 62 |
| Oak Ridge Reservation (1943 to 1993) | 35 |
| Nevada Test Site(a) (1951 to 1993) | 1.4 |
| Spent nuclear fuel shipments for Alternatives 1-5 | |
| Naval(b) | 1.5 to 15 |
| DOE truck (100%)(c) (1995 to 2035) | 0.0 to 1,000 |
| DOE train (100%)(c) (1995 to 2035) | 0.0 to 130 |
| Reasonably foreseeable actions | |
| Geologic repository(c,d) | |

| | |
|---|---|
| Truck (100%) | 8,600 |
| Train (100%) | 750 |
| Waste Isolation Pilot Plante | |
| Test phase (100% truck) | 110 |
| Disposal phase | |
| Truck (100%) | 1,800 |
| Train (maximum)(f) | 68 |
| Submarine reactor compartment disposalg | -- |
| Return of cesium-137 isotope capsulesh | 0.42 |
| Uranium billets(i) | 0.50 |
| General transportation | |
| 1943 to 1982 | 220,000 |
| 1983 to 2035 | 89,000 |
| Summary | |
| Historical | 200 |
| Spent nuclear fuel shipments for Alternatives 1-5 | |
| Truck | 1.5 to 1,000 |
| Train | 1.5 to 150 |
| Reasonably foreseeable actions | |
| Truck | 11,000 |
| Train | 820 |
| General transportation (1943 to 2035) | 310,000 |
| Total collective dose | 320,000 |
| Total latent cancer fatalities | 130 |

a. Shipments from Turkey Point Power Plant in Florida to the Engine Maintenance, A Facility at the Nevada Test Site.

b. Naval SNF and test specimen shipments based on a combination of truck and rail

c. Shipments based on 100 percent transport by truck or 100 percent transport by r

d. Reference: DOE (1986)

e. Reference: DOE (1990)

f. The maximum rail case is based on rail transport where rail access is available where rail access is not available.

g. Reference: USN (1984)

h. Reference: DOE (1994).

i. Reference: DOE (1992).

Using census data for 1990 overestimates historical collective doses because the Un continuously increased over the time covered in these assessments. Basing collecti United States highway and rail system as it existed in 1993 may slightly underestim that occurred in the 1940s, 1950s, and 1960s, because a larger portion of the trans been on non-interstate highways where the population may have been slightly closer not available that correlated transportation routes and population densities for th 1970s; therefore, it was necessary to use more recent data to make dose estimates. structure of the interstate highway system was largely fixed and most shipments wou interstates.

Shipment data were linearly extrapolated for years when data were unavailable uncertainty. However, this technique was validated by linearly extrapolating the d 1973 through 1989 to estimate the number of shipments that took place during the ti 1972 (also contained in SAIC 1991). The 1973 through 1989 time period corresponded when data were available for the Idaho Chemical Processing Plant. The data in SAIC used directly because only shipment counts are presented for 1964 through 1982 and destinations were listed for years before 1983. Based on the data in SAIC (1991),

data for 1973 through 1989 overestimates the shipments for 1964 through 1972 by 20 compared to the actual shipment counts for 1964 through 1972.

Collective doses for SNF shipments associated with Alternatives 1 through 5 w previously in this appendix and in Appendix D of Volume 1 of this EIS (for naval sp truck shipments, the collective dose to workers ranged from 1.5 person-rem (the No 1,000 person-rem (Centralization at Savannah River), or 0.00060 to 0.40 latent canc dose to the general population ranged from 0.34 person-rem (the No Action alternati (Centralization at Savannah River), or 0.00017 to 1.2 latent cancer fatalities. Th fatalities include shipments of naval SNF and test specimens.

For train shipments, the collective dose to workers ranged from 1.5 person-re Alternative) to 150 person-rem (Centralization at Nevada Test Site), or 0.00060 to fatalities. Collective dose to the general population ranged from 0.34 person-rem to 190 person-rem (Centralization at Savannah River), or 0.00017 to 0.095 latent ca doses and latent cancer fatalities include shipments of naval SNF and test specimen

Transportation impacts may also result from reasonably foreseeable projects. projects that involve extensive transportation of radioactive material are: (a) shi high-level waste to a geologic repository, and (b) shipments of transuranic waste t Plant, located in Carlsbad, New Mexico. DOE is presently determining the suitabili Nevada, as a site for a geologic repository for commercial SNF and defense high-lev geologic repository was assumed to be located in Yucca Mountain, Nevada, for the tr impacts analysis.

Based on the transportation dose assessments presented in DOE (1986), the wor for truck shipments to a repository was 8,600 person-rem or 3.4 latent cancer fatal to the general population from truck shipments to a repository was 48,000 person-re fatalities. The worker collective dose for train shipments to a repository was 750 cancer fatalities. The collective dose to the general population from train shipme 740 person-rem or 0.37 latent cancer fatalities.

Based on the transportation dose assessments presented in DOE (1990), the wor from truck shipments to the Waste Isolation Pilot Plant was 1,900 person-rem or 0.7 The collective dose to the general population from truck shipments to the Waste Iso 1,500 person-rem or 0.75 latent cancer fatalities. The worker collective dose from Waste Isolation Pilot Plant was 180 person-rem or 0.072 latent cancer fatalities. general population from train shipments to the Waste Isolation Pilot Plant was 990 cancer fatalities. These collective doses include the 5-year Test Phase and the 20

There are three other reasonably foreseeable projects that involve limited tr radioactive material: (a) 100 shipments of submarine reactor compartments from the Shipyard to the Hanford Site for burial, (b) return of cesium-137 isotope capsules transport of uranium billets from the Hanford Site to the United Kingdom. The tran reactor compartments is an ongoing activity that is not yet completed; therefore, i reasonably foreseeable action. The doses for these actions are presented in Table

There are also general transportation activities that take place that are unr evaluated in this EIS or to reasonably foreseeable actions. Examples of these acti radiopharmaceuticals to nuclear medicine laboratories and shipments of commercial l waste to commercial disposal facilities. The U.S. Nuclear Regulatory Commission ev shipments based on a survey of radioactive materials transportation published in 19 Categories of radioactive material evaluated in NRC (1977) included: (a) limited qu medical, (c) industrial, (d) fuel cycle, and (e) waste.

The U.S. Nuclear Regulatory Commission estimated that the annual collective w shipments was 5,600 person-rem or 2.2 latent cancer fatalities. The annual collect for these shipments was estimated to be 4,200 person-rem or 2.1 latent cancer fatal comprehensive transportation doses were not available, these collective dose estima transportation collective doses for 1943 through 1982 (40 years). These dose estim radioactive waste shipments and truck and rail shipments.

Based on the transportation dose assessments in NRC (1977), the cumulative tr collective doses for 1943 through 1982 were 220,000 person-rem for workers and 170, the general population. These collective doses correspond to 88 latent cancer fata latent cancer fatalities for the general population.

In 1983, another survey of radioactive materials transportation in the United (Javitz et al. 1985). This survey included U.S. Nuclear Regulatory Commission and licensees and the U.S. Department of Energy. Both SNF and radioactive waste shipme the survey. Weiner et al. (1991a, b) used the survey by Javitz et al. (1985) to es general transportation. The transportation dose assessments in Weiner et al. (1991 transportation doses for 1983 through 2035 (53 years). The interval 1995 through 2 interval of time associated with the spent nuclear fuel management activities evalu

Weiner et al. (1991a) evaluated eight categories of radioactive material ship industrial, (b) radiography, (c) medical, (d) fuel cycle, (e) research and developm (f) unknown, (g) waste, and (h) other. Based on a median external exposure rate, a dose of 1,400 person-rem and an annual collective general population dose of 1,400 estimated. These collective doses correspond to 0.56 and 0.70 latent cancer fatali and the general population, respectively. Over the 53-year time period from 1983 t collective worker and general population doses would be 74,000 person-rem or 30 and fatalities for workers and the general population, respectively.

Weiner et al. (1991b) also evaluated six categories of radioactive material s industrial, (b) radiography, (c) medical, (d) research and development, (e) unknown a median external exposure rate, an annual collective worker dose of 290 person-rem general population dose of 450 person-rem were estimated. These collective doses c 0.23 latent cancer fatalities per year for workers and the general population, resp time period from 1983 through 2035, the collective worker dose would be 15,000 pers population collective dose would be 24,000 person-rem or 6.0 and 12 latent cancer f the general population, respectively.

Like the historical transportation dose assessments, the estimates of collect general transportation also exhibit considerable uncertainty. For example, data fo general transportation activities from 1943 through 1982. This approach probably o because the amount of radioactive material that was transported in the 1950s and 19 amount transported in the 1970s. For example, in 1968, the shipping rate for radio was estimated to be 300,000 packages per year (Patterson 1968); in 1975 this rate w 2,000,000 packages per year (NRC 1977). However, because comprehensive data that w realistic transportation dose assessment are not available, the dose estimates deve Regulatory Commission were used.

The total worker and general population collective doses are summarized in Ta collective worker doses from all types of shipments (historical, the alternatives, actions, and general transportation) were estimated to be 320,000 person-rem (130 l for the period of time 1943 through 2035 (93 years). Total general population coll estimated to be 320,000 person-rem (160 latent cancer fatalities). The majority of workers and the general population was because of general transportation of radioac number of latent cancer fatalities over the time period 1943 through 2035 was estim same period of time (93 years), approximately 28,000,000 people would die from canc latent cancer fatalities per year (NRC 1977). It should be noted that the estimate related latent cancer fatalities would be indistinguishable from other latent cance transportation-related latent cancer fatalities are 0.0010 percent of the total num

## I-10.2 Vehicular Accident Impacts

Fatalities involving the transport of radioactive materials were surveyed for using the Radioactive Material Incident Report database. For 1971 through 1993, 21 involving 36 fatalities occurred. These fatalities resulted from vehicular acciden with the radioactive nature of the cargo. No radiological fatalities because of tr ever occurred in the United States. During the same period of time, over 1,000,000 vehicular accidents in the United States.

For Alternatives 1 through 5, 0.047 to 1.4 vehicular accident fatalities are During the 40-year time period from 1995 through 2035, approximately 1,600,000 peop vehicular accidents in the United States.

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# APPENDIX A

PRIMER ON RADIOACTIVITY AND TOXICOLOGY

This appendix gives a brief introduction to radioactivity and toxicology. In topics covered include radioactive decay, fission, radioactive wastes, and units an [taken from WINCO (1988)]. In the toxicology section, topics covered include defi toxicology, how substances or materials can be toxic, major types of toxic substanc factors in determining toxicity. In addition to the sections covering these topics exposure pathways, which have the same attributes whether the source of the exposur

## A-1 Radioactivity

Through natural or man-made processes, atoms of elements can be put in an uns atom is in an unstable state, its nucleus (which is made up of protons and neutrons change by releasing energy in order to achieve stability. This change can come abo radioactive decay or fission.

Radioactive decay is the process whereby the nuclei (plural of nucleus) of un in the form of subatomic-sized particles or light-like waves in order to become sta termed ionizing radiation, passes through a material, it can change the chemical st material's atoms. It is through this process of chemical structure change that rad damage in humans. The level of damage depends on several factors, including the am absorbed.

Radioactive decay produces three main types of ionizing radiation-alpha parti and gamma rays. None can be detected by our senses. These types can each have dif and thus have varying abilities to penetrate and harm the human body. Because each characteristics, different amounts of material must be used to stop (shield) the ra the least penetrating and can be stopped, or shielded, by thin layers of material s paper. Shielding for beta particles requires thicker material, such as several rea of wood or water. For gamma rays, which are highly penetrating, very thick materia several feet of paper or several inches of concrete or lead.

Fission is the process whereby a large nucleus (for example, uranium-235) abs splits into two fragments, resulting in the release of energy. In each fission, tw released, on the average, which may go on to produce fissions of nearby nuclei. If released neutrons go on to cause additional fissions, and the process is repeated a a self-sustained chain reaction, and a condition called criticality. When the trem fission is controlled (as in a nuclear reactor), it can be used for various benefit or to provide electricity that can light and heat homes.

Radiation occurs on earth in many forms, both natural and man-made. Natural heat from the sun, and the decay of radioactive elements in the earth's crust. Rad naturally within the human body, mostly from potassium, which is an essential eleme also deliberately created sources of ionizing radiation for various uses, such as n diagnostic and therapeutic medicine, nondestructive testing of pipes and welds, and to the production of atomic weapons.

Radioactive waste is another possible product of activities dealing with radi Department of Energy (DOE) manages various types of radioactive wastes, mostly gene production and nuclear-power research programs. Such wastes are classified as low- high-level. Also managed by DOE is spent nuclear fuel, which has been used as the and is highly radioactive (though not officially regarded currently as "waste"). L dangerous of these and can in some cases be handled with no shielding other than th container. Transuranic waste, high-level waste, and spent nuclear fuel are more da handling procedures, shielding, and other measures to isolate them from people and

Special units are used to measure radiation and its effects. The most common radiation absorbed dose (rad), roentgen equivalent man (rem), and person-rem.

The roentgen measures the amount of electrical charge (or ionization) produce radiation in air. Rad is the amount of energy absorbed by a material. Neither the an indication of biological damage. The rem equates the biological damage done to the type of ionizing radiation absorbed. For external radiation exposure from gamm rem, and effective dose equivalent are approximately equal. (See below for a defin equivalent.) Person-rem is a unit of collective radiological dose, that is, the co population. Person-rem is calculated by summing the individual dose to each member example, if 100 workers each received 0.1 rem (100 millirem), then the collective d rem (100 persons x 0.1 rem). Current regulatory limits, as well as limits describe are expressed in effective dose equivalent.

The biological effects of ionizing radiation vary according to the type of ra and the type of cell affected. Any dose of radiation can damage body cells. Howev such as those administered to patients receiving x-rays or those received by worker wastes, damage to cells is so slight that they can usually either repair themselves regeneration of healthy cells.

Effective dose equivalent is another key term used in the radiological protec damage that radiation exposure can do to the body. The effective dose equivalent m exposed individual's total body due to radiation exposure. The effective dose equi estimate the exposed individual's risk of health effects. Effective dose equivalen such as different susceptibilities of body tissues to different forms of radiation. is often referred to simply as dose.

Exposures are often classified into two categories-acute exposure, which is a over a few hours or less; and chronic exposure, which involves repeated small doses to years). Chronic doses are usually less harmful than acute doses because the tim dose rates allows the body time to repair damaged cells.

# A-2 Toxicology

When certain natural or man-made materials or substances have harmful effects or not solely at the site of contact, the materials or substances can be described Toxicology is a branch of science dealing with the toxic effects that chemicals or on living organisms.

Chemicals can be toxic for many reasons, including their ability to cause can tissue or organs; or to harm body systems such as reproductive, immune, blood-formi (Ottoboni 1991). The following list gives a brief definition and examples of three can be toxic:

- Carcinogens are substances known to cause cancer in humans or to cause and therefore may be capable of causing cancer in humans. Examples of human carcinogens include asbestos, benzene, and vinyl chloride (Kamrin

- Some chemicals in controlled studies have been shown to cause a harmful Examples include metals such as cadmium, lead, and mercury; strong acid acid and sulfuric acid; some welding fumes; coal dust; sulfur dioxide; (Ottoboni 1991).

- Some biological materials that may be toxic include various body fluids infectious agents (Ottoboni 1991).

Some waste materials contain substances that may be toxic if not handled prop substances that are no longer useful or that may be discarded from manufacturing, m or research operations. Some wastes contain toxic materials to which the public ma is not treated, stored, or disposed of properly, so their handling and care is espe

There are two major types of nonradioactive wastes-industrial/commercial soli INEL, this is called INEL industrial waste) and hazardous waste. Industrial/commer generated by manufacturing or industrial processes that do not contain hazardous in waste is any waste that is either characteristically hazardous or is listed as haza Conservation and Recovery Act. Examples of hazardous waste include metals, such as

lead, and mercury, and organic compounds, such as carbon tetrachloride and trichlor

Even though chemicals can be toxic, many factors influence whether inhalation particular substance has a toxic effect on humans (Ottoboni 1991). These factors i the substance the person comes into contact with, (b) whether the person inhales or amount of the substance in a short time (called acute exposure) or a relatively sma chronic exposure), and (c) the period of time over which the exposure occurs.

Scientists determine a substance's toxic effect (or toxicity) by performing c In addition to environmental and physical factors, these tests help establish three are considered when measuring toxicity-dose-response relationship, threshold concep (Ottoboni 1991). The dose-response relationship is established as a result of cont relates percentage of animals with observable toxic effects to dose administered. administered, it is increased or decreased until, at the upper end, all animals are no animals are affected. The threshold concept means that most toxic chemicals wil present in small enough amounts. Thus, there is a threshold of effect or a "no-eff is an arbitrary separation between the highest exposure level producing no adverse species and the exposure level that has been estimated to be safe for humans. No m universally established. For some chemicals, a small margin of safety is sufficien a larger margin is required. The importance of margin of safety is that all factor chemical are taken into account so that a permissible exposure level is set well in

To ensure protection of the health and safety of workers and the public, comp that help keep toxic exposures to a minimum. In some cases, specific levels are se professional organizations. In others, the protection guideline is more strict tha case, the greater the health hazard, the greater the level of protection required. level of protection allows no exposure under normal conditions and much effort is m exposure will result from accidents.

# A-3 Exposure Pathways

Normal and emergency operations at some DOE facilities have the potential to members of the public to radioactive or toxic materials. To maintain high levels o exposure scenarios possible for normal operations and accidents. The materials inv protective measures are also considered. The term used to describe these scenarios exposure pathways." The following describes the four conditions that must exist to radioactive or toxic materials can be transported through the environment to worker and Thorne 1993):

1. Source term - This is the material released to the environment, includi radioactivity (if any) or mass of material, the physical form (solid, l distribution, and chemical form.

2. Environmental transport medium - This can be air, surface water, ground chain.

3. Exposure route - This is the method by which a person can come into con material, for example, external exposure from contaminated ground or im contaminated air or internal exposure from inhalation or ingestion of r material.

4. Human receptor - This is the person or persons potentially exposed. Th depends on such factors as location, duration of exposure, time spent o intake.

These four elements define an exposure pathway. For example, one scenario mi released from a stack as the source term, air as the transport medium, external gam passing cloud as the exposure route, and an onsite worker as the human receptor. A involve a volatile organic compound as the source term, groundwater as the transpor contaminated drinking water as the exposure route, and an offsite member of the pub receptor. No matter which pathway the scenario involves, local factors, such as wa and weather patterns, also play a big role in determining the pathway's importance

# A-4 References

Kamrin, M. A., 1988, Toxicology--A Primer on Toxicology Principles and Appli Michigan: Lewis Publishers, Inc.

Maheras, S. J. and D. J. Thorne, 1993, New Production Reactor Exposure Pathw Engineering Laboratory, EGG-NPR-8957, EG&G Idaho, Inc., January.

Ottoboni, M. A., 1991, The Dose Makes the Poison: A Plain-Language Guide to edition, New York: Van Nostrand Reinhold.

WINCO (Westinghouse Idaho Nuclear Co., Inc.), 1988, Introduction to Radiolog Rev. 2, Idaho Falls, Idaho.

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# APPENDIX B

CONSULTATION LETTERS

This appendix includes consultation/approval letters between the U.S. Departm and the U.S. Department of the Interior, Fish and Wildlife Service, regarding threa species, and between other State and Federal agencies as needed. Letters currently Department of the Interior, Fish and Wildlife Service, to DOE.

Also included in Appendix B is a description of the public involvement proces documenting consultation meetings held between DOE and various concerned agencies.

## B-1 Consultation/Approval Letters

**United States Department of the Interior**

FISH AND WILDLIFE SERVICE
Idaho State Office, Ecological Services
4696 Overland Road, Room 576
Boise, Idaho 83705

January 24, 1995

Tim Reynolds
Environmental Science Research Foundation
101 South Park Suite #2
P.O. Box 51838
Idaho Falls, Idaho 83405-1838

Subject: INEL-DOE Species List Update
(SP# 1-4-95-SP-80/Updates SP# 1-4-94-46/506.0000)

Dear Mr. Reynolds:

As requested by your telephone call on January 11, 1995, we have attached a list (Enclosure 1) of endangered and threatened, proposed and/or candidate species that may be present in the proposed project area. The list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under Section 7(c) of the Endangered Species Act of 1973 (Act), as amended. The requirements for Federal agency compliance under the Act are outlined in Enclosure 2. Please reference the species list number on Enclosure 1 in all subsequent correspondence, reports, environmental assessments, environmental impact statements, biological assessments (evaluations), Coordination Act reports, etc. If a construction project is not commenced within 180 days of this response, a subsequent species list request is required by regulations. This letter updates the Service's species list response of January 26, 1994, SP# 1-4-94-46.

If a listed species appears on Enclosure 1, a biological assessment (evaluation) would be prudent. Should your biological assessment (evaluation) determine that a listed species is likely to be affected adversely by the project, the Environmental Science Research Foundation should request formal Section 7 consultation through this office. If a proposed species is likely to be jeopardized by a Federal action, regulations require a conference between the Federal agency and the Service.

Candidate species that may appear on Enclosure 1, have no protection under the Act, but are included for early planning consideration. Proposed species could be formally listed and candidate species could be formally proposed and listed during

project planning, thereby falling within the scope of Section 7 of the Act. Therefore, if they appear on Enclosure 1, we recommend that additional surveys be made for proposed and/or candidate species that are likely to be in your project area. If the project is likely to adversely impact candidate species, informal consultation with this office is recommended.

If you have any questions regarding Federal consultation responsibilities under the Act, please contact Alison Beck Haas of this office at (208) 334-1931.

Thank you for your continued interest in the Endangered Species Program.

Sincerely,
Susan B. Martin
for
Charles H. Lobdell
State Supervisor-Ecological Services

Enclosures
cc: IDFG, Hdqtrs., Boise
IDFG, Region 6, Idaho Falls

**ENCLOSURE 1**

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, AND CANDIDATE SPECIES, THAT MAY OCCUR WITHIN THE AREA OF THE INEL-DOE PROJECT AREAS

FWS-1-4-95-SP-80

| LISTED SPECIES | COMMENTS |
|---|---|
| Bald Eagle (LE) (Haliaeetus leucocephalus) | Occasionally winter on part of INEL |
| PROPOSED SPECIES | |
| None | |
| CANDIDATE SPECIES | |
| Burrowing Owl (C2) (Athene cunicularia) | |
| Ferruginous Hawk (C2) (Buteo repalis) | |
| Long-eared Myotis (C2) (Mvotis evotis) | |
| Small-footed Myotis (C2) (Mvotis subulatus) | |
| Idaho pointheaded grasshopper (C2) (Acrolophitus punchellus) | Occur just north of INEL |
| Townsend's big-eared Bat (C2) (Plecotus townsendii) | Also State species of special concern status |
| Pygmy Rabbit (C2) (Brachylagus idahoensis) | Also State species of special concern status |
| Painted milkvetch (3c) (Astragalus ceramicus var. apus) | Also State species INPS monitor status |
| OTHER SPECIES OF CONCERN | |
| Merriam's Shrew (Sorex merriami) | State protected species |
| Long-billed curlew (Numenius americanus) | State protected species |
| King's bladderpod (Lesauerella kingii var. cobrensis) | State INPS monitor species |
| Nipple cactus (Coryphantha missouriensis) | State INPS monitor species |
| Sepal-tooth dodder (Cuscuta denticulata) | State INPS 1 species |
| Lemhi milkvetch (Astragalus apuilonius) | State INPS sensitive species |
| Winged-seed evening primrose (Camissonia pterosperma) | State INPS sensitive species |
| Spreading gila (Ipomopsis polycladon) | State INPS 2 species |

| | |
|---|---|
| (Gilia polycladon) | |
| Tree-like oxyytheca (Oxytheca dendroidea) | State INPS sensitive species |

GENERAL COMMENTS

C2 = Categorv 2 Taxa for which information now in possession of the U.S. Fish and Wildlife Service indicates that proposing to list as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat are not currently available to support proposed rules. Further biological research and field study may be needed to ascertain the status of taxa in this category.

INPS M - Monitor Taxa that are common within a limited range as well as those taxa which are uncommon, but have no identifiable threats.

INPS S = Sensitive Taxa with small populations or localized distributions within Idaho that presently do not meet the criteria for classification as Priority 1 or 2, but whose populations and habitats may be jeopardized without active management or removal of threats.

IMPS 1 - State Priority 1 Taxa in danger of becoming extinct or extirpated from Idaho in the foreseeable future if identifiable factors contributing to their decline continue t operate; these are taxa whose populations are present only at critically low levels or whose habitats have been degraded or depleted to a significant degree.

IMPS 2 - State Priority 2 Taxa likely to be classified as Priority 1 within the foreseeable future in Idaho, if factors contributing to their population decline or habitat degradation or loss continue.

**ENCLOSURE 2**

FEDERAL AGENCIES' RESPONSIBILITY UNDER SECTIONS 7(a) AND (c) OF THE ENDANGERED SPECIES ACT

SECTION 7(a) - Consultation/Conference

Requires: 1) Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2) Consultation with FWS when a Federal action may affect a listed endangered or threatened species to insure that any action authorized, funded or carried out by a Federal agency is not likely to jeopardize the continued existence~of listed species; or result in destruction or adverse modification of critical habitat. The process is initiated by the Federal agency after determining the action may affect a listed species; and

3) Conference with FWS when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat.

SECTION 7(c) - Biological Assessment for Major Construction Activities `

Requires Federal agencies or their designees to prepare Biological Assessment (BA) for major construction activities. The BA analyzes the effects of the action(y) on listed and proposed species. The process begins with a Federal agency in requesting from FWS a list of proposed and listed threatened and endangered species (list attached). If the BA is not initiated within 90 days of receipt of the species list, the accuracy of the species list should be informally verified with our Service. The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). No irreversible commitment of resources is to be made during the BA process which would foreclose reasonable and prudent alternatives to protect endangered species. Planning, design, and administrative actions may be taken; however, no construction may begin.

We recommend the following for inclusion in the BA; an onsite inspection of the area to be affected by the proposal which may include a detailed survey of the area to determine if the species are present; a review of literature and scientific data to determine species' distribution, habitat needs, and other biological requirements; interviews with experts, including those within FWS, State conservation departments, universities and others who may

have data not yet published in scientific literature; an analysis of the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; an analysis of alternative actions considered. The BA should document the results, including a discussion of study methods used, any problems encountered, and other relevant information. The BA should conclude whether or not a listed or proposed species will be affected. Upon completion, the BA should be forwarded to our office.

A major construction activity is a construction project (or other undertaking having similar physical impacts) which is a major action significantly affecting the quality of human environment as referred t the NEPA (42 U.S.C. 4332 (2) (C).

"Effects of the action" refers to the direct and indirect effects on action on the species or critical habitat, together with the effects of activities that are interrelated or interdependent with that action.

**United States Department of the Interior**

Fish and Wildlife Service
Idaho State Office, Ecological Service
4696 Overland Road, Room 576
Boise, Idaho 83705

January 26, 1994

Dr. Tim Reynolds
Department of Energy
Idaho Field Office
785 DOE Place
Idaho Falls, Idaho 83401-1562

Subject: INEL Species List Update
SP# 1-4-94-SP-46/updates 1-4-93-SP-362 File # 506.0000

Dear Dr. Reynolds:

The U.S. Fish and Wildlife Service (Service) is writing to update the species list SP-1-4-S3-362 for the Department of Energy. That list is enclosed for your information. There are no additions or changes to the list; the previous list continues to fulfill the requirements of the Service under Section 7(c) of the Endangered Species Act of 1973 (Act), as amended. This officially updates the list as of the date of this letter, and provides you with a new reference number SP-1-4-94-46. You should refer to the new species list number in all subsequent correspondence and documentation.

Information regarding Federal agency obligations under the Act, biological assessments, and candidate species has been provided to you in previous correspondence from this office. If you have further questons, or would like the information sent to you again, please contact Richard Howard of this office at 208-334-1931.

Thank you for your continued interest in the Endangered Species Program.

Sincerely,
Charles H. Lobdell
State Supervisor

Enclosure
cc: FWS-ES, Portland
IDFG-HQ, Boise
IDFG-Reg. 6, Idaho Falls

**ENCLOSURE 1**

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, AND CANDIDATE SPECIES, THAT MAY OCCUR WITHIN THE AREA OF THE INEL PROJECTS
FWS-1-4-94-SP-46/ UPDATES 1-4-93-SP-162

| LISTED SPECIES | COMMENTS |
|---|---|
| Bald Eagle (Haliaeetus leucocephalus) | Wintering area |
| PROPOSED SPECIES | |
| None | |
| CANDIDATE SPECIES | |
| Pygmy Rabbitt (c2) | |

(Brachvlagus idahoensis)
Loggerhead Shrike (c2)
(Lanius ludovicianus)
Townsend's Big-eared Bat (C2)
(Plecotus townsendii)
Ferruginous Hawk (C2)
(Buteo regalis)
Long-billed Curlew (3c)
(Numenius americanus)
Painted milkvetch (3c)
(Astragalus ceramicus var. apus)

GENERAL COMMENTS

C2 - Category 2 Taxa for which information now in possession of the U.S. Fish and Wildlife Service indicates that proposing to list as endangered or threatened is possibly appropriate but for which conclusive data on biological vulnerability and threat are not currently available to support proposed rules. Further biological research and field study may be needed to ascertain the status of taxa in this category.

3c = Category 3 Taxa that have proven to be more abundant or widespread than previously believed and/or those that are not subject to any identifiable threat. If further research or change, in habitat indicate a significant decline in any of these taxa, they may be reevaluated for possible inclusion in categories 1 or 2.

**ENCLOSURE 2**

FEDERAL AGENCIES' RESPONSIBILITY UNDER SECTIONS 7(A) AND OF THE ENDANGERED SPECIES ACT

SECTION 7(a) - Consultation/Conferencs

Requires: 1) Federal agencies to utilize their authorities to carry out programs conserve endangered and threatened species;

2) ConsultatiOn with FWS when a Federal action may affect a listed endan threatened species to insure that any action authorized, funded or carried out by a agency is not likely to jeopardize the continued existence of listed species; or re destruction or adverse modification of critical habitat. The process is initiated Federal agency after determining the action may affect a listed species; and

3) Conference with FWS when a Federal action is likely to jeopardize th continued existence of a proposed species or result in destruction or adverse modif of proposed critical habitat.

SECTION 7(c) - Biological Assessment for Major Construction Activities 1

Requires Federal agencies or their designees to prepare Biological Assessment (SA) construction activities. The SA analyzes the effects of the action2/ on listed and species. The process begins with a Federal agency in requesting from FWS a list of and listed threatened and endangered species (list attached). If the BA is not ini within 50 days of receipt of the species list, the accuracy of the species list sho informally verified with our Service. The BA should be completed within 180 days a initiation (or within such a time period as is mutually agreeable). No irreversibl commitment of resources is to be made during the SA process which would foreclose r and prudent alternatives to protect endangered species, planning, design, and administrative actions may be taken; however, no construction may begin.

We recommend the following for inclusion in the BA; an onsite inspection of the are affected by the proposal which may include a detailed survey of the area to determi species are present; a review of literature and scientific data to determine specie distribution, habitat needs, and other biological requirements; interviews with exp including those within FWS, State conservation departments, universities and others have data not yet published in scientific literature; an analysis of the effects of proposal on the species in terms of individuals and populations, including consider cumulative effects of the proposal on the species and its habitat; an analysis of alternative actions considered. The~BA should document the results, including a di of study methods used, any problems encountered, and other relevant information. T should conclude whether or not a listed or proposed species will be affected. Upon completion, the BA should be forwarded to our office.

1. A major construction activity is a construction project (or other undertaking h similar physical impacts) which is a major action significantly affecting the quali

human environment as referred to in the NEPA (42 U.S.C. 4332 (2)(c).
2. "Effects of the action" refers to the direct and indirect effects on an action species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action.

**United States Department of the Interior**

FISH AND WILDLIFE SERVICE
Boise Field Station
4696 Overland Road, Room 576
Boise, Idaho 83705

December 15, 1992

R.S. Rothman
EIS Project Manager
Department of Energy
785 DOE Place
Idaho Falls, Idaho 83401

Subject: EIS - Environmental Restoration and Waste Management (505.0110/1019.2036/ER 92/0911)

Dear Mr. Rothman:

The U. S. Fish and Wildlife Service is writing in response to your letter of November 10, 1992 concerning the preparation of an Environmental Impact Statement (EIS) for the Environmental Restoration and Waste Management (ER&WM) activities at the Idaho National Engineering Laboratory. On November 4, 1992 we responded with scoping statements to the Notice of Intent to Prepare an EIS and sent it to your office. This letter amends those scoping statements by providing a list of threatened, endangered and candidate species that are found in the area. For further information please contact Bill Mullins or Rich Howard of my staff at 208/334-1931.

Sincerely,
Charles H. Lobdell
Field Supervisor

cc: BFA (ERT), Washington, D.C.
FWS-FWE, Portland

**ATTACHMENT A**

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, AND CANDIDATE SPECIES, THAT MAY OCCUR WITHIN THE AREA OF THE DEPARTMENT OF ENERGY'S IDAHO NATIONAL ENGINEERING LABORATORY SITE
FWS-1-4-93-SP-84

| | COMMENTS |
|---|---|
| LISTED SPECIES | |
| Bald Eagle (Haliaeetus leucocephalus) | Wintering Area |
| PROPOSED SPECIES | |
| None | |
| CANDIDATE SPECIES | |
| Pygny Rabbit (C2) (Brachylagus idahoensis) | |
| Loggerhead Shrike (C2) (Lanius ludovicianus) | |
| Townsend's Big-eared Bat (C2) (Plecotus townsendii) | |
| Long-billed Curlew (3c) (Numenius americanus) | |
| Ferruginous Hawk (C2) (Bueto regalis) | |
| Painted milkvetch (3c) (Astragalus ceramicus var. apus) | |
| OTHER SPECIES | |
| Lemhi Milvetch (Astracalus acuilonius) | USFS/3LM Sensitive |
| Plains milkvetch (Astragalus cilviflorus) | USFS/BLM Sensitive |
| Thistle milkvetch | BLM Sensitive |

| | |
|---|---|
| (Astragalus kentrophyta var. dessize) | |
| Winged-seed evening primrose (Camissonia pterosperma) | BLM Sensitive |
| Nipple cactus (Coryphanta missouriensis) | INPS Monitor Species |
| Large-flowered gymnosteris (Gymnosteris nudicaulis) | BLM Sensitive |
| Spreading gilia (Ipomopsis polycladon) | BLM Sensitive |
| King's bladderpod (Lesquerella kingii var. cobrensis) | INPS Monitor Species |
| Tree-like oxytheca (Oxytheca dendroidea) | BLM Sensitive |

GENERAL COMMENTS

C2 = Category 2 Taxa for which information now in possesion or the U.S. Fish and Wildlife Service indicates that proposing to list as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat are not currently available to support proposed rules. Further biological research and field study may be needed to ascertain the status of taxa in this category.

C3 = Category 3 Taxa that have proven to be more abundant or widespread than previously believed and/or those that are not subject to any identifiable threat. If further research or changes in habitat indicate a significant decline in any of these taxa, they may be reevaluated for possible inclusion in categories 1 or 2.

Sensitive Species - OSFS Those animal species identified by the Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward-trends in population numbers or density or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Sensitive Species - BLM Sensitive species are those designated by the state direstor, usually in cooperation with the state agencies responsible for managing the species sensitive. They are those species that are 1)under status review by USFWS/NMFS; or 2)whose numbers are declining so rapidly that federal listing may become necessary; or 3)with typically small and widely dispersed populations; or 4)those inhabiting ecological refugia ot other specialized or unique habitats.

IMPS M = Monitor Taxa that are common within a limited range as well as those taxa which are uncommon, but have no identifiable threats.

**United States Department of the Interior**

FISH AND WILDLIFE SERVICE
Idaho State Office, Ecological Services
4696 Overland Road, Room 576
Boise, Idaho 83705

May 18, 1994

Roger Twitchell
Acting NEPA Compliance Officer
Department of Energy
Idaho Operations Office
850 Energy Drive
Idaho Falls, Idaho 83401-1563

Subject: Species List Update for Environmental Restoration and Waste Management
(SP# 1-4-94-SP-142/File# 506.0110)

Dear Mr. Twitchell:

The U.S. Fish and Wildlife Service (Service) is writing to provide you with an updated list of threatened, endangered, candidate, and proposed species which may occur on the project site at the Idaho National Engineering Laboratory. You requested the update in a letter to our office on April 26, 1994. There are no additions or changes to the previous list. This letter officially updates species list number 1-4-93-SP-84 and provides

you with a new number 1-4-94-SP-142. You should refer to the new number in subsequent Correspondence and documents.
Information concerning Federal agency obligations under the Endangered Species Act have been provided to you in the past. If you would like us to send you any of this information again or if you have questions, please contact Alison Beck Haas of my staff at (208)334-1931.
Thank you for your continued interest in the endangered species program.

Sincerely,
Charles H. Lobdell
State Supervisor, Ecological Services

Enclosure
cc: FWS-ES, Portland

**#Department of Energy**

Idaho Operations Office
850 Energy Drive
Idaho Falls, Idaho 83401-1563

Charles H. Lobdell
Field Supervisor
U.S. Fish and Wildlife Service
4696 Overland Road, Room 576
SUBJECT: Species List Update Request for the Spent Nuclear Fuel (SNF) and Environmental Restoration and Waste Management (ER & WM) Environmental Impact Statement (EIS) (OPE-EIS-94.235)
Dear Mr. Lobdell:
We are in receipt of your letter dated December 15, 1992, which provides a list of endangered, and candidate species for the above referenced project at the Idaho Nat Engineering Laboratory (INEL). Due to the length of time since the last request for information, we are formally requesting an update for any changes in species' statu additional available information regarding critical habitats. Thank-you for your co

Sincerely,
Roger Twitchell
Acting NEPA Compliance Offi
EIS Project Office

**United States Department of the Interior**

FISH AND WILDLIFE SERVICE
Idaho State Office, Ecological Services
4696 Overland Road, Room 576
Boise, Idaho 83705

May 18, 1994

Roger Twitchell
Acting NEPA Compliance Officer
Department of Energy
Idaho Operatins Office
850 Energy Drive
Idaho Falls, Idaho 83401-1563
Subject: Species List Update for Environmental Restoration and Waste management
(SP# 1-4-94-SP-142/File# 506.0110)
Dear Mr. Twitchell:
The U.S. Fish and Wildlife Service (Service) is writing to provide you with an updated list of threatened, endangered, candidate, and proposed species which may occur on the project site at the Idaho National Engineering Laboratory. You requested the update in a letter to our office on April 26, 1994. There are no additions or changes to the previous list. This letter officially updates species list number 1-4-93-SP-84 and provides you with a new number 1-4-94-SP-142. You should refer to the new number in subsequent correspondence and documents.

Information concerning Federal agency obligations under the Endangered Species Act have been provided to you in the past. if you would like us to send you any of this information again or if you have questions, please contact Alison Beck Haas of my staff at (208) 334-1931.

Thank you for your continued interest in the endangered species prpgram.

Sincerely,
Charles H. Lobdell
State Supervisor, Ecological Services

Enclosure
cc: FWS-ES, Portland

**ENCLOSURE**

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, AND CANDIDATE SPECIES THAT MAY OCCUR WITHIN THE AREA OF THE DEPARTMENT OF ENERGY'S IDAHO NATIONAL ENGINEERING LABORATORY SITE
SP# 1-4-94-SP-142

| | |
|---|---|
| LISTED SPECIES | COMMENTS |
| Bald Eagle (Haliaeetus leucocephalus) | Wintering Area |
| PROPOSED SPECIES | |
| None | |
| CANDIDATE SPECIES | |
| Pyqmy Rabbit (C2) (Brachylagus idahoensis) | |
| Loggerhead Shrike (C2) (Lanius ludovicianus) | |
| Townsend's Big-eared Bat (C2) (Plecotus townsendii) | |
| Long-billed Curlew (3c) (Numenius americanus) | |
| Ferruginous Hawk (C2) (Buteo Regalis) | |
| Painted Milkvetch (3c) (Astragalus ceramicus var. apus) | |
| OTHER SPECIES | |
| Lemhi Milkvetch (Astragalus aguilonius) | USFS/BLM Sensitive |
| Plains Milkvetch (Astragalus gilviflorus) | USFS/BLM Sensitive |
| Thistle Milkvetch (Astragalus kentrophyta var jessiae) | BLM Sensitive |
| Winged-seed Evening Primrose (Camissonia pterosperma) | BLM Sensitive |
| Nipple Cactus (Coryphantha missouriensis) | INPS Monitor Species |
| Large-flowered Gymnosteris (Gymnosteris nudicaulis) | BLM Sensitive |
| Spreading Gilia (Ipomopsis polycladon) | BLM Sensitive |
| King's Bladderpod (Lesquerella kingii var. cobrensis) | INPS Monitor Species |
| Tree-like Oxytheca (Oxytheca dendroidea) | BLM Sensitive |

GENERAL COMMENTS:

C2 Category 2 Taxa for which information now in possession of the U.S. Fish and Wildlife Service indicates that proposing to list as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat are not currently available to support proposed rules. Further

biological research and field study may be needed to ascertain the status of taxa in this category.
3c = Category 3 Taxa that have proven to be more abundant or widespread than previously believed and/or those that are not subject to any identifiable threat. If further research or changes in habitat indicate a significant decline in any of these taxa, they may be reevaluated for possible inclusion in categories 1 or 2.
Sensitive Species - USFS Those animal species identified by the Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward trends in population numbers or density or significant current or pr~diCted downward trends in habitat capability that would reduce a species' existing distribution.
Sensitive Species - BLM Sensitive species are those designated by the state director, usually in cooperation with the state agencies responsible for managing the species as sensitive. They are those species that are: 1) under status review by the Service/National Marine Fisheries Service; or 2) whose numbers are declining so rapidly that federal listing may become necessary; or 2) with typically small and widely dispersed populations; or 4) those inhabiting ecological refugia or other specialized or unique habitats.
INPS M = Monitor Taxa that are common within a limited range as well as those taxa which are uncommon, but have no identifiable threats.

**Department of Energy**

Idaho Operations Office
850 Energy Drive
Idaho Falls, Idaho 83401-1563
May 26. 1994

Ms. Mollie Beattie, Director
U.S. Fish and Wildlife Service
1849 C Street NW, MIB 3012
Washington, D.C. 20240

Subject: Department ofEnergy (DOE) Consultation Strategy in Conjunction with the Preparation of a Draft Programmatic Environmental Impact Statement (EIS). (OPE-EIS-94.302)

Dear Ms. Beattie:

The DOE Idaho Operations Office is preparing a draft EIS for DOE Programmatic Spent Fuel (SNF) Management and Idaho National Engineering Laboratory (INEL) Environmenta Restoration and Waste Management (ER&WM) Programs.

The EIS is organized into two separate volumes. Volume I addresses programmatic spe fuel management for the entire DOE complex. Volume II covers spent nuclear fuel man and ER&WM management actions within the boundaries of the INEL. In order to fulfill responsibilities to consult under the National Environmental Policy Act cNEPA) and Endangered Species Act, we requested an updated species list for INEL and the surro from the USFWS Idaho State Supervisor for Ecological Services. Our request was mail April 26, 1994 and the updated species list was received in our office May 23, 1994 Volume I of the EIS deals with Programmatic Spent Nuclear Fuel issues that involve sites and five Navy sites. We have not specifically requested species lists in conj preparation of Volume I, although recent USFWS species lists were among the resourc characterizing the sites and analyzing potential impacts to threatened and endanger Site specific NEPA documents will be prepared for actions based on decisions derive final programmatic EIS. It is our strategy to request species lists for these more specific environmental reviews.

We fully recognize our responsibility under NEPA and the Endangered Species Act to with your agency. This letter is to inform you of our strategy with regard to the p aspects of this EIS.

The draft EIS will be available for your review in early July 1994 through Lillian of the Department of Interior (DOI) and we look forward to your review and comments DOE's consolidated response. If you have any questions concerning this or related m contact me at (208) 526-0776.

Sincerely,
Roger Twitchell
Acting NEPA Compliance Officer

# B-2 Public Involvement

In scoping this Environmental Impact Statement (EIS), DOE actively solicited a wide group of interested parties. A Notice of Intent, announcing the scoping peri programmatic EIS addressing environmental restoration and waste management activiti spent nuclear fuel management) across the entire DOE complex, was published by DOE Federal Register (see 55 FR 204; October 22, 1990; p. 42633), as required under the Environmental Policy Act. Written comments, as well as oral comments received at 23 scoping meetings, were received in response to this announcement, Comments were rec Draft Implementation Plan for the DOE Programmatic EIS during six regional workshop the Country in early 1992. In October 1992, a Notice of Intent was published in the (see 57 FR 193; October 5, 1992; p. 45773), addressing the Idaho National Engineeri (INEL) environmental restoration and waste management and spent nuclear fuel activi scoping meetings were subsequently held throughout Idaho at which additional commen received.

A Notice of Opportunity to Comment, announcing DOE's intention to expand the s ongoing Spent Nuclear Fuel (SNF) and INEL EIS to include a review of spent nuclear management alternatives across the entire DOE complex, was published in the Federal 58 FR 170; September 3, 1993; p. 46951). Government agencies and the public were in comment On the expanded scope. The Notice of Opportunity included a toll-free telep which comments could be sent by facsimile, oral comments could be recorded for late or information could be requested. To facilitate the scoping and public involvement has compiled a mailing list that contains the addresses of interested agencies, org individuals. As a result of this effort, numerous comments have been received that to EIS planning.

As a result of the scoping process and related activities, DOE developed its m potentially interested parties for the initial distribution of the Department of En Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environment Restoration and Waste Management Programs Draft Environmental Impact Statement (SNF EIS). This list for the draft ElS includes more than 1000 Federal, State, and local organizations and private citizens to whom the EIS (or a Summary only, if so reques available for review and comment during the comment period. The list was updated ba responses to the Notice of Availability for the draft EIS.

# B-3 Agency Meetings

The EIS Project Office has reviewed all comments received on the draft SNF an To more fully understand, evaluate, and consider certain agency comments, consultat place among agency, INEL, and Navy officials. In addition to addressing specific co draft SNF and INEL EIS, these consultations helped promote a mutual understanding o important to the agencies. Continued consultation between these agencies and the Fe enhances the knowledge and expertise of both and promotes both informed decisionmak effective mitigation of potential impacts from the proposed actions. Table B-1 show locations of the meetings held with the various agencies. Meeting correspondence fo subsequent pages.

**Table B-1. Meetings held in response to agency comments on the Department of Energy** Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laborator Environmental Restoration and Waste Management Programs Draft Environmental Impact

| Agency | Location | Date |
|---|---|---|
| Defense Nuclear Facilities Safety Board | Washington, D.C. | November 9, 1994 |
| Environmental Protection Agency | Washington, D.C. | December 15, 1994 |
| Center for Disease Control | Conference call | November 22, 1994 |
| Council on Environmental Quality | Washington, D.C. | December 21, 1994 |
| Seneca Nation of New York | New York | January 10, 1995 |
| Shoshone-Bannock Tribes of Idaho | Fort Hall, Idaho | December 2, 21, and 29, 1994<br>January 10, 1995 |

**Department of Energy**

Washington, DC 20585
JAN 20 1995

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW
Suite 700
Washington, DC 20004

Dear Mr. Chairman:

Thank you very much for the Defense Nuclear Facilities Safety Board (DNFSB) staff participation in the meeting held November 9, 1994. The Department of Energy (DOE) requested that meeting with the goal of resolving, where possible. your September 30, 1994. comments on the Spent Nuclear Fuel and Idaho National Engineering Laboratory Draft Environmental Impact Statement (EIS). The Department desired, by bringing our respective staffs together, to glean further insight into the bases of DNFSB's comments arid to exchange technical information regarding the DOE'S analytical approach in the Draft EIS, The results of our meeting should enhance the quality of the information presented to the DOE decisionmakers and the public in the Final EIS.

The purpose of this follow-up letter is to Summarize our discussions and agreements during the meeting. The enclosed Comment Resolution Summary constitutes DOE's understanding of what was discussed and agreed to during our meeting, as well as the Department's proposed action to resolve the DNFSB technical comments. We would appreciate confirmation of the acceptability of the proposed resolution of your comments, Thank you again for the Board's participation in this process.

Sincerely,
Jill E. Lyltle
Deputy Assistant Secretary
for Waste Management
Environmental Management

Enclosure

a

**Department of Energy**

Idaho Operations Office
850 Energy Drive
Idaho Falls. Idaho 83401-1563
February 17, 1995

Mr. Andrew Stadnik
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, N.W., Suite 700
Washington. D. C. 20004

SUBJECT: Resolution ofDefense Nuclear Facilities Safety Board (DNFSB) Comment on t Multifacility Accident Assessment in the Department of Energy (DOE) Spent Nuclear Fuel Management (SNF) and Idaho National Engineering Laboratory (INEL) Draft Environmental Impact Statement (EIS) (OPE-EIS-95.0)

Dear Mr. Stadnik:

Enclosed are the more detailed information the Department of Energy committed to pr

during the November 9. 1994, meeting berween the DOE and the DNFSB on DNFSB comment number B. 1 (multifacility accident assessment).

Three enclosures are included. The first is a copy of the Comment B.1 resolution su was transmitted to Mr. J. Conway, DNFSB Chairman, under separate cover The second enclosure contains the assessments of multifacility accident caused by a seismic ev addressed in the material include the Idaho National Engineering Laboratory, the Ha Savannah River site, and the Navy sites. The discussion is based on the review the completed following the November 9 meeting. Finally, the third enclosure is the ref material which supports the EIS accident analysis for the Idaho National Engineerin Report #DOE/ID-10471 Draft. The draft report is cited as a reference in Enclosure 2 important to note that this report will be slightly modified to support the final E of addressing the DNFSB's comments.

If you would like to discuss the details of the analysis, or have any questions, pl Mr. Mark Pellechi, (208) 526-1545, of my staff.

Sincerely,
Tom Wichmann, Manager
EIS Project Office

Enclosure (3)

cc w/enc: D. Brown, DOE-OR
S.Clark, DOE-RL
D.Connors, Bettis
C.Gertz, DOE-NV
IL Guida, NR
C.Hansen, NR-1BO
P.Phillips, DOE-OR
D.Ryan, DOE-SR
K.Waltzer, DOE-SR

cc w/o enc: J. Conway, DNFSB
D.Hoel, EM-37

**Department of Energy**

Washington, DC 20585
January 19 1995

Ms. Katie Biggs
United States Environmental Protection Agency
Office of Federal Activities
Mail Stop: 2252
401 M Street, SW
Washington, D.C. 20460

Dear Ms. Biggs:

This letter transmits the final meeting minutes for the conference calls held on December 15, 19g4, to clarify and resolve the Environmental Protection Agency's (EPA) comments on the Department of Energy's Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Inipact Statement (EIS). We have incorporated your comments on the draft minutes and are pleased to provide this final version for your records and for distribution as you deem appropriate.

Once again, I would like to express our appreciation for the excellent cooperation we have received from EPA in reviewing the EIS and in discussing the comments,

Sincerely yours,
David F. Hoel
Office of Spent Fuel Management
Office of Waste Management
Environmental Management

Enclosure

**Department of Energy**

Idaho Operations Office
850 Energy Drive
Idaho Falls, Idaho 83401-1563
January 6, 1995

Mr. Kenneth W. Holt, M.S.E.H.

Special Prograrns Group (F29)
National Center for Environmental Health
Centers for Disease Control
Atlanta, GA 30341-3724
SUBJECT: Transmittal of Telephone Conference Call Meeting Minutes (OPE-EIS-95.01O
Dear Mr. Holt:
Thank you very much for your participation in the conference call held November 22, Department of Energy requested this meeting with the National Center for Environmen (NCEH) with the goal of resolving, where possible, your September 30, 1994 comments Spent Nuclear Fuel and Idaho National Engineering Laboratory Environmental Restorat Waste Management Draft Environmental Impact Statement. The Department desired, by bringing our respective staffs together, to glean further insight into the bases of comments and to exchange technical information regarding DOE's analytical approach DEIS.
As agreed to during the conference call, DOE prepared draft meeting minutes documen results of the conference call. NCEH reviewed and commented on the draft minutes on January 5. 1995.
Enclosed please find for your review the final meeting minutes, which reflect NCEH' January 5, 1995 comments. Please sign and return the minutes to the EIS Project Off you again for your valuable participation in this effort.

Sincerely,
Tom Wichmann, Manager
EIS Project Office

Enclosure

**ENCLOSURE 1**

DECEMBER 21, 1994, MEETING WITh COUNCIL ON ENVIRONMENTAL QUALITY (CEQ) STAFF REGARDING ThE DRAFT SNF/INEL EIS

Participants:

| CEQ STAFF | DOE |
|---|---|
| Ray Clark | David Hoel, EM-37 |
| Elizabeth Blag | Matt Urie, GC-51 |
| Joe Fuller | Stan Lichtman, EH-25 |

David Hoel opened the meeting by thanking the CEQ staff for agreeing to meet with us and then proposed to brief them on the DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement (SNF/INEL EIS) per the attached handout. (A copy of the Draft EIS Summary had been previously provided to Ray Clark.)
Before beginning the briefing, Stan Lichtman briefly described history or spent fuel management and the 1992 phaseout of DOE spent fuel reprocessing, which led to the need for interim storage decisions. David Hoel described the evolution of the SNF/INEL EIS as a result of the INEL court order, including the rationale for combining programmatic spent fuel management NEPA analyses (Volume 1) with that of the INEL cleanup and waste management programs (Volume 2).
The following summarizes the discussions that occurred during the course of the handout briefing:

DOE (Hoel and Lichtman) clarified for Elizabeth Blag the relationship of the SNF/INEL EIS to the DOE Waste Management Programmatic EIS, the EIS on the Proposed Policy for Acceptance of Foreign Research Reactor Spent Nuclear Fuel, and the Office of Civilian Radioactive Waste Management EIS regarding development of a Multi-Purpose Canister.

When discussing the public comments regarding confusion on how all DOE's & EISs tie together (see chart #5), Stan Lichtman offered to provide a separate briefing on this to CEQ staff at a later date.

Elizabeth Blag noted the Defense Nuclear Facilities Safety Board (DNFSB) comment that the EIS lacks a proposed action (see chart #5) and stated that she previously had conversations with John MacEvoy, of the DNFSB staff, on this subject. She told Mr. MacEvoy that she believes that the DOE approach to framing the proposed action and alternatives analyzed is appropriate and in accordance with CEQ regulations, DOE agreed with her opinion and Matt Urie briefly

described DOE/DNFSB staff interactions regarding this DNFSB comment.

- Ray Clark asked whether there was any research going on to explore different technologies for treatment of SNF. DOE (Hoel and Lichtman) explained that, while the EIS does analyze the reasonably foreseeable impacts of the use of technologies for wet storage, dry storage and SNF processing, the EIS' is not intended to support decisions on use of these technologies. Such decisions would be based on project- or site-specific NEPA reviews. DOE further explained that except for some ideas on using surplus plutonium as fuel in nuclear reactors, we are unaware of any research to reduce the radioactivity or accelerate the radioactive decay of SNF or other highly radioactive materials.
- During discussion of EIS analyses being performed on environmental justice (see chart #13), Matt Urie reminded Elizabeth Blag of the EIS technical guideline on environmental justice that had been provided for her review. Blag stated that she had reviewed the technical guideline and passed it to another CEQ staff member for review. Generally, she feels that the technical guideline is a reasonable approach and would forward any comments after consulting with the other staff member.
- David Hoel emphasized that the briefing information on cost comparisons (charts #14-16) was preliminary and the selection of preferred alternatives (charts #17 and 20-24) was pending Secretarial approval.

The CEQ staff thanked the DOE representatives for the briefing, as it greatly enhances their understanding of DOE spent nuclear fuel management proposals and respective NEPA reviews.

Attachment:

SNF and INEL ER&WM EIS Briefing for Council on Environmental quality (27 charts on 11 pages)

**ENCLOSURE 2**

Meeting with Seneca Nation Representatives

Date: January 10, 1995

Location: SNI Offices, Irving NY

Attendees: Ahmad Al-Daouk, DOE-WVAO
Russ Gill, WVNS
John Chamberlain, WVNS
Lisa Maybee, SNI
Adrian Stevens, SNI
Doug Wiggins, SNI

WVDP activities and potential cooperative actions with SNI were discussed. DOE spent fuel stored at WVDP was discussed and the DOE Programmatic EIS for Fuel.

D. Wiggins was primarily interested in any potential WVDP waste shipments, including the DOE spent fuel stored at the WVDP, that may cross or pass near the SNI reservations. He requested that SNI be included in planning for any future waste shipinents.

SNI representatives did not inquire about possible waste shipments other than from the WVMP. DOE contacts for information on the Programmatic Fuel EIS were offered in addition to those available in the documentation SNI had previously received. SNI representatives declined.

**Department of Energy**

Idaho Operations Office
850 Energy Drive
Idaho Falls, Idaho 83401-1563
December 14, 1994

Mr. Marvin Osborne
Shoshone-Bannock Tribes
P.O. Box 306
Fort Hall, Idaho 83203-0306

SUBJECT: Resolution of Shoshone-Bannock Comments on the Department of Energy (DO Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Draft Environmental Impact: Statement (PSNF and INEL ER&WM DEIS) (OPE-EIS-94.774)

Dear Mr. Osborne:

Thank you very much for the Tribes' participation in the meeting held December 2, 1 Hall. The DOE arranged this meeting with the Shoshone-Bannock Tribes with the goal resolving, where possible, your September 29, 1994, comments on the PSNF and INEL ER&WM DEIS. The Department desired, by bringing our respective staffs together, to further insight into the bases of the Tribes' comments and to exchange technical in regarding DOE's analytical approach in the DEIS. The results of our meeting should the quality of the information presented to the DOE decisionmakers in the Final EIS The purpose of this followup letter is to summarize what was discussed and agreed t meeting. The enclosed ninutes constitute DOE's understanding of what was discussed agreed to, as well as the Department's action to resolve the comments. If your unde differs from what is described in the enclosed, please notify us as soon as possibl I look forward to continued sessions between our technical specialists, as well as meeting with Tribal Council members and our management officials to conclude our consultation on this document. Thank you again for your participation in this proce

Sincerely,
Tom Wichmann, Manager
EIS Project Office

Enclosure

**Department of Energy**

Idaho Operations Office
850 Energy Drive
Idaho Falls, Idaho 83401-1563
January 9, 1995

Ms. Diane Yupe, Tribal Anthropologist
Shoshone-Bannock Tribes
Bureau of Indian Affairs
P.O. Box 306
Fort Hall, ID 83203-0306

SUBJECT: Ethmobotany Concerns of the Shoshone-Bannock Tribes (OPE-EIS-95.012)

Dear Ms. Yupe:

Per a commitment at our December 22, 1994 meeting, we have obtained a preliminary ethnobotany table from the forthcoming Environmental and Research Science Foundatio publication: Anderson, J. E., K. Rupple, J. M. Glernon, K E. Holte, and R.C. Rope. Vegetation, Flora, and Ethnoecology of the Idaho National Engineering Laboratory, E Please review and supplement the information in the table for its accuracy, particu relates to the Shoshone-Bannock Tribes. We are currently considering the appropriat detail, and format of the information for the Final Environmental Impact Statement. To meet production schedules, we need your comments by January 17, 1995. If you hav questions or need additional information, please call Roger Twitchell, our ecologic at (208) 526-0776.

Sincerely,
Tom Wichmann, Manager
EIS Project Office

Enclosure

**THE SHOSHONE-BANNOCK TRIBES**
Fort Hill Indian Reservation
Phone (208) 238-3706
Fax (208)237-0797

Cultural Resour
Anthropologis
P.O. Box
Fort Hall, I

January 18, 1995

Mr. Roger L. Twitchell
NEPA Compliance Officer
U.S. Department of Energy
850 Energy Drive, MS--1216
Idaho Falls, Idaho 83401-1563

RE: Vegetation, flora, and Ethnoecology of the INEL, ESRF-005 (Anderson, JE., et.

Dear Roger,
The Tribes' recieved the several pages of tables of the botanical study done by Ida University on the INEL. Please thank Mr. Wichmann for his immediate attention to ga information we requested.
I have reviewed the enclosed documents and I also spoke with one of the researchers content of the tables. I believe the information provided is accurate in the sense analysis and referencing previous anthropological work I noted that the authors did the category of Shoshone-Bannock terms and uses, I further believe that additional the researchers and the Tribes' can compliment a completed document and be a major both our interests.
In summary, the document as written is acceptable for EIS purposes. Additionally, t and DOE may went to make plans.in cotnp[cting the omitted portions of the study doc there are any questions or concerns, feel free to contact me (238-3706) at your con
Sincerely,
Diana K. Yupe
Cultural Resource Coordinator

**Department of Energy**

Idaho Operations Office
850 Energy Drive
Idaho Falls, Idaho 83401-1563
January 25, 1995

Ms. Jeanette Wolfley, Esquire
Counsel, The Shoshone-Bannock Tribes
P.O. Box 306
Fort Hall, ID 83202

SUBJECT: Comments on the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Draft Environmental Impact Statement (OPE-EIS-95.029)

Dear Ms. Wolfley:
Thank you very much for your participation in the meeting held on December 29, 1994 office in Fort Hall. The Department of Energy requested this consultation with Trib with the goal of resolving, if possible, the Tribes' comments on the legal aspects INEL ER&WM Draft EIS. I appreciate your discussions with me on these matters, as we the Tribes' legal system, and the Tribes' viewpoint on its relationship with the IN of our meeting should enhance the quality of the information presented to the DOE d makers in the Final EIS.
The purpose of this follow-up letter is to summarize what we discussed during our m Please review the enclosed draft meeting notes for accuracy. If these notes are acc please sign them indicating your agreement, and return the original to me. If I hav our discussion, or otherwise left out pertinent points, or made any other errors, p know as soon as possible, and I will make corrections.
Thank you again for your participation in this process.

Sincerely,
Denise Glore
Counsel

**Department of Energy**

Idaho Operations Office
850 Energy Drive
Idaho Falls, Idaho 83401-1563
February 2, 1995

Mr. Curtis Williams
Transportation Manager, The Shoshone-Bannock Tribes
P.O. Box 306
Fort Hall, Idaho 83202

SUBJECT: Documents Irom Union Pacitic (OPE-EIS-95-049)

Dear Mr. Williams:
Enclosed is a copy ofthe subject reply for your information and use. The Project Of these documents as an element of after-actions from our recent consultation with th Bannock Tribes. Thank you very much for your participation in the meeting held on December 2, 1994, at the Business Council Chambers at Fort Hall. The Department of requested this consultation with the goal of resolving, if possible, the Tribes' Co

Spent Nuclear Fuel (SNF) Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Draft EIS.
Thank you again for your participation in this process. Questions regarding the doc be directed to Mark Howard, (208) 5234164.

Sincerely,
Tom Wichmann, Manager
EIS Project Office

Enclosures
cc w/enc: J. Wolfley, Shoshone-Bannock Tribes
B.Hayball, Shoshone-Bannock Tribes

# APPENDIX C

INFORMATION SUPPORTING THE ALTERNATIVES

**CONTENTS**

FIGURES

TABLES

# APPENDIX C

INFORMATION SUPPORTING THE ALTERNATIVES

## C-1 INTRODUCTION

This appendix provides data and environmental information about the Idaho Nat Laboratory (INEL) site and surrounding area, related to projects that are being com considered, to implement the four spent nuclear fuel management, environmental rest management alternatives shown in the box to the right. Chapter 3 of Volume 2 of th Statement (EIS) describes these alternatives in detail.

The appendix presents two types of projects:

1. Planned or ongoing projects whose National Environmental Policy Act (NEPA) documentation was proposed to be completed before the Record of Decision for this EIS is issued.

2. Foreseeable proposed projects whose

detailed design or planning will not begin until the Department of Energy (DOE) has determined that the requirements of the NEPA process for the project have been completed.

---

SNF and INEL EIS ALTERNATIVES

A (no action)

Complete all near-term actions identified and continue operating mo facilities. Serves as benchmark for comparing potential effects from th three alternatives.

B (Ten-Year Plan)

Complete identified projects and initiate new projects to enhance clean manange the Idaho National Engineering Laboratory waste streams and spe nuclear fuel, prepare waste for final disposal, and develop technologies for spent nuclear fuel ultimate disposition.

C (Minimum Treatment, Storage, and Disposal)

Minimize treatment, storage, and disposal functions at the INEL to the extent possible (including receipt of spent nuclear fuel). Conduct minimum cleanup and decontamination adn decommissioning prescribed by regulation. Transfer spent nuclear fuel and waste from environmental restoration activities to another site.

D (Maximum Treatment, Storage, and Disposal)

Maximize treatment, storage, and disposal functions at the Idaho Nation Engineering Laboratory to accomodate waste and spent nuclear fuel from DOE facilities. Conduct maximum cleanup and decontamination and decommi

---

An objective of this appendix is to provide sufficient analysis for twelve foreseeable projects to allow timely deployment if needed for the project. DOE would evaluate the remaining 25 foreseeable projects on a case-by-case basis to determine if any additional NEPA or further evaluation is needed before implementing the project. The twelve projects are as follows:

| Project | Alternative |
|---|---|
| Expended Core Facility Dry Cell Project | B, D |
| Increased Rack Capacity for CPP-666 | B, D |
| Dry Fuel Storage Facility; Fuel Receiving, Canning/Characterization, and Shipping | B, C, D |
| Fort St. Vrain Spent Nuclear Fuel Receipt and Storage | B, D |
| Tank Farm Heel Removal Project | B, C, D |
| High-Level Tank Farm New Tanks | C, D |
| Shipping/Transfer Station | C |
| Waste Experimental Reduction Facility Incineration | B, D |
| Nonincinerable Mixed Waste Treatment | B, D |
| Sodium Processing Project | B, D |
| Gravel Pit Expansions | B, D |
| Calcine Transfer Project | B, D |

Figure C-1-1 shows the locations of all 49 projects. Most of these projects industrial areas on the INEL site corresponding to the numbered areas shown on the correspond to the numbered Waste Area Groups used to facilitate environmental remed INEL site. Throughout this appendix these areas are called major facility areas.

**Figure C-1-1. The Idaho National Engineering Laboratory location of projects assoc**

Table C-1-1 lists the twelve projects called "ongoing projects." Because the was proposed to be completed before the Record of Decision for this EIS, they are i (No Action) and other applicable alternatives. Their descriptions are presented in appendix in the order listed in the table. The list of twelve includes three remed NEPA review was well advanced before the decision of June 1994 for DOE to institute duplication by using the Comprehensive Environmental Response, Compensation, and Li (CERCLA) process for review of actions to be taken under CERCLA (DOE 1994a).

Foreseeable projects(a) are listed in Table C-3-1 at the beginning of Section

generic environmental information applicable to these projects. Summary descriptio presented in Section C-4 in the order listed in the table.

The remaining introductory sections discuss the organization and content of t (C-1.1) and generic assumptions (C-1.2).

## C-1.1 Organization of Project Summaries

Each project summary contains a narrative and a data sheet. The narrative in objective and a project description. Foreseeable projects summaries include projec (alternatives) where these differ from the EIS alternatives or are options within a project data sheets provide project-specific data for both ongoing and foreseeable nuclear fuel, environmental restoration, and waste management activities. These da upon the applicable phases(s) of a project: (a) projects with a construction and o with an operations phase only, and (c) decontamination and decommissioning projects

---

a. In response to public comments, the portion of this appendix dealing with these projects has been revised and expanded to consolidate environmental information found in other parts of this EIS and supporting documentation.

---

**Table C-1-1. Ongoing projects associated with programs and waste streams.**

| Projects | Facility locationa | Material/ waste streama | A |
|---|---|---|---|
| SPENT NUCLEAR FUEL PROJECTS | | | |
| Test Area North Pool Fuel Transfer | TAN | SNF | A |
| ENVIRONMENTAL RESTORATION-REMEDIATION PROJECTS | | | |
| Remediation of Groundwater Contamination c | TAN | NA | A |
| Pit 9 Retrievalc | RWMC | NA | A |
| Vadose Zone Remediation | RWMC | NA | A |
| ENVIRONMENTAL RESTORATION-DECONTAMINATION AND DECOMMISSIONING PROJECTS (D&D) | | | |
| Auxiliary Reactor Area (ARA)-II D&D | PBF/ARA | NA | A |
| Boiling Water Reactor Experiment V D&Dd | EBR-I/BORAX | NA | A |
| WASTE MANAGEMENT PROJECTS | | | |
| High-Level Tank Farm Replacement (upgrade phase) | ICPP | HLW | A |
| Transuranic Storage Area Enclosure and Storage P | RWMCct | TRU | A |
| Waste Characterization Facility | RWMC | TRU | A |
| Waste Handling Facilityd | ANL-W | LLW, MLLW, hazardous | A |
| INFRASTRUCTURE PROJECTS | | | |
| Health Physics Instrument Lab | CFA | NA | A |
| Radiological and Environmental Sciences Laboratory Replacementd | CFA | NA | A |

a. Acronym definition:

- BORAX Boiling Water Reactor Experiment
- CFA Central Facilities Area
- EBR-I Experimental Breeder Reactor I
- ICPP Idaho Chemical Processing Plant
- LLW low-level waste
- HLW high-level waste
- MLLW mixed low-level waste
- NA not applicable
- PBF/ARA Power Burst Facility/Auxiliary Reactor Area
- RWMC Radioactive Waste Management Complex
- SNF spent nuclear fuel
- TAN Test Area North
- TRU transuranic waste

b. Alternatives (See also box on page C-1-1 and discussion in Chapter 3, EIS Volum

- A - No Action
- B - Ten-Year Plan
- C - Minimum Treatment, Storage, and Disposal
- D - Maximum Treatment, Storage, and Disposal

c. When DOE decided in June 1994 to institute a policy to avoid duplication by usi
Compensation, and Liability Act (CERCLA) process for review of CERCLA actions (DOE
appendix, was an Interim Action being implemented under the INEL Federal Facility A
Record of Decision would be signed for the Final Action.
d. National Environmental Policy Act documentation for these projects is essential
may not be approved before June 1, 1995.
[table at end of file] A generic data sheet is shown in Figure C-1-2, and a guide t
the types of data on the sheet is given in Table C-1-2. The data sheets provide th
for the analyses of the impacts for the following environmental attributes:

- Geology and soil (acres disturbed)
- Water resources
- Wildlife and habitat
- Historic, archaeological, or cultural resources
- Air resources
- Human health
- Transportation
- Waste management
- Socioeconomic conditions.

The project summaries for foreseeable projects include a table that summarize
impacts of the proposed action on selected conditions within these environmental at

## C-1.2 Generic Assumptions

The general assumptions used for analysis purposes that are applicable to sev
listed in the section. Project-specific assumptions are given in individual projec
that form the basis for all the project analyses are as follows:

1. INEL construction projects scheduled for completion by June 1, 1995, are i
baseline against which the impacts of the proposed alternatives are analyz
were assumed to have their NEPA documentation completed by that time.

2. The time frame for the SNF and INEL EIS is the 10 years from June 1, 1995,
Ultimate shutdown and decontamination and decommissioning (life cycle) imp
projects are qualitatively assessed if they occur beyond the time frame an
Figure C-1-2. Generic project data sheet (refer to Table C-2 for guide to

---

a. These projects are not described in this appendix (see EIS section 2.2.4).

---

**Table C-1-2. Guide to project data sheet.**

| Data box identification (Refer to Figure C-1-2) | Parameter name | Explanation |
|---|---|---|
| | | GENERIC INFORMATION |
| (1) | Description/Function | Project title |
| (2) | Waste Area Group (WAG) | Indicates which INEL grouping is us environmental remediation efforts. "units" (facilities or areas) desig WAGs are identified on Figure C-1-1 follows:<br><br>WAG 1 Test Area North (TAN)<br>WAG 2 Test Reactor Area (TRA)<br>WAG 3 Idaho Chemical Processing<br>WAG 4 Central Facilities Area (C<br>WAG 5 Power Burst Facility (PBF) (ARA)<br>WAG 6 Experimental Breeder React<br>WAG 7 Radioactive Waste Manageme<br>WAG 8 Naval Reactors Facility (N |

| | | |
|---|---|---|
| | | WAG 9 Argonne National Laborator<br>WAG 10 Miscellaneous surface sites throughout the INEL that ar WAGs |
| (3) | EIS alternative | Indicates which SNF and INEL EIS al project:<br><br>Alternative A No Action<br>Alternative B Ten-Year Plan<br>Alternative C Minimum Treatment, S<br>Alternative D Maximum Treatment, S |
| (4) | Spent nuclear fuel or waste stream | Indicates the type of project: spen program (waste streams), environmen Acronyms used are as follows:<br><br>SNF spent nuclear fuel<br>HLW high-level waste<br>TRU transuranic waste [includes alp LLW)]<br>LLW low-level waste<br>MLLW mixed low-level waste<br>GTCC greater-than-Class-C waste<br>HW hazardous waste<br>ER environmental restoration<br>Infra. infrastructure |
| (5) | Action type | Provides the major objective of the<br>New - construction of a new facilit<br>D&D - D&D of an existing facility<br>Expand - expand a facility or proce<br>Modify - modify a facility or proce<br>Operation - operation of an existin |
| (6) | Structure type | Indicates the type of structure to D&D projects, lists the facilities structure size (square meters), and |
| (7) | Location | Indentifies the physical location o INEL facilities |

CONSTRUCTION OR DECONTAMINATION AND DECOMMISSIONING (D&D) INFORMATION: The D&D she is basically the same as the construction data sheet but does not include an operat

| | | |
|---|---|---|
| (8) | Preconstruction (Pre-D&D) costs | Indicates project costs prior to co |
| | Construction (D&D) costs | Indicates project costs associated |
| | Schedule dates | Provides schedule dates in calendar |
| (9) | Number of workers | Projects the number of workers that or D&D |
| (10) | Heavy equipment | Defines equipment that would be use and estimates heavy equipment traff construction or D&D site |
| (11) | Acres disturbed | Provides description of land use, b disturbed and revegetated areas (ac |
| (12) | Air emissions | References Technical Support Docume et al 1995) for project-specific ai D&D |
| (13) | Effluents | Identifies the type and lists amoun be generated during construction or |
| (14) | Solid wastes | Identifies the type and lists amoun would be generated during the const |
| (15) | Hazardous/toxic chemicals | Lists the types and lists amounts ( toxic chemicals that could be prese |
| (16) | Cultural resource effects | Identifies issues that would relate preservation of the construction or |
| (17) | Pits and ponding created | Indicates if a new pit or pond woul D&D and lists area(s) (square meter |

| | | |
|---|---|---|
| (18) | Water usage | Projects the total amount of water construction or D&D |
| (19) | Energy requirements | Projects the amount of electricity fuels (liters) that would be needed |
| (20) | Night lights | Indicates if night lights would be |
| (21) | Generators | Indicates if a generator would be r and whether day or night use would |
| OPERATIONAL INFORMATION | | |
| (22) | Operation costs | Projects the operating cost of a pr |
| | Schedule | Provides start and end operation da |
| (23) | Number of workers | Projects the number of workers (new required for operations |
| (24) | Heavy equipment | Defines equipment that would be use heavy equipment traffic volumes (tr |
| (25) | Air emissions | References operations air emission amount of air emissions to the envi |
| (26) | Effluents | Identifies the types and lists amou that would be generated during oper |
| (27) | Solid wastes | Identifies the types and lists amou waste that would be generated durin |
| (28) | Hazardous/toxic chemicals | Identifies the types and lists amou and toxic chemicals that would be p |
| (29) | Pits and ponding used: | Indicates if a pit or pond would be area(s) (square meters) |
| (30) | Water usage | Projects the amount of water (liter operations |
| (31) | Energy requirements | Projects the amount of electricity fuels (liters per year) that would |
| (32) | Night lights | Indicates if new night lights would |
| (33) | Generators | Indicates if a new generator would whether it would be used day or nig |

3. INEL industrial wastes are not analyzed as a separate waste stream. The v small considering the size of the INEL, and recycling and waste reduction quantities. Incremental changes to this waste stream are addressed in the summary section (Section 4.9) and in the evaluation of the Industrial/Comm Expansion project (Section 4.9.2), which would be sized to accommodate all

4. The following references were used for waste stream values:

| Spent nuclear fuel or waste stream | Reference |
|---|---|
| Spent nuclear fuel | Heiselmann (1995) |
| Transuranic, low level, and mixed low level | Morton and Hendrickson (1995) |
| High level | Freund (1995) |

5. Project schedules in the data sheets for each project are for analysis pur

6. The following general assumptions relate to the transportation of spent nu on and off the INEL site:

- The number of shipments associated with each project is based on the vo will be transported to and/or from each facility and the capacity of th The method of determining the number of shipments is consistent with th environmental impacts section on transportation (Section 5.11) of the

- Shipments within major facility areas (for example, from CPP-603 to CPP Chemical Processing Plant) are not analyzed.

- High-level wastes are stored at the INEL, but shipments of high-level w within the timeframe of this EIS.

- Offsite shipments are allocated to those foreseeable projects (summariz that are required to manage the spent nuclear fuel or waste in those sh example, naval spent nuclear fuel shipments are allocated to the Increa CPP-666 project, described in Section C-4.1.2.) Specific assumptions a

footnotes of the impact table for the applicable foreseeable project.

- All onsite shipments would be made by truck. All offsite shipments wer by truck; some offsite shipments may be by rail, which would result in shipments.

# C-2 ONGOING PROJECTS-DESCRIPTIONS

Ongoing projects as identified in Table C-1-1 in Section C-1 are described in this

## C-2.1 TEST AREA NORTH POOL FUEL TRANSFER

PROJECT NAME: Test Area North Pool Fuel Transfer
This project is proposed to be evaluated, approved, and in process as of June 1, 19 included in EIS Alternatives A (No Action), B (Ten-Year Plan), and D (Maximum Treat Disposal).
GENERAL PROJECT OBJECTIVE: The proposed general objectives of the Test Area North Transfer Project are (a) to provide a low-cost, environmentally sound alternative t Three Mile Island, Loss-of-Fluid-Test, and commercial spent fuels in the Test Area pool and (b) to ensure compliance with applicable codes and regulations regarding i nuclear fuel.
PROJECT DESCRIPTION: The Test Area North Hot Shop storage pool contains greater th curies of spent fuel and fuel debris consisting primarily of 343 canisters of core Island reactor accident. The storage pool also contains fuel and fuel remnants fro facility tests and U.S. Government-owned commercial fuel rods and assemblies.
DOE proposes to remove all of these materials from the storage pool and place them storage.
The Three Mile Island fuel canisters must be dewatered or dewatered and dried befor storage casks to prevent canister corrosion. The dryer system is located inside th canisters would be individually transferred to the dryer system using the existing grapple and overhead crane. The water would then be removed from the canisters by hot (300oF) nitrogen and heating the exterior with heating blankets. This nitrogen existing liquid nitrogen storage system and filtered and vented through the existin after passing through the canister. Four canisters would be dried at a time.
When seven canisters are ready, they would be loaded into the NRC-certified 125B sh to Test Area North or Idaho Chemical Processing Plant for storage.
At the Idaho Chemical Processing Plant, the shipping cask would be upended and the a new storage facility via a shielded transfer cask for safe interim storage. The Facility would be an aboveground concrete monolith with individual storage vault po The concrete monolith would provide for seismic stability, shielding, and monitorin conditions. The individual vaults would be cylindrical in section and would be sea Provisions for monitoring the interior of the individual vaults would be provided. retrievable for future transfer or maintenance activities.
The Loss-of-Fluid-Test and commercial fuel would be removed from the water, washed contamination, and suspended in the Hot Shop to dry. These fuels would be stored d Processing Plant or at Test Area North in unvented storage containers.
Approximately 3 million liters (780,000 gallons) of water would remain in the stora removal of the spent fuel and fuel debris. Spectroanalysis of the pool water condu identified a total radionuclide concentration of approximately 3 curies in the pool level waste, approximately 485 cubic meters (635 cubic yards) consisting of Three M storage hardware and metals, would be removed from the pool and transferred to the Management Complex after the fuel and fuel debris have been removed. The pool wate demineralization, filtration, and ion-exchange until it meets the criteria for disc

impoundment. The water would then be discharged to a surface impoundment area. Th empty of material and water and would be dispositioned in a separate project.

## C-2.2 REMEDIATION OF GROUNDWATER CONTAMINATION

**Figure. Project Data Sheet-North Pool Fuel Transfer.**

PROJECT NAME: Remediation of Groundwater Contamination

This project is proposed to be evaluated and approved as of June 1, 1995 and in pro included in EIS Alternatives A (No Action), B (Ten-Year Plan), C (Minimum Treatment Disposal), and D (Maximum Treatment, Storage, and Disposal).

GENERAL PROJECT OBJECTIVE: The proposed general project objective of the Remediati Groundwater Contamination Project is to reduce contamination in the vicinity of an located in the Test Area North Technical Support Facility.

PROJECT DESCRIPTION: The first phase of the Remediation of Groundwater Contaminati Interim Action being implemented under the INEL Federal Facility Agreement and Cons Interim Action is already in process in accordance with a Comprehensive Environment Compensation Liability Act Record of Decision signed by the Department of Energy Id (DOE-ID), the Idaho Department of Health and Welfare, and the U.S. Environmental Pr (Region 10). A second Record of Decision for the Final Action will implement the s remainder of the project.

This project would reduce the concentrations of trichloroethylene, tetrachloroethyl strontium-90, and other contaminants in the groundwater surrounding the TSF-05 inje Technical Support Facility. This well was used from 1955 until 1972 to dispose of wastes into the Snake River Plain Aquifer. On at least one occasion, concentrated the processing of low-level radioactive and process wastes were disposed of through The liquid wastes injected through the well included organic, inorganic, and low-le that were added to industrial and sanitary wastewater.

Contaminants have been found in the aquifer down to 122 meters (400 feet) below the contaminant plume is estimated to have spread up to 2.5 kilometers (1.5 miles) in t groundwater flow and continues to grow. The injection well (TSF-05) has been ident these contaminants, and the highest concentration of groundwater contaminants is fo well. These levels drop rapidly as the distance from the well increases.

The first-phase or Interim Action plan calls for extraction of groundwater with a p TSF-05 well casing, removal of contaminants from the groundwater in a treatment fac the cleaned water to a surface impoundment. The Interim Action treatment facility multimedia sand filter, carbon off-gas treatment, and an ion-exchange system. Grou extracted from two new monitoring wells, TAN-25 and TAN-26, if it is determined tha improve the efficiency of the remediation effort or if more water is needed to oper Additional groundwater could be obtained by pumping existing Test Area North and Un Geological Survey (USGS) wells, including USGS-24 and TAN-18.

If additional water needs to be added to meet treatment system requirements, extrac stored awaiting treatment in a 75,700-liter (20,000-gallon) surge tank. The first processing through an air stripper unit. Air discharge from the air stripper unit activated carbon to capture volatile organic compounds removed from the groundwater then filtered through a multimedia sand filter to remove any solids or sediments. groundwater is processed through an ion-exchange column to remove radionuclides. F groundwater is discharged to the Test Area North disposal pond (TSF-07).

Wastes generated during the treatment of contaminated groundwater include spent car resins, and filter sediment. Each of these solid wastes is disposed of in approved treatment site includes a contaminated waste storage area for the storage of proces classified as hazardous, low-level radioactive, or mixed low-level radioactive wast The Final Action or second phase to further remediate the contaminant plume will fo Information and analytical data gathered during the Interim Action on contaminant c pumping will be used in designing the Final Action. The Final Action could modify/ Action, resulting in significant changes to scope, cost, and schedule.

## C-2.3 PIT 9 RETRIEVAL (Interim Action)

**Figure. Project Data Sheet-Remediation of groundwater contamination.**

PROJECT NAME: Pit 9 Retrieval (Interim Action)

This project has been previously evaluated (DOE 1993a) and approved with a finding Impact (issued September 29, 1993). It is expected to be operable as of August 199

GENERAL PROJECT OBJECTIVE: The proposed general objectives of this Pit 9 Interim A reduce the potential for exposure of workers, the public, and the environment to co 9; to expedite the overall cleanup of the Radioactive Waste Management Complex at t Engineering Laboratory; and to reduce the potential for migration of Pit 9 wastes t Aquifer.

PROJECT DESCRIPTION: The Pit 9 Retrieval Project is an Interim Action initiated un Federal Facility Agreement and Consent Order. This Pit 9 Interim Action would exca contaminated with radioactive and hazardous substances disposed of at Pit 9 of the of the Radioactive Waste Management Complex. Included in the project would be the and operation of a double-containment retrieval enclosure, treatment facilities, wa office facility for project personnel.

Pit 9 is approximately 5 meters (17 feet) deep, 39 meters (127 feet) wide, and 116 Materials disposed in Pit 9 include sludges, graphite, combustibles, plastics, wood Radioactive contaminants include plutonium and americium. Organic hazardous contam trichloroethylene and carbon tetrachloride.

Proof-of-process testing for the proposed remediation technologies was completed in construction of the facilities began. A limited production test will be performed before full-scale remediation would begin. Key elements of the proof-of-process te production test would include showing that the primary steps of the remedial proces integrated system, proving that material cleaned during processing meets the treatm returned to the pit, and demonstrating that the final waste material could be safel disposal and/or storage criteria.

The approach approved in the Comprehensive Environmental Response, Compensation, an Interim Action Record of Decision would require that waste and contaminated materia be removed from Pit 9 using remotely operated excavators. After sorting and charac placed into a treatment unit. Treatment could include physical separation, chemica stabilization processes. Physical separation technologies would be used to separat concentrate the contaminants before further treatment. The physical separation tre mechanical methods, such as wet or dry screening, flotation, gravity concentration, filtration. Chemical extraction is the treatment technology selected to remove con sludges. A final stabilization process would add solidifying agents or use thermal concentrated waste contaminants to an unleachable form.

After treatment, concentrated waste contaminants would be placed in drums. These d then be placed into storage at the Radioactive Waste Management Complex Transuranic such drummed wastes would remain in storage until they were sent offsite for dispos facility.

Cleaned soils and waste materials meeting standards would be returned to the Pit 9 disposal. Any waste being returned to the pit would be required to meet an average transuranic isotopes of less than 10 nanocuries per gram and to meet all other appl requirements, including land disposal restrictions under the Resource Conservation land disposal restrictions would be met for these wastes through delisting (that is demonstrated to be nonhazardous). Nonhazardous wastes are not subject to Subtitle disposal and site closure requirements of the Resource Conservation and Recovery Ac operations were completed, Pit 9 would be closed in accordance with applicable requ Subpart D of the Resource Conservation and Recovery Act and State of Idaho solid wa requirements.

The treatment facility would be designed to treat 1,800 cubic meters (2,400 cubic y 200 cubic meters (260 cubic yards) per year would be concentrated waste contaminant retained for disposal. The remaining cleaned soils, 1,600 cubic meters (2,100 cubi returned to Pit 9 for disposal. All waste generated by the operation of the facili stream and treated with the recovered wastes.

## C-2.4 VADOSE ZONE REMEDIATION

**Figure. Project Data Sheet-Pit 9 Retrieval (Interim Action).**

PROJECT NAME: Vadose Zone Remediation

This project is proposed to be evaluated, approved, and in process as of June 1, 19 Alternatives A (No Action), B (Ten-Year Plan), C (Minimum Treatment, Storage, and D

(Maximum Treatment, Storage, and Disposal).
GENERAL PROJECT OBJECTIVE: The proposed general objective of the Remediation of Or Contamination of the Vadose Zone Project is to prevent organic contaminant migratio Plain Aquifer that underlies the Idaho National Engineering Laboratory (INEL) in gr concentrations exceeding acceptable risk levels and/or Federal and State maximum co
PROJECT DESCRIPTION: The Remediation of Organic Contamination of the Vadose Zone p remove volatile organic contamination found in the unsaturated hydrogeologic zone ( the Subsurface Disposal Area of the Radioactive Waste Management Complex at the INE treating vapors of volatile organic contaminants from soils and underlying rock. C established as vadose zone contaminant concentrations that would not result in grou concentrations exceeding maximum contaminant levels or resulting in unacceptable ri groundwater users.
Organic contaminant concentrations have been detected in soil vapor, surficial soil the Subsurface Disposal Area in concentrations ranging from 1 part per million to 2 The primary contaminants of concern are carbon tetrachloride, trichloroethylene, te 1,1,1-trichloroethane. Most of these contaminants were transported to the INEL for solidified lubricants, solvents, used oils, and degreasing agents. A small quantit reached the Snake River Plain Aquifer in concentrations that are lower than Federal water standards. The Snake River Plain Aquifer has been designated as a sole-sourc Environmental Protection Agency.
Vapor vacuum extraction has been chosen as the remediation technology to be used to from the vadose zone. In implementing this technology, extracted vapors would be t surface with catalytic oxidation. This program would use the existing vapor vacuum several additional extraction wells that would be located in areas of the Subsurfac have significant levels of organic vapors in the vadose zone.
The complexities of the subsurface environment and uncertainty associated with mode response to extraction make it difficult to predict how many wells would eventually period of time they would need to operate to achieve cleanup goals. Up to three ph could be implemented over six years. The first phase of the project would include additional extraction wells, vapor treatment units, and vapor monitoring wells. If subsequent phases may include more vapor extraction wells, monitoring wells and vap maximum number of vapor extraction wells and accompanying vapor treatment units wou Each vapor extraction well would be linked to a catalytic oxidation unit or equival capable of maintaining an airflow that would range between 125 and 150 cubic feet p treatment wastes would result from use of this treatment system.
Long-term groundwater and soil vapor monitoring would be performed to confirm the a vacuum extraction system to prevent contaminants from migrating to the Snake River that would result in unacceptable groundwater contaminant concentrations. Monitori groundwater would continue after remediation is complete to verify that organic con in the vadose zone remain below acceptable levels.

## C-2.5 AUXILIARY REACTOR AREA (ARA)-II

**Figure. Project Data Sheet-Vadose Zone Remediation.**

DECONTAMINATION AND DECOMMISSIONING
PROJECT NAME: Auxiliary Reactor Area (ARA)-II Decontamination and Decommissioning
This project has been previously evaluated (DOE 1993b) and approved with a finding Impact (issued September 29, 1993). It is expected to be in process as of June 1,
GENERAL PROJECT OBJECTIVE: The proposed general objectives of the Auxiliary Reacto (ARA)-II Decontamination and Decommissioning Project are to ensure that the identif safe configuration, to determine and execute appropriate decontamination activities facilities that are surplus to DOE's future programmatic needs. This project would radioactive exposure and eliminate the need for, and cost of, further surveillance sites.
PROJECT DESCRIPTION: This project would decontaminate and decommission the radiolo contaminated buildings, structures, utilities, and other miscellaneous items at ARA The Auxiliary Reactor Area is composed of ARA-I, -II, -III, and -IV. ARA-II was th Low-Power Reactor No. 1 (SL-1). An accident occurred at SL-1 in 1961 that resulted Following the accident, the SL-1 building was disassembled and buried 0.8 kilometer ARA-II facility boundary, and the reactor was buried at the Radioactive Waste Manag Remaining support buildings at ARA-II were decontaminated and converted to laborato

shops. During the 1980s, the use of these buildings was discontinued. All buildin at ARA-II would be demolished and removed and the site recontoured and reseeded. Contaminated building materials would be cut up to reduce bulk and packaged and tra Radioactive Waste Management Complex for disposal. Conventional radiological decon such as surface wiping and scabbling (which is the mechanical or hydraulic removal used to decontaminate buildings, structures, and utilities. During scabbling, effl through high-efficiency particulate air filters to minimize releases of particulate At Auxiliary Reactor Area (ARA)-II, about 114 liters (30 gallons) of fuel oil remai gallon) ARA-705 underground storage tank. This oil may be contaminated and, theref mixed waste. If contaminated, it would be disposed of at the Waste Experimental Re to the INEL Radioactive Mixed Waste Storage Facility for storage. Fifty-five cubic of contaminated asbestos has been removed from ARA-II and would be transported to t Management Complex.

# C-2.6 BOILING WATER REACTOR EXPERIMENT (BORAX)-V

**Figure. Project Data Sheet-Auxillary Reactor Area (ARA)-II Decontamination and Deco**

DECONTAMINATION AND DECOMMISSIONING
PROJECT NAME: Boiling Water Reactor Experiment (BORAX)-V Decontamination and Decommissioning
This project is proposed to be evaluated, approved, and in process as of June 1, 19 included in EIS Alternatives A (No Action), B (Ten-Year Plan), C (Minimum Treatment Disposal), and D (Maximum Treatment, Storage, and Disposal).
GENERAL PROJECT OBJECTIVE: The proposed general objectives of the Boiling Water Re Experiment (BORAX)-V Decontamination and Decommissioning Project are to remove the facility from the list of surplus facilities, remove or stabilize potential sources eliminate or significantly reduce the requirement of future surveillance and mainte
PROJECT DESCRIPTION: This project would decontaminate and decommission the remaini facility by one of two alternatives:

1. Dismantlement would restore the BORAX-V site at the Idaho National Enginee to its natural condition. Dismantling would involve the removal of the BO BORAX-II/III/IV reactor vessels and removal of remaining facility systems and associated structural material) from the basements. After removal of piping, and equipment, the walls of the reactor building and adjacent area decontaminated to acceptable release limits. The reactor building foundat demolished to a minimum of six feet below grade. The site would then be b resemble existing contours in the area, and revegetated.

2. Entombment would involve limited removal of wastes followed by backfilling vessels and building and installing a concrete cap. Because this action w excavation, cultural resources would not be impacted, airborne pollutant e minimal, industrial hazards to workers would be reduced, and residual cont radiation fields would remain in place under concrete containment.

Entombment would generate significantly less airborne pollutant emissions bec excavation would be conducted. Also, significantly less solid waste would be would consist of lead shielding, instruments containing mercury, and a small material that would not be contaminated.

**Figure. Project Data Sheet-Boiling Water Reactor Experiment (BORAX)-V Decontaminati**

# C-2.7 HIGH-LEVEL TANK FARM REPLACEMENT

(UPGRADE PHASE)
PROJECT NAME: High-Level Tank Farm Replacement (Upgrade Phase)
This project has been previously evaluated (DOE 1993c) and approved with a finding Impact (issued June 1993). It is expected to be in process as of June 1, 1995.
GENERAL PROJECT OBJECTIVE: The proposed general objective of this project is to de

and start up modifications to the existing Idaho Chemical Processing Plant high-lev ancillary systems. These modifications would (a) provide compliance with the Notic Consent Order, (b) provide compliance with the Notice of Violation Consent Order, a maintenance and as-low-as-reasonably-achievable issues. The Notice of Noncomplianc compliance date is December 31, 1995; the Notice of Violation Consent Order complia 31, 1996.

PROJECT DESCRIPTION: Design for this project has been completed. The construction awarded June 1993; construction is in progress.

All valve boxes, transfer piping, and pressure/vacuum relief piping being upgraded Idaho Chemical Processing Plant tank farm systems that must remain in service throu use" dates (March 2009 for five tanks; June 2015 for six tanks) established in the eleven existing high-level waste storage tanks. Some transfer lines and valves wou service if new replacement tanks are constructed.

Detailed upgrade requirements and actions are the following:

1. Two valve boxes (B2 and B3) require secondary containment improvement. Se containment piping is being installed.

2. Five valve boxes (C28, C29, C30, C31, C38) require a second form of leak d Conductivity probes are being installed.

3. Twenty-five valve boxes require replacement valves because of as-low-as-re achievable and other maintenance considerations. The existing valves have useful life, have become highly failure prone, and are no longer supported New top loading ball valves, with remote maintenance capability, are being

4. Six valve boxes (A6, B2, B3, B4, B5, B9) must have their tops raised to gr the new valve systems and to allow the secondary containment improvements B3.

5. The tile-encased pipe from Building CPP-641 to valve box C-29 must be repl incompatibility of the secondary containment. A new double-encased, stain pipe is being installed.

6. Tile-encased pipes at Building CPP-604 must be replaced because of incompa secondary containment. This action would be accomplished by providing a n and the associated double encased stainless steel replacement piping. Fiv are being demolished.

7. The pressure/vacuum relief pipe from all eleven tanks must be replaced to safety and as-low-as-reasonably-achievable considerations. The existing p and physically deteriorated. New stainless steel pipe is being installed.

**Figure. Project Data Sheet-High-Level Tank Farm Replacement (Upgrade Phase).**

## C-2.8 TRANSURANIC STORAGE AREA ENCLOSURE

AND STORAGE PROJECT

PROJECT NAME: Transuranic Storage Area Enclosure and Storage Project

This project has been previously evaluated (DOE 1992) and approved with a finding o Impact (issued May 18, 1992). It is expected to be in process as of June 1, 1995.

GENERAL PROJECT OBJECTIVE: The proposed general objective of this project is to co to retrieve and re-store transuranic waste to allow compliance with Resource Conser storage requirements and the Idaho National Engineering Laboratory's Part B Resourc Recovery Act Permit.

PROJECT DESCRIPTION: This project would provide for the retrieval and re-storage o Storage Area waste by constructing and operating the Retrieval Enclosure, Waste Sto facilities, and associated upgrades to utilities. Transuranic Storage Area waste i Waste Management Complex.

This project summary describes both the Transuranic Storage Area Enclosure Facility Facility Project. The projects are described together because the Environmental As activities and to facilitate documentation and review activities.

Since 1970, Department of Energy defense-generated and other contact-handled transu placed in 20-year retrievable storage at the Transuranic Storage Area. Presently, meters (85,000 cubic yards) of contact-handled transuranic waste is stored in drums stacked on three asphalt pads (Transuranic Storage Area Pads 1, 2, and R) and in tw weather shield buildings at the Transuranic Storage Area. Approximately 80 percent pads and is covered with 1 to 1.5 meters (3 to 4 feet) of soil and/or with a fabric percent of the waste is stored in two air support weather shield buildings.

Approximately 95 percent of the waste stored at the Transuranic Storage Area is est contaminated with chemically hazardous substances regulated under the Resource Cons Act, Toxic Substances Control Act, and the Idaho Hazardous Waste Management Act. T methods and configurations do not comply with these and other Federal and State req regulations.

Because retrievable storage of Transuranic Storage Area waste began in 1970 at the Management Complex, some of the waste containers have been stored for over 20 years conservatively estimated, based on limited container integrity inspections and dete 10 percent of the Transuranic Storage Area waste containers may be breached. This waste containers presents the problem of potential radiological and hazardous chemi environment unless retrieval and re-storage occur and increases the need for an enc This project would provide capabilities to retrieve and re-store wastes in new perm designed to meet requirements of the Resource Recovery Conservation Act/Toxic Subst Act/Idaho Hazardous Waste Management Act. The design would incorporate the flexibi accommodate future modifications and adaptations for various waste forms and compos Radioactive Waste Management Complex. The facility and support equipment would hav design life of 25 years. Wastes characterized and repackaged at the Waste Characte transferred to the Waste Storage Facility for permitted storage until the waste can geologic repository such as the Waste Isolation Pilot Plant, as low-level waste at until appropriate treatment can be performed.

The Retrieval Enclosure would be a metal building that would enclose Transuranic St and R. The Waste Storage Facility would consist of a series of individual pre-engi The Waste Storage Facility would replace the current air support weather shield bui Resource Conservation and Recovery Act-permitted storage facility providing a large support facilities would include an operations control building. Utility upgrades include fire water, potable water, electric power, communications, alarms, and sewa

The retrieval process would consist of four steps:

1. Removing and disposing of the soil covering the waste (not applicable for the Air Support Weather Shield buildings).

2. Removing the waste containers from the Air Support Weather Shield building done as part of Radioactive Waste Management Complex operations) and from Storage Area Pads 1, 2, and R (which would take place within the Retrieval

3. Surveying the containers during retrieval for contamination and integrity or overpacking the containers, if necessary.

4. Re-storing the waste in the weather-protected, Resource Conservation and R permitted Waste Storage Facility.

Transuranic Storage Area enclosure waste, 52,000 cubic meters (68,000 cubic yards), rate of approximately 5,200 cubic meters, (2,750 cubic yards) or 25,000 drum equiva equivalent = 0.21 cubic meters (0.275 cubic yards)]. This activity would continue years. This throughput may be expanded if breached or contaminated containers are rate than the 10 percent assumed for design analyses.

Of the storage modules in the Waste Storage Facility, three are completed; all woul The Retrieval Enclosure would be complete by 1996, and the Operations Control Build by June 1995.

## C-2.9 WASTE CHARACTERIZATION FACILITY

**Figure. Project Data Sheet-Transuranic Storage Area Enclosure and Storage Project.**

PROJECT NAME: Waste Characterization Facility

This project (DOE 1995c, 1995d) is proposed to be evaluated, approved, and in proce It is included in EIS Alternatives A (No Action), B (Ten-Year Plan), C (Minimum Tre

Disposal), and D (Maximum Treatment, Storage, and Disposal).
GENERAL PROJECT OBJECTIVE: The proposed general objective of this project is to pr
National Engineering Laboratory (INEL) with a waste characterization facility for t
reclassified low-level waste as required by the Resource Conservation and Recovery
PROJECT DESCRIPTION: This project would provide the design, construction, and oper
Characterization Facility at the Radioactive Waste Management Complex on the INEL.
Characterization Facility would provide facilities to open containers of contact-ha
reclassified low-level waste, and mixed low-level waste; obtain and examine samples
characterized waste in an environment designed to contain alpha-type radiation.
The facility would perform the following specific functions:

- Verify waste forms contained in representative samples of waste stored in been certified using nondestructive examination techniques at the Stored W Pilot Plant

- Sample waste in containers for characterization and analysis required by t Pilot Plant Waste Acceptance Criteria, including their "no migration deter and other conditions that Environmental Protection Agency may promulgate f assessment. Data would be used to assign and verify waste codes, complet manifests, and to prepare waste profile data forms required for shipment a actual analysis would be performed by an approved analytical laboratory.

- Identify waste forms and composition to aid in planning future treatment a facilities for wastes that do not meet certification criteria for the Wast Plant

- Demonstrate container opening, waste handling, and packaging equipment req treatment facilities

- Provide experimental and pilot-scale treatment process mockup and testing treatment facilities

- Provide facilities for visual characterization of unknown waste contents

- Provide facilities for removal of items from containers that otherwise cou disposal.

## C-2.10 WASTE HANDLING FACILITY

**Figure. Project Data Sheet-Waste Characterization Facility.**
PROJECT NAME: Waste Handling Facility
The National Environmental Policy Act documentation for this project is ongoing and
complete by June 1, 1995. This project is included in EIS Alternatives A (No Actio
(Minimum Treatment, Storage, and Disposal), and D (Maximum Treatment, Storage, and
GENERAL PROJECT OBJECTIVE: The proposed general objective of this project is to co
operate a Waste Handling Facility at Argonne National Laboratory-West that has the
proposed objectives:

1. Provide an indoor storage area for low-level waste and mixed low-level was packaged and awaiting transport for final disposal.

2. Provide an indoor 90-day storage and repackaging area [as defined in 40 CF hazardous waste and for polychlorinated biphenyl wastes regulated by the T Control Act per 40 CFR 761.65(b).

3. Provide an indoor storage area for recyclable excess items awaiting transp excess area, including Resource Conservation and Recovery Act-regulated re such as batteries and lead scrap.

4. Provide an area and equipment for the sorting, segregation, and dumpster l wastes.

5. Provide monitoring equipment for performing bulk radiological surveys of a

wastes to ensure that no radiological wastes are released to the environme nonpermitted facility.

6. Provide controlled aboveground outdoor tank systems for storage of waste o glycol awaiting recycling.

7. Provide a controlled outdoor storage area for nonradioactive metal and woo

PROJECT DESCRIPTION: The Waste Handling Facility at Argonne National Laboratory-We provide a central point for waste receipt, sorting, storage, and transportation fro Laboratory-West. The wastes would include low-level radioactive waste, mixed low-l waste, polychlorinated biphenyl-contaminated waste, and solid (nonradioactive, nonh facility would contain the following:

- Hazardous waste storage area
- Municipal sanitary waste (cold waste) sorting area
- Contact-handled radioactive waste storage area
- Excess items (nonradioactive, nonhazardous) storage area
- Offices.

The 650-square-meter (780-square-yard) Waste Handling Facility would provide room f all solid waste generated at Argonne National Laboratory-West for radioactive conta hazardous materials.

- Hazardous wastes are accumulated at over 40 hazardous waste satellite accu located throughout the Argonne National Laboratory-West site. In the haza area, the new facility would accept hazardous wastes from the satellite ac following the filling of the waste container or termination of the waste p Handling Facility would store the wastes in a dedicated hazardous waste st transport from Argonne National Laboratory-West. A smaller room (the Drum would be dedicated to the combining of like wastes into a single container of shipments offsite. Hazardous wastes with recycle potential would be co identified.

- The municipal sanitary waste sorting area would provide for (a) monitoring generated at Argonne National Laboratory-West for radioactive contaminatio hazardous materials and (b) sorting waste to recover recyclable materials. Resource Conservation and Recovery Act proposed Subtitle D requirements an meeting DOE waste minimization requirements, this facility would provide a establishing a maximum recycling effort. Tank storage for waste oil and e also be provided.

- The Waste Handling Facility would include a storage area for contact-handl radioactive wastes generated at Argonne National Laboratory-West. Radioac would be packaged at the Argonne National Laboratory-West generating facil Waste Handling Facility for storage pending transport to the Radioactive W Complex, the Waste Experimental Reduction Facility, or the Radioactive Mix Facility, all located on the INEL. Covered storage of radioactive materia requirements of DOE Orders 5400.5 (DOE 1993d) and 5820.2A (DOE 1988) to pr personnel and the environment from releases of radioactive materials.

- The Waste Handling Facility would include controlled (fenced) outdoor stor wood and metal that have been verified to be nonradioactive/nonhazardous. segregation would allow for recycling.

## C-2.11 HEALTH PHYSICS INSTRUMENT LAB

**Figure. Project Data Sheet-Waste Handling Facility.**

PROJECT NAME: Health Physics Instrument Lab

This project is proposed to be evaluated, approved, and in process as of June 1, 19 included in EIS Alternatives A (No Action), B (Ten-Year Plan), C (Minimum Treatment Disposal, and D (Maximum Treatment, Storage, and Disposal).
GENERAL PROJECT OBJECTIVE: The proposed general objective of the Health Physics In Project is to provide a technologically up-to-date facility that safely accommodate operational needs of the health physics program at the Idaho National Engineering L
PROJECT DESCRIPTION: The existing Health Physics Instrument Lab is located in Cent Building 633, which was originally designed for the World War II naval gun testing 40 years old, has significant structural and mechanical deficiencies, and was const wallboard. The final disposition of Building 633 would not be part of this project
This project would provide the design, construction, and operation of a replacement the Health Physics Instrument Lab at the INEL. The new facility would provide appr meters (2,900 square yards) of space divided among four major areas: (a) transport storage; (b) instrument control and repair; (c) laboratory operations; and (d) offi
The Health Physics Instrument Lab would provide portable health physics monitoring direct reading dosimetry procurement, calibration, and maintenance, along with rese support services to the INEL and others. The existing Health Physics Instrument La Institute of Standards and Technology quality calibration services and provides sup acceptance evaluation of new radiological instrumentation. These instruments are c in compliance with standards of the American National Standards Institute and are u exposure of personnel from radiological sources and to ensure a safe and healthy wo workers.
All instrumentation returned to the Health Physics Instrument Lab would be brought receiving area, surveyed for contamination, and decontaminated. Once the instrumen have an "as found" determination performed to check the condition of the instrument would then be repaired per recommended repair procedures.
After repair, each instrument would have a reproducibility check performed before a adjustments are made. The actual calibration control adjustment procedure would de readout for the instrument. Calibrations would be performed in the gamma well lab, ray lab, low-level lab, or low-scatter lab as required. After calibration, the ins calibration sticker attached and placed in storage.
In addition to calibrations, the Health Physics Instrument Lab would provide techni irradiations for the Operational Dosimetry Unit. These irradiations would be perfo alpha/beta irradiation lab, low-level lab, or low-scatter lab as required. The dos be used for disassembly before irradiation and assembly after irradiation of the do

## C-2.12 RADIOLOGICAL AND ENVIRONMENTAL SCIENCES

**Figure. Project Data Sheet-Health Physics Instrument Lab.**

LABORATORY REPLACEMENT
PROJECT NAME: Radiological and Environmental Sciences Laboratory Replacement
The National Engineering Policy Act (NEPA) documentation fbr this project is essent Due to budget contraints, the finding of No Significant Impact may not be approved 1995. This project is included in EIS Alternatives A (No Action), B Ten-Year Plan), Treatment, Storage, and Disposal), and D (Maximum Treatment, Storage, and Disposal)
GENERAL PROJECT OBJECTIVE: The proposed general objective of the Radiological and Environmental Sciences Laboratory Replacement Project is to provide updated analyti capabilities for the environmental, oversight, and standardization programs of DOE, Geological Survey, and the INEL.
PROJECT DESCRIPTION: The Radiological and Environmental Sciences Laboratory include buildings CFA-690, CFA-676, and CFA-638 located at the Central Facilities Area with National Engineering Laboratory (INEL) site boundaries. CFA-690 includes the Direct the Analytical Chemistry Branch, Environmental Sciences Branch, Laboratory Quality Radiological Sciences Branch; and offices for the Lockheed Idaho Technologies Compa Dosimetry Unit and the United States Geological Survey. CFA-638 is used for irradia gannna, x-ray, and neutron) of dosimeters. CFA-690 was constructed in 1963, CFA-676 Butler storage building, and CFA-638 is a 1950 munitions bunker, all of which are i current operational requirements and have various code deficiencies. The potential and decommissioning of existing facilities would not be part of this action.
This project would provide for the design, construction, and operation of replaceme storage facilities with the capability to support environmental surveillance progra

DOE contractor activities nationwide, and provide services as a DOE standardization
This project would provide approximately 5,300 square meters (6,300 square yards) o
office space to consolidate Radiological and Environmental Sciences Laboratory oper
existing facility deficiencies, and provide additional space to meet the demand of
Radiological and Environmental Sciences Laboratory activities. The replacement faci
include the enhanced ability to conduct beta, gamma, x-rays, and neutron dosimetry
would streamline sample receipt and flow through the testing process. The facility
controlled environmental labs, chemical and biological labs, a central library, a s
record storage area, a loading dock, a receiving room, a computer room and waiting
body count clients, and sufficient office space to support the facility personnel.

# C-3 ENVIRONMENTAL INFORMATION

**Figure Project Data Sheet**

This section provides environmental information applicable to the foreseeable pro
Section C-4. Much of the information is given by reference to places in the EIS ch
Appendix F, Technical Methodologies and Key Data, that describe the affected enviro
environmental impacts. Topics covered are affected environment (C-3.1), generic en
(C-3.2), mitigation of impacts (C-3.3), and other generic issues (C-3.4).

Foreseeable projects are shown in Table C-3-1. This table correlates the pro
they implement. As shown by the table some projects support management of more tha
Summary descriptions of these projects are presented in Section C-4 in the order li
project is applicable to more than one category, the project is cross referenced to
located (for example, the Idaho Waste Processing Facility would manage transuranic,
low-level waste, but is described only in the transuranic waste section).

Consistent with the Secretary of Energy's June 1994 (DOE 1994a) statement reg
Environmental Policy Act, DOE will rely on the Comprehensive Environmental Response
and Liability Act (CERCLA) process for review of actions to be taken under CERCLA.
does not plan to make project-specific decisions on potential remedial actions at t
analysis in this EIS, and thus summaries of such remedial action projects are not l
documentation prepared for remedial actions pursuant to CERCLA and the Federal Faci
Consent Order will consider National Environmental Protection Act values such as an
offsite, ecological, and socioeconomic impacts, consistent with the Secretarial Pol
The cumulative impacts of reasonably foreseeable remedial actions at the INEL are i
in this EIS. In addition, in line with DOE (1994a), the list does include for NEPA
construction and operation of treatment, storage, and disposal facilities, whose fu
management of waste from remediation-related projects.

## C-3.1 Affected Environment

The baseline environmental conditions against which the potential environment
foreseeable projects (alternatives) can be measured are described primarily in Chap
EIS. Table C-3-2 lists the major environmental attributes, the conditions that are
and INEL EIS sections or support documents where they are described in more detail.
environmental attributes correspond to the summary impact tables included in indivi

For easier reference, applicable information from EIS Chapter 4 figures has b
Figures C-3-1 through C-3-3. These figures are referenced in Table C-3-2 to show t
characterized conditions relative to foreseeable projects and the INEL site. Figur
INEL site, Figure C-3-2 is a map of the INEL site and its vicinity showing the seve
influence, and Figure C-3-3 includes the INEL in relation to southern Idaho and por

**Table C-3-1. Foreseeable projects associated with programs and waste streams.**

| Project | Appendix C section | Facility location | Other supported waste streamsa,b |
|---|---|---|---|

| | | | |
|---|---|---|---|
| SPENT NUCLEAR FUEL PROJECTS | C-4.1 | | |
| Expended Core Facility Dry Cell Project | C-4.1.1 | NRF | NA |
| Increased Rack Capacity for CPP-666 | C-4.1.2 | ICPP | NA |
| Additional Increased Rack Capacity CPP-666) | C-4.1.3 | ICPP | NA |
| Dry Fuel Storage Facility; Fuel Recieving, Canning/ Characterization, and Shipping | C-4.1.4 | ICPP | NA |
| Fort St. Vrain Spent Nuclear Fuel Reciept and Storage | C-4.1.5 | ICPP | NA |
| Spent Fuel Processing | C-4.1.6 | ICPP | NA |
| Experimental Breeder Reactor-II Blanket Treatment | C-4.1.7 | ANL-W | NA |
| Electrometallurgical Process Demonstration | C-4.1.8 | ANL-W | NA |
| ENVIRONMENTAL RESTORATION PROJECT | C-4.2 | | |
| Decontamination and Decommissioning (D&D) | | | |
| Central Liquid Waste Processing Facility | C-4.2.1 | ANL-W | NA |
| Engineering Test Reactor | C-4.2.2 | TRA | NA |
| Materials Test Reactor | C-4.2.3 | TRA | NA |
| Fuel Processing Complex (CPP-601) | C-4.2.4 | ICPP | NA |
| Fuel Receipt and Storage Facility (CPP-603) | C-4.2.5 | ICPP | NA |
| Headend Processing Plant (CPP-640) | C-4.2.6 | ICPP | NA |
| Waste Calcine Facility (CPP-633) | C-4.2.7 | ICPP | NA |
| WASTE MANAGEMENT PROJECTS | | | |
| High-level waste | C-4.3 | | |
| Tank Farm Heel Removal | C-4.3.1 | ICPP | NA |
| Waste Immobilization Facility | C-4.3.2 | ICPP | NA |
| High-Level Tank Farm New Tanks | C-4.3.3 | ICPP | NA |
| New Calcine Storage | C-4.3.4 | ICPP | NA |
| Radioactive Scrap/Waste Facility | C-4.3.5 | ANL-W | NA |
| Transuranic waste | C-4.4 | | |
| Private Sector Alpha-Contaminated Low-Level Waste Treatment | C-4.4.1 | INELd,e | NA |
| Radioactive Waste Management Complex Modifications to Support Private Sector Treatment of Alpha-Contaminated Mixed Low-Level Waste | C-4.4.2 | RWMC | NA |
| Idaho Waste Processing Facility | C-4.4.3 | INELd | LLW, MLLW |
| Shipping/Transfer Station | C-4.4.4 | RWMC | LLW, MLLW |
| Low-level waste | C-4.5 | | |
| Waste Experimental Reduction Facility Incineration | C-4.5.1 | PBF/ARA | MLLW |
| Mixed Low-Level Waste Treatment Facility | C-4.5.3 | INELd | MLLW |
| Mixed Low-Level Waste Disposal Facilty | C-4.5.4 | INELd | MLLW |
| Mixed low-level waste | C-4.6 | | |
| Nonincinerable Mixed Waste Treatment | C-4.6.4 | TRA/PBF | NA |
| Remote Mixed Waste Treatment | C-4.6.6 | ANL-W | NA |

| | | | |
|---|---|---|---|
| Facility | | | |
| Sodium Processing Project | C-4.6.7 | ANL-W | NA |
| Greater-than-Class-C waste | C-4.7 | | |
| Greater-Than-Class-C Dedicated Storage | C-4.7.1 | TRA or TANNA | |
| Hazardous waste | C-4.8 | | |
| Hazardous Waste Treatment, Storage, and Disposal Facilities | C-4.8.1 | INELd | NA |
| INFRASTRUCTURE PROJECTS | C-4.9 | | |
| Industrial/Commercial Landfill Expansion | C-4.9.1 | CFA | NA |
| Gravel Pit Expansions | C-4.9.2 | INEL | NA |
| Central Facilities Area Clean Laundry and Respirator Facility | C-4.9.3 | CFA | NA |
| TECHNOLOGY DEVELOPMENT PROJECT | C-4.10 | | |
| Calcine Transfer Project (Bin Set #1) | C-4.10.1 | ICPP | (f) |
| Plasma Hearth Process Project | C-4.10.2 | ANL | (g) |

a. Acronym definition:

ANL-W Argonne National Laboratory-West
CFA Central Facilities Area
GTCC greater-than-Class-C
ICPP Idaho Chemical Processing Plant
LLW low-level waste
MLLW mixed low-level waste
NA not applicable
NRF Naval Reactor Facility
PBF/ARA Power Burst Facility/Auxiliary Reactors Area
RWMC Radioactive Waste Management Complex
TAN Test Area North
TRA Test Reactor Area
TRU transuranic

b. As shown by this column some projects support management of more than one waste

c. Alternatives (See also box on page C-1-1 and discussion in Chapter 3, EIS Volum
A - No Action
B - Ten-Year Plan
C - Minimum Treatment, Storage, and Disposal
D - Maximum Treatment, Storage, and Disposal

d. For the impact analysis, these projects are assumed to be at a new location, 4 Management Complex.

e. For air emission and transportation analysis, this project is also assumed to b

f. This project is applicable to high-level waste.

g. This project is applicable to mixed low-level and transuranic wastes.

**Table C-3-2. Affected environmental attributes and conditions characterized in the** Statement.

| Environmental attribute | Characterized existing conditions | Secti Appendi |
|---|---|---|
| Geology and soil, acres disturbed | General geology, seismicity, and volcanism: | |
| | -Geology | 4.6.1, |
| | -Natural resources (soil, minerals) | 4.6.2 |
| | -Seismicity | 4.6.3, Figure |
| | -Volcanism | 4.6.4 |

| | | |
|---|---|---|
| | -Acres disturbed | 4.9.1 |
| Water resources | General hydrologic conditions: | Section<br>Appendi<br>Figures |
| | -Snake River Plain Aquifer | 4.8.2.1<br>Figure |
| | -Surface drainage | 4.8.1.1<br>Figures |
| | -Groundwater flow | Figure |
| | -Floodplains | 4.8.1.3<br>Figure |
| | -Vadose zone | 4.8.2.3 |
| | -Wetlands | See wil |
| | -Water quality | 4.8.2.5 |
| | -Water use and rights | 4.8.3 |
| Wildlife and habitat | General biotic resources: | Section<br>Figures |
| | -Vegetation | 4.9.1, |
| | -Animal communities | 4.9.2 |
| | -Threatened, endangered, and sensitive species | 4.9.3, |
| | -Wetlands | 4.9.4,<br>Figure |
| | -Human-caused radionuclides in flora and fauna | 4.9.5 |
| Historic, archaeological, or cultural resources | General cultural resources: | Sectio<br>4.2, La |
| | -Archaeological sites and historic structures | 4.4.1 |
| | -Native American cultural resources | 4.4.2, |
| | -Paleontological resources | 4.4.3 |
| Air resources | General air quality: | 4.5, Ae<br>Air Res<br>Appendi<br>Belange |
| | -Climate and meteorology | 4.7.1 |
| | -Standards and regulations | 4.7.2, |
| | -Radiological air quality, including existing emissions, onsite and offsite doses | 4.7.3 |
| | -Nonradiological conditions including sources and concentrations of air pollutants onsite and offsite | 4.7.4 |
| | -Designated wilderness air quality standards | 4.5.2, |
| Human health | Potential health effects from current INEL operations: | 4.12, H<br>Appendi |
| | -Radiological and nonradiological health risks to public from atmospheric releases | 4.12.1, |
| | -Radiological and nonradiological health risks to public from groundwater releases | 4.12.1. |
| | -Radiological and nonradiological exposures and health effects to workers | 4.12.2 |
| Transportation | General transportation: | 4.11, T |
| | -Roadways and railroads | 4.11.1,<br>Figure |
| | -Baseline road and rail traffic | Tables |
| | -Airports | 4.11.3, |
| | -Waste and material transportation, including baseline radiological doses | 4.11.5 |
| Waste management | General activities (minimization, characterization, treatment, storage, and disposal of waste generated from ongoing activities): | Section<br>Table 2 |
| | -Radioactive waste | 2.2.7.1 |
| | -Hazardous waste | 2.2.7.2 |
| | -INEL industrial waste | 2.2.7.3 |
| Socioeconomic conditions | General socioeconomic conditions: | 4.3, So<br>Appendi<br>Figure |

| | |
|---|---|
| -Employment and income | 4.3.1, |
| -Population and housing | 4.3.2, |
| -Community services and public finance | 4.3.3, |

Figure C-3-1. Selected environmental attributes at the Idaho National Engineering

## C-3.2 Generic Environmental Impacts

Figure C-3-3. Selected environmental attributes in southern Idaho and portions of

This section provides generic information on environmental impacts of foreseeable supplement the summary impact tables in the individual project summaries and to aid these tables.

The foreseeable INEL projects(a) fall into several categories with differing impacts as follows:

- Decontamination and decommissioning of existing facilities
- New projects within existing facilities
- New construction within developed industrial areas (identified by numbers o These areas are described as major facility areas in Section 2.2.4. This t following discussion and throughout this appendix
- New construction conservatively assumed to be outside any established major (shown on Figure C-1-1 as being 2.5 miles east of the Radioactive Waste Man
- Expansion of existing supporting infrastructure.

The differing generic impacts and mitigation measures for these categories ar following paragraphs.

Decontamination and Decommissioning of Existing Facilities. The process for foreseeable decontamination and decommissioning (D&D) projects and (b) the preferre each such project is described in Section 2.2.6.2. The short-term impacts of any D

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a. No forseeable projects are located at the INEL Idaho Falls facilities. Consisten recent DOE secretarial policy on NEPA (DOE 1994a), no remediation-related projects as discussed in the introduction to this Section C-3.

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long-term productivity depend upon the end use generally specified by the EIS alter (Ten-Year Plan) specifies industrial use and Alternative D (Maximum Treatment, Stor specifies complete dismantlement consistent with unrestricted residential use. Alt Treatment, Storage, and Disposal) relies on surveillance by institutional controls restoration to long-term productivity. Because the preferred D&D option has not ye individual projects are assumed to produce waste consistent with Alternative B.

New Projects Within Existing Facilities. In foreseeable projects located in construction impacts would be minimized by the building confinement or containment. following projects:

- Increased Rack Capacity for CPP-666 (spent nuclear fuel storage)
- Modification within an existing Argonne National Laboratory-West building f sodium coolant (Sodium Processing Project).

For activities involving outdoor facilities, such as demonstrating calcine tr [Calcine Transfer Project (Bin Set #1)], other precautions would be taken to confin

For some of these projects, operational impacts (such as water use, emissions be within the existing operational envelope for the various INEL major facility are storage projects (such as the additional spent nuclear fuel racks project mentioned development projects (such as the calcine transfer demonstration mentioned above). as the sodium coolant processing project (also mentioned above) and the Waste Exper Facility incineration project, the change in impacts due to the project would be ou operational envelope.

New Construction Within Major Facility Areas. Other foreseeable projects inv

construction of new facilities within the perimeter of major facility areas at the Reactor Area, Idaho Chemical Processing Plant, Radioactive Waste Management Complex Facility, and Argonne National Laboratory-West. The construction impacts would dep or not newly disturbed land is involved. In either case, location within one of th minimize certain impacts (such as on wildlife and habitat) and make it easier to mi water resources, and historic, archaeological, and cultural resources) compared wit these major facility areas.

Some projects in this category represent continuing functions, so operational use, emissions, and effluents) would be within the existing operational envelope fo facility areas. Examples are the Expended Core Facility Dry Cell Project at the Na the High-Level Tank Farm New Tanks Project at the Idaho Chemical Processing Plant. functions, most operational impacts would be sufficiently small to be considered wi operational envelope. Examples are the Dry Fuel Storage Facility (Fuel Receiving, and Shipping) Project and the Greater-Than-Class-C Dedicated Storage Project. For treatment facilities, such as the Waste Immobilization Facility Project, the change project would be outside the existing operational envelope.

New Construction Assumed to be Outside Major Facility Areas. New treatment a facilities for transuranic waste, mixed low level (both alpha-contaminated and beta waste, low-level waste, and hazardous waste may be located outside existing major f specific foreseeable projects are as follows: Idaho Waste Processing Facility; Priv Contaminated Mixed Low-Level Waste Treatment; Mixed/Low-Level Waste Treatment Facil Mixed/Low-Level Waste Disposal Facility; and Hazardous Waste Treatment, Storage, an Facilities. For analysis of impacts, these projects are assumed to be at a new loc miles) east of the Radioactive Waste Management Complex as indicated on Figure C-1-

**Table C-3-1. The impacts based on the assumed location are reasonably conservative** (a) on previously undisturbed ground, (b) near an INEL site boundary, which increas air emissions on the public, and (c) in the INEL quadrant closest to the Craters of the nearest Class I visibility area as defined by the Clean Air Act (42 U.S.C -7401

For the Private Sector Alpha-Contaminated Mixed Low-Level Waste Treatment, a assumed at the INEL boundary near U.S. Highway 26 for air and transportation impact

Expansion of Existing Supporting Infrastructure. Expansion of existing infra landfill and gravel pits, involves disturbing new land or extracting surface deposi outside fenced major facility locations.

Table C-3-3 lists environmental attributes and the analyzed conditions used t environmental impacts of each foreseeable project. The EIS section where the analy also referenced. The following subsections discuss the generic impacts of the proj

## C-3.2.1 Geology and Soil, Acres Disturbed

Proposed reasonably foreseeable projects would only have minor, localized imp the INEL site for all alternatives evaluated. Direct impacts to geologic resources associated with disturbing land or extracting surface deposits to construct new fac remediation activities, as needed. Acreage disturbed and quantities of surface dep summary impact tables and data sheets for the individual projects. None of the for conflict with existing land use policies for the INEL site, existing uses of lands local land use plans.

## C-3.2.2 Water Resources

The current practice of no direct radioactive discharges exceeding DOE Order limits to the Snake River Plain Aquifer would continue. No foreseeable project wou radioactive liquids to the vadose zone. Impacts from all foreseeable projects und (considered cumulatively with existing conditions) would not result in concentratio Environmental Protection Agency's maximum contaminant levels (or DOE-derived concen beyond the INEL site boundary. The projects collectively would have minimal impact water quality and their water usage would have a negligible effect on the quantity Effluents and water usage quantities are identified on summary impact tables and da individual projects.

**Table C-3-3. Environmental attributes, analyzed impacts, and cross references.**

| Environmental attributes | Impacts analyzed | Environmental Impact Stateme document cross references |
|---|---|---|
| Geology and soil, acres disturbed | Surface deposit excavation; use of aggregate resources; new or previously disturbed acres | Section 5.6, Geology<br>Section 5.2, Land Use<br>Appendix F-2, Geology and Wa<br>Section C-3.2.1 |
| Water resources | Water use, effluent type and quantity | Section 5.8, Water Resources<br>Section 5.13, INEL Services<br>Appendix F-2, Geology and Wa<br>Section C-3.2.2 |
| Wildlife and habitat | Disturbed acreage (effects on flora and fauna productivity, individual displacement, and habitat fragmentation | Section 5.9, Ecology<br>Section 5.2, Land Use<br>Section C-3.2.3 |
| Historic, archaeological, or cultural resources | Cultural resource sites | Section 5.4, Cultural Resour<br>Section C-3.2.4 |
| Air resources | Radiological and nonradiological emissions, visibility | Section 5.7, Air Resources<br>Appendix F-3, Air Resources<br>Section C-3.2.5 |
| Human health | Health impacts to workers and public releases of radioactive and nonradioactive contaminants to the atmosphere and groundwater; radiological impacts in terms of exposure and cancer risk | Section 5.12, Health and Saf<br>Appendix F-4, Health and Saf<br>Section C-3.2.6 |
| Transportation | Heavy equipment types and trips (onsite and offsite) | Section 5.11, Traffic and Tr<br>Section C-3.2.7 |
| Waste management | Waste volumes generated during project construction and operation | Section 3.1, Description of<br>Section C-3.2.8 |
| Socioeconomic conditions | New and existing number of workers for construction and operation | Section 5.3, Socioeconomics<br>Appendix F-1, Socioeconomics<br>Section C-3.2.9 |
| Other impacts | Visual impacts on aesthetic and scenic resources | Section 5.5, Aesthetic and S<br>Section C-3.2.10.1 |
| | Facility accident health impacts and public; secondary (environmental) impacts | Section 5.14, Facility Accid<br>Appendix F-5, Facility Accid<br>Section C-3.2.10.2 |

## C-3.2.3 Wildlife and Habitat

Reasonably foreseeable projects outside existing buildings and some D&D proje identified in C-3.2.1. For such projects both within and outside the fence lines o previously undisturbed habitat would be impacted by loss of plant productivity and resulting from loss of species common to INEL shrub-steppe vegetation. Nonnative a replace more desirable, less vigorous native species. Mortality or displacement of include those species that are less mobile such as burrowing animals, insects, and could also be adversely impacted if construction activities occur during prime nest lines, some potential for habitat fragmentation exists. For previously disturbed h productivity loss, and resulting animal displacement and animal mortality would be

Short-term adverse impacts could potentially include temporary elevated expos hazardous materials and radionuclides during and immediately after construction act controlled areas inside major facility areas(a). Residual radionuclides and hazard activities, not part of the proposed project, would still be potentially consumed b plants. These materials may result in injury to individual animals or plants, but in measurable impacts to populations on or off the INEL site.

Federal protected and candidate species and State-sensitive species would not implementing any foreseeable project within major facility areas because no critica species has been designated on the INEL site. Because of their location, potential

and aquatic resources (Figure C-3-3) would also not be affected for any foreseeable facility area. For foreseeable projects in a new location outside the major facili likely be selected to avoid such habitats, wetlands, and aquatic resources and appl would be implemented as described in Section C-3.3.3.

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a. An environmentally controlled area (ECA) is a defined region within the boundari facility area where a hazardous and/or radioactive waste spill/release has been doc when the spill/release has been cleaned up, the area retains its ECA destination.

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## C-3.2.4 Historic, Archaeological, or Cultural Resources

Established Federal laws and regulations would be followed for identifying, e mitigating impacts to cultural resources. Impacts to resources of value to Native or hunting and gathering areas, archaeological sites, and human remains) would be d consultation with the affected Native American groups.

In previously unsurveyed areas, undiscovered archaeological, Native American, resources may exist and could potentially be adversely impacted. For foreseeable p areas, a cultural resource or paleontological survey would be performed.

Direct impacts to archeological resources from individual projects would be t ground disturbance from construction activities. Direct impacts to existing struct from demolition or modification of the structures. Direct impacts to traditional r land disturbance, or by changing the environmental setting of traditional use and s and structures have not been formally evaluated, they would be considered potential National Register of Historic Places.

For decontamination and decommissioning projects and projects inside existing disturbed, or previously disturbed land has already been surveyed. Any structures National Register of Historic Places are identified in project summaries as are oth structures. For other projects inside major facility areas and for projects outsid requirements of the appropriate laws and regulations would be followed, as detailed

## C-3.2.5 Air Resources

Impacts of radiological and nonradiological air emissions have been assessed operation of new facilities and for demolition activities associated with decontami decommissioning of existing facilities, both including heavy equipment operation wi assessment is in conjunction with maximum operation of existing facilities, environ activities, and other mobile sources such as vehicular traffic.

For radiological emissions, impacts at onsite and offsite locations from indi in percent of the applicable dose limit, in the summary impact table of the project values is more than a few percent of the dose limit of 10 millirem per year specifi Standards for Hazardous Air Pollutants (NESHAP).

Nonradiological impacts are expressed in terms of concentrations of criteria in ambient air (that is, locations to which the public has access, such as outside along public roads traversing the site) and potential impact on other air quality v locations, the highest predicted concentrations of criteria pollutants from the 36 Alternative D (Maximum Treatment, Storage, and Disposal) (plus the other activities remain well below applicable air quality standards. Concentrations at public road boundary could increase significantly from current levels, but would remain well be even with proposed the locations of some major construction projects or combustion to a public road. Offsite levels of all toxic air pollutants would be below applic

For foreseeable projects collectively, the incremental impacts at onsite loca emissions are well below occupational standards in all cases. Health effects due t discussed in Section C-3.2.6.

Collective impacts related to ozone formation and stratospheric ozone depleti volatile organic compounds are well below the levels considered "significant" by St The potential for impacts on atmospheric visibility at Craters of the Moon National associated Wilderness Area has been found to exist under conservative screening ana acceptable color shift is exceeded, due mainly to nitrogen dioxide emissions. Some (specifically the Waste Immobilization Facility and Waste Experimental Reduction Fa

projects) exceed the criterion alone or, in the case of the Idaho Waste Processing significantly to the total. The potential for visibility degradation would be less control equipment to reduce nitrogen dioxide emissions. More refined visibility mo conservative screening methods) could result in lower predicted impacts. Emission required if more refined modeling still predicts visibility impacts. Controls may, regulations, even if visibility degradation criteria are not exceeded.

## C-3.2.6 Human Health

Section 5.12 provides estimates of health impacts to workers and the public f radioactive and nonradioactive contaminants to the atmosphere and groundwater. A d the health effects methodology is contained in Appendix F-4.

**C-3.2.6.1 Radiological Atmospheric Releases. Under the conservative assumptions**

described in Section 5.12.1.1.1, some foreseeable projects are calculated to produc radiation exposure (mrem per year) and in lifetime fatal cancer risk, due to air em materials, to an INEL worker and to the maximally exposed individual at the site bo calculated risk of a fatal cancer effect expected over the next 70 years among the population would increase. These values for individual projects are given in the s project summaries.

**C-3.2.6.2 Nonradiological Atmospheric Releases. As described in Appendix F-4.2.1.2, a**

hazard coefficient of one establishes the level of exposure to nonradioactive emiss noncarcinogenic) below which it is unlikely for even sensitive populations to exper effects. As described in Section 5.12.1.1.2, calculated hazard coefficients are cu risks associated not only with foreseeable projects but also with the maximum basel Because of the conservative methods and assumptions used in the assessment, health for hazard coefficients somewhat above one. As discussed in Section C-3.2.5 and su specific impact tables, pollution levels would be within air quality standards, and effects is expected for the foreseeable projects.

Minor construction-related impacts would include localized levels of fugitive emissions of combustion products from construction equipment.

**C-3.2.6.3 Groundwater Releases. No health effects specific to groundwater releases from**

foreseeable projects are identified in Section 5.12.1. This absence is due to chan discharge practices (as described in Section C-3.2.2) compared to past practices.

## C-3.2.7 Transportation

Activities included in the scope of this EIS involve the transportation of in radioactive materials within the boundaries of the INEL site (onsite) and on highwa outside the boundaries of the INEL site (offsite). The total number of shipments f in Tables 5.11-4 and 5.11-5 of Section 5.11, Transportation. General assumptions u transportation impacts (number of truck trips) to specific projects are included in Assumptions, and specific assumptions are identified in footnotes to the summary im applicable foreseeable projects.

The impact on the regional traffic system from foreseeable projects under all minimal. U.S. Highway 20, the regional highway with highest use around the INEL, w provide free flowing (Level A) service.

**C-3.2.7.1 Incident-Free Transportation. The impacts of incident-free transport of waste**

(transuranic, low-level, and mixed low-level) and spent nuclear fuel have been eval For truck shipments of waste, approximately one cancer fatality was estimated among of the public under Alternative D due to radiation and toxic exposure. These impac double the consequences of Alternative B. The increase in Alternative D would be a to and from existing INEL waste management facilities and the proposed Transuranic Enclosure and Storage Project, Private Sector Alpha-Contaminated Mixed Low-Level Wa Facility, and the Greater-Than-Class-C Dedicated Storage Facility. Train shipments that were much lower than truck shipments.

For spent nuclear fuel, Alternative C yielded the highest consequences (appro fatalities among workers and the general public). These impacts are approximately consequences under Alternative B, and would be associated primarily with the propos Canning/Characterization, and Shipping Facility.

**C-3.2.7.2 Transportation Accidents. The potential impacts from offsite transportation**

accidents involving spent nuclear fuel or radioactive waste have been evaluated in spent nuclear fuel, the radiological risk from transportation accidents would be hi still well below one cancer fatality). For radioactive waste, radiological risk fr would be highest for alternatives A and B (also well below one cancer fatality). I risks associated with the accidental release of radioactivity, transportation accid risks, such as risk of fatality from the physical impact sustained during an accide from vehicle impacts would be approximately 10 to 10,000 times higher than the risk accidental release of radioactivity. From this perspective, the nonradiological ri accidents would be approximately 2.5 fatalities under Alternative B; this risk woul times higher under Alternative D. The increased risks under Alternative D would be increased spent fuel and waste volumes shipped to existing facilities, and the five Alternative D but not in Alternative B in Table C-3-1.

The maximum reasonably foreseeable onsite spent nuclear fuel transportation a baseline activity and not any foreseeable project. Because the estimated number of shipments is expected to be the same for all EIS alternatives, the annual frequency maximum reasonably foreseeable accident are not affected by foreseeable projects.

Onsite transuranic waste shipments are expected to be dominated by a baseline between the INEL Radioactive Waste Management Complex and Argonne National Laborato of the characterization and certification program required for shipments of INEL tr Waste Isolation Pilot Plant). Because the estimated number of onsite transuranic w to be approximately the same for all EIS alternatives, the annual frequency and con reasonably foreseeable accident are not affected by foreseeable projects.

Onsite low-level and mixed low-level waste shipments are expected to be domin routine operational waste from INEL facilities to INEL treatment, storage, and disp variability in the number of shipments, and consequently the probability of acciden foreseeable decontamination and decommissioning projects. Total waste transportati about 40 percent by these decontamination and decommissioning activities. While th foreseeable accident doses are the same, the annual frequencies are increased by 40 related fatal cancer risk for the population within 50 miles (80 kilometers) from a level waste onsite shipment is about one in 18,000 years for a generic suburban pop estimate conservatively bounds the impact of all foreseeable decontamination and de (and hence any one project) (a) because these projects only contribute about 30 per estimate, and (b) because the population density around the INEL site is less than suburban population zone.

## C-3.2.8 Waste Management

Waste management would involve not only the throughput of various waste treat also the incidental waste generated during construction and operation of these and Estimated quantities of waste materials characterized by type are included on proje Resource Conservation and Recovery Act (RCA) issues are not yet identified, they wo the permitting process. Individual foreseeable projects would be designed, constru compliance with Federal and State laws and DOE orders and other guidelines affectin transportation, treatment, storage, or disposal of hazardous and/or radioactive was

activities are discussed under other subheadings in this section (C-3.2).

## C-3.2.9 Socioeconomic Conditions

As stated in Section 5.15.2, the cumulative impact on regional employment und all foreseeable projects under any of the EIS alternatives would be an overall decl frame of this EIS. Initially, implementation of any of the EIS alternatives would in employment within the region surrounding the INEL, primarily due to construction individual construction projects could be manned by the regional work force. The m cumulative impact on regional employment under implementation of all foreseeable pr EIS alternatives is not expected to be sufficient to notably affect the socioeconom

No environmental impact due to noise is expected from the foreseeable project the primary source of road noise. Construction workers would be driving private ve operating staff would change the total number of buses significantly.

Individual project requirements for electricity, water usage, waste water dis fuel, and propane are given on the individual project data sheets. Existing system are expected to handle collective requirements, except as indicated in individual p

## C-3.2.10 Other Impacts

### C-3.2.10.1 Aesthetic and Scenic Resources. Except for the potential for impacts on

atmospheric visibility at Craters of the Moon Wilderness Area (see Figure C-3-2) un conditions (see C-3.2.5 above), no adverse visual impact on aesthetic and scenic re for any of the foreseeable projects. In all instances, new facilities would resemb would not change the visual character of the INEL site.

### C-3.2.10.2 Facility Accidents. Section 5.14 addresses the consequences of possible facility

accidents for a member of the public at the nearest site boundary, for the collecti kilometers (50 miles), for workers, and for the environment. Under the conservativ foreseeable projects are calculated to produce some potential for increase in human increases are summarized below.

- For the individual at the nearest site boundary: The foreseeable projec change either the potential radiation exposure or the frequency of the high accidents (those producing a potential exposure greater than about 0.1 rem) Figures 5.14-2, -6, -9, and -12.) However, the very low risk of fatal canc higher-frequency accidents causes this annual cancer risk to increase from 20 million per year to about one in 5 million per year. This increase is m additional spent fuel and waste management activities at the INEL and the a projects in Alternative D but not in Alternative B (see Table C-3-1). Even risk is about a factor of ten below the DOE National Safety Policy Goal (DO

  The potential health effects for hazardous materials are more qualitative t materials. They are reported as a percentage of the concentration at the s cause life-threatening health effects. Without the foreseeable projects, c below the threshold values for life-threatening health effects. The concen reasonably foreseeable accidents remain unchanged as a result of the 31 for Alternative B. Lower-consequence accidents could occur as a result of thes Concentrations as a result of the increased inventories and management acti D, and of the five foreseeable projects in Alternative D but not in Alterna higher for a few accidents, but still well below life-threatening values.

- For the collective population: Without foreseeable projects, the estimat from any maximum foreseeable radiation accident range from 10-7 to 10-4 per estimates remain essentially unchanged for the 31 foreseeable projects in A also remain essentially unchanged for the 36 foreseeable projects in Altern exception: The estimate for low-level/mixed low-level waste increases from

excess fatal cancers due primarily to increased inventories and management

- For the worker: The estimated radiation dose to the facility worker [def 100 meters (300 feet) from the point of release] from various maximum fores essentially unaffected for the 36 foreseeable projects in Alternative D. R alternative, workers closer to the point of release have the potential for

Generic potential impacts on the environment from maximum foreseeable acciden projects, termed secondary impacts in Section 5.14, are characterized there accordi

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a. The policy that the cancer fatality risk to the population within one mile of th boundary of a DOE nuclear facility should not exceed 0.1 percent of the sum of all fatality risks resulting from all other sources.

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spent nuclear fuel, high-level waste, or transuranic waste, low-level waste, mixed hazardous waste. A summary of these impacts follows.

- No environmental impacts would result from hazardous waste, low-level waste level waste accidents.

- No change in land use is expected from transuranic waste accidents. A one- withdrawal of land on or off the INEL site may be necessary--up to 10,000 a foreseeable spent nuclear fuel accident and up to 4,000 acres for a maximum level waste accident.

- A spent nuclear fuel, high-level waste, or transuranic waste accident could effects to surface water, ground water, vegetation, or wildlife. No impact endangered or threatened species.

- Land may have temporary restrictions (up to one year) for agricultural and

## C-3.3 Mitigation of Impacts

An overview of all mitigation measures applicable to foreseeable projects is Section 5.19. These measures are summarized below (with subheadings in the same or Section C-3.2).

### C-3.3.1 Geology and Soil, Acres Disturbed

Potential soil erosion in areas of ground disturbance would be mitigated thro surface disturbance and by using engineering practices (as described in Section 5.1 runoff control, slope stabilization, and wind erosion (fugitive dust) protection. covering soil stockpiles and water spraying. No other mitigation measures related

### C-3.3.2 Water Resources

The development of pollution prevention plans, such as the INEL Storm Water P Plans (DOE-ID 1993a, 1993b) and the INEL Groundwater Protection Management Plan (Ca and implementation of best management practices are also important to preventing fu to water resources (see Section 5.19.5). These practices develop standard procedur materials and preventing accidental discharges. Existing monitoring and surveillan and ponds would also reduce impacts of inadvertent liquid release by restricting th
C-3.3.3 Wildlife and Habitat

Unavoidable impacts to biota from foreseeable projects within major facilitie disturbance of a limited amount of habitat, mortality or displacement of some anima mammals, reptiles, and birds), and possibly temporary elevated exposure levels to a hazardous materials. Mitigation measures (see Section 5.19.6) for ground disturban

drainage structures to minimize soil erosion and reseeding bare ground. Uptake of minimized by dust suppression, containment, and erosion control, and by rapid remov soil contaminants.

For any new location not within the perimeter of a major facility area, preac sensitive and protected species and habitats, identification of jurisdictional wetl appropriate agencies would be conducted. Needed mitigations would be explicitly id results of the surveys and consultations. DOE would evaluate the project design to modifications would minimize potential negative effects. Where practicable, modifi implemented.

### C-3.3.4 Historic, Archaeological, or Cultural Resources

For cultural resources (Section 5.19.1), all mitigation plans would be develo Native American Tribes (where appropriate), the State Historic Preservation Office, Council on Historic Preservation. These plans would conform to appropriate standar established for historic preservation activities by the Secretary of the Interior u National Historic Preservation Act. If a foreseeable project affects areas of reli value to Native Americans, DOE would follow the mandates of the Archaeological Reso the Native American Graves Protection and Repatriation Act, and the American Indian Act.

### C-3.3.5 Air Resources

For air resources (Section 5.19.4), controls to reduce radiological emissions on the nature of the specific process and the types and amounts of radionuclides th example, controls would include limiting iodine-129 emissions from spent nuclear fu processing by means such as charcoal or silver zeolite filtering media. High-effic would be used extensively to reduce emissions of radionuclides that are particulate criteria for waste treatment processes would put a limit on the radioactive source

Best available control technology would be designed for each pollutant associ emissions increase as defined in the State of Idaho regulations. These impacts wou resolved during the air permitting process before a project could proceed. Emissio be used as required or appropriate to reduce such impacts.

### C-3.3.6 Human Health

Health and safety hazards would be mitigated by best management practices and radiological safety programs that operate under the same regulatory standards and l the INEL. Elements of these programs include access control, personnel dosimetry, inspection and surveillance, annual reporting. The intent of these programs is to reasonably achievable. For this reason, administrative limits on radiation exposur well below the allowed regulatory limits.

### C-3.3.7 Transportation

Mitigation measures related to transportation of radioactive and hazardous approved transport vehicles and containers. There are U.S. Department of Transport drivers, packaging, labeling, marking, and placarding. There are also requirements dose rate associated with radioactive material shipments, which help to reduce inci doses. Mitigation of consequences from transportation accidents would also be thro programs.

### C-3.3.8 Waste Management

Pollution prevention and waste minimization practices would be applied both t various waste treatment facilities and also to the incidental waste generated durin of these and other foreseeable projects.

### C-3.3.9 Socioeconomic Conditions

No mitigation measures are required for socioeconomics or noise. For INEL se would be implemented to reduce inefficient use of utilities and energy services. R be considered during planning of decontamination and decommissioning projects.

### C-3.3.10 Other Impacts

With regard to visibility degradation of aesthetic and scenic resources (Sect operations, mitigation measures could include administrative controls on facility o combustion control equipment to further reduce nitrogen dioxide emissions.

Mitigation of consequences from facility accidents would be primarily through preparedness, and response programs. Response actions could include immediate and access to and cleanup of contaminated land, as well as interdiction of agricultural

## C-3.4 Other Generic Issues

### C-3.4.1 Cumulative and Indirect Impacts

Cumulative and indirect impacts are discussed in Section 5.15. The specific this appendix are included in the cumulative impact analysis in Section 5.15 for ea alternatives. Each project, and the alternative under which it would be implemente and C-3-1.

### C-3.4.2 Beneficial and Adverse Effects

Adverse environmental effects which cannot be avoided are described in Sectio

**C-3.4.2.1 Water Resources. The foreseeable projects do not include comprehensive**

remediation of all contaminated media and areas. This impact is considered unavoid quality.

**C-3.4.2.2 Wildlife and Habitat. As described in C-3.2.3, unavoidable impacts to biota for some**

foreseeable projects would include disturbance of undisturbed habitat and/or of pre that is of low quality and limited use to wildlife. Short-term adverse impacts to include temporary elevated exposure to residual radionuclides and hazardous materia during and immediately after construction activities for foreseeable projects.

Utilization of an additional acreage outside the major facility areas would i habitat loss and would have the potential to enhance habitat fragmentation on the I

**C-3.4.2.3 Cultural Resources. Adverse impacts related to removal or alteration of potentially**

significant historic structures could occur. Adverse impacts may also occur to arc

importance to Native Americans and areas of traditional or religious importance. A effects to sites can be mitigated through scientific study, effects to sites that a American groups may remain adverse. The number of potentially significant historic archaeological sites is listed for each foreseeable project in its summary impact t the extent they have been surveyed.

**C-3.4.2.4 Air Resources. Discharge of combustion products and particulate matter into the air**

from proposed projects would contribute to localized reduction of air quality. At Wilderness Area, potential impacts on visibility impairment as a result of nitrogen associated with some projects. If such impacts are confirmed by more refined analy would be required before projects could proceed.

## C-3.4.3 Irretrievable and Irreversible Commitments of Resources

Irretrievable and irreversible commitments of resources are described in Sect Irreversible and irretrievable commitments of resources for certain foreseeab potentially include land, aggregate, groundwater (areas of contamination), air reso However, some materials (for example, structural and stainless steel) and resources are considered recyclable and are not considered an irreversible and irretrievable

Facilities for disposal of radioactive and/or hazardous wastes would cause ir irretrievable commitments of land resources of previously open-space land. Local s from the commitment of these acreages would include lost vegetation productivity, l and lost multiple-use or alternative-use opportunities (for example, disposal sites decommissioning or decontamination and habitat reclamation).

Some of the aggregate resources (sand, gravel, pumice, and landscaping cinder would be irreversibly and irretrievably committed in support of certain foreseeable quantities utilized during construction for concrete production and foundation prep individual project data sheets. Aggregate demands for these uses and for road cons vary by EIS alternative, as shown on the data sheets for the Gravel Pit Expansion P

Activities at the INEL site have resulted in the irreversible and irretrievab groundwater in the Snake River Plain Aquifer that has been affected by chemical and plumes. Because of changed practices, this commitment is not expected to increase projects. All potable water wells on the INEL site are monitored routinely to ensu from the aquifer is utilized appropriately, as specified under Federal and State re

Portions of air resources at the INEL site would be committed under some fore services associated with commitments of air resources may include lower visitor use because of lowered visual quality.

Commitment of energy resources (electricity, heating oil, diesel fuel, and pr individual project data sheets.

## C-3.4.4 Relationship Between Short-Term Use of the Environment and the Maintenance

and Enhancement of Long-Term Productivity

The relationship between short-term use of the environment and the maintenanc long-term productivity is discussed in Section 5.17.

Implementation of most foreseeable projects would cause some adverse impacts and would permanently commit certain resources. However, many of these uses of the of short duration and offset by long-term enhancements to the environmental product following is a description of the generic short-term influences on the environment on the maintenance and enhancement of long-term productivity of the environment.

- General: Implementation of any of the alternatives would cause some advers environment and would permanently commit certain resources. However, under alternatives these uses of the environment would be of short duration and o enhancements to the environmental productivity of the region, as discussed Section 5.17.

- Land Use: Even when environmental impacts include land disturbance and lan changes from open space to industrial uses (as for projects outside major f

on long-term productivity of the total INEL environment is expected.

- Geology: For foreseeable projects undergoing construction activities, some aggregate/borrow loss would be expected. However, these activities would b and soil loss would be minimized by initiating the mitigation measures outl Section C-3.3.1. Therefore, no long-term effect on environmental productiv surrounding these sites is expected.

- Wildlife and Habitat: The potential short-term productivity loss in habita INEL facilities and to major facility areas would be offset by a reduction to ecological resources, thereby increasing environmental productivity. Th term loss of productivity and biodiversity associated with the acreage that used.

- Cultural Resources: Additional information gained during preactivity surve historical, or paleontological resources could be compiled into a database database to improve the knowledge of area history. Also coordination with Americans would increase sensitivity to their concerns and show greater con that hold cultural and religious significance for them. Increasing the his understanding of the area would provide a basis for the enhancement of futu cultural resources in the region.

- Air Quality: Areas disturbed for construction activities would result in s levels of particulate matter in these areas of disturbance. Mitigation mea Section C-3.3.1 would reduce fugitive dust potential. No long-term effect expected from construction.

### C-3.4.5 Environmental Justice

As stated in Section 5.20, DOE has reviewed the projects to consider the exte low-income populations could be affected. DOE's overall review indicated that the calculated for each discipline under each of the proposed alternatives present no s constitute a reasonably foreseeable adverse impact to the surrounding population. also do not constitute a disproportionately high and adverse impact on any particul population, including minorities or low-income communities in the area, and thus do environmental justice concern.

### C-3.4.6 Consultation with Other Agencies

Letters regarding consultation under Endangered Species Act and National Hist are included in Appendix B, Consultation Letters. A listing of agencies and person included in Appendix B.

# C-4 FORSEEABLE PROJECTS-DESCRIPTIONS

Forseeable proposed projects, whose detailed design or planning will not begin until the DOE has determined that the requirements of the National Environmental Policy Act process for project have been completed, are listed in Table C-3-1 in Section C-3 and are described in this section.

## C-4.1 PROJECTS RELATED TO SPENT NUCLEAR FUEL

## C-4.1.1 EXPENDED CORE FACILITY DRY CELL PROJECT

PROJECT NAME: Expended Core Facility Dry Cell Project
GENERAL PROJECT OBJECTIVE: The general project objective of the Expended Core Faci project would be to increase the efficiency of naval spent nuclear fuel module prep the new Dry Cell would improve module preparation efficiency, minimize transportati disturbances of other sites, and make efficient use of existing facilities.
Historically, naval spent nuclear fuel has been transported from the defueling loca Engineering Laboratory (INEL) where it is unloaded into water pools at Expended Cor nuclear fuel modules were prepared for examination and storage by removing the nonf in the Expended Core Facility water pools. After preparation and examination, the shipped to the Idaho Chemical Processing Plant for storage. Removal of nonfuel str to facilitate examination and to minimize the amount of material managed as spent n
PROJECT DESCRIPTION: Expended Core Facility
The Expended Core Facility is located within the confines of the Naval Reactors Fac large laboratory facility used to receive, examine, and prepare for storage and tra fuel and irradiated test specimen assemblies. The information derived from the exa the Expended Core Facility provide engineering data on nuclear reactor environments design performance. These data are used to develop longer-lived naval fuel and to in warships can be operated as long as possible. Naval spent nuclear fuel is prepa Facility for storage and shipment to the Idaho Chemical Processing Plant.
The building that houses the Expended Core Facility is a concrete block structure a by 194 feet. This space provides offices and enclosed work areas, including an arr reinforced concrete water pools that permit visual observation of naval spent nucle inspection while shielding workers from radiation. Adjacent to the water pools are operations that must be performed dry. Access to the Expended Core Facility for re large containers is provided by large rollup doors that allow railcar and truck ent The water pools are 430 feet long and about 40 feet wide. The depths of the differ from 20 feet to 45 feet. There are five crane bridges for routine movement of mate network of walkways also serves as work platforms from which examination technician manipulate the tools and measuring apparatus which must be used under water.
Walls and gates divide water pools into smaller work areas. This sectionalization only a small portion of the pool at a time for equipment maintenance and repair. T located to the north of the water pools. Transfer of irradiated material between t cells is conducted via three transfer canals.
All water pools are watertight, reinforced concrete construction. The water pool f support installed equipment and shielded shipping containers. The depths and sizes zones have been determined by shielding requirements, the size of the materials to accommodation of the machine tools and operating equipment. All construction joint contain water stops. Water pool walls and floors are coated with a thermal-setting highly resistant to radiation damage, is amenable to easy decontamination, and cont Liquid radioactive wastes are generated in the Expended Core Facility through the r of the water pool water by the introduction of corrosion products from the fuel and irradiations test programs and the unloading of spent fuel shipping containers. Th has developed a variety of techniques for treating liquid wastes and has achieved a radioactive waste to the environment. The design basis for the Expended Core Facil system is to maintain zero discharge, maintain water clarity, minimize the amount o reduce exposures to personnel to as low a value as possible.
The shielded cells afford another major capability of the Expended Core Facility. used for examination of smaller components. The shielded cells are constructed of densities, normal (150 pounds per cubic foot), 195 pounds per cubic foot, and 280 p Walls are 3 feet thick to provide the necessary shielding to reduce radiation in oc cells is done by remotely operated equipment controlled from the operating gallery windows which are specially constructed to be nonbrowning and equal in shielding va walls.
At the Expended Core Facility, the spent fuel is unloaded from shipping containers shielded transfer casks to protect the workers from radiation. The spent fuel is r cask in the water pool where the depth of the water is sufficient to shield the wor exposed spent fuel modules. The subsequent machining operations and examinations o performed in the water pool under the required depth of water where operations and performed safely. After the work on the spent fuel is completed, the spent fuel is transfer cask (under water) for transit to the storage location, such as the Idaho

These are the main pieces of special equipment and facilities that are required to operations with naval spent nuclear fuel. There are many other pieces of equipment also used along with the main equipment to do the necessary work safely and efficie
PROJECT DESCRIPTION:. Dry Cell Project:

Purpose and Need: This project would provide for the design, construction, a facility for the preparation of naval spent nuclear fuel modules for shipment to st operations are currently performed in the Expended Core Facility water pool. The p facility would be to examine fuel modules and remove nonfuel structures from the fu reducing the volume of material that must be managed as fuel. Additionally, contro to the fuel modules to ensure shutdown conditions are maintained. This work would shielded, radiologically controlled area with remotely operated equipment utilizing methods. The facility would be designed for a 40-year life, built of structural st be integral with the existing Expended Core Facility building.

Location: The Naval Reactors Facility Expended Core Facility is located on t County which is part of the Eastern Idaho Intrastate Air Quality Control Region No. Facility is in the southern portion of the INEL site, about 23 kilometers (14 miles boundary. The Dry Cell Project would be a southeast extension of the Expended Core Universal Transverse Mercator coordinates for the Dry Cell Facility Main Exhaust St meters north and 345550 meters east. The township, range, section coordinates are

Type of Facility: The Expended Core Facility Dry Cell would be a shielded co remotely operated equipment for preparing naval spent nuclear fuel modules for exam storage facilities.

The major element of the Dry Cell Facility would be a large reinforced concrete shi dimensions of 22 feet wide by 84 feet long by 21 feet high, containing all the equi and disassemble fuel modules. Shielded decontamination and repair cells would be a shielded cell to allow remote decontamination and repair of equipment used througho Facility.

Design Objectives: The facility would have the capability to prepare and loa shift in a shipping cask. Based on a two shift per day operation (500 shifts per y 25 percent of the time the facility would be shut down for maintenance, the Dry Cel is expected to be about 375 modules.

The cell design would incorporate 4-foot-thick radiation shielding walls constructe normal-density concrete. The shielding would be designed to limit radiation levels around the cell to 0.1 millirem per hour or less. At the INEL site boundary, there elevation above the naturally occurring background radiation levels. The Dry Cell latest seismic requirements and would include negative pressure air ventilation for control. Shielded lead glass windows and viewing aids would be provided as require Power, lighting, and a fire suppression system would be provided.

The Dry Cell would also be designed to facilitate decontamination and decommissioni This would be achieved by including cell liner contamination barriers, no fixed emb of cracks and crevices, smooth surfaces, and wall penetrations large enough to be r verify decontamination effectiveness.

The Dry Cell would be attached to the existing Expended Core Facility building and made to transfer fuel modules between the Dry Cell and existing water pit facilitie presently performed. Operations of the Dry Cell would increase the efficiency of f the Expended Core Facility by performing the operations dry instead of using the cu

Description of Dry Cell Physical Layout: The Dry Cell Project would include south extension of the existing Expended Core Facility building. The east extensio feet and would be the same height as the existing Expended Core Facility High Bay w The east extension would house a truck bay and an overhead bridge crane. The 2,400 extension of the Expended Core Facility building would be constructed similar to th design life of the building would be 40 years. Construction materials would be non corrosion-resistant.

Critical items and systems (ventilation, electrical, fire protection, and utility s provide confinement of radioactive materials under normal operations and Design Bas Structural design, including loading combinations and construction of critical item in accordance with current editions of pertinent nationally recognized codes and st DOE Order 6430.1A (DOE 1989a).

The 2,400 square foot southeast corner extension would be constructed of reinforced metal sandwich panels. Roofs would be designed to resist vertical live, snow, and with ANSI Standard A58.1. The roof would also be designed as a part of the lateral make the building unit(s) act as an integral system.

The Expended Core Facility building extension to the south would be 8,210 square fe

story construction approximately 36 feet high. The south extension would house on shielded cell operating gallery, a truck bay, support office spaces, restrooms, and floor of the south extension would house an equipment support area above the operat open storage space above the support office spaces. The east end of the second flo shielded cell ventilation system high efficiency particulate air (HEPA) filters and The building south extension structure would match that of the existing Expended Co The building would have a structural steel frame and a steel truss supported roof w inch reinforced concrete block up to a height of 10 feet above floor level.

The shielded cell would include a preparation cell, a decontamination cell, and a r viewing windows and master-slave manipulators would be installed for remote operati The shielded preparation cell would be fabricated of reinforced concrete with inter wide by 84 feet long by 21 feet high. The decontamination cell would be 22 feet wi long by 21 feet high. The repair cell would be 22 feet wide by 28 feet 6 inches lo shielded cell walls would be constructed of high density concrete with a minimum de cubic foot. Shielded wall thickness would be 4 feet.

The Dry Cell shielding would be designed to limit radiation levels in normally occu to 0.1 millirem per hour or less. At the INEL site boundary, there would be no mea radiation above the naturally occurring background radiation levels.

The spread of radioactivity would be minimized by confinement barriers: the shield fully lined floor and partially lined wall of stainless steel and the building's ve be filtered. Confinement would also be achieved by providing air locks and otherwi differential pressures in the various areas of the building to maintain the air flo toward areas of higher contamination and by HEPA filtration and carbon adsorber fil The radioactive ventilation system has three exhaust fans with 7,500 cubic feet per fan. Overall system capacity is sized for two fans to be running and one in standb zone differential pressure requirements and in-cell air change requirements. The i negative differential pressure of 1 to 2 inches of water and 7 air changes per hour The shielded cell would include a shipping cask transfer canal that extends underne main cell. The shipping cask transfer tunnel would be 27 feet deep, 17 feet wide, shipping port and shield plug would be in the floor of the cell over the shipping c would be removed when a cask is placed beneath it for loading. The shipping cask t supported by two rails. Directly under the shipping port, provisions would be made restraining the transfer cart.

The Dry Cell facility shielded cell, and repair and decontamination cells would req A combination high-density glass and oil-filled viewing windows would be required. designed to remain unbroken and in place after a seismic event.

The Dry Cell facility east extension would have an overhead crane. The overhead br minimum 130-ton capacity and a minimum hook height of 39 feet 6 inches above the Ex building floor.

The Dry Cell shielded cell would have up to two overhead bridge cranes on a common working load of 10 tons. The Dry Cell shielded cell would also have up to three el manipulators mounted on a common rail to perform remote handling and maintenance.

The design of the fire protection system would achieve a level of fire protection t "improved risk" level.

The shielded cell special suppression system is carbon dioxide. Agent quantity req procedures shall comply with NFPA 12.

Fire screens would be installed upstream of the HEPA filters in the ventilation sys from fire in-cell. The fire screens shall be accessible for replacement and cleani The building extension facility fire sprinkler system would be a wet type and would with NFPA 13. The new system shall be similar to the existing system and would be sprinkler alarm system. The standpipe system would conform to NFPA 14 and would in in required locations.

Schedule for Construction and Initial Operation: The schedule for the Dry Ce commence construction in May 1996 and complete construction in May 1998. Initial o August 1998.

PROJECT-SPECIFIC OPTIONS

NOTE: The previous project description was used for the analysis of potential cons Volume 2 of the spent nuclear fuel and INEL ER&WM EIS where the project would be im Alternatives B (Ten-Year Plan) and D (Maximum Treatment, Storage, and Disposal).

The option to phase out examinations at the Expended Core Facility is evaluated in Action) and C (Minimum Treatment, Storage, and Disposal) of Volume 2 of this EIS. presentation and evaluation of options are specific to meeting the need to efficien structural sections at the Expended Core Facility. This need would only exist if a implemented that involves continued operation of the Expended Core Facility examina

for storage of naval spent nuclear fuel.

No Action: Under this option, the Dry Cell would not be constructed. Naval modules would be prepared with existing equipment at the Expended Core Facility. T efficiently meet the need to handle the larger naval spent nuclear fuel modules tha Expended Core Facility over the next two decades. Performing this work in the Expe pools would be much more expensive.

Remove the Nonfuel Structural Sections at Servicing Facility: If this option naval spent nuclear fuel modules would be prepared at the location where it was rem during servicing. This option would require additional handling of the spent nucle facilities with specialized equipment (five facilities instead of one, with no redu impact), and additional transportation for the nonfuel sections at each of the five Expended Core Facility already has the trained personnel, proven procedures, and sp equipment necessary for this work. If the spent nuclear fuel modules were prepared Facility, the fuel section could be transferred to another part of the Expended Cor examination without having to load it into a transport cask for shipment to another

Prepare the Modules at Another Location: If this option were carried out, na would be transported to a central location where it would be unloaded, the nonfuel removed, and the fuel section reloaded into a transport cask and shipped to the Exp examination. This option would require additional handling, construction of new fa specialized equipment, and additional transportation.

Phase Out Removing Nonfuel Structural Sections: If this option were implemen nuclear fuel would be examined and stored without removing the nonfuel structural s this would make internal examination of the spent nuclear fuel modules more difficu procedures would need to be developed to perform the internal examinations. Implem would increase the amount of material to be managed as spent nuclear fuel since the sections can be disposed of as low-level waste when removed.

Increase Water Pit Capacity: Under this option all naval spent nuclear fuel prepared in the Expended Core Facility water pit; however, unlike the "No Action" o action would be taken to efficiently support the shipping and handling of larger na modules that would be received at the Expended Core Facility over the next two deca Implementation of this option would require extensive engineering effort for equipm and procurement. The option would also require refurbishment of existing water pit impact ability of the Expended Core Facility to maintain ongoing materials test pro Implementation of the option would provide no significant advantage for reduced env would increase costs of operations while reducing the capability of the Expended Co materials.

AFFECTED ENVIRONMENT: A general description of the area and existing industrial si Volume 1, Appendix D, Part A, Section 4.2. The Dry Cell Project would have negligi environment.

ENVIRONMENTAL CONSEQUENCES OF THE DRY CELL PROJECT:

Overview of Environmental Impacts: The following sections discuss the potent consequences at the INEL site associated with the construction of the Dry Cell Proj Facility. The environmental consequences are based on the fact that the Expended C in existence and operating within the perimeter of the Naval Reactors Facility at t environmental effects of this project are discussed in the following paragraphs. Review of the environmental effects of operation of the Expended Core Facility Dry the preparation of naval spent nuclear fuel has shown that the impact on the enviro work is very small. The largest effect in the vicinity of INEL site is a small inc emissions. The differences in all other impacts in the vicinity of INEL site for t very small or nonexistent.

Number of Employees: Approximately 500 engineers, technicians, clerical, and personnel are employed in the receipt and examination of naval spent nuclear fuel a Facility or in direct support of these activities. The table below provides a summ would be associated with the Expended Core Facility if the Dry Cell Project is cons table, there is an increase in workers in the period 1996 through 1998 for construc operation would not require any additional personnel and as shown in the table, the work force would return to 500 after construction of the Dry Cell is completed.

Summary of direct jobs for Dry Cell Project - Expended Core Facility.

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|---|---|---|---|
| 574 | 574 | 550 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |

Air Emissions: Small quantities of radioactivity are contained in the air re Core Facility and prototype plant operations at the Naval Reactors Facility. The a Expended Core Facility total approximately 1.1 curies, composed primarily of 0.30 c curie of carbon-14, 0.094 curie of tritium, 0.000011 curie of combined strontium-90

0.0000048 curie of iodine-131. These releases at the Naval Reactors Facility would curies per year by the Dry Cell Project. The primary contribution to the small inc from carbon-14.

The principal sources of current nonradioactive industrial gaseous effluents are ai from cooling towers, and fuel combustion products from the three steam generating b The Dry Cell operations would contribute a negligible amount of PM-10 and Volatile Compounds (VOC). The PM-10 release from the Dry Cell would be 2.45 y 10-9 tons per less than 1,800 pounds per year.

Potential impacts to air quality from construction activities would include fugitiv from support equipment. The modeling assessment showed that expected construction-impacts should be minor and temporary and, when added to the baseline concentration percentage of applicable standards (Section 5.7 of Volume 2).

Asbestos-containing material is present at the Naval Reactors Facility, but, as a r conditions with regard to asbestos at the Naval Reactors Facility, releases would b Cell Project.

Water Emissions: No radioactive liquids are discharged to the environment at Facility. The Dry Cell would not release any radioactive liquids and would have no radioactive liquids at the Naval Reactors Facility.

Since the water released to the industrial waste ditch does not include any effluen Facility, the discharges to the ditch would be unaffected by the Dry Cell Project. Core Facility produces about 25 percent of the total sewage discharge at the Naval Expended Core Facility discharge would remain the same with the Dry Cell Project si personnel would be required for operations.

No hazardous wastes are disposed of at the Naval Reactors Facility site and all sol wastes are transported by vendors to treatment, storage, and disposal facilities ap Environmental Protection Agency and operating under approvals or permits granted by regulatory agencies. The Dry Cell Project would not generate any additional hazard therefore have no impact on water quality in the area.

A flood at the Expended Core Facility due to overflow of any surface water within t is a low probability event. Flooding of the Expended Core Facility building is pos Dam fail; however, there is adequate time following the dam break until the flood w Reactors Facility to complete emergency procedure preparations.

Solid Waste: All nonhazardous solid wastes that cannot be recycled or used b agencies are transported to the INEL landfills at the Central Facilities Area. Ope Facility makes little contribution to these wastes other than the trash associated persons who work at that facility. Except for the generation of approximately 500 waste during construction, the Dry Cell Project would not change the number of Expe personnel and the impact in this area at the INEL site is little affected by the Dr The use of hazardous materials in essential applications at the Expended Core Facil generation of some hazardous wastes, including photographic solutions, solutions co organic solvents, paint-related wastes, and laboratory wastes. All hazardous waste vendors to treatment, storage, and disposal facilities approved by the Environmenta operating under approvals or permits granted by state and federal regulatory agenci of at the INEL. When appropriate, wastes are recycled or provided to other federal additional hazardous waste would be produced from the Dry Cell operation so the ove environment is unchanged by the alternative selected.

Energy and Water Consumption: Operations at the Expended Core Facility curre approximately 10,000 megawatt hours of electricity each year. The Dry Cell operati consumption by 873 megawatt hours per year for new ventilation system fans and faci Annual water consumption by the Expended Core Facility is about 2.5 million gallons would have no discernible effect on water usage, because the groundwater withdrawn would be small in comparison to the total INEL site water consumption. Expended Co operation would have virtually no effect on surface waters.

Radioactive Waste: Operations at the Expended Core Facility contribute appro meters (15,000 cubic feet) of radioactive solid waste each year. No high-level was transuranic waste (less than 0.0001 cubic meter per year) are generated from curren Expended Core Facility. The principal solid low-level waste generated by the Dry C approximately 113 cubic meters per year of radioactive nonfuel structures removed f the Dry Cell. This material would be shipped to the Radioactive Waste Management C This waste is part of the 425 cubic meters already contributed each year. The diff meters is now generated in the water pit and would be generated in the Dry Cell whe begin. An additional 2 cubic meters per year of radioactive waste would be generat in the new Dry Cell radioactive ventilation system. The increased radioactive wast offset by reduced water pit resin filter waste since the nonfuel structural cutting

performed in the water pits. Consequently, the overall effect on the environment i the Dry Cell Project.

## C-4.1.2 INCREASED RACK CAPACITY FOR CPP-666

**Figure. Project Data Sheet-Expended Core Facility Dry Cell Project.**

PROJECT NAME: Increased Rack Capacity for CPP-666

GENERAL PROJECT OBJECTIVE: The general objective of this proposed project would be near-term capability of the Idaho Chemical Processing Plant to continuously receive increasing the capacity for fuel storage in three storage pools in the Fuel Storage process is commonly called reracking and involves replacing fuel storage racks in P need for this project comes from an analysis of Idaho Chemical Processing Plant fue that demonstrates additional storage capacity would be required under several of th of the analysis show the following:

- Fuel Storage Area fuel storage in Pool #6 for aluminum clad (research) fue Spring 1993, but the date can be extended to 1994 or 1995 through revised fuel management and limited, temporary storage of aluminum clad fuel in st
- Fuel Storage Area fuel storage capacity for zirconium clad (primarily nava (that is, 10- or 12-inch square) fuel positions would allow receipt throug reracking.
- Fuel Storage Area fuel storage capacity for zirconium clad (naval) fuel re 16- or 18-inch square) fuel positions would allow receipt through 1997 and reracking; receipt through 2000 would be accommodated if the safety analys allowing stacking of fuel.

For the proposed reconfiguration, reracking of CPP-666 fuel storage Pool #1 must oc filled beyond the "manageable level"; otherwise, this project cannot be accomplishe dependent on operational safety requirements that restrict the movement of fuel sto and the movement of heavy objects over, or in proximity to, loaded fuel racks.

PROJECT DESCRIPTION: This proposed project would involve replacing and rearranging storage racks in three of the six Fuel Storage Area pools in CPP-666. These pools Dissolution Process and Fuel Storage Facility (CPP-666). The fuel storage capacity replacing existing racks in three storage pools with new racks. The new racks woul cases would have different storage port dimensions and different spacing dimensions minimum of eight feet of water shielding would be maintained over fuel being moved. requirements would be met in the design of the new fuel storage racks, and by criti reconfigured fuel storage pools and administrative controls on their operation. Th designed to meet the High Hazard Facility Use Category requirements in DOE Order 64 and other applicable codes, standards, and regulations. Their layout and design wo Storage Area structural limits. The existing design of the Fuel Storage Facility bu from other natural phenomena, including high winds, tornadoes, and floods. The exi water treatment systems and heating, ventilating, and air conditioning systems are reracking.

The project would also include decontamination of the racks being replaced and thei would initially be decontaminated underwater to remove as much of the loose contami standard techniques, such as high-pressure water jets, brushing, or scrubbing, befo pool. An underwater vacuum system would be used to capture most of the material wa Following their removal from the fuel storage pools, local decontamination of hot s if needed, and the racks would be bagged while damp to contain the potential releas radionuclides. To limit free standing water in the bags, the racks would be allowe into the bags and absorbent material may be placed at the bottom of the bags. Addi racks may be dried by circulating air through the bags. The bag exhaust would be t particulate air filter system designed for moist air.

Expanding the storage capacity would involve replacing fuel storage racks in Pools in storage capacity would result from the following reconfiguration:

- Pool #1 would replace 27 racks containing 486 storage locations, which are 10-feet tall, with 35 racks containing 925 storage locations, which are ap tall. The number of storage locations would increase because the spacing locations would be less than that in the existing configuration.

- Pool #5 would replace 24 racks containing 384 storage locations, which are 10-feet tall and 12-inches square, with 21 racks containing 294 storage lo approximately 15-feet tall and 16-inches square. There are fewer storage proposed configuration, but the proposed storage locations would be larger

- Pool #6 would replace only 20 of the existing 32 racks in Pool #6. The 20 one half of the surface area of Pool #6 and contain 300 storage locations and 8-inches square. These racks would be replaced with 12 racks containi locations, which would be approximately 15-feet tall and 8-inches square.

This project (Pools #1, #5, and #6) would increase the capacity of the Fuel Storage 18 metric tons of heavy metal (MTHM) to approximately 32 MTHM. This amount is only because the actual capacity depends upon such factors as the geometry of the indivi characteristics of their heavy metal. The fuel receipt and storage in the Fuel Sto continue as follows:

- Receipt of aluminum-clad research reactor fuel could be extended from 1995 and 2009 (depending on fuel receipt).

- Naval fuel requiring small storage locations could be extended from 1995 t

- Naval fuel requiring large storage locations could be extended from 1997 t

In the preliminary plans, Pools #1 and #5 would be emptied of fuel before rack repl consequences of accidentally dropping a rack or rack handling tool in Pool #6, a ro locations in the loaded racks between the loaded storage locations and the new rack buffer zone during fuel rack replacement activities. Pool #6 would contain fuel in fuel rack storage locations and the storage locations closest to the new racks woul Following reracking, operations in Pool #1 would resume in 1997, Pool #6 in 1998, a The 51 fuel racks from Pools #1 and #5 would be decontaminated and dispositioned to commercial vendor. The 20 racks from Pool #6 may be used in the south basin of Bui dispositioned like the others. If Pool #6 racks need to be decontaminated and disp waste would increase by 235 cubic meters (305 cubic yards). The balance of the rad packaged and disposed of at the Radioactive Waste Management Complex or incinerated Experimental Reduction Facility, whichever is appropriate. The industrial waste wo Central Facilities Area landfill.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.

The proposed project would be located in an existing facility within a major facili Processing Plant). (See Figure C-1-1 for location and Section C-3.2 for a discussi existing facility.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.1.2-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

**Table C-4.1.2-1. Summary of potential environmental impacts of the Increased Rack** CPP-666 Project under Alternative B.

| Impact attribute | Potential impacta,b | Potential mi |
|---|---|---|
| Geology and soil, acres disturbed | None (no disturbed acreage) | Project will |
| Water resources | Construction: 26,875 liters<br>Operation: Usage within operational envelope of ICPP major facility area<br>Effluents: 29,000 liters of low-level waste water to the ICPP Process Equipment Waste system | Storm Water Plan in plac |
| Wildlife and Habitat | None | Project will |
| Historic, archaeological, or cultural resources | None | Storage will<br>facility |

| | | |
|---|---|---|
| Air resources | Radiological operational emissions<br>1.4 y 10-5% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>None<br>Prevention of Significant Deterioration (PSD)<br>None | Project woul<br>stack with a<br>filtering ca |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>1.4 y 10-6 mrem/yr<br>7.0 y 10-13 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: 7.4 y 10-6 person-rem/yr<br>3.7 y 10-9 latent cancer fatalities/yr<br>Year 2010: 8.1 y 10-6 person-rem/yr<br>4.0 y 10-9 latent cancer fatalities/yr<br>Nonradiological effects: No effects | Access contr<br>safety analy<br>surveillance |
| Transportationd | Construction (onsite truck trips):<br>Nonradiological - 8<br>Radiological - 21<br>Operation (truck trips per year):<br>Nonradiological - 1.4 onsite<br>Radiological - 0.1 onsite<br>Spent nuclear fuel - 14 onsite; 14 offsite | Use of appro<br>and containe<br>equipment op<br>manifesting |
| Waste management | Construction (m3): industrial waste - 300<br>low-level waste - 770<br>Operation (m3/yr): industrial waste - 50<br>low-level ion resins waste - 0.3 | Waste minimi<br>programs in<br>the INEL |
| Socioeconomic conditions | Construction: 40 existing workers<br>Operation: No additional workers | None |

a. Definition of acronyms: HEPA - high-efficiency particulate air; ICPP - Idaho C
NESHAP - National Emission Standards for Hazardous Air Pollutants.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.
d. All offsite shipments of naval spent nuclear fuel are allocated to this project

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, the present fuel storage capacity in the Fuel Stor would be retained. This option corresponds to Alternatives A (No Action) and C (Mi Storage, and Disposal) evaluated in this EIS. Without changing the racks, the pool capacity several years earlier than under the proposed alternative. During a three spent nuclear fuel would continue to be received and stored at the INEL. Filling t storage pools beyond the manageable level would also preclude future fuel storage e the Fuel Storage Area storage pools as an option in DOE evaluations and decisions o

Provide New Storage - This option is presented in the Dry Fuel Storage Facility S corresponds to Alternatives B (Ten-Year Plan) and D (Maximum Treatment, Storage, an evaluated in this EIS. Depending upon the availability of other storage facilities the specific fuel types proposed for CPP-666 storage, this new storage could suppla project.

Use Existing Idaho Chemical Processing Plant Storage Facilities - New fuel receip water-filled basins of CPP-603. This option is not evaluated in this EIS. This fa environmental safety and health vulnerabilities that would be difficult to correct storage. Storage in CPP-603 would violate the Court Order.

Use an Existing Non-Idaho Chemical Processing Plant Fuel Storage Facility - Existin Processing Plant storage facilities do not meet the near-term fuel storage requirem is not evaluated in this EIS. Several miscellaneous fuel storage areas on the INEL fuel canals associated with the Advanced Test Reactor, the Engineering Test Reactor Reactor, and the Advanced Reactivity Measurement Facility; and a Test Area North (T for storing fuel prior to disassembly and examination in the Test Area North Hot Ce feasible because of their limited size and the work that would be required to ready example, structural, safety, and environmental evaluations and modifications; secur naval fuel). Consideration was also given to holding the fuel in storage for sever Reactors Facility Expended Core Facility on the INEL.

Since the Expended Core Facility only holds spent nuclear fuel incidental to examin limited storage capacity, there is insufficient existing storage space for the amou under all alternatives without the addition of new racks to the water pools. Alter out receipt of naval fuel at the Expended Core Facility would be precluded by stora Fuel storage facilities at the Savannah River Site [that is, the Receiving Basin fo associated with the individual production reactors (K, L, and P)] were also examine storage space at the Receiving Basin for Offsite Fuels is very limited. New fuel s acquisition and upgrade of an existing facility would be required prior to acceptin Idaho Chemical Processing Plant research reactor fuels at the Savannah River Site. would have to be transported to the DOE Savannah River Site from the Naval Reactors where it would be initially received, examined, and prepared for transport.

## C-4.1.3 ADDITIONAL INCREASED RACK CAPACITY (CPP-666)

**Figure. Project Data Sheet-Increased Capacity for CPP-666 Project.**

PROJECT NAME: Additional Increased Rack Capacity (CPP-666)

GENERAL PROJECT OBJECTIVE: The general objective of the proposed Additional Increa Capacity Project would be to increase the capacity for fuel storage in at least two CPP-666 Fuel Storage Area at the Idaho Chemical Processing Plant without increasing pools.

PROJECT DESCRIPTION: This project would involve replacing and rearranging (commonl reracking) existing fuel storage racks in at least two of the six Fuel Storage Area Area pools are in the Fluorinel Dissolution Process and the Fuel Storage Facility ( could be reracked with this project include Pools #2, #3, and #4. In addition, the does not contain racks, would be considered for installation of racks under this pr This project would increase the capacity of the Fuel Storage Area from approximatel heavy metal (MTHM) to approximately 62 MTHM. This amount is only an approximation actual capacity depends upon such factors as the geometry of the individual fuel bu of their heavy metal, if racks were installed in the fuel cutting pool, etc. The a be to the maximum amount consistent with safety and regulatory requirements. The i result from installing or replacing racks without increasing the size of the storag taller and in some instances would have different storage port dimensions and diffe between ports. The new racks would provide flexibility for storing more fuel of di the existing pools.

Included in the project are (a) decontamination and disposition of the racks being (b) continued operation of these pools with the increased capacity. Facility suppo ventilation and water treatment capability have been determined to be adequate for the facility.

Liquid low-level waste generated by the project would be disposed of in the existin systems at the Idaho Chemical Processing Plant. The solid radioactive wastes, exce packaged and disposed of at the Radioactive Waste Management Complex or incinerated Experimental Reduction Facility, whichever is appropriate. The nonradioactive wast in the Central Facilities Area landfill.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.

The proposed project would be located in an existing facility within a major facili Processing Plant). (See Figure C-1-1 for location and Section C-3.2 for a discussi existing facility.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.1.3-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, the present fuel storage capacity in the Fuel Stor would be retained. This option corresponds to Alternatives A (No Action) and C (Mi Storage, and Disposal) evaluated in this EIS. Without changing the racks, the pool capacity several years earlier than under the proposed alternative. As the existin capacity, replacing them would no longer be an alternative in the Department of Ene decisions on spent fuel management.

Provide New Storage - Under this option, additional spent fuel storage would be c corresponds to Alternatives B (Ten-Year Plan) and D (Maximum Treatment, Storage, an evaluated in this EIS. This option is presented in the Dry Fuel Storage Facility P upon the availability of other storage facilities and their appropriateness for the for CPP-666 storage, this new storage could supplant the need for this project.

**Table C-4.1.3-1. Summary of potential environmental impacts of the proposed Additi** Increased Rack Capacity (CPP-666) Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potential mitiga |
|---|---|---|
| Geology and soil, acres disturbed | None (no disturbed acreage) | Project would |
| Water resources | Construction: 27,000 liters<br>Operation: None<br>Effluent: 27,000 liters to ICPP Process Equipment Waste system (as low-level waste) | Storm Water P in place at I |
| Wildlife and habitat | None | Project would |
| Historic, archaeological, or cultural resources | None | Project would |
| Air resources | Radiological operational emissions<br>1.4 y 10-5% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs) - None<br>Prevention of Significant Deterioration (PSD)<br>None | Project would with appropri capabilities |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>1.4 y 10-6 mrem/yr<br>7.0 y 10-13 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: 7.4 y 10-6 person-rem/yr<br>3.7 y 10-9 latent cancer fatalities/yr<br>Year 2010: 8.1 y 10-6 person-rem/yr<br>4.1 y 10-9 latent cancer fatalities/yr<br>Nonradiological effects - No emissions | Access contro analysis, ins annual report |
| Transportationd | Construction (onsite truck trips):<br>Nonradiological - 8<br>Radiological - 22<br>Operation (truck trips per year):<br>Nonradiological - 1.4 onsite<br>Radiological - 0.1 onsite<br>Spent nuclear fuel - 272 onsite; 272 offsite | Use of approv containers, q operators, an procedure |
| Waste management | Construction (m3): industrial waste - 300<br>low-level waste - 800<br>Operation (m3/yr): industrial waste - 50<br>low-level waste - 0.3 | Waste minimiz programs in p INEL |
| Socioeconomic conditions | Construction: 40 existing workers<br>Operation: No additional workers | None required |

a. Definition of acronyms: HEPA - high-efficiency particulate air; ICPP - Idaho C NESHAP - National Emission Standards for Hazardous Air Pollutants.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.
d. All offsite shipments of spent nuclear fuel other than naval fuel and Fort St. project or the Dry Fuel Storage Facility; Fuel Receiving, Canning/Characterization,

## C-4.1.4 DRY FUEL STORAGE FACILITY; FUEL RECEIVING,

Figure. Project Data Sheet-Additional Increased Rack Capacity Project.

CANNING/CHARACTERIZATION, AND SHIPPING
PROJECT NAME: Dry Fuel Storage Facility; Fuel Receiving, Canning/Characterization,
GENERAL PROJECT OBJECTIVE: The general project objective of the proposed Dry Fuel Facility; Fuel Receiving, Canning/Characterization, and Shipping project is to prov storage project that would accommodate the various fuel types and configurations in INEL fuels, projected naval and Advanced Test Reactor fuels, and spent nuclear fuel offsite sources such as government, commercial, and university nuclear reactors. T DOE in safe, environmentally sound management of spent nuclear fuel during the esti (1995-2035) until final disposition can be achieved.

While the functions performed by a proposed Dry Fuel Storage Facility and a Fuel Re Canning/Characterization, and Shipping Facility would be the same for several of th the magnitude of the facilities would change depending on the alternative. The pro with the alternative. The project would provide for the design, construction, and

PROJECT DESCRIPTION: The spent nuclear fuel materials at the Idaho Chemical Proces historically been stored in wet storage facilities (as has the spent nuclear fuel a their reprocessing to recover the highly enriched uranium. In April 1992, the Secr that the reprocessing of spent nuclear fuel for recovery of uranium was no longer r determination then changed the Idaho Chemical Processing Plant mission from reproce conditioning and interim storage.

The two facilities of this project would perform the following functions:

1. Receive fuel shipping casks from various INEL and/or offsite locations dep specific alternative considered.

2. Unload full casks into fuel unloading pools or directly into a dry hot cel specific alternative considered.

3. Inspect, dry, characterize, can, seal and test cans of fuel.

4. Load canned fuel into dry storage canisters.

5. Transport dry storage canisters to the Dry Fuel Storage Facility.

6. Retrieve dry storage canisters from the Dry Fuel Storage Facility.

7. After interim storage, transport full casks from the facility to a permane another facility for additional conditioning prior to disposal in a reposi

8. Monitor storage conditions as required.

The Fuel Receiving, Canning/Characterization, and Shipping Facility would be consid nuclear facility. The facility would be a multilevel facility with a operating hot surrounded by the auxiliary and support areas. Depending on the required throughpu could range in size from 50,000 to 100,000 square feet. The major areas of the fac following:

- The cask receiving area would contain a washdown capability for rail or tr overhead cranes for cask lifting and movement, transfer carts, cask mainte repairs on casks; for example, replacement of seals), and storage areas fo cask impact limiters, access platforms, and similar equipment.

- Capabilities required for characterization would include nondestructive ev determine its physical, chemical, and radiological properties. Sampling e provided to acquire small samples of fuel to send to the analytical labora

- Common equipment in the hot cell would include shielded viewing windows, m manipulators, electromechanical manipulators, and remote-operated bridge c

- An analytical laboratory for complete chemical and radiological analysis o rubble, or broken spent nuclear fuel. This laboratory would require a hot handling capabilities for sample analysis and for removal of waste from th

- A control room for overview of the automatic operations of the facility in handling hot cell and manual override of facility functions as required. contain monitors that report real-time data for selected systems and allow parameters as necessary. Other monitors would allow viewing via remote ca

activities and other selected activities.

- The facility would contain cold and hot shop areas to support building act equipment fabrication, maintenance, repair, and fabrication of new systems
- Crane and electromechanical manipulator maintenance area for repair and pr maintenance of this equipment.
- Administrative support areas (office, conference room, rest rooms, change equipment and mechanical/electrical rooms to support overall operations in

The proposed Dry Fuel Storage Facility would be integrated with the Fuel Receiving, Characterization, and Shipping Facility. This integration would alleviate the need dry storage in a transfer cask. The storage facility would consist of a Modular Ab system and a fenced storage yard. This system would eliminate the construction of to provide active cooling, and would allow additional storage capacity to be purcha support long-term consolidation of the current DOE spent nuclear fuel inventory.
The number of Modular Aboveground Dry Storage units required would depend on the sp alternative considered, as described in the following project-specific options.
The previous project description was used for the analysis of potential consequence 2 of the SNF and INEL EIS where the project would be implemented under Alternatives C (Minimum Treatment, Storage, and Disposal), and D (Maximum Treatment, Storage, an project data sheets at the end of this project summary support the above project de
The proposed project would be located within a major facility area (the Idaho Chemi (See Figure C-1-1 for location and Section C-3.2 for a discussion of new constructi area.)
Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Tables C-4.1.4-1 and C-4.1.4-2. These tables are complemented by environmental impacts in Section C-3.2 and on mitigation of impacts in Section C-3. issues are discussed in Section C-3.4.
PROJECT-SPECIFIC OPTIONS:
No Action - Under this option, no new canning/characterization or dry storage cap constructed. This option corresponds to Alternative A (No Action) evaluated in thi (CPP-603 Irradiated Fuel Storage Facility, CPP-749, and CPP-666) would be utilized nuclear fuel on the INEL. During a three-year transition period, naval spent nucle received and stored in CPP-666. No major upgrades or new facilities would be insta conditioning would proceed for maintaining safe operation.
Receiving/Canning/Characterization in an Existing Facility, New Dry Storage Facilit an existing Idaho Chemical Processing Plant facility would be used for spent nuclea receiving/canning/characterization, and a new dry storage facility would be constru comparable to Alternative B (Ten-Year Plan) evaluated in this EIS (data sheets on p C-4.1.4-10). The canning/characterization capability would be placed in an existin (CPP-666 Fluorinel Dissolution Process cell). The existing fuel receiving and tran CPP-666 Fuel Storage Area (pool storage with reracking accomplished) would be used

**Table C-4.1.4-1. Summary of potential environmental impacts of the Dry Fuel Storag** segment of the Dry Fuel Storage Facility; Fuel Receiving, Canning/Characterization, Shipping Project under Alternative B.

| Impact area | Potential impacta,b | Potential m |
|---|---|---|
| Geology and soil | Disturbs 18.5 acres of previously disturbed soil | Previously d would be wit area |
| Water resources | Construction: water usage<br>Effluent: construction water | Storm Water Prevention P |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Previously d prevent soil |
| Historic, archaeological, or cultural resources | Unknown number of sites | Conduct and mitigate acc regulations |
| Air resources | Radiological operational emissions<br>3.2 y 10-3% of NESHAP dose limitd<br>Toxic Air Pollutants (TAPs) - None | Facility des inspection a annual repor |

| | | |
|---|---|---|
| | Prevention of Significant Deterioration (PSD) - None | |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>3.2 x 10-4 mrem/yr<br>1.6 y 10-10 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2010: 2.0 x 10-3 person rem/yrd<br>1.0 y 10-6 latent cancer fatalities/yr<br>Nonradiological effects - No emissions | Access contr safety analy surveillance requirements |
| Transportatione | Construction (onsite truck trips):<br>Nonradiological - 1<br>Operation (truck trips per year)<br>Nonradiological - 1 onsite<br>Radiological - 1 onsite | Use of appro vehicles and casks, quali operators, a manifesting |
| Waste management | Construction (m3): industrial waste - 37.5<br>Operation (m3/yr): low-level waste - 5<br>industrial waste - 10 | Waste minimi recycling pr INEL |
| Socioeconomic conditions | Construction: 50 subcontractor personnel<br>Operation: 15 existing workers | None require |

a. Definition of acronyms: NESHAP - National Emission Standards for Hazardous Air
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.
d. Includes dose associated with receiving, canning/characterization, and shipping 4.1.4-2.
e. Offsite shipments of spent nuclear fuel other than naval fuel and Fort St. Vrai project or the Additional Increased Rack Capacity (CPP-666) Project .

**Table C-4.1.4-2. Summary of potential environmental impacts of the fuel receiving,** canning/characterization, and shipping segment of the Dry Fuel Storage Facility; Fu Canning/Characterization, and Shipping Project under Alternative B.

| Impact area | Potential impacta,b | Potential m |
|---|---|---|
| Geology and soil | None (no disturbed acreage) | Project woul facility |
| Water resources | Construction: minimal water usage<br>Operation: No information<br>Effluent: construction water | Storm Water Prevention P |
| Wildlife and habitat | None | Project<br>facility |
| Historic, archaeological, or cultural resources | None | Project woul facility |
| Air resources | Radiological operational emissions<br>3.2 y 10-3% of NESHAP dose limitd<br>Toxic Air Pollutants (TAPs) - None<br>Prevention of Significant Deterioration (PSD) - None | Facility des inspection a annual repor |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>3.2 x 10-4 mrem/yr<br>1.6 y 10-10 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2010: 2.0 x 10-3 person rem/yrd<br>1.0 y 10-6 latent cancer fatalities/yr<br>Nonradiological effects - No emissions | Access contr safety analy surveillance requirements |
| Transportatione | Construction (onsite truck trips):<br>Nonradiological - 1<br>Operation (truck trips per year)<br>Nonradiological - 13.3 onsite<br>Radiological - 6.0 onsite<br>Spent nuclear fuel - 272 onsite; 272 offsite | Use of appro vehicles and casks, quali operators, a manifesting |

| | | |
|---|---|---|
| Waste management | Construction (m3): industrial waste - 37.5<br>Operation (m3/yr): low-level waste - 220<br>industrial waste - 490 | Waste minimi recycling pr INEL |
| Socioeconomic conditions | Construction: 100 subcontractor personnel<br>Operation: 20 existing workers | None require |

a. Definition of acronyms: NESHAP - National Emission Standards for Hazardous Air
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.
d. Includes dose associated with storage segment of this project.
e. All offsite shipments of spent nuclear fuel other than naval fuel and Fort St. project.

for these activities. A new storage facility would be developed for placement of d spent nuclear fuel.

Degradable spent nuclear fuel would be placed into dry storage using a canning faci Fluorinel Dissolution Process cell and procurement of modular dry storage container The dry storage containers would be placed inside a concrete biological shield for Appropriate equipment would be provided to move the canned fuel and other fuels tha life in dry storage, from the CPP-666 Fuel Storage Area to the dry storage containe The Irradiated Fuel Storage Facility and CPP-749 vaults would continue to be used a Canning/Characterization/Shipping in Existing Facility, No New Dry Storage - Unde nuclear fuel stored at the INEL would be transported to another DOE site for condit disposal. This option corresponds to Alternative C evaluated in this EIS (data she INEL spent nuclear fuel would be placed into safe shipping packages and transported offsite location. Some Idaho Chemical Processing Plant fuels that are degraded wou before shipment. This would be performed in the CPP-666 Fluorinel Dissolution Proc Alternative B (Ten-Year Plan) above] or in the CPP-603 Irradiated Fuel Storage Faci (cave).

For transport of the spent nuclear fuel from the Irradiated Fuel Storage Facility, upgrades to accept the larger truck casks and to properly test the casks for verifi safety analysis report. Shipments from the CPP-666 Fuel Storage Area, which has ad capacity, may require some shipping cask testing capabilities.

Minor modifications might be needed at other INEL fuel storage facilities to load a These modifications are expected to be covered by maintenance activities at these f New Receiving/Canning/Characterization Facility and New Dry Fuel Storage - Under nuclear fuel storage in the DOE Complex would be centralized at the INEL. This opt Alternative D (Maximum Treatment, Storage, and Disposal) evaluated in this EIS (dat 4.1.4-12 and C-4.1.4-13). A new Fuel Receiving, Canning/Characterization, and Ship as a Dry Storage Facility, would be constructed to accommodate the larger number of nuclear fuel from Hanford and Savannah River. Storage capacity in existing CPP-666 expanded under this alternative [see Sections C-4.1.2, Increased Rack Capacity for 4.1.3, Additional Increased Rack Capacity (CPP-666)] in order to provide storage f fuel and to provide interim storage capabilities for other spent nuclear fuel waiti The CPP-666 receiving area and pools have a mission to receive naval fuel on a firs nuclear fuel packages that have been prepared for dry shipment should not be placed unloading environment; therefore, the receiving bays in the proposed new facility w used so that the spent nuclear fuel would be unloaded in a dry environment and plac containers. Under the Centralization alternative (Volume 1), it was assumed that d the CPP-666 Fluorinel Dissolution Process cell interim canning/ characterization ca for INEL water-stored fuels and potentially for wet-shipped fuels. The proposed dr large volume of spent nuclear fuel would be a modular dry storage vault concept (ap modular aboveground dry storage containers).

Wet Storage - An alternative to the above-described dry storage would be to provi wet storage. While nuclear industry and DOE experience has demonstrated a general the processing, storage, and handling complications in a wet environment, this alte considered, but was not evaluated in this EIS.

Locate Facilities Elsewhere on the INEL - Under this option, canning/characteriza facilities would be constructed at a location other than the Idaho Chemical Process not evaluated in this EIS. The Test Area North facility has an existing hot cell w spent nuclear fuel shipments by rail or truck. However, spent nuclear fuel storage Area North (see Section C-2.1, Test Area North Pool Transfer), and the majority of at the INEL is approximately 32 kilometers (20 miles) south of Test Area North at I

Processing Plant, part of the way on a public highway. Spent nuclear fuel canning/ storage at Test Area North would probably require upgrade/modification to the Test Complex, and would require construction of dry storage facilities at Test Area Nort

Figure. Project Data Sheet-Dry Fuels Storage Facility. (page 1)

## Figure. (page 3) Figure. (page 4) Figure. (page 5) C-4.1.5 FORT ST. VRAIN SPENT NUCLEAR FUEL

Figure. (page 2)

RECEIPT AND STORAGE
PROJECT NAME: Fort St. Vrain Spent Nuclear Fuel Receipt and Storage
GENERAL PROJECT OBJECTIVE: The general objective of the proposed Fort St. Vrain Sp Fuel Receipt and Storage project would be to complete the transportation, receipt, blocks of Fort St. Vrain spent nuclear fuel from the Public Service Company of Colo facility in Platteville, Colorado, to the Idaho Chemical Processing Plant Irradiate INEL. In accordance with existing agreements between DOE and Public Service Compan spent fuel would be transported to the INEL by Public Service Company of Colorado i applicable transportation requirements using shipping casks certified by the U.S. N Commission.

The Fort St. Vrain reactor is a High Temperature Gas-Cooled Reactor owned by Public Colorado. The development, construction, and startup of the reactor was co-sponsor Energy Commission (now DOE) through Contract No. AT(04-3)-633, dated July 1, 1965. overall research and development effort related to High Temperature Gas-Cooled Reac Energy Commission had planned to build a facility to demonstrate the reprocessing o Gas-Cooled Reactor fuel. The Idaho Chemical Processing Plant was to be the locatio fuel reprocessing plant. Due to changes in the development of commercial High Temp Reactor facilities, construction plans for the fuel reprocessing demonstration plan However, the Atomic Energy Commission designed and constructed the Irradiated Fuel (CPP-603) in 1975 at the Idaho Chemical Processing Plant to store the spent fuel fr environmental impacts for this facility were evaluated in the mid-1970s.

In modification No. M010 (effective April 1, 1980) to the 1965 contract, the partie obligation to accept a total of eight segments of fuel from the Fort St. Vrain reac include a ninth segment that is in storage at Fort St. Vrain. DOE is responsible f eight segments. DOE also agreed that, at the sole discretion of DOE and under cert would accept additional spent fuel elements without further adjustment in the agree 1980, DOE entered into Contract No. DE-SC07-79ID01370, which incorporated the 1965 defined the procedures and specifications for fuel receipt.

This spent fuel transportation project would involve movement of approximately 16 m metal (spent Fort St. Vrain fuel) across public highways in U.S. Nuclear Regulatory shipping casks to the INEL where the spent fuel would be unloaded by remote capabil storage space (Irradiated Fuel Storage Facility). Each Fort St. Vrain fuel segment (or elements) and a small but variable number of test elements. Receipt of the f existing DOE contractual commitment.

Three segments were transported and received at the INEL between 1980 and 1987. Si fuel remain at the Fort St. Vrain Fuel Storage Facility, except three shipments tot completed in 1991 following issuance of an environmental assessment (DOE/EA-0441) ( Currently 744 blocks are in storage at the Irradiated Fuel Storage Facility. This transporting of the remaining six spent fuel segments to the INEL by Public Service and receipt and storage of the spent fuel in the Irradiated Fuel Storage Facility. approximately 1,464 blocks total. Each shipment would consist of one cask containi requiring a total of 244 shipments.

PROJECT DESCRIPTION: The Fort St. Vrain fuel is in the form of uranium and thorium coated with layers of pyrolytic carbon and silicon carbide, bonded by a carbonaceou rods, which are subsequently inserted into graphite blocks. Fresh fuel blocks have thorium contents. The Fort St. Vrain design fuel life is 1800 effective full power which has been in the Fort St. Vrain reactor for the longest time has been irradiat power days, or less than half of the design life. Because of the designed, tested, characteristics of the fuel, and the reduced actual fuel service history, there is

St. Vrain fuel proposed to be received at the INEL will have less than one percent
Each shipment would consist of one TN-FSV cask containing six spent fuel blocks. T
designed by Transnuclear, Inc., and certified by the U.S. Nuclear Regulatory Commis
public highways using semitractor trailer rigs (Certificate of Compliance No. 9253,
Shipments of spent fuel would arrive at the Irradiated Fuel Storage Facility unload
the cask atmosphere would be removed for analysis to verify there is no damage to a
container. It should be noted that 744 fuel blocks have been transported, received
been damaged.

Receipt of the six remaining segments of spent fuel at the Irradiated Fuel Storage
following operations:

1. Transport of the fuel from Fort St. Vrain to the INEL by Public Service Co
2. Relocation to CPP-749 or a new dry storage facility of some non-Fort St. V the Irradiated Fuel Storage Facility.
3. A fuel handling sequence at the Irradiated Fuel Storage Facility to place into storage.
4. Storage of fuel at the Irradiated Fuel Storage Facility.

Because of the previous use of the Irradiated Fuel Storage Facility for storage of
BER-TRIGA, Peach Bottom, and TORY-IIC), space for a portion of the ninth segment wi
available. The space would be made available by transferring the ROVER and Peach B
existing facilities or a new dry storage facility. Some of the Peach Bottom Core I
to the CPP-749 Underground Dry Vaults where the Peach Bottom Core I is stored. The
transfer would require purchase of stainless steel storage containers that would be
Fuel Storage Facility and transported in existing INEL shipping casks.

The above project description was used for the analysis of potential consequences i
of the SNF and INEL EIS where the project would be implemented. The project data s
project summary supports the above project description.

The proposed project would be located in an existing facility within a major facili
Processing Plant). (See Figure C-1-1 for location and Section C-3.2 for a discussi
existing facility.)

Information regarding the environment affected by this project is covered by other
summarized and referenced in Section C-3.1. The potential environmental effects as
are summarized in Table C-4.1.5-1. This table is complemented by information on en
Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu
C-3.4.

PROJECT-SPECIFIC OPTIONS:

Retain the Fuel in the Independent Spent Nuclear Fuel Storage Facility at Fort St.
corresponds to Alternative A (No Action) evaluated in this EIS. The Public Service
built a spent nuclear fuel storage facility onsite and transferred all spent fuel f
and subsequently began converting the reactor building into a natural gas fueled el
This option is not considered responsive to the DOE contractual commitment to take
St. Vrain fuel. Also, Public Service Company would not achieve its goal of becomin
materials by 1998 under this option.

Receive Fort St. Vrain Fuel at Another DOE Facility - This option corresponds to
Treatment, Storage, and Disposal) evaluated in this EIS. Under this option, existi
at another DOE site would be used for storage of the Fort St. Vrain fuel.

Receive Fort St. Vrain Fuel at Another INEL Facility - The consequences of this o
the analysis performed for this project. No DOE facility other than Irradiated Fue
specifically designed for dry storage of graphite reactor fuels. However, the Test
TAN-607, built for the Aircraft Nuclear Propulsion Program, has the necessary space
Fort St. Vrain fuels. This facility would be difficult to qualify to current stan
compliance with electrical, ventilation, and filtration codes, and other requiremen
to the storage of spent nuclear fuels. Construction programs would have to be unde
facility to meet current requirements.

**Table C-4.1.5-1. Summary of potential environmental impacts of the Fort St. Vrain** Fuel Receipt and Storage Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potential m |
|---|---|---|
| Geology and soil, acres disturbed | None (no disturbed acreage) | Storage f |

| | | |
|---|---|---|
| Water resources | None expected. The facility would not use any water and no effluents are generated | Dry sto Water P in plac |
| Wildlife and habitat | None | Storage |
| Historic, archaeological, or cultural resources | None, | Storage facilit |
| Air resources | Radiological operational emissions<br>4.9 y 10-5% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>2.3 y 10-5% of significance level for combined TAPs<br>Prevention of Significant Deterioration (PSD)<br><0.1% for all pollutants, all classes, all locations | Access safety surveil |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>4.9 y 10-6 mrem/yr<br>2.5 y 10-12 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: 4.2 y 10-5 person-rem/yr<br>2.1 y 10-8 latent cancer fatalities/yr<br>Year 2010: 4.5 y 10-5 person-rem/yr<br>2.3 y 10-8 latent cancer fatalities/yr<br>Nonradiological effects<br>Negligible impact on health effects expected. | Access safety surveil require |
| Transportation | Operation (truck trips per year):<br>Spent nuclear fuel - 244 offsite | Use of vehicle casks, operato manifes |
| Waste management | Small amounts of waste generated from cask decontamination, facility inspection, and maintenance. No increase above current level of waste generation | Waste m program |
| Socioeconomic conditions | Operation: No additional workers | None re |

a. Definition of acronym: NESHAP - National Emission Standard for Hazardous Air
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

Receive Fort St. Vrain Fuel at Another Idaho Chemical Processing Plant Facility - option are not bounded by the analysis performed for this project. This option is fuel in the Underground Storage Facility or the Unirradiated Fuel Storage Facility, fuels now stored in the Irradiated Fuel Storage Facility. The Unirradiated Fuel St store only unirradiated fuel and would not provide proper storage for the Fort St. irradiated. The Underground Storage Facility is designed to provide proper storage unirradiated fuels. However, before the Underground Storage Facility could be used St. Vrain fuel, an upgrade construction project would be needed to construct additi storage vaults.

Receive Fort St. Vrain Fuel at Newly Constructed Storage - The consequences of th bounded by the analysis performed for this project.

Receive Only Contracted Amount of Fuel - This option corresponds to Alternatives B (Maximum Treatment, Storage, and Disposal) evaluated in this EIS. DOE is obligated five of the six fuel segments currently stored at the Fort St. Vrain spent fuel sto sixth segment is at the discretion of the DOE. Under this option, Public Service C continue to store the balance of the fuel at their spent fuel storage facility. Th Service Company of Colorado continue to employ a staff of operators, maintenance pe force to operate the storage facility. If the sixth segment is not received, the P would continue to be stored in the Irradiated Fuel Storage Facility and would not r 749 or a new dry storage facility. There would be a reduction in the quantity of f

SUMMARY OF IMPACTS: The cask design limits radioactive material releases following

accidents to satisfy the requirements of 10 CFR 71.51 for Type B packages. These r summarized below:

1. No escape of krypton-85 in one week exceeding ten times the maximum krypton-85 activity value from 10 CFR Part 71, Table A-1.

2. No escape of other radionuclides exceeding the total amount specified in 10 CFR 71, Table A-1.

3. No external radiation dose rate exceeding one rem per hour at one meter fr surface of the package.

The cask must be designed and prepared for shipment so that, for a cask transported highway, radiation levels at any point two meters from the outer surface of the veh millirem per hour. The expected maximum number of vehicle round trips that would b the transfer of fuel from Fort St. Vrain to Irradiated Fuel Storage Facility would would total approximately 250 round trips.

The project does not require new construction or excavation. Small quantities of r mixed wastes would be generated during cask decontamination activities. These wast disposed of according to procedures that are in compliance with applicable State an Assuming air emissions from the Irradiated Fuel Storage Facility were to increase l measured data as the facility were filled with Fort St. Vrain fuel, INEL site emiss approximately 40 microcuries per year.

Relocation of Peach Bottom and ROVER/Parka fuels from the Irradiated Fuel Storage F Underground Storage Facility and the Unirradiated Fuel Storage Facility would cause cumulative radioactive airborne emissions. Peach Bottom fuels would be placed insi before relocation to the underground vaults of the Underground Storage Facility. T after receiving the Peach Bottom fuel, except for two normally closed sample connec fuel is unirradiated and makes no contribution to radioactive airborne emissions.

## C-4.1.6 SPENT FUEL PROCESSING

__Figure. Project Data Sheet-Fort St.Vrain Spent Nuclear Fuel Reciept and Storage Pro__

PROJECT NAME: Spent Fuel Processing

GENERAL PROJECT OBJECTIVE: For the purposes of analysis, a hypothetical Spent Fuel project was assumed. The general project objective would be to provide the capabil enriched spent nuclear fuel. Concerns about criticality during interim storage or dictate separation of the fissile material (uranium and plutonium) from the highly or disposal. Aqueous dissolution and separation was assumed because DOE has data f that could be used for analysis. This process was intended to be bounding for what actually be developed and used. Processing these fuels would alleviate some of the repackaging needs, as stated in the Dry Fuel Storage Facility; Fuel Receiving, Cann Shipping project summary (see Section C-4.1.4). Fuel processing could be done in o spent nuclear fuel and remove risks associated with storage and disposal, and to sa high-level waste in a cost-effective manner. For analysis purposes, it was assumed Chemical Processing Plant processing and chemical separations facilities to conditi disposal by removal of the fissile material would be the bounding case.

PROJECT DESCRIPTION: Historically, many DOE spent nuclear fuel types were processe dissolution and the fissile material segregated. Several processes were used becau materials making up the fuel elements: aluminum-clad fuels, stainless-steel-clad fu and graphite fuels. Aluminum-clad and zirconium-clad fuels were processed by highl dissolution. Stainless steel-clad fuels were electrolytically dissolved. Graphite then the ash dissolved. These processes generated solutions that included the radi the fissile material, usually uranium-235, which were subsequently separated to seg Once the fissile material is extracted, the remaining waste solution is referred to For analysis purposes, it is assumed that this project would process the current in existing Fluorinel Dissolution Process facility (CPP-666) and Fuel Processing Build 1997 and provide upgraded and new facilities to support long-term fuel stabilizatio the earliest time the facilities could be restarted and was used to maximize the im window.

Upgrades and new facilities would be required to support long-term processing of sp been identified to some facilities that would increase efficiency, safety, or throu improvements are described below with estimated costs.

Completion of maintenance activities, operation readiness reviews, and obtaining DO required before the existing facilities could be restarted. About two to three yea accomplish these activities. Thus, FY 1997 would be the earliest the restart could a June 1995 decision to start processing. Two or three processing campaigns could the fluorinel dissolution process would be shut down in FY 2000 to accomplish its u The following paragraphs summarize the upgrades and new facilities that would be re

The fluorinel dissolution process was run in the past to process zirconium fuel. F upgrades were assumed to increase the throughput roughly 2 to 3 times the historica upgrade would be designed to include an electrolytic dissolution process for alumin fuels. The old electrolytic stainless steel process is no longer operable. The ne also provide a more environmentally acceptable method for processing aluminum fuel. assumed by 2006. FY 2006 was assumed in this analysis because early processing wou case for impacts. A rough estimate of the fluorinel dissolution process upgrade in process is $700 million.

The Fuel Processing Restoration project that was canceled in 1992 was to provide ne uranium from the dissolver product solutions. The increased capacity for solvent e not be required until FY 2006 when the fluorinel dissolution process would begin ho estimate to restart the project and finish the facility is approximately $500 milli Graphite fuel processing would require a new pilot plant/production facility at an million.

These new and replacement facilities would be sufficient to stabilize essentially a types that are in inventory at the INEL. Other fuels of different materials may re processes to produce acceptable waste forms.

If this alternative were to be pursued aggressively, the generated wastes may requi waste tankage, which would be covered by the High-Level Tank Farm New Tanks project C-4.3.3).

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternative D Treatment, Storage, and Disposal). The project data sheet at the end of this proje above project description.

The proposed project would be located mostly in existing facilities within a major Chemical Processing Plant). (See Figure C-1-1 for location and Section C-3.2 for a within an existing facility.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.1.6-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, the existing facilities would not be restarted and constructed. This option corresponds to Alternatives A (No Action), B (Ten-Year Pl Treatment, Storage, and Disposal) evaluated in this EIS. The no action option rega fuel is evaluated by each of the spent fuel storage alternatives. Processing fuels INEL (for example, N-Reactor or Fast Flux Test Facility fuels) is not presented her included as site-specific alternatives within Volume 1.

**Table C-4.1.6-1. Summary of potential environmental impacts of the Spent Fuel Proc** Project under Alternative D.

| Environmental attribute | Potential impacta,b | Potenti |
|---|---|---|
| Geology and soil, acres disturbed | Minimal previously disturbed soil, and in an existing facility | Most of existing |
| Water resources | Construction: 100,000 liters<br>Operation: 48,000,000 liters per year | Storm Wa Preventi |
| Wildlife and habitat | None | Most of |
| Historic, archaeological, or cultural resources | None | Most of existing |
| Air resources | Radiological operational emissions<br>0.4% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>110% of significance level for combined TAPs | Facility criteria inspecti annual r |

| | | |
|---|---|---|
| | Prevention of Significant Deterioration (PSD) - None | |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>0.04 mrem/yr<br>2.0 y 10-8 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: not in operation<br>Year 2010: 0.29 person-rem/yr<br>1.5 y 10-5 latent cancer fatalities/yr<br>Nonradiological effects<br>Negligible impact on health effects expected<br>Accidents - Handling and criticality: MEI cancer risk increases from 4.8 y 10-8/yr (Alternative B) to 2.0 y 10-7/yr due to this project | Access c<br>safety a<br>surveill<br>Addition<br>may be r<br>air poll |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 84.2<br>Operation (onsite truck trips per year):<br>Nonradiological - 73.4<br>Radiological - 8.4<br>Spent nuclear fuel - 16 | Use of a<br>vehicles<br>equipmen<br>shipment |
| Waste management | Construction (m3): industrial waste - 3100<br>Operation (m3/yr):<br>high-level liquid waste - 4,500<br>low-level waste - 310<br>industrial waste - 2,700 | Waste mi<br>recyclin<br>INEL |
| Socioeconomic conditions | Construction: 450 peak subcontractor personnel; 50 existing<br>Operation: 300 existing; 25 new workers | None req |

a. Definition of acronyms: MEI - maximally exposed individual; NESHAP - National Hazardous Pollutants.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

## C-4.1.7 EXPERIMENTAL BREEDER REACTOR-II

**Figure. Project Data Sheet-Spent Fuel Processing Project.**

BLANKET TREATMENT
PROJECT NAME: Experimental Breeder Reactor-II Blanket Treatment
GENERAL PROJECT OBJECTIVE: The general objective of the proposed Experimental Bree Reactor-II Blanket Treatment Project would be to modify the Fuel Cycle Facility to Breeder Reactor-II blanket fuel assemblies to a suitable form for safe, interim sto is part of the electrometallurgical process under development at Argonne National L The fuel treatment project would condition the spent blanket fuel to a stable form elements, including transuranic elements, would be separated and stabilized for sto geologic disposal. Nearly pure depleted uranium metal would be separated for stora level waste. This project would have the advantage of neutralizing the reactive co and would produce material that would be better suited for interim storage. The wa activity would be treated for disposal in the same manner as other wastes at Argonn Laboratory-West and would benefit from the common approach to waste disposal.
PROJECT DESCRIPTION: Argonne National Laboratory-West would treat Experimental Bre Reactor-II fuel assemblies in the Fuel Cycle Facility following the electrometallur Experimental Breeder Reactor-II spent driver fuel assemblies located at either Argo West or the Idaho Chemical Processing Plant. The Experimental Breeder Reactor-II c blanket fuel assemblies that will be removed from the core during Fiscal Years 1994 have previously been removed and are stored on the INEL site. The blanket fuel ass depleted uranium fuel slugs immersed in sodium, within a stainless steel jacket/can heat transfer between the fuel and stainless steel. A number of the fuel elements clustered together to form an assembly. Electrometallurgical processing would turn

the blankets into nonreactive sodium chloride while converting the blanket fuel to
The treatment would require shearing the stainless steel jackets to expose the fuel
The Fuel Cycle Facility stabilizes the Experimental Breeder Reactor-II metallic spe
following treatment steps:

- A molten salt electrorefining process to separate the fission products fr uranium using an electrochemical cell to drive the process.

- A furnace and mold system to cast the noble metal fission products and ra steel cladding into a disposable form.

- Other processes to place the active fission products into zeolites, and v into a mineral waste.

The uranium would be separated from most of the fission products. The fission prod fuel would be placed in two stable waste forms: a mineral waste containing the act metal waste containing the noble metal fission products and the cladding alloys fro waste forms would be thoroughly analyzed for subsequent repository disposal. The s transuranic elements present in the fuel would be extracted with the active fission alloyed with the structural stainless steel recovered from the fuel assemblies to p could be stored for later disposition.

This project would modify the Fuel Cycle Facility element chopper to handle the lar assemblies, and add a high-throughput electrorefiner to handle the larger quantitie the blankets. The increased capacity would allow the Fuel Cycle Facility to treat assemblies in the Experimental Breeder Reactor-II as well as the others in storage increase the treatment rate from 90 to 120 spent driver fuel assemblies per year. products, and elemental sodium from the blankets would be treated in the same manne Experimental Breeder Reactor-II driver fuel assemblies. The treatment would conver in the blankets to sodium chloride.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.

The proposed project would be located in an existing facility within a major facili Laboratory-West). (See Figure C-1-1 for location and Section C-3.2 for a discussio existing facility.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.1.7-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, the present practice for blanket handling would be blankets are removed from Experimental Breeder Reactor-II, they are transported to Examination Facility. The top and bottom section of the blanket fuel assemblies ar remaining assemblies with the blanket fuel elements are placed in a storage can. T another can and transported to the Radioactive Scrap/Waste Facility. The blanket a at the Radioactive Scrap/Waste Facility until a decision is made on processing or t option corresponds to Alternatives A (No Action) and C (Minimum Treatment, Storage, evaluated in this EIS.

From an environmental perspective, this option would have disadvantages. The blank elemental sodium that will react with water and produce hydrogen gas. This charact material as reactive. Reactive material is best handled by eliminating or stabiliz The storage option would only isolate the reactive component.

Develop a New Process - This option would be to develop a new process to stabiliz blanket fuel assemblies. This option is not evaluated in this EIS. This option wo development program and then implementation of the process into a remote handling f would require additional treatment and the fuel would have to be stored while this implemented.

**Table C-4.1.7-1. Summary of potential environmental impacts of the Experimental Br** Reactor-II Blanket Treatment Project under Alternative B.

| Environmental attribute | Potential impacta,b | Poten |
|---|---|---|
| Geology and soil, | None (no disturbed acreage) | Proje |

| | | |
|---|---|---|
| acres disturbed | | |
| Water resources | No increase | Not r |
| Wildlife and habitat | None | Proje |
| Historic, archaeological, or cultural resources | None | Proje |
| Air resources | Radiological operational emissions<br>5.7 y 10-3% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>None<br>Prevention of Significant Deterioration (PSD)<br>None | Facilit criteri and sur |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>5.7 y 10-4 mrem/yr<br>2.9 y 10-10 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: 0.012 person-rem/yr<br>6.0 y 10-6 latent cancer fatalities/yr<br>Year 2010: 0.014 person-rem/yr<br>7.0 y 10-6 latent cancer fatalities/yr<br>Nonradiological effects - No emissions | Access analysi annual |
| Transportation | Construction: None<br>Operation (onsite truck trips per year):<br>Radiological - 4.9<br>Spent nuclear fuel - 11 | Use of and con operato procedu |
| Waste management | Construction: None<br>Operation (m3/yr): high-level waste - 3.5<br>transuranic - 4.0<br>low-level waste - 7.4<br>mixed low-level waste - 0.4 | Waste m program |
| Socioeconomic conditions | Construction: 10 existing workers<br>Operation: 12 existing workers | None re |

a. Definition of acronym: NESHAP - National Emission Standards for Hazardous Air
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

## C-4.1.8 ELECTROMETALLURGICAL PROCESS DEMONSTRATION

<u>Figure. Project Data Sheet-Experimental Breeder Reactor-II Blanket Treatment Projec</u>

PROJECT NAME: Electrometallurgical Process Demonstration

GENERAL PROJECT OBJECTIVE: The general objective of this proposed project would be demonstration and testing of new spent nuclear fuel management processes. The goal be the following:

- Demonstrate the technical and economic feasibility of electrometallurgical conditioning spent nuclear fuel for disposal.
- Demonstrate a waste product that is compatible with the expected acceptanc geologic repository.
- Explicitly quantify the volume reduction of the waste stream components.

PROJECT DESCRIPTION: Argonne National Laboratory-West would perform the process de and demonstrate the conditioning of Department of Energy (DOE) spent nuclear fuel f energy use. Much of the spent nuclear fuel at the INEL is highly enriched, has ser storage, contains chemically reactive material, or cannot be expected to retain its making direct disposal into a repository potentially unacceptable. These concerns

stabilization processes such as electrometallurgical processing. An environmental aspects of the proposed project has previously been prepared (DOE 1990a, 1990b). Presently in storage at the INEL are 72 distinct and different DOE fuel types with These fuel types include metal, hydride, metal alloy sodium bonded, graphite, alumi fuel matrices. Demonstration fuels would be transported from other locations to Ar Laboratory-West as needed. Argonne would first complete process development and de unirradiated fuel containing representative fission product elements and then condu demonstration of spent nuclear fuel stabilization in the Hot Fuel Examination Facil at the Argonne National Laboratory-West site. This demonstration would include ele processing of representative DOE fuel types and cover the complete range of operati the fuel for ultimate disposition. The only new equipment required for this demons installation of a vessel for carrying out the reduction of oxide to metal. The was course of stabilizing oxide fuel would be identical to those produced with other fu compositional differences in the metal waste forms, which depend on the composition materials used in the particular fuel types. For metallic spent fuel, additional e the present equipment would be required to disassemble fuel assemblies and chop the Electrometallurgical processing generally includes processes such as molten salt-me salt electrorefining and electrowinning, salt-metal retorting, and metal slagging a basic process steps consist of chopping the fuel rods, electrorefining the fuel mat processing, and then injection casting the resulting material into metal ingots. T as follows:

- The spent fuel assembly is introduced for processing into a remotely opera called a hot cell. The assembly is taken apart, and the structural compon the fuel rods themselves) are removed and discarded as waste. The rods ar shear and chopped into short pieces. For oxide fuels, the pieces are plac to produce a metal product. This product or chopped metallic fuel segment electrorefiner at 500oC. Electrorefining is an established industrial pro metals like nickel. This type of electrometallurgical processing operates anode, cathode, and electrolyte. At the appropriate cell voltage, uranium metal cathode. The small percentage of plutonium in most DOE spent nuclea collected with a mixture of uranium and fission products in a liquid cadmi majority of fission products are left in the electrolyte.

- The next step involves separating the product from the electrolyte or cadm cathode this means raising the temperature of the cathode product in a fur (1000 to 1200oC) that separates the uranium/plutonium from the cadmium and cadmium for collection and reuse. The uranium/plutonium product will be r electrorefiner for eventual removal with the fission products in the waste separation will be used to remove the salt from the uranium on the solid c

- Raw metal ingots would then be produced by injection casting, a process si routinely in the manufacture of many plastic products. The raw fuel ingot removed from molds and placed in storage for a three-to-five year period u made as to their final disposition.

- The principal process wastes would be from the electrorefiner. The fissio extracted and placed in two stable waste forms: a mineral waste containin products, and a metal waste containing the noble metal fission products an from the fuel elements. These waste forms would be evaluated to determine acceptance criteria for subsequent repository disposal. The waste volume percent of the direct disposal volume, depending on the fuel type.

The naval spent nuclear fuel could also be electrometallurgically processed to reco out the fission products and transuranic elements in the same manner as the other f In this instance, an additional dissolution step at the beginning of the process wo processing. Process development would be required to establish a preferred means f dissolution; preliminary evaluations indicate that material could be readily dissol metal at normal process operating temperatures. Development of this process step w irradiated fuel in the Hot Fuel Examination Facility and Fuel Cycle Facility. A se dissolution step may be required for this demonstration. The waste form production recovery/disposition steps would be the same as with the metal and oxide fuels.
These processes could also apply to other DOE spent nuclear fuel. The facilities w demonstrate electrometallurgical processing for the highest priority fuels.
The above project description was used for the analysis of potential consequences i

of the SNF and INEL EIS where the project would be implemented under Alternatives B (Minimum Treatment, Storage, and Disposal), and D (Maximum Treatment, Storage, and project data sheet at the end of this project summary supports the previous project The proposed project would be located in an existing facility within a major facili Laboratory-West). (See Figure C-1-1 for location and Section C-3.2 for a discussio existing facility.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.1.8-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, electrometallurgical processing demonstration woul option corresponds to Alternative A (No Action) evaluated in this EIS.

**Table C-4.1.8-1. Summary of Potential Environmental Impacts of the Electrometallurg** Demonstration Project under Alternative B.

| Environmental attribute | Potential impacta,b | Poten |
|---|---|---|
| Geology and soil, acres disturbed | None (no acreage disturbed) | Pr |
| Water resources | Effluents: No increase | |
| Wildlife and habitat | None | Pr |
| Historic, archaeological, or cultural resources | None | |
| Air resources | Radiological operations emissions<br>0.036% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>None<br>Prevention of Significant Deterioration (PSD)<br>None | in |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>3.6 y 10-3 mrem/yr<br>1.8 y 10-9 latent cancer fatalities/yr<br>80-km (50-mile) population<br>Year 2000: 0.074 person-rem/yr<br>3.7 y 10-5 latent cancer fatalities/yr<br>Year 2010: 0.081 person-rem/yr<br>4.0 y 10-5 latent cancer fatalities/yr<br>Nonradiological effects: No emissions | Ac<br>an<br>ann |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 5.8 Radiological - 1<br>Operation (onsite truck trips per year):<br>Radiological - 7.8<br>Spent nuclear fuel - 11 | U<br>and<br>pr |
| Waste management | Construction: no increase<br>Operation (m3/yr): high-level waste - 2.7<br>mixed low-level - 0.4<br>low-level waste - 33<br>transuranic - 32<br>industrial - 212 | pr |
| Socioeconomic conditions | Operation: 25 existing workers | |

a. Definition of acronym: NESHAP - National Emission Standard for Hazardous Air P
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

## C-4.2 PROJECTS RELATED TO ENVIRONMENTAL RESTORATION

Figure. Project Data Sheet-Electrometallurgical Process Demonstration Project.

### C-4.2.1 CENTRAL LIQUID WASTE PROCESSING FACILITY

DECONTAMINATION AND DECOMMISSIONING

PROJECT NAME: Central Liquid Waste Processing Facility Decontamination and Decommis
GENERAL PROJECT OBJECTIVE: The general objective of this proposed project would be remove excess, obsolete, contaminated equipment from the Central Liquid Waste Proce that the Analytical Laboratory could use this floor space for other missions.
PROJECT DESCRIPTION: The Central Liquid Waste Processing Area is located in the sou corner of the Analytical Laboratory in the first floor and basement levels of Build National Laboratory-West at the INEL. The area occupies approximately 14 square met (150 square feet) on each floor. The Central Liquid Waste Processing Area was used Analytical Laboratory to treat radioactive liquid waste. Central Liquid Waste Proce operations were discontinued in July 1983 when the Radioactive Liquid Waste Treatme began operating and partially assumed the previous Central Liquid Waste Processing The Central Liquid Waste Processing Area has been declared an excess area per DOE O 5820.2A, "Radioactive Waste Management" (DOE 1988). This proposed project would inc surveillance and maintenance and the decontamination and decommissioning of the Cen Waste Processing Area.
The Central Liquid Waste Processing Area system was used to receive, store, and red liquid waste. The system is considered contaminated by mixed fission products, acti uranium, thorium, and tritium. Interior surfaces of piping, tanks, valves and pumps contaminated with radioactive material. Some sludge residue in vessel bottoms and p can be expected. This sludge would be removed only if the components do not meet th an empty tank per 40 CFR 261.7(b)(1)(iii). Any removed waste would be characterized Stored, treated, and/or disposed of in accordance with that characterization. Some waste may result because asbestos-bearing insulation adhesive was permitted during Waste Processing Area construction, even though asbestos was not specified as an in Other waste would be held at the Argonne National Laboratory-West Mixed Waste Stora The Central Liquid Waste Processing Area would contain approximately 140 cubic mete (5,000 cubic feet) of low-level contaminated materials (a low percentage may be mix disposed. Types of media contaminated are (a) concrete; (b) steel in the form of pi valves, electrical conduct, etc.; (c) electrical wiring; (d) instrumentation panels The tasks for surveillance and maintenance include (a) daily visual inspections, wi necessary preventive or corrective maintenance, documented; (b)monthly radiological document radiation and contamination levels, and (c) yearly status reports for the Waste Processing Area. These tasks would be continued only until the decontaminatio decommissioning field work is begun.
The decontamination and decommissioning tasks would include (a) preparation of Nati Environmental Policy Act documentation, (b)waste sampling and analysis, (c) Title I design, and (d) decontamination and decommissioning field work and Title III engine During Title I, preliminary design concepts would be developed to provide the basis working cost estimate for the Title II design effort and a rough cost estimate for and decommissioning work and Title III. During Title II design a detailed engineeri be developed. This package would include (a) drawings, procedures, waste packaging plans for removing the radioactively contaminated process equipment (possibly mixed detailed working cost estimate for decontamination and decommissioning work and Tit All decontamination and decommissioning work would be done within temporary contami containment enclosures in Building 752. The enclosures would discharge to existing discharge systems for contaminated air/gases. Some particulates may pass through hi particulate air filters during decontamination and decommissioning operations, but would be bounded by normal radioactive air emissions at Argonne National Laboratory air emissions would be generated by trucks hauling the solid waste to the Radioacti Management Complex, estimated to be 40 shipments.
The above project description was used for the analysis of potential consequences i Volume 2 of the SNF and INEL EIS where the project would be implemented under Alter (Ten-Year Plan) and D (Maximum Treatment, Storage, and Disposal). The project data

end of this project summary supports the above project description.
The proposed project involves decontamination and decommissioning of an existing fa major facility area, Argonne National Laboratory-West. (See Figure C-1-1 for locati Section C-3.2 for a discussion of decontamination and decommissioning projects.)
Information regarding the environment affected by this project is covered by other EIS, as summarized and referenced in Section C-3. 1. The potential environmental ef with this project are summarized in Table C~.2.1-1. This table is complemented by i environmental impacts in Section C-3.2 and on mitigation of impacts in Section C-3. applicable issues are discussed in Section C-3.4.
PROJECT-SPECIFIC OPTIONS:
No Action - Under this option, decontamination and decommissioning of the Central L Processing Facility would be deferred. This option corresponds with Alternatives A C (Minimum Treatment, Storage, and Disposal) evaluated in this EIS. This option wou the continuation of potential environmental releases and radiation safety hazards t floor space would not be available to the Analytical Laboratory for other missions.

**Table C-4.2.1-1. Summary of potential environmental impacts of the Central Liquid** Processing Facility Decontamination and Decommissioning Project under Alternative B

| Environmental attribute | Potential impacta,b | Potentia |
|---|---|---|
| Geology and soil, acres disturbed | None (no disturbed acreage) | Project |
| Water resources | Construction water usage | None |
| Wildlife and habitat | None | Project |
| Historic, archaeological or cultural resources | None | Project |
| Air resources | Radiological emissions<br>Negligible<br>Toxic Air Pollutants (TAPs)<br>None<br>Prevention of Significant Deterioration (PSD)<br>None | D&D emis existing HEPA fil |
| Human health | Negligible impact on health effects expected. | All D&D temporar Building discharg discharg air/gase |
| Transportation | D&D (onsite truck trips):<br>Nonradiological - 1.6<br>Radiological - 4 | Use of a containe operator procedur |
| Waste management | D&D waste (m3):<br>mixed low-level (solid) - 0.2<br>low-level waste - 142<br>industrial waste - 60 | Waste mi programs |
| Socioeconomic conditions | D&D: 2 to 4 existing workers | None req |

a. Definition of acronyms: D&D - decontamination and decommissioning; HEPA - high
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

## C-4.2.2 ENGINEERING TEST REACTOR

Figure Project Data Sheet Central Liquid Waste Processing Facility D%Figure Project

DECONTAMINATION AND DECOMMISSIONING

PROJECT NAME: Engineering Test Reactor Decontamination and Decommissioning

GENERAL PROJECT OBJECTIVE: The general objective of the proposed Engineering Test R Decontamination and Decommissioning Project would be to remove the Engineering Test associated support structures from the INEL Surplus Facilities List in accordance w directives. This proposed project would reduce the risk of radioactive exposure and need for, and cost of, further surveillance and maintenance at this facility.

PROJECT DESCRIPTION: The Engineering Test Reactor was a 175-megawatt (thermal) pres light water test reactor that operated between 1957 and 1982. This surplus facility reactor building and about 10 support structures that are candidates for decontamin decommissioning. The main concentration of radioactive contamination is in the reac the experiment cubicles that contained the loop equipment for the various experimen The Engineering Test Reactor facility includes the following major buildings/struct

1. Reactor Building - This building contains the reactor vessel and shielding control room, a large water canal, and several areas and cubicles associat experimental in-pile loops. The reactor building is 42 meters (136 feet) i direction by 34 meters (112 feet) in the north-south direction. It extends (58 feet) above grade level and 12 meters (38 feet) below grade level to t floor. Significant contamination levels exist and the reactor core compone radioactive.
2. Compressor Building - The compressor building houses the equipment that wa supply large quantities of heated, hydrocarbon-free air to various experim building is the process control room that was used to control all plant se reactor and a sample laboratory that was used to conduct chemistry samples primary and secondary coolant systems.
3. Heat Exchanger Building - The building includes (a) main room and lower le (b)demineralizer wing, (c) degassing tank room, (d) cubicle exhaust booste room, and (e) secondary pipe pit. The primary function of the heat exchang main room was to house the 12 primary coolant/secondary coolant system hea and associated piping.
4. Secondary Coolant Pump House - The building houses four secondary coolant pumps, four utility cooling water pumps, and a cooling tower fire Water co distribution system. The building also houses switchgear for the cooling t UCW pumps, a sump pump, and electrical heaters. It also contains the water room which houses the chlorinator, chemical proportioning pumps, chemical and chemical storage tanks.
5. Electrical Building - The electrical building consists of the 13.8-kV, 416 switchgear, No. 1 emergency diesel generator, five motor-generator units, storage battery bank. The building is a two-level structure consisting of and a basement level referred to as the cable vault.
6. Engineering Test Reactor Office Building - This building housed the Reacto Room, Amplifier Room, and all the office space. This building continues to for office space including the control room area.
7. Critical Facility - This facility consisted of a low-power reactor that wa mock-up of the Engineering Test Reactor. The critical facility was housed addition on the southeast corner of MTR-635. The critical facility was use fuel and experiment arrangements before their use in the Engineering Test facilitate calculation of neutron flux, flux patterns, excess reactivity, operating parameters.
8. Exhaust Gas - A 76-meter (249-feet) high concrete exhaust stack, a monitor and associated piping are contaminated.
9. Liquid Waste Storage - Several catch tanks inside the reactor building are contaminated.

Performance of this decontamination and decommissioning project would require a tho and radiological characterization, a decision analysis to determine the preferred d decommissioning mode, appropriate project planning documents, a safety analysis and National Environmental Policy Act documentation, and the execution of the field dec decommissioning activities.

The mode, scope, and detail of the proposed decontamination and decommissioning cle

needed for this project have not been determined and would depend to some extent up characterization results. Cleanup activities would probably range from the simple d and reuse of a building to total structure demolition and disposal.

All actions related to this project would take place within the Test Reactor Area f involve about 0.8 hectares (2 acres). Soil disturbance would be caused by the remov contaminated materials, including underground foundations, vaults, and piping. All would occur in previously disturbed areas (the same areas initially disturbed in th construction in the 1950s), and would be followed by backfill, surface recontouring required.

The above project description was used for the analysis of potential consequences i Volume 2 of the SNF and INEL EIS where the project would be implemented under Alter (Ten-Year Plan) and D (Maximum Treatment, Storage, and Disposal). The project data end of this project summary supports the above project description.

The proposed project involves decontamination and decommissioning of an existing fa major facility area, the Test Reactors Area. (See Figure C-1-1 for location and Sec discussion of decontamination and decommissioning projects.)

Information regarding the environment affected by this project is covered by other EIS, as summarized and referenced in Section C-3.1. The potential environmental eff

**Table C-4.2.2-1. Summary of potential environmental impacts of the Engineering Tes** Decontamination and Decommissioning Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | Disturb 5 acres of previously disturbed soil | Previo would |
| Water resources | Effluents: None expected | Storm Plan i |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Previo soil e |
| Historic, archaeological, or cultural resources | Survey completed, no sites identified | None r |
| Air resources | Radiological operational emissions<br>No information<br>Toxic Air Pollutants (TAPs)<br>None<br>Prevention of Significant Deterioration (PSD)<br>None | Measur emissi filtra |
| Human health | Radiation exposures and cancer risk<br>No information<br>Nonradiological effects<br>No information | Access safety survei requir |
| Transportation | D&D (onsite truck trips):<br>Nonradiological - 344<br>(0.1 asbestos)<br>Radiological - 168.5 | Use of and co equipm shipme |
| Waste management | D&D waste (m3):<br>low-level waste - 6,178<br>mixed low-level - 17<br>asbestos - 2<br>industrial - 12,658 | Waste progra |
| Socioeconomic conditions | D&D: 30 to 40 existing workers and subcontractor personnel | None r |

a. Definition of acronyms: D&D - decontamination and decommissioning; NESHAP - Na Standards for Hazardous Air Pollutants.

b. Potential impacts are described further in Section C-3.2.

c. Mitigative measures are described further in Section C-3.3.

with this project are summarized in Table C-4.2.2-1. This table is complemented by environmental impacts in Section C-3 .2 and on mitigation of impacts in Section C-3 applicable issues are discussed in Section C-3.4.

PROJECT-SPECIFIC OPTIONS:
No Action - Under this option, decontamination and decommissioning of the Engineeri Reactor would be deferred. This option corresponds with Alternatives A (No Action) (Minimum Treatment Storage, and Disposal) evaluated in this EIS. This option would continuation of surveillance and maintenance of the building and essential support ventilation, filtration, and radiation monitoring within the facility. This option continuation of potential environmental releases and radiation safety hazards to pe

## C-4.2.3 MATERIALS TEST REACTOR

**Figure Project Data Sheet Engineering Test Reactor D%Figure Project Data Sheet Engi**

DECONTAMINATION AND DECOMMISSIONING
PROJECT NAME: Materials Test Reactor Decontamination and Decommissioning
GENERAL PROJECT OBJECTIVE: The general objective of the proposed Materials Test Rea Decontamination and Decommissioning Project would be to remove the Materials Test R associated support structures from the INEL Surplus Facilities List in accordance w directives. This proposed project would reduce the risk of radioactive exposure and need for, and cost of, further surveillance and maintenance at this facility.
PROJECT DESCRIPTION: The Materials Test Reactor was a 40-megawatt (thermal) pressur light water test reactor that operated between 1952 and 1970. This surplus facility reactor building and about 14 support structures that are candidates for decontamin decommissioning. The main concentration of radioactive contamination is in the reac contains large amounts of beryllium and graphite that were used as reflector materi operations.
The Materials Test Reactor facility includes the following major buildings and stru

1. Reactor Building - This building contains the reactor vessel and shieldin control room, a large water canal, and several areas and cubicles associa experimental in-pile loops and neutron beam holes. The Materials Test Rea Canal (previously entitled the Test Train Assembly Facility) would be a s decontamination and decommissioning project. The structure is primarily c 40 meters square (130 feet square), 24 meters (80 feet) high, and has a 5 deep basement. Significant contamination levels exist and the reactor cor are highly radioactive.
2. Reactor Building Wing - This adjacent building was used for laboratory an and remains in use at this time. The basement area has significant proble the radiologically contaminated liquid waste storage tanks and associated
3. Process Water Building - A concrete structure containing the reactor prima process equipment. This is a two-story building with a basement associated primary coolant pipe tunnel to the reactor building.
4. Plug Storage Facilities - These facilities were used to store highly radio horizontal steel tubes shielded by concrete and earth fill.
5. Compressor Building - A single level, concrete block structure that origin equipment associated with the reactor air systems.
6. Services Building - A concrete block building located against the reactor being used for material storage and staging activities.
7. Liquid Waste Storage - There are several significant underground structure catch tanks, concrete vaults and pump pits, pump houses, retention basins, piping that exist outside facility buildings and are highly contaminated.
8. Exhaust Gas - A 76-meter-high concrete exhaust stack, a monitoring buildin associated piping are contaminated.
9. Gamma Facilities Building - A single-story, concrete block structure conta canal that was used to perform gamma irradiation experiments.

Performance of this proposed decontamination and decommissioning project would requ chemical and radiological characterization, a decision analysis to determine the pr decontamination and decommissioning mode, appropriate project planning documents, a analysis and the necessary National Environmental Policy Act documentation, and the field decontamination and decommissioning activities.
The mode, scope, and detail of the proposed decontamination and decommissioning cle needed for this project have not been determined and would depend to some extent up characterization results. It is expected that cleanup activities would range from s

decontamination and reuse of the building to total structure demolition and disposa All actions related to this project would take place within the Test Reactor Area f involve about 0.8 hectares (2 acres). Soil disturbance would be caused by the remov contaminated materials, including underground foundations, vaults, and piping. All would occur in previously disturbed areas (the same areas initially disturbed in th construction in the 1950s), and would be followed by backfill, surface recontouring required.

The above project description was used for the analysis of potential consequences i Volume 2 of the SNF and INEL EIS where the project would be implemented under Alter (Ten-Year Plan) and D (Maximum Treatment, Storage, and Disposal). The project data end of this project summary supports the above project description.

The proposed project involves decontamination and decommissioning of an existing fa major facility area, the Test Reactors Area. (See Figure C-1-1 for location and Sec discussion of decontamination and decommissioning projects.)

Information regarding the environment affected by this project is covered by other EIS, as summarized and referenced in Section C-3.1. The potential environmental eff with this project are summarized in Table C~.2.3-1. This table is complemented by i environmental impacts in Section C-3.2 and on mitigation of impacts in Section C-3. applicable issues are discussed in Section C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, decontamination and decommissioning of the Material would be deferred. This option corresponds to Alternatives A (No Action) and C (Min Treatment, Storage, and Disposal) evaluated in this EIS. This option would involve of surveillance and maintenance of the building and essential support systems such filtration, and radiation monitoring within the facility. This option would result potential environmental releases and radiation safety hazards to personnel.

**Table C-4.2.3-1. Summary of potential environmental impacts of the Materials Test** Decontamination and Decommissioning Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acrea disturbed | Disturb 2.8 acres of previously disturbed soil | Previou would b area |
| Water resources | Effluents: 454,200 liters to existing Test Reactor Area liquid low-level waste management system | Enginee Storm W Plan in |
| Wildlife and habitat | Minimal short-term impact on biodiversity, and animal displacement and mortality within major facility area | Previou soil er |
| Historic, archaeological, or cultural resources | Survey completed, no sites identified | None re |
| Air resources | Radiological operational emissions<br>No information<br>Toxic Air Pollutants (TAPs)<br>None<br>Prevention of Significant Deterioration (PSD)<br>None | Measure emissio enclosu |
| Human health | Radiation exposures and cancer risk<br>No information<br>Nonradiological effects<br>No information | Access safety surveil require |
| Transportation | D&D (onsite truck trips):<br>Nonradiological - 424<br>(asbestos - 0.1)<br>Radiological - 210.3 | Use of vehicle equipme shipmen |
| Waste management | D&D waste (m3):<br>low-level solid waste - 7,740<br>mixed low-level waste - 10<br>asbestos - 2<br>industrial waste - 15,598 | Waste m program |
| Socioeconomic | D&D: 30 to 40 existing workers and | None re |

conditions subcontractor personnel

a. Definition of acronyms: D&D - decontamination and decommissioning.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

## C-4.2.4 FUEL PROCESSING COMPLEX (CPP-601)

**Figure Project Data Sheet Materials Test Reactor D%Figure Project Data Sheet Materi**

DECONTAMINATION AND DECOMMISSIONING
PROJECT NAME: Fuel Processing Complex (CPP-601) Decontamination and Decommissionin
GENERAL PROJECT OBJECTIVE: The general objectives of this proposed project would b identified facility would be in a safe configuration, to determine and execute appr activities, and to decommission CPP-601 when it becomes surplus to the DOE's future This proposed project would reduce the risk of radioactive exposure and eliminate t surveillance and maintenance.
PROJECT DESCRIPTION: This proposed project would address the characterization, dec decommissioning of the Fuel Processing Complex (CPP-601) at the Idaho Chemical Proc The CPP-601 facility contains chemical processing equipment that was used to recove types of nuclear fuel. The facility is essentially rectangular (244 feet by 102 fe (up to 95 feet high, mostly below ground). The top level is above grade and contai that was used to transfer fuel elements to the process equipment and for chemical s transfer. The top level is constructed of Transite panels (containing asbestos) an levels (largely below ground) are constructed of reinforced concrete with walls up The lower levels contain 29 process cells (most of which are about 20 feet square a numerous corridors, and auxiliary cells that house equipment and controls. The lar 60 feet by 20 feet by 40 feet high. The floor and part of the walls of each cell a and most of the equipment is stainless steel. Most of the processing equipment in the heavily shielded cells and was designed to be operated remotely and maintained equipment controls were installed in an operating corridor that runs the length of A service (piping) corridor is located below the operating corridor and a cell acce the service corridor. Sampling and cell ventilation corridors are located outside Nuclear fuel reprocessing at CPP-601 was terminated in 1992 making the facility obs intended mission. Phaseout of facility operation is being conducted. This phaseou uranium from the facility and leave the facility in a stable, low-cost surveillance be held in this surveillance and maintenance status until a decision is made to con dismantle it. The proposed project described in this section assumes no new use fo identified and dismantlement of the facility would be conducted.
Upon satisfactory completion of the proposed deactivation effort, CPP-601 would be contamination present in the facility would be contained and public and worker safe During this surveillance and maintenance period, a detailed characterization of the conducted. This characterization effort would gather radiological, chemical, and p would be used to identify and select the most cost-effective decontamination and de implementation strategy. A detailed decontamination and decommissioning plan and d decommissioning work packages would be prepared based upon the results of this char analysis. The dismantlement work packages would be implemented during the decontam decommissioning operations phase of the project.
For the purposes of this EIS, it is assumed the CPP-601 decontamination and decommi

- Remove all contaminated equipment except the tanks identified with a WG or are required for Idaho Chemical Processing Plant operation
- Decontaminate the remaining facility surfaces
- Remove the above-grade portion of the facility
- Entomb the concrete substructure in place.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of

supports the above project description.
The proposed project involves decontamination and decommissioning of an existing fa facility area, the Idaho Chemical Processing Plant. (See Figure C-1-1 for location discussion of decontamination and decommissioning projects.)
Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.2.4-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.
PROJECT-SPECIFIC OPTIONS:
No Action - Under this option, decontamination and decommissioning of the Fuel Pr would be deferred. This option corresponds to Alternatives A (No Action) and C (Mi Storage, and Disposal) evaluated in this EIS. This option would involve the contin maintenance of the building and essential support systems such as ventilation, filt monitoring within the facility. This option would result in the continuation of po releases and radiation safety hazards to personnel.
Remediation - Under this option, the Fuel Processing Complex would be decontamina decommissioned, followed by the demolition of the building underground structures. with Alternative D (Maximum Treatment, Storage, and Disposal) evaluated in this EIS contaminated underground structure and associated embedded piping and electrical co removed and transported to the appropriate waste handling facility on the INEL.

**Table C-4.2.4-1. Summary of potential environmental impacts of the Fuel Processing** (CPP-601) Decontamination and Decommissioning Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | Disturb 0.6 acres of previously disturbed soil | Previou would b |
| Water resources | Effluents: 423,000 liters to the ICPP Process Equipment Waste system | Enginee Storm W Plan in |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Previou soil er |
| Historic, archaeological, or cultural resources | Survey completed, no sites identified | None re |
| Air resources | Radiological/nonradiological emissions<br>No increase above ICPP operational envelope | None re |
| Human health | None | Monitor |
| Transportation | D&D (onsite truck trips):<br>Nonradiological - 49.1<br>Radiological - 190 | Use of and con equipme shipmen |
| Waste management | D&D waste (m3):<br>low-level solid waste - 6,900<br>mixed low-level waste - 18<br>hazardous waste - 1<br>transuranic waste - 10<br>industrial waste - 1,800 | Waste m program |
| Socioeconomic conditions | D&D: 50 to 75 existing workers and subcontractor personnel | None re |

a. Definition of acronyms: D&D - decontamination and decommissioning; ICPP - Idah Plant; ECA - environmentally controlled area.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

## C-4.2.5 FUEL RECEIPT AND STORAGE FACILITY (CPP-603)

**Figure. Project Data Sheet-Fuel Processing Complex.**

DECONTAMINATION AND DECOMMISSIONING
PROJECT NAME: Fuel Receipt and Storage Facility (CPP-603) Decontamination and Deco
GENERAL PROJECT OBJECTIVE: The general objectives of the proposed CPP-603 Decontam Decommissioning Project would be to reduce the risk of radiological exposure and to extensive long-term surveillance and maintenance.
PROJECT DESCRIPTION: The proposed project would address the characterization and d and decommissioning of the three water-filled storage basins and a nuclear Fuel Ele located in the CPP-603 Fuel Receipt and Storage Facility at the Idaho Chemical Proc The CPP-603 underwater storage basins were operational 1953 through 1957 and were c reinforced concrete with no liners or leak-detection systems. The basin storage po approximately 50,000 square feet, provides underwater storage for spent nuclear fue approximately 1,500,000 gallons of filtered water. The three interconnected basins to treat and maintain the basin water quality, including filtration, ion exchange, osmosis demineralization, and ultraviolet light sterilization. The integrity of th and its fuel handling monorail system has become suspect because the facility was c criteria of the late 1940s to early 1950s. The affected facility interior surfaces cell areas (Fuel Element Cutting Facility), and the building exterior require radio material decontamination.
Activities are being conducted that will transfer the spent fuel stored under water storage facilities at the Idaho Chemical Processing Plant. Upon satisfactory compl transfer effort, CPP-603 would be monitored to ensure contamination present in the public and worker safety is maintained. The storage basin sludges would be removed of the final operations activities and not as a part of this project. During the s period, a detailed characterization of the facility would be conducted. This chara gather radiological, chemical, and physical information that would be used to ident cost-effective decontamination and decommissioning implementation strategy. A deta and decommissioning plan and work packages would be prepared based upon the results characterization and analysis. The dismantlement work packages would be implemente decontamination and decommissioning operations phase of the project.
For this EIS, the proposed CPP-603 decontamination and decommissioning project woul accomplish the following tasks:

- Remove all contaminated equipment from the underwater storage portion of C ancillary support systems
- Decontaminate the remaining affected facility surfaces
- Fill in (gravel) and seal entry to the affected basins
- Entomb the affected basins in place
- Initiate an appropriate level of surveillance and maintenance.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.
The proposed project involves decontamination and decommissioning of an existing fa facility area, the Idaho Chemical Processing Plant. (See Figure C-1-1 for location discussion of decontamination and decommissioning projects.)
Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.2.5-1. This table is complemented by information on

**Table C-4.2.5-1. Summary of potential environmental impacts of the Fuel Receipt an** Facility (CPP-603) Decontamination and Decommissioning Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | Disturb 0.5 acres of previously disturbed soil | Previou would b |
| Water resources | Effluents: 7,570,000 liters low-level waste water; 370,000 liters sodium-bearing low-level waste to | Enginee Storm W |

| | | |
|---|---|---|
| | the ICPP Process Equipment Waste system | |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Plan in Previou soil er |
| Historic, archaeological, or cultural resources | Survey conducted, no sites identified | None re |
| Air resources | Radiological/nonradiological emissions No increase above ICPP operational envelope | None re |
| Human health | None | Monitor |
| Transportation | D&D (onsite truck trips): Nonradiological - 7.9 Radiological - 49.1 | Use of and con equipme shipmen |
| Waste management | D&D waste (m3): low-level solid waste - 1,800 mixed low-level waste - 1 hazardous waste - 1 industrial waste - 288 | Waste m program |
| Socioeconomic conditions | D&D: 30 existing and subcontractor personnel | None re |

a. Definition of acronyms: D&D - decontamination and decommissioning; ECA - envir ICPP - Idaho Chemical Processing Plant.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

environmental impacts in Section C-3.2 and on mitigation of impacts in Section C-3. issues are discussed in Section C-3.4.
PROJECT-SPECIFIC OPTIONS:
No Action - Under this option, decontamination and decommissioning of the Fuel Re Facility would be deferred. This option corresponds to Alternatives A (No Action) Treatment, Storage, and Disposal) evaluated in this EIS. This option would involve surveillance and maintenance of the building and essential support systems such as radiation monitoring within the facility. This option would result in the continua environmental releases and radiation safety hazards to personnel.
Remediation - Under this option, the Fuel Receipt and Storage Facility would be d decommissioned, followed by the demolition of the building underground structures. to Alternative D (Maximum Treatment, Storage, and Disposal) evaluated in this EIS. underground structure and associated embedded piping and electrical conduits would transported to the appropriate waste handling facility on the INEL.

## C-4.2.6 HEADEND PROCESSING PLANT (CPP-640)

**Figure. Project Data Sheet-Fuel Reciept and Storage Facility.**

DECONTAMINATION AND DECOMMISSIONING
PROJECT NAME: Headend Processing Plant (CPP-640) Decontamination and Decommissioni
GENERAL PROJECT OBJECTIVE: The general objectives of this proposed project would b identified facility is in a safe configuration, determine and execute appropriate d decommission the fuel processing systems within CPP-640 when it becomes surplus to programmatic needs. This proposed project would reduce the risk of radioactive exp surveillance and maintenance.
PROJECT DESCRIPTION: This proposed project would address an assessment and deconta decommissioning of two unique nuclear fuel processing systems housed in the CPP-640 Chemical Processing Plant. The proposed CPP-640 decontamination and decommissionin reduce the risk of radiological exposure, and eliminate the need for extensive long and maintenance.
The Headend Processing Plant contains approximately 1,395 square meters (15,000 squ space and houses two unique spent fuel headend processing systems and a liquid wast The ROVER and ELECTROLYTIC headends operated in heavily shielded concrete and steel

with remote manipulation capabilities and some remote maintenance capabilities. Th system includes three tanks in heavily shielded concrete vaults situated below the The processing systems (ROVER and ELECTROLYTIC) have been shut down since 1984 and respectively. Although much of the process chemical and radionuclide inventory has headend systems, both systems remain highly contaminated and the ROVER system conta quantities of fissile material. The liquid waste system is included in the Resourc Act Part A permit and is planned for Resource Conservation and Recovery Act closure phaseout effort will remove the fissile material entrapped in the ROVER system and stable, low-cost surveillance and maintenance status until a decision is made to co dismantle it. The proposed project assumes that no new use for the CPP-640 will be facility equipment would be dismantled.

Upon satisfactory completion of the fissile material removal effort, the CPP-640 wo ensure contamination present in the facility is contained and public and worker saf the surveillance and maintenance period, a detailed characterization of the facilit characterization effort would gather radiological, chemical, and physical informati identify and select the most cost-effective decontamination and decommissioning imp detailed decontamination and decommissioning plan and decontamination and decommiss packages would be prepared based on results of this characterization and analysis. packages would be implemented during the proposed decontamination and decommissioni phase of the project.

For this EIS, the proposed CPP-640 decontamination and decommissioning project woul accomplish the following tasks:

- Remove all contaminated equipment remaining after completion of the fissil activity
- Close the waste collection system under the terms of the Resource Conserva Act
- Decontaminate the remaining affected facility surfaces
- Decommission the empty hot cell units.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.

The proposed project involves decontamination and decommissioning of an existing fa facility area, the Idaho Chemical Processing Plant. (See Figure C-1-1 for location discussion of decontamination and decommissioning projects.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.2.6-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, decontamination and decommissioning of the Headend would be deferred. This option corresponds to Alternatives A (No Action) and C (Mi Storage, and Disposal) evaluated in this EIS. This option would involve the contin maintenance of the building and essential support systems such as ventilation, filt monitoring within the facility. This option would result in the continuation of po releases and radiation safety hazards to personnel.

Remediation - Under this option, the Headend Processing Plant would be decontamin decommissioned, followed by the demolition of the building's underground structures corresponds to Alternative D (Maximum Treatment, Storage, and Disposal) evaluated i contaminated underground structures and associated embedded piping and electrical c removed and transported to the appropriate waste handling facility on the INEL

**Table C-4.2.6-1. Summary of potential environmental impacts of the Headend Process** (CPP-640) Decontamination and Decommissioning Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | None (no disturbed soil) | Project facilit |
| Water resources | | Enginee |

| | | |
|---|---|---|
| | Effluents: Low-level decon solution: 1,900 - 7,600 liters to ICPP Process Equipment Waste system | Storm W Plan in |
| Wildlife and habitat | None | Project facilit |
| Historic, archaeological, or cultural resources | None | Project facilit |
| Air resources | Radiological/nonradiological emissions No increase above ICPP operational envelope | None re |
| Human health | None | None re |
| Transportation | D&D (onsite truck trips): Radiological - 2.2 | Use of and con operato procedu |
| Waste management | D&D waste (m3): low-level solid waste - 80 | Waste m program |
| Socioeconomic conditions | D&D: 50 existing and subcontractor personnel, 2 to 3 new workers | None re |

a. Definition of acronyms: D&D - decontamination and decommissioning; ICPP - Idah Plant.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

## C-4.2.7 WASTE CALCINE FACILITY (CPP-633)

**Figure. Project Data Sheet-Headened Processing Plant**

DECONTAMINATION AND DECOMMISSIONING
PROJECT NAME: Waste Calcine Facility (CPP-633) Decontamination and Decommissioning
GENERAL PROJECT OBJECTIVE: The general objectives of this proposed project would b Waste Calcine Facility is in a safe configuration, determine and execute appropriat activities, and decommission the facility, which is surplus to the DOE's future pro
PROJECT DESCRIPTION: This proposed project would address the assessment and decont decommissioning of the Waste Calcine Facility located in CPP-633 at the Idaho Chemi The Waste Calcine Facility decontamination and decommissioning project would reduce radiological exposure and eliminate the need for extensive long-term surveillance a project would determine and execute the appropriate decontamination and decommissio Waste Calcine Facility.

The Waste Calcine Facility was the world's first plant scale facility built to achi of high-level radioactive liquid wastes resulting from processing spent nuclear fue From 1963 through 1981 the Waste Calcine Facility converted high-level radioactive granular solids that were less corrosive, less mobile, and occupied less storage vo Facility was designed for direct contact (hands-on) maintenance conducted during it with remote capabilities for primary offgas filter change-out and process control.

The Waste Calcine Facility is a reinforced concrete structure encompassing approxim meters (20,000 square feet) of floor space. The facility includes a ground level a which include operating and access corridors. Within the Waste Calcine Facility ar radiation and extensive radiological contamination. These areas would require exte remote decontamination efforts. The Waste Calcine Facility process system also inc Conservation and Recovery Act units (tanks) that are permitted under interim status Processing Plant Part A Resource Conservation and Recovery Act Permit.

Efforts to decontaminate the Waste Calcine Facility equipment and remove the residu are under way. Upon completion of these ongoing phaseout activities, an assessment identify remaining hazards and ensure those hazards do not endanger the public or w surveillance and maintenance period, a detailed characterization of the facility wo characterization effort would gather radiological, chemical, and physical informati

identify and select the most cost-effective decontamination and decommissioning imp decontamination and decommissioning plan and decontamination and decommissioning wo be prepared based upon the results of this characterization and analysis. The dism would be implemented during the proposed decontamination and decommissioning operat project.

For this EIS, the proposed decontamination and decommissioning project would be ass the following tasks:

- Remove all contaminated equipment remaining after completion of the phaseo
- Close the five permitted units (tanks) under the Resource Conservation and
- Decontaminate the remaining facility surfaces
- Decommission the Waste Calcine Facility and demolish to ground level and f subsurface levels.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.

The proposed project involves decontamination and decommissioning of an existing fa facility area, the Idaho Chemical Processing Plant. (See Figure C-1-1 for location discussion of decontamination and decommissioning projects.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.2.7-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, decontamination and decommissioning of the Waste C be deferred. This option corresponds to Alternatives A (No Action) and C (Minimum and Disposal) evaluated in this EIS. This option would involve the continuation of maintenance of the building and essential support systems such as ventilation, filt monitoring within the facility. This option would result in the continuation of po releases and radiation safety hazards to personnel.

Remediation - Under this option, the Waste Calcine Facility would be decontaminat followed by the demolition of the building's underground structures. This option c D (Maximum Treatment, Storage, and Disposal) evaluated in this EIS. All of the con structures and associated embedded piping and electrical conduits would be removed appropriate waste handling facility on the INEL.

**Table C-4.2.7-1. Summary of potential environmental impacts of the Waste Calcine F** (CPP-633) Decontamination and Decommissioning Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | acDisturb 0.5 acres of previously disturbed soil | Previou would b |
| Water resources | Effluents: Low-level decontamination solution 715,000 liters to ICPP Process Equipment Waste system | Enginee Storm W Plan in |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Previ soil er |
| Historic, archaeological, or cultural resources | Survey completed, no sites identified | None re |
| Air resources | Radiological/nonradiological emissions No increase above ICPP operational envelope | None re |
| Human health | None | Monitor |
| Transportation | D&D (onsite truck trips): Radiological - 37 | Use of and con equipme shipmen |
| Waste management | D&D waste (m3): | Waste m |

| | | |
|---|---|---|
| | low-level solid waste - 1,350<br>mixed low-level waste - 10 | program |
| Socioeconomic conditions | D&D: 20 existing and subcontractor personnel | None re |

a. Definition of acronyms: D&D - decontamination and decommissioning; ECA - envir areas;
ICPP - Idaho Chemical Processing Plant.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

**Table C-4.2.7-1. Summary of potential environmental impacts of the Waste Calcine F** (CPP-633) Decontamination and Decommissioning Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | acDisturb 0.5 acres of previously disturbed soil | Previou would b |
| Water resources | Effluents: Low-level decontamination solution 715,000 liters to ICPP Process Equipment Waste system | Enginee Storm W Plan in |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Previ soil er |
| Historic, archaeological, or cultural resources | Survey completed, no sites identified | None re |
| Air resources | Radiological/nonradiological emissions<br>No increase above ICPP operational envelope | None re |
| Human health | None | Monitor |
| Transportation | D&D (onsite truck trips):<br>Radiological - 37 | Use of and con equipme shipmen |
| Waste management | D&D waste (m3):<br>low-level solid waste - 1,350<br>mixed low-level waste - 10 | Waste m program |
| Socioeconomic conditions | D&D: 20 existing and subcontractor personnel | None re |

a. Definition of acronyms: D&D - decontamination and decommissioning; ECA - envir areas;
ICPP - Idaho Chemical Processing Plant.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

## C-4.3 Projects Related to High-Level Waste

**Figure Project Data Sheet Waste Calcine Facility**

## C-4.3.1 TANK FARM HEEL REMOVAL PROJECT

PROJECT NAME: Tank Farm Heel Removal Project
GENERAL PROJECT OBJECTIVE: Liquid waste at the Idaho Chemical Processing Plant has in eleven tanks of a tank farm. Pursuant to a Federal Facilities Compliance agreem Environmental Protection Agency, the Department of Energy, and the State of Idaho, WM-182 through -186) must cease by March 2009, and of the remaining six tanks by Ju Resource Conservation and Recovery Act closure of these tanks and their ancillary s following the cease-use provision. The general objectives of this proposed project

procure, and install equipment, and to perform necessary tank systems modifications
liquid and solids heel from the storage tanks and (b) to support the subsequent clo
PROJECT DESCRIPTION: This project would provide for the design, construction, and
equipment to perform tank internal rinsing and removal of the 5,000-to-20,000-gallo
remaining when tanks have been emptied using the currently installed transfer jets)
300,000-gallon storage tanks in the Idaho Chemical Processing Plant Tank Farm. The
provide for the design and modifications to existing ancillary piping systems to al
in support of the Resource Conservation and Recovery Act Closure actions that would
cease-use of the eleven tanks.

The special heel removal equipment to be provided would be mixing pumps to mobilize
and keep them in suspension for transfer out of the tanks, and transfer pumps to re
transfer the mobilized heel solution from the tank being cleaned to another tank or
Calcining Facility. This technology is currently being developed and used at other
Rinsing of the tank's interior walls and dome would be accomplished using a special
spray of water or other solution onto the dome and walls. Robotic arms currently b
DOE complex would probably be used.

A supplemental vessel offgas system would be provided to maintain a slight vacuum i
on. This system, including demisters, high efficiency particulate air filters, blo
components, would discharge into the existing offgas cleanup systems and then up th
Processing Plant main stack. Because of the tank farm surface load limits (to avoi
vaults), special structural provisions would be provided to support the required he
Temporary weather enclosures over the work areas would be provided if required to a
Order completion schedules.

Conversion of one of the remaining operating tanks to a heel receiver tank, by modi
pumps, would be accomplished. A heel receiver tank would be required to allow the
to be performed independently of New Waste Calcining Facility operation. Final dry
would be accomplished by forced evaporation. Special equipment to blow dry air int
it through a vessel offgas system would be provided.

Transfer valving and piping modifications to allow some tanks to remain in service
being removed from service would be provided. Provisions to sequentially flush anc
physically isolate flushed piping and tanks from the remaining tanks would be provi
sequential action plan, with required supporting equipment and modifications, would
Handling and storage equipment for the special equipment, including the mixing and
special utility arm, would be provided.

The above project description was used for the analysis of potential consequences i
of the SNF and INEL EIS where the project would be implemented under Alternatives B
(Minimum Treatment, Storage, and Disposal), and D (Maximum Treatment, Storage, and
project data sheet at the end of this project summary supports the above project de
The proposed project would be located within a major facility area (the Idaho Chemi
(See Figure C-1-1 for location and Section C-3.2 for a discussion of projects withi
Information regarding the environment affected by this project is covered by other
summarized and referenced in Section C-3.1. The potential environmental effects as
are summarized in Table C-4.3.1-1. This table is complemented by information on en
Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu
Section C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, the tank heels would not be removed. This option
A (No Action) evaluated in this EIS because the Finding-of-No-Significant-Impact po
project would not be included in Alternative A (No Action). The tanks cannot be em
heel remains. The heel contains high levels of radioactivity and is both toxic and
removal equipment is installed and operated, the storage tanks cannot be emptied.
comply with the Consent Order entered into by DOE, U.S. Environmental Protection Ag
Idaho that requires DOE to cease use of the first five storage tanks (VES-WM-182 th
not be able to complete closure of these Resource Conservation and Recovery Act sto

In Situ Stabilization - This option is not evaluated in this EIS. Under this opt
stabilized in place by adding some form of solidification material (for example, ce
mixing it with the heel. This option is not further developed since no materials w
completely compatible with the tank heels, and the mechanisms required to ensure mi
complicated than simple removal. Also, one cannot ensure that the grout would prev
hazardous elements (that is, heavy metals) into the environment.

Delayed Heel Removal - The tanks would be removed from service per the Notice of
use requirement. The heels would then be part of closure and would be removed as t
equipment became available. This removal of the heels would then not be driven by
This option was not evaluated in this EIS because the Consent Order would need to b

**Table C-4.3.1-1. Summary of potential environmental impacts of the Tank Farm Heel Project under Alternative B.**

| Environmental attribute | Potential impacta,b | Potentia |
|---|---|---|
| Geology and soil, acres disturbed | Disturb less than 10 acres of previously disturbed soil | Previous would be |
| Water resources | Construction: 500,000 liters decon solution (mixed low level)<br>Operation: 2,000,000 liters decon solution (mixed low level) | Storm Wa in place |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement, and mortality within major facility area | Previous erosion; |
| Historic, archaeological or cultural resources | Survey completed; no sites identified | None req |
| Air resources | Operational emissions<br>Radiological and nonradiological emissions within operational envelope of ICPP<br><br>Construction emissions (tons/yr)<br>Total suspended particulates<br>PM10 150<br>CO 3.2<br>NO2 6.1<br>SO2 0.47 | Facility inspecti reportin |
| Human health | Potential impacts within operational envelope of the existing tank farm. | Access c analysis annual r during c |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 0.1<br>Radiological - 0.1<br>Operations (onsite truck trips per year):<br>Nonradiological - 0.1<br>Radiological - 0.3 | Use of a containe operator procedur |
| Waste Management | Construction (m3):<br>low-level waste (solid) - 2.0<br>industrial waste (solid) - 2.0<br>Operation (m3/yr):<br>mixed low-level waste (solid) - 2.0<br>low-level waste (solid) - 8.0<br>industrial waste (solid) - 5.0 | Waste mi programs |
| Socioeconomic conditions | Construction: 2 existing, 25 subcontractor personnel<br>Operation: 2 existing workers | None req |

a. Definition of acronyms: ECA - environmentally controlled area; ICPP - Idaho Che
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

SUMMARY OF IMPACTS: The removal of the final approximately 5,000 to 20,000 gallons liquid waste (that is, the heel) from the five tanks proposed for replacement (VES-WM-186) would be carried out as a normal Tank Farm operation. The heel removal equ installed by the High-Level Waste Tank Farm Project would tie into existing transfe subsequent high-level liquid waste produced during tank cleaning, would be transfer Farm storage tanks, the Process Equipment Waste Evaporator, or directly to the New Facility, using existing operating procedures that include sampling of the waste to appropriate. Drying of the tanks (passively or actively) would be performed after effluent air from drying would exit through the normal exhaust system. The removal and drying of tanks VES-WM-182 through VES-WM-186 would, therefore, be encompassed

operation of the existing Tank Farm and would introduce no new environmental impact

## C-4.3.2 WASTE IMMOBILIZATION FACILITY

**Figure. Project Data Sheet-Tank Farm Heel Removal Project.**
(Technology Selection for Treatment of Sodium-Bearing and Calcined Wastes)
PROJECT NAME: Waste Immobilization Facility
GENERAL PROJECT OBJECTIVE: The general objective of the proposed Waste Immobilizat Project would be to provide the processes and facilities to immobilize Idaho Chemic radioactive wastes (sodium-bearing liquid and solid calcine) into a form(s) suitabl This Project Summary provides information to be used in the selection of technologi bearing and calcined wastes. More comprehensive descriptions and analyses of the p technologies, that form the basis of this summary, are in ICPP Radioactive Liquid a Technologies Evaluation Interim Report (WINCO 1994).
This project would involve mixed wastes. Under the Federal Facility Compliance Act required to negotiate with states or U.S. Environmental Protection Agency, as appro treatment plans, including schedules and milestones, to develop treatment technolog that would treat mixed wastes. Decisions on these treatment technologies and relat made in conjunction with negotiations already under way with the State of Idaho pur Facility Compliance Act, and after appropriate National Environmental Policy Act re completed.
DOE has identified two primary treatment technologies to address treatment of sodiu calcine: (a) vitrification and (b) separation followed by vitrification and groutin technology, three options were identified: (a) radionuclide partitioning, (b) preci crystallization. Either of the two primary technologies could be implemented throu Immobilization Facility. The emissions, effluents, and final waste forms from proc Immobilization Facility would vary depending on the treatment technology selected. provides a preliminary analysis of the impacts of construction and operation of the Facility for each of the treatment technologies. The impact analyses presented bou result from each of the treatment technologies, and the options within the treatmen analyses are intended to support DOE decisions regarding technologies to treat sodi calcine. Before a decision is made to proceed with the construction of the Waste I further National Environmental Policy Act review would be conducted, as appropriate High-activity waste is currently stored at the Idaho Chemical Processing Plant in l calcine forms. These waste forms require engineered confinement systems because th hazardous materials would be mobile in the environment, and therefore cannot be dis treatment. The Waste Immobilization Facility would be developed to process the hig inventory into a final form that would effectively isolate radionuclides and hazard environment and therefore render the waste safer for storage, treatment, transport, there are no certified transportation casks for liquid or calcine wastes, and the d would take considerable time at great cost. Following immobilization, waste would pending transport offsite and disposal in a geologic repository.
The need to identify treatment technologies is primarily driven by the Resource Con Act, and the Federal Facility Compliance Act (which amended the Resource Conservati The Federal Facility Compliance Act requires the DOE to identify treatment technolo treatment technologies are available. Sodium-bearing wastes and calcine wastes are purposes of the Federal Facility Compliance Act. These wastes must meet both Resou Recovery Act, Land Disposal Restriction requirements because of the hazardous const U.S. Environmental Protection Agency and Nuclear Regulatory Commission requirements radioactive constituents, before being permanently disposed.
PROJECT DESCRIPTION: This proposed project would involve technology selection for treating sodium-bearing liquid waste and for converting calcine waste into a waste disposal, followed by the design, construction, and operation of a Waste Immobiliza processing these wastes. Such processing would produce a single high-activity wast placement in a geological repository and potentially a low-activity waste form. Th located south and east of the existing Fluorinel Dissolution and Storage Facility i within the Idaho Chemical Processing Plant boundary, and to occupy an area of appro meters (43,000 square feet). No disposal facilities would be provided by this proj storage for waste pending disposal would be constructed as part of this facility.
The primary treatment technologies to address Idaho Chemical Processing Plant radio in this EIS (which consists primarily of sodium-bearing liquid waste) in the propos Facility are direct vitrification [Alternative B (Ten-Year Plan)] and separation/ v

(Minimum Treatment, Storage, and Disposal) and D (Maximum Treatment, Storage, and D vitrification would involve treatment to produce a glass or glass-ceramic final was a greater quantity of high-activity waste than options involving separation. Separ partition the waste into high- and low-activity fractions. The separation options partitioning that would produce a small stream of high-activity waste and a large s waste, (b) precipitation that would produce a moderate amount of high-activity wast and (c) freeze crystallization that would also produce a moderate amount of high-ac waste. Following separation, the high-activity portion of the waste would be prepa (perhaps by calcining), followed by vitrification. The low-activity portion would or vitrification and subsequently disposed of in a low-level waste disposal facilit Radionuclide partitioning involves removing specific actinide and transuranic eleme bulk of the radioactivity, by employing a solvent extraction technique previously d of plutonium (that is, TRUEX). Similar to freeze crystallization, this technology activity fraction requiring glass or glass ceramic stabilization. However, unlike technology concentrates on isolating the radioactivity rather than isolating the so more concentrated, low-volume, high-activity fraction than freeze crystallization. would also likely require ion exchange to remove the cesium, employ a solvent-extra removal of strontium (that is, SREX), and would require a solvent recovery system. In the precipitation process, the transuranic elements, heavy metals (mercury, lead of the transition elements would be precipitated by adding the proper proportion of other neutralizing agent). The sodium, cesium, and some strontium would remain sol The liquid would be separated from the solid and processed to remove cesium and str Electrohydrolysis would be used to recycle some of the sodium hydroxide and the rem grouted. The resulting high-activity fraction could be calcined without aluminum n be vitrified directly.

The freeze crystallization process would separate approximately 66 percent of the s stream; this low-activity fraction would be grouted or could be recycled using elec uses of the solutions are found. The expected high-activity product from the freez calcined with aluminum nitrate in a reduced quantity. The low-activity stream woul transuranics, cesium, and strontium, as well as heavy metals, to produce a low-acti transuranic separations, the transuranics could be recovered for re-use or storage waste storage facility.

The options for processing solid calcine waste examined in this EIS are direct vitr separation, and immobilization following dissolution of the calcine. Direct vitrif larger amount of high-activity waste than options involving separation. Separation the waste into high- and low-activity fractions and if necessary, to remove heavy m stream. The separation options include (a) radionuclide partitioning that would pr high-activity waste and a large stream of low-activity waste and (b) precipitation moderate amount of high-activity waste and low-activity waste. The choice of waste which waste form type gives the highest waste loading per unit volume with respect chemistry and overall cost. The technology for treating the calcine by separation is considered feasible based on laboratory experiments and full-scale application o However, further development and verification testing of the technology would be re The process of directly incorporating the calcine material into a glass-ceramic wou calcine material to obtain a homogenous mixture, stabilizing the mixed calcine in a remove residual nitrates and any absorbed water, and grinding the calcine to improv formation step. The pretreated calcine would then be mixed with glass-ceramic form processed under elevated temperature and pressure to produce the final waste form. dissolved and slurried with glass-ceramic-forming additives to produce the final wa ceramic process has been demonstrated on a laboratory scale using nonradioactive ma would still need to be demonstrated on an engineering scale and verified using actu In the vitrification process, the calcine could be dissolved and slurried with glas composition (frit) and introduced to the melter. The dry calcine could also be ble dry to a melter. In either case, the calcine would first have to be thoroughly mix homogeneous melter feed and might have to be stabilized and ground to improve the m efficiency. As with the glass-ceramic process, the process of directly immobilizin would require further development and verification testing before the technology co the wastes at issue.

The high-activity waste form would be glass or glass-ceramic, and the low-activity grout, glass, or glass-ceramic. The high-activity waste and the low-activity strea at the INEL would be mixed wastes under Resource Conservation Recovery Act and must disposal. The specified land disposal restriction treatment standard for high-acti Resource Conservation Recovery Act regulations issued by U.S. Environmental Protect implemented by the State of Idaho under the Idaho Hazardous Waste Management Act) i

Vitrification" (40 CFR Part 268, Subpart D-Treatment Standards). Therefore, the IN waste must be tested and demonstrated to meet the high-level vitrification treatmen Both the high-activity and low-activity waste forms could be delisted or, if approp Resource Conservation Recovery Act-approved Subtitle C hazardous waste disposal sit the Federal Facility Compliance Act of 1992, DOE and the State of Idaho are develop treatment plan, which is scheduled to be issued in February 1995, and will include for developing and implementing treatment technologies for mixed wastes at the INEL mixed wastes. A signed Consent Order between DOE and the State of Idaho containing milestones would be issued by October 1995. The selection of a high-level waste tr being closely coordinated with the State of Idaho as part of the Federal Facility C Candidate high-level waste treatment technologies were evaluated by first identifyi the potential of treating and immobilizing Idaho Chemical Processing Plant sodium-b waste. Those technologies that either could not be developed in time to meet the r were inferior to competing technologies were eliminated from further consideration. technologies include encapsulation of sodium-bearing waste in silica via the Sol-Ge by liquid extraction using crown ethers, and sodium removal via bioremediation.

As a result of this preliminary evaluation, a range of feasible candidate technolog converting sodium-bearing and calcine wastes into acceptable waste forms for dispos information on each candidate technology was collected and documented, including ex performance, need for additional process development, facility capital costs, opera costs, treated waste volumes, interim storage costs, and projected waste disposal c obtained from literature sources, benchmarking operating waste treatment systems, a laboratory tests conducted at the Idaho Chemical Processing Plant, and is summarize As an aid to evaluation of the technologies, a systems analysis model was developed alternative candidate technologies against selection criteria. Selection criteria the Resource Conservation Recovery Act, and related Consent Orders with the State o and life-cycle costs, (c) implementation time, and (d) expected performance of the quantities and waste. In all instances, the comparisons were based on waste forms would meet the high-level waste durability standards used at several other DOE site Valley, Hanford); see DOE (1993e). The durability standard includes testing for me form stability, and other physical parameters critical to long-term disposal.

Although the final waste acceptance criteria for a repository have not yet been dev undertaken initial assessments of repository performance and waste acceptance crite requirements already identified by the U.S. Environmental Protection Agency and the Regulatory Commission for a final repository. Specifically, an initial repository conducted, and a preliminary waste acceptance criteria developed for the INEL-speci Initial Performance Assessment of the Disposal of Spent Nuclear Fuel and High-Level INEL, Volumes I & II (Rechard 1993) and Preliminary Waste Acceptance Criteria for Processing Plant Spent Fuel and Waste Management Technology Development (Taylor and Additional information regarding activities conducted to date may be found in the W Nuclear, ICPP Radioactive Liquid and Calcine Waste Technologies Evaluation Interim 1994).

After selecting a treatment technology, DOE would need to perform additional bench-testing on actual waste solutions before designing and constructing the Waste Immob final waste form treatment technologies in all cases would be subject to U.S. Envir Agency and State of Idaho approval.

Preliminary output from the systems analysis model is provided for four of several sodium-bearing and calcine waste treatment technologies in Table C-4.3.2-1 and Figu 4.3.2-4. The combinations presented include the three separations technologies ide waste and direct vitrification.

**Table C-4.3.2-1. Waste immobilization cost and volume data for example options ove** lifetime of the facility.

| Option | Casesb | Costsa (million dollars) Construction and operation | Waste disposal | Final waste volume (cubic meters) High activity | Low act |
|---|---|---|---|---|---|
| 1 | a | 4,200 | 11,000 | 19,000 | 1,5 |
| | b | 3,300 | 2,900 | 4,400 | 230 |
| 2 | a | 3,800 | 5,500 | 9,000 | 11, |
| | b | 4,200 | 2,200 | 3,300 | 2,1 |
| 3 | a | 1,900 | 860 | 870 | 20, |
| | b | 3,200 | 300 | 220 | 4,7 |
| 4 | a | 4,200 | 12,000 | 21,000 | Non |

| | | | | |
|---|---|---|---|---|
| b | 2,900 | 3,100 | 4,700 | Non |

a. All costs are discounted to 1994 dollars.

b. For Case a, the high-activity waste form would be glass and the low-activity wa normal grout. For Case b, the high- and low-activity waste forms would be glass-ce

**Figure 4.3.2-1. Waste Immobilization Facility: Option 1. Figure 4.3.2-2. Waste I** the technologies and associated waste management assumed for each. Costs are provi and operation, and final waste form disposal. Final volumes are also provided for activity waste forms. For each of the combinations, output is also provided for a final waste form volume (glass for high-activity waste and grout for low-activity w case, glass-ceramic for both wastes for the minimum case).

For each of the combinations presented, it is assumed that the existing sodium-bear processed through the high-level waste evaporator to minimize the volume of high-ac detailed information on these and other treatment combinations is in WINCO (1994).

SUMMARY OF IMPACTS: Environmental consequences for this project would involve airb generated wastes, and radiation exposures from routine operations and construction. emissions would be nonradioactive and would consist primarily of dust, paint fumes, and construction equipment. Dust generation would be mitigated, and emissions duri comply with applicable Federal and State standards.

Nonradioactive airborne emissions during normal operations would consist primarily NOx emitted would be approximately 1,650,000 kilograms per year. In addition, the emit smaller quantities of other pollutants such as SO2, particulate matter, hydrof Particulate emissions would be mitigated using high efficiency particulate air filt radioactive airborne emissions during normal operations would consist primarily of iodine-129 (0.15 curies). Particulate radioactive emissions are estimated at less effectiveness of high efficiency particulate air filtration. Total radioactive emi maximum exposure to the public well below the U.S. Environmental Protection Agency Standards for Hazardous Air Pollutants requirement of 10 mrem per year.

Liquid effluents produced during construction would consist of water from cleaning and would be treated as necessary with Idaho Chemical Processing Plant facilities. hazardous and radioactive liquid wastes would be treated within the facility or by Chemical Processing Plant facilities.

Solid nonhazardous wastes in the form of paper, wood, and metal would be generated phase of the project. During operations, the facility would produce between 20 and of immobilized high-activity waste and between 10 and 1,250 cubic meters per year o activity waste, based on facility sizing and the technologies chosen. Both high-ac wastes would be stored at the Waste Immobilization Facility pending ultimate dispos note that these quantities are estimates only, and that the final design capacities the stated ranges depending again on the facility's size and the technologies chose

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B (Minimum Treatment, Storage, and Disposal), and D (Maximum Treatment, Storage, and project data sheet at the end of this project summary supports the above project de

The proposed project would be located within a major facility area (the Idaho Chemi (See Figure C-1-1 for location and Section C-3.2 for a discussion of new constructi area.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as preferred alternative for this project are summarized in Table C-4.3.2-2. This tab information on environmental impacts in Section C-3.2 and on mitigation of impacts applicable issues are discussed in Section C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under the no-action option, a Waste Immobilization Facility would not liquid high-activity waste and sodium-bearing liquid waste would be processed in th Calcine solids would continue to be stored in vaults at Idaho Chemical Processing P processed. This option corresponds with Alternative A (No Action) evaluated in thi not provide for compliance with the following:

**Table 4.3.2-2. Summary of potential environmental impacts of the Waste Immobilizat** Project - Separation with Vitrification under Alternatives C and D.

| Environmental | Potential impacta,b | Potenti |
|---|---|---|

| | | |
|---|---|---|
| attribute | | |
| Geology and soil, acres disturbed | Disturb up to 0.8 acres of previously disturbed soil | Previou<br>would b |
| Water resources | Construction: 11,500,000 liters<br>Operation: 150,000,000 liters per year, which includes 10,000,000 liters per year of evaporator overheads, and 3,500,000 liters of service water. | Enginee<br>Storm W<br>Plan in |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Previou<br>erosion |
| Historic, archaeoligical, or cultural resources | No sites identified | None re |
| Air quality | Radiological operational emissions<br>0.18% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>11% of significance level for combined TAPs<br>44% of significance level for fluorides<br>260% of significance level for mercury<br>Prevention of Significant Deterioration (PSD)<br>19% Annual average NO2 - Class II, public highways<br>Visibility: Control measures may be required to avoid degraded visibility at Craters of the Moon Wilderness Area | Facilit<br>inspect<br>reporti |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual<br>0.018 mrem/yr<br>9.0 y 10-9 latent cancer fatalities/yr<br>80-km (50-mile) population<br>Year 2000: Not in operation<br>Year 2010: 0.099 person-rem/yr<br>5.0 y 10-5 latent cancer fatalities/yr<br>Nonradiological effects<br>Negligible impact on health effects expected | Access<br>analysi<br>annual<br>during<br>have it<br>HEPA fi |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 272<br>Operation (onsite truck trips per year):<br>Nonradiological - 4<br>Radiological - 0.3 | Use of<br>and con<br>operato<br>procedu |
| Waste management | Construction (m3): industrial waste - 10,000<br>Operation (m3/yr): low-level waste -10<br>industrial waste - 150 | Waste m<br>program<br>Chemica<br>INEL |
| Socioeconomic conditions | Construction: 300 subcontractor personnel peak<br>Operation: 180 existing workers | None re |

a. Definition of acronyms: ECA - environmentally controlled area; HEPA - high-eff
NESHAP - National Emission Standards for Hazardous Air Pollutants.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

- Federal Facility Compliance Act, which requires the development of technol for treating/disposing of mixed wastes

- December 22, 1993, court order (Amended Order Modifying Order of June 28, requires that technologies be selected to process sodium-bearing liquid wa

- The Notice of Noncompliance Consent Order between the Department of Energy and the Environmental Protection Agency requiring DOE to cease use of the Chemical Processing Plant Tank Farm tanks by specified dates, unless alter

provided

- Modification of the Notice of Nonccompliance Consent Order between the DOE 1994, State of Idaho, and the U.S. Environmental Protection Agency requiri be selected for processing sodium-bearing liquid waste and calcine solids Processing Plant into waste forms acceptable for final land disposal.

Direct Vitrification - Under this option (Figure 4.3.2-4), waste would be vitrified waste form. This option was used for purposes of analysis for Alternative B (Ten-Y previously discussed, direct vitrification would produce the largest amount of high C-4.3.2-1). The facility would be constructed at the Idaho Chemical Processing Pla location within the INEL. This option was chosen to bound the high-activity waste emissions. Also, since it contains the minimum of pretreatment, it would require t construct and make operational.

Vitrification with Pretreatment - Under this option (Figures 4.3.2-1 through 4.3.2- Immobilization Facility would include pretreatment (a separation step) before vitri used for purposes of analysis for Alternatives C (Minimum Treatment, Storage, and D (Maximum Treatment, Storage, and Disposal) in this EIS. Pretreatment would produce waste but greater amounts of low-activity waste than direct vitrification (Table C- Waste Immobilization Facility does not reflect the treatment of additional high-act generated by spent nuclear fuel processing under Alternative D (Maximum Treatment, Disposal).

Treatment at Another Site - This alternative would require transportation of liqu another site for treatment before disposal. If sited at a location other than the Plant, costs would be high because of the need to design and/or certify transportat transport of the liquid and solid wastes. High costs would be incurred because of modifications to the existing processing facilities at Savannah River or Hanford to characteristics of the Idaho Chemical Processing Plant wastes. For these reasons, as a reasonable alternative.

## Figure. (page 2) C-4.3.3 HIGH-LEVEL TANK FARM NEW TANKS

**Figure. Project Data Sheet-Waste Immobilization Facility Project. (page 1)**

PROJECT NAME: High-Level Tank Farm New Tanks

PURPOSE AND NEED FOR ACTION: The purpose of the proposed Idaho Chemical Processing High-Level Tank Farm New Tanks project is to reduce the environmental health and sa with the current storage of high-level liquid waste at the Idaho National Engineeri providing sufficient replacement storage capacity, as required under Alternatives C Storage, and Disposal) and D (Maximum Treatment, Storage, and Disposal) in this Env Statement (EIS).

The Notice of Noncompliance issued by the U.S. Environmental Protection Agency on J supported the decision to construct replacement tanks by contending that the eleven Chemical Processing Plant Tank Farm and much of their associated valves and piping with secondary containment requirements. The Notice of Noncompliance Consent Order 1992, outlines a strict compliance schedule for the completion of several tasks tha the required permanent cessation of use of the five pillar and panel (segmented) ta March 31, 2009; and the remaining six cast-in-place (monolithic) vaults on or befor other provisions. The decision in April, 1992, to no longer reprocess spent fuel a Processing Plant resulted in the tank replacement project being put on hold. The A (the District Court) Order of June 28, 1993 (signed December 22, 1993) calls for be new tanks by the end of the 1996 construction season if new tanks are determined to of Decision on this EIS.

For Alternative C (Minimum Treatment, Storage, and Disposal), this project would be alternative the New Waste Calcining Facility would not be used to calcine liquid wa sodium-bearing waste, both of which would be generated in limited quantities primar efforts. For Alternative D (Maximum Treatment, Storage, and Disposal), this projec were decided to process spent nuclear fuel before ultimate disposal.

PROPOSED ACTION AND ALTERNATIVES

The existing Tank Farm concrete containment vault designs include five with segment WM-182 through VES-WM-186) and six with monolithic concrete construction (VES-WM-18

through -189, and the spare empty tank, -190). Based on the results of the best av models and scoping seismic evaluations (for example, Hashimoto 1988), the five segm vaults do not meet the current seismic criteria. Although continuous monitoring of has not yielded any evidence to suggest a leak of high-level liquid waste to the en (approximately 35 years), seismic deficiencies, and the inability to remotely inspe systems to completely ensure continued tank integrity make their long term use unac The liquid waste is subject to Resource Conservation and Recovery Act (RCRA) requir existing tanks do not meet all of the current INEL seismic requirements for seconda proposed project in the original environmental assessment (DOE 1993c) included (a) tank cover gas piping and high-level waste transfer systems, (b) providing equipmen called heel (the remaining liquid in each existing tank that cannot be removed by e providing for replacement tankage. However, DOE approved that environmental assess Finding of No Significant Impact only for the high-level waste tank upgrades portio action. These system upgrades are under construction [see Section C-2.7, High-Leve Replacement (Upgrade Phase)]. The proposed Tank Farm Heel Removal Project is a sep action (see Section C-4.3.1). The larger project to replace the tankage was suspen fuel reprocessing was curtailed at the Idaho Chemical Processing Plant.

The proposed action would be to replace five high-level liquid waste storage tanks with four new tanks, containment vaults, and support systems. Alternative A (No Ac storage in the existing tanks. This alternative would conflict with the Notice of Order, which alleges secondary containment violations of the RCRA and Hazardous Was (Idaho) regulations. Three other project-specific alternatives are considered: (a waste storage capacity requirements (primarily by calcining), (b) retrofit existing the waste at other INEL facilities.

Proposed Action: The proposed action would replace the five segmented tank an (VES-WM-182 through VES-WM-186) that do not meet current INEL seismic criteria with 500,000-gallon storage tanks. The new tanks would be located in separate vaults wi ground concrete containment vault structure. The primary stainless steel storage t inside a secondary containment barrier. The secondary containment barrier would co standing stainless steel vessel between the primary tank and the vault or a stainle directly to the interior of the vault. In either instance, a separate secondary co designed to accommodate 110 percent of the volume for each of the primary tanks. T be approximately 60 feet in diameter, with a shell height of about 24 feet and a do The tanks and containment vault structure would be designed for a 50-year life and permit from the State of Idaho.

Support systems for the tank and vaults would include solids handling, tank cooling offgas with associated high-efficiency particulate air filtration, vault ventilatio decontamination, fire protection, and remote maintenance. These systems would prov operation and maintenance of the proposed new facilities and would facilitate event decommissioning. Since the new vessel offgas and vault ventilation systems would p exceed the handling capacity of the existing Idaho Chemical Processing Plant main s supplemented by a new stack not to exceed 65 meters (210 feet) in height. The new with emission monitoring instrumentation meeting the specifications set forth in th Standards for Hazardous Air Pollutants permit and the State of Idaho Permit to Cons Operate.

To supply electricity to operate the proposed facilities, two new feeder lines, of would be constructed from existing circuits. Alternate power would be supplied by generation system. A redundant, solid-state, uninterruptible power supply (batteri instrumentation and lighting that require an uninterruptible power supply. Other e include exterior, interior, and emergency lighting; grounding; lightning protection system. Other utility interfaces would include demineralized water, potable water, steam, compressed air, decontamination systems, and steam condensate return.

The largest of three new enclosure buildings would be the weather enclosure buildin the proposed new tanks. The weather enclosure building would support operation, in maintenance activities. A mechanical building would house and/or support mechanica ventilation and vessel offgas air filtration systems. An electrical building would generator and electrical switchgear.

Low-level liquid mixed waste would either be stored at an approved interim mixed wa INEL (outside of the Idaho Chemical Processing Plant facility area) or treated at t equipment waste evaporator at the Idaho Chemical Processing Plant. The radioactive disposed of at the Radioactive Waste Management Complex. The hazardous substances treated, and disposed at permitted RCRA hazardous waste treatment, storage, and dis Site preparation activities for the proposed project would include demolition or re buildings, possible structural shoring in areas to be excavated, and relocation or

utilities (Shaffer 1993). Subsequent to site preparation, overburden would be exca and the bedrock would be removed to the required depth.

Once construction and acceptance testing were complete, operation of the Tank Farm substantially from current operations. The tanks would be operated so that one new left empty to act as spares in case of emergency. The maximum heat generation rate tanks would be limited to 100 watts per cubic meter.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives C Treatment, Storage, and Disposal), and D (Maximum Treatment, Storage, and Disposal) sheet at the end of this project summary supports the above project description.

PROJECT-SPECIFIC OPTIONS:

No Action - No replacement waste storage tanks would be provided for the five tanks through VES-WM-186). This option corresponds to Alternative A (No Action) evaluate the existing tank vaults do not meet the secondary containment requirements, a Noti Consent Order between DOE, the U.S. Environmental Protection Agency, and the State use of the existing tanks to cease. Thus, adequate treatment must be provided to t tanks to meet the Consent Order dates or the Consent Order would not be met. There risk of a leak or rupture in these five tanks/vaults in the event of a large earthq for variances [40 CFR Part 265.193(g)], but obtaining a variance for the Tank Farm unlikely due to the difficulties in performing the annually required leak detection

Reduce High-Level Liquid Waste Storage Capacity Requirements - A reduction in high- storage capacity requirements could be possible if generation of waste could be red calcining processing capacity or rate were increased, thereby eliminating the neces Palmer et al. (1994) evaluated Tank Farm capacity and storage requirements to deter options for emptying the existing Tank Farm and the need for replacement tanks. Be Noncompliance Consent Order requirements, the problem and the defined system became just the new tanks. Since determining the need for new tanks also includes evaluat existing tanks, many other factors were considered. Some of these are liquid waste storage capacity, phased removal from service of existing tanks for heel removal ac capacity, and waste immobilization. The defined system becomes all of the Idaho Ch involved in generation, storage, or treatment of Tank Farm or related wastes.

Therefore, simply calcining the wastes in the existing New Waste Calcining Facility use of the tanks by the specified dates to meet the requirements of the Notice of N Order. Other treatment of the wastes must also be provided. This project-specific Case 4a in Palmer et al. (1994)] complies with the Notice of Noncompliance Consent to Alternative B (Ten-Year Plan) evaluated in this EIS. It would consist of runnin Calcining Facility campaigns after 1996, operating the Waste Immobilization Facilit in 2008, and using the High-Level Liquid Waste Evaporator at the maximum rate betwe

Retrofit Existing Tanks/Vaults - The option of retrofitting the existing tank/vault seismic design criteria and secondary containment requirements has been thoroughly extensive study. Options evaluated in the study included internal bracing, driving overburden, external support of vault roof, excavation and external bracing, fillin curtain, vault column post-tensioning, low-pressure grout, and the installation of barrier. No retrofit option was determined to be feasible based on the criteria of radiation exposure, reliability, construction risk, schedule, cost, waste minimizat requirements. This option has not been included as either a project-specific alter because it has been determined to be not practical or feasible with current technol (1993c).

Location at Other INEL Facilities - This option has not been pursued due to the ext be encountered in transporting high-level liquid wastes and the requirement to cons transport casks and tank farm support. The location of existing liquid waste gener processing facilities dictates a close connection to replacement tankage.

AFFECTED ENVIRONMENT:

The proposed action would be located within a major facility area (the Idaho Chemic INEL). (See Figure C-1-1 for location and Section C-3.2 for a discussion of new co facility area.) The proposed project location is to a great extent already develop Idaho Chemical Processing Plant operations. The limited acreage outside the fence during construction is predominantly in the sagebrush vegetative community, which i community type at the INEL.

Construction of part of the proposed project would take place in areas that have be Environmentally Controlled Areas (ECAs). ECAs are defined regions within the Idaho Plant boundaries where a hazardous and/or radioactive waste spill/release has been designation remains in spite of cleanup actions following the spill/release.

Other information regarding the affected environment of the Idaho Chemical Processi

surrounding area is covered by other sections of this EIS, as summarized and refere

ENVIRONMENTAL EFFECTS:

The potential environmental effects associated with the proposed project other than summarized in Table C-4.3.3-1. This table is complemented by information on envir Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

Accidents: The radiological and nonradiological impacts from postulated reasonably (greater than 1 y10-7 per year) are encompassed by those accidents analyzed in this 5.14. Specifically, in Section 5.14, due to a seismic event, a high-level waste ta draining was analyzed to determine potential impacts on groundwater. This event is bounding foreseeable accident for this project.

Cumulative Impacts: Because the proposed action would replace or upgrade existing I Processing Plant Tank Farm facilities, there would be no significant additional cum to the construction, testing, and startup of the new facilities.

Decontamination and Decommissioning and RCRA Closure: The proposed new facilities ( vaults, and ancillary systems) and the five tanks and piping systems being taken ou eventually require decontamination and decommissioning and RCRA closure. The

**Table C-4.3.3-1. Summary of potential environmental impacts of the High-Level Tank** Tanks Project under Alternative C.

| Environmental attribute | Potential impact | Potenti |
|---|---|---|
| Geology and soil, acres disturbed | Disturb up to 20 acres of previously disturbed soil | Previou would b |
| Water resources | Construction: 2,000,000 liters<br>Operation: No information | Storm W in plac would b elevati than th No exca 400 ft |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Previou erosion |
| Historic, archaeological, or cultural resources | Survey completed; no sites identified | None re |
| Air resources | Operational radiological/nonradiological emissions<br>No increase over current emissions<br>Nonradiological construction emissions (kg/yr)<br>CO - 1.90 y 103; NOx - 5.89 y 103; SO2 - 5.90 y 102 ; Particulate - 5.60 y 102 | Facilit inspect reporti |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>Construction: 1 y 10-3 mrem/yr<br>5.5 y 10-10 latent cancer fatalities/yr<br>Normal operation: 2.8 y 10-1 mrem/yr<br>1.4 y 10-7 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Construction: 5.2 y 10-3 person-rem/yr<br>2.6 y 10-6 latent cancer fatalities/yr<br>Normal operation:0.19 person-rem/yr<br>9.5 y 10-5 latent cancer fatalities/yr<br>Nonradiological effects<br>Negligible impact on health effects expected | Access analysi annual during |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 82<br>Radiological - 18.6<br>Operation (onsite truck trips per year):<br>Nonradiological - 0.5<br>Radiological - 0.3 | Use of and con operato procedu |

| | | |
|---|---|---|
| Waste management | Construction (m3): low-level waste - 553; mixed low-level - 20; transuranic - 22 industrial - 3000<br>Operation (m3/yr): low-level waste - 8; mixed low-level - 2; hazardous - 15; industrial - 5 | Waste m program |
| Socioeconomic conditions | Construction: 150 subcontractor personnel<br>Operation: No additional workers | None re |

a. Definition of acronyms: ECA - environmentally controlled area.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.
decontamination and decommissioning and RCRA closure of the existing facilities bei covered under a subsequent National Environmental Policy Act (NEPA) review.
In accordance with DOE Orders 5820.2A (DOE 1988) and 6430.1A, Section 1300-11 (DOE new facilities would be designed to facilitate decontamination and decommissioning. NEPA actions for decontamination and decommissioning of the proposed new facilities covered by a subsequent NEPA review.

## C-4.3.4 NEW CALCINE STORAGE

**Figure. Project Data Sheet-High-Level Tank Farm New Tanks Project.**

PROJECT NAME: New Calcine Storage

GENERAL PROJECT OBJECTIVE: The general objective of the proposed eighth Calcined S Facility New Calcine Storage project at the Idaho Chemical Processing Plant would b storage for calcine solids produced by the operation of the New Waste Calcining Fac capacity would be required to allow the continued processing of liquid wastes in th Facility until the final waste form is established and implemented.

PROJECT DESCRIPTION: This proposed project would provide for the design, construct a new facility for the storage of calcined high-level radioactive waste resulting f Waste Calcining Facility. In the New Waste Calcining Facility, the liquid wastes a solids via a fluidized bed process.

Five calcined solids storage facilities are currently filled at the Idaho Chemical still receiving calcine and a seventh ready to receive calcine. The eighth storage project, would be a near copy of the seventh facility, and would have a capacity of cubic feet.

The proposed eighth Calcined Solids Storage Facility would consist of seven annular bins, arranged with six bins in a circle and the seventh in the middle, in a reinfo base would be on bedrock, with approximately the top half of the vault projecting a walls and roof would provide required radiation shielding as well as structural sup anchored into the vault base slab; the vault, bins, and all interconnecting piping applicable seismic, structural, and thermal requirements.

The calcined solids produced by the New Waste Calcining Facility would be pneumatic top of the proposed storage facility where the solids would be separated from the t located in a separate cell. The transporting air would be returned to the New Waste Calcining Facility; the solids would fall by gravity thro of the seven bins.

A combination natural and forced convection cooling system would be provided to mai below its caking temperature and the facility structure below temperature limits. through a filter, be discharged at the bottom of the vault and flow upward around a space in the tanks, and be discharged to atmosphere through a stack on top of the v radioactivity would automatically channel the exhaust air through in-line high effi and centrifugal exhaust blowers.

A bins vent and relief system would protect the bins from over or under pressurizat in a separate cell on top of the vault would vent to the atmosphere via high effici This system would also allow the bins pressure to equilibrate with the atmosphere w from the New Waste Calcining Facility.

To facilitate eventual retrieval of the calcine, each bin would have four retrieval hatches in the vault roof. Corrosion coupons, fabricated from the bins material, w of the bins and into the vault through separate access hatches.

Vault, bin, and calcine temperatures would be monitored by thermocouples installed

bins exterior surfaces, and by multipoint thermocouples installed in thermowells at temperature zone in each of the bins. Other temperature and pressure instrumentati monitor and control the performance of the cooling, pressure relief, and pneumatic instrument room on the vault roof would house the facility instrument recorders and Plant utilities would provide the required steam, instrument air, and electrical po Special maintenance features, including small jib cranes, access hatches, and inspe provided.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternative D Treatment, Storage, and Disposal). The project data sheet at the end of this proje above project description.

The proposed project would be located within a major facility area (the Idaho Chemi (See Figure C-1-1 for location and Section C-3.2 for a discussion of new constructi area.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.3.4-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, no additional calcine storage would be constructed to Alternative A (No Action) evaluated in this EIS.

Eliminate or Reduce Generation of Calcine - Under this option, high-level liquid not converted to calcine. This option corresponds to Alternative C (Minimum Treatm Disposal) evaluated in this EIS.

Convert Existing Calcine to Another Form - Under this option, a calcine conversio developed and constructed to convert the existing calcine to another form. This op Alternatives B (Ten-Year Plan) and C (Minimum Treatment, Storage, and Disposal) eva Storage facilities for the other waste form may need to be developed and constructe

Store Idaho Chemical Processing Plant Calcine at Other DOE Facilities - Under thi Processing Plant calcine would be transferred to another DOE facility for storage. than the Idaho Chemical Processing Plant, costs would be high because of the need t transportation containers/casks for transport of the solid wastes. This option wou wastes that is not allowed by DOE orders and is not evaluated in this EIS.

**Table C-4.3.4-1. Summary of potential environmental impacts of the New Calcine Sto**
Project under Alternative D.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | Disturb 0.5 acres of previously disturbed soil | Project area; p |
| Water resources | Construction: No information<br>Effluent: construction water | Storm W Plan in |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Previou soil er |
| Historic, archaeological, or cultural resources | Survey completed, no sites identified | None re |
| Air resources | Radiological operational emissions<br>2.0 y 10-5% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>None<br>Prevention of Significant Deterioration (PSD)<br>None | Facilit inspect reporti |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>2.0 y 10-6 mrem/yr<br>1.0 y 10-12 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: not operational<br>Year 2010: 1.9 y 10-5 person rem/yr<br>9.5 y 10-9 latent cancer fatalities/yr<br>Nonradiological effects - No emissions | Access analysi annual monitor |

| | | |
|---|---|---|
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 15.6<br>Operation (onsite truck trips per year):<br>Nonradiological - 0.1<br>Radiological - 0.2 | Use of and con operato procedu |
| Waste management | Construction (m3): industrial waste - 576<br>Operation (m3/yr): low-level waste - 8<br>industrial waste - 1 | Waste m program |
| Socioeconomic conditions | Construction: 35 to 40 subcontractor personnel<br>Operation: No additional workers | None re |

a. Definition of acronyms: ECA - environmentally controlled area; NESHAP - Nation Hazardous Air Pollutants.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

**Figure. Project Data Sheet-New Calcine Storage Project.**

## C-4.3.5 RADIOACTIVE SCRAP/WASTE FACILITY

PROJECT NAME: Radioactive Scrap/Waste Facility
GENERAL PROJECT OBJECTIVE: The general objective of this proposed project is to qu Radioactive Scrap/Waste Facility for interim storage of high-level waste until a hi available.
PROJECT DESCRIPTION: Some of the material that would be a by-product from operatio Cycle Facility may be classified as a high-level waste. Since no final repository high-level waste, Argonne National Laboratory-West proposes to store the high-level Fuel Cycle Facility at the Radioactive Scrap/Waste Facility until a final repositor Radioactive Scrap/Waste Facility has been used since 1965 to store radioactive and and material containing recoverable quantities of nuclear material (that is, scrap) reprocessed. The Radioactive Scrap/Waste Facility is a 1.6-hectare (4-acre) facili is stored in carbon steel pipes, called liners. The Radioactive Scrap/Waste Facili about 50 storage pipes per row, for a total capacity of approximately 1350 potentia Storage volume is about 193 cubic meters (6,800 cubic feet).
Because of the radioactive fields that would be associated with the waste (regardle example, mixed, low-level, transuranic, or high-level) and scrap stored at the Radi Facility, special handling and storage would be required. The waste and scrap woul containers within shielded hot cells using remote methods. The containers would be transferred to the Radioactive Scrap/Waste Facility in a shielded cask. The Radioa provides shielding to protect personnel working in the facility from gamma radiatio the waste or scrap. The necessary shielding is provided by a "shield ring" that pr between the cask and the storage liner where the material is placed. Once filled, with a 76-centimeter (30-inch) concrete shield plug that is welded to the liner. T would be a maximum of 10 centimeters (4 inches) above the ground surface. The grou necessary shielding.
After corrosion was detected in Radioactive Scrap/Waste Facility liners removed in program for the facility was begun. The upgrade program calls for all the existing Scrap/Waste Facility to be relocated into new steel liners equipped with an impress protection system. In addition to this system, the new steel liners are further pr moderately corrosive nature of the soils at the Radioactive Scrap/Waste Facility by layer of noncorrosive sand slurry. This slurry is backfilled around the steel line The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B (Minimum Treatment, Storage, and Disposal), and D (Maximum Treatment, Storage, and project data sheet at the end of this project summary supports the above project de The proposed project would be located in an existing facility within a major facili Laboratory-West). (See Figure C-1-1 for location and Section C-3.2 for a discussio existing facility.)
Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.3.5-1. This table is complemented by information on en

Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu
C-3.4.
PROJECT-SPECIFIC OPTIONS:
No Action - Under this option, high-level waste would be accumulated in the Fuel
Fuel Examination Facility. This option corresponds to Alternative A (No Action) ev

**Table C-4.3.5-1. Summary of potential environmental impacts of the Radioactive Scr** Facility Project under Alternative B.

| Environmental attribute | Potential impacta | Pote |
|---|---|---|
| Geology and soil, acres disturbed | None (no disturbed soil) | Proj |
| Water resources | None expected | None |
| Wildlife and habitat | None | Proj |
| Historic, archaeological, cultural resources | None | Proj |
| Air resources | No increase over existing facility | None |
| Human health | No increase over existing facility | None |
| Transportation | None expected | None |
| Waste management | None (no new waste generated) | None |
| Socioeconomic conditions | Operation: 5 existing workers | None |

a. Potential impacts are described further in Section C-3.2.
b. Mitigative measures are described further in Section C-3.3.

## C-4.4 PROJECTS RELATED TO TRANSURANIC WASTE

**Figure. Project Data Sheet-Radioactive Scrap/Waste Facility Project.**

### C-4.4.1 PRIVATE SECTOR ALPHA-CONTAMINATED MIXED

LOW-LEVEL WASTE TREATMENT
PROJECT NAME: Private Sector Alpha-Contaminated Mixed Low-Level Waste Treatment
GENERAL PROJECT OBJECTIVE: The general objective of the proposed Private Sector Al
Contaminated Mixed Low-Level Waste Treatment Project would be to provide private se
alpha-contaminated mixed low-level wastes, and possibly transuranic waste, and smal
waste and mixed low-level waste presently stored at the INEL. It might also provid
buried wastes that may be retrieved during environmental restoration projects at th
other DOE sites and the commercial sector may also be treated at the facility. Tre
contaminated mixed low-level wastes would be sufficient to allow disposal in accord
5820.2A (DOE 1988) and Resource Conservation and Recovery Act Land Disposal Restric
of transuranic waste would be sufficient to allow disposal in the Waste Isolation P
PROJECT DESCRIPTION: This project would provide for the processing of alpha-contam
low-level wastes, transuranic waste, and possibly small amounts of low-level waste
waste by the private sector.
The DOE-Idaho has solicited feasibility studies for this endeavor from private indu
range from use of their own existing facility upgraded to treat the waste, to build
waste treatment facility. It is expected that a nonreactor nuclear facility would
package alpha-contaminated mixed low-level wastes (for treatment purposes this is d
than 100 nanocuries per gram) and transuranic waste as required, as well as small a
and mixed low-level waste.
The specifics of the treatment process and system components would be determined by
supplier. Expected throughput volumes would be approximately 2,000 cubic meters pe
yards per year) of alpha-contaminated low-level waste and 4,000 cubic meters per ye
year) of transuranic waste. Based upon current descriptions of INEL wastes, likely
of the treated waste products, and known available treatment process technologies,
treatment process system technical description is provided.

- Treatment would begin upon receipt of the wastes at the Private Sector Alp Mixed Low-Level Waste Treatment plant site. A receiving inspection and ap characterization of the wastes would be conducted sufficient to ensure the for receipt and treatment within the constraints of the facility design an inspection and characterization, waste containers would be sorted and segr subsequent processing. Containers would likely be vented, opened, and con further sorting and processing as needed.

- Bulk waste volume processing would proceed involving some combination of p chemical processing to remove or destroy hazardous organics, remove or sta in a solid material, and stabilize radionuclides in a solid material as pe disposal acceptance requirements. The most likely bulk volume treatment p include a combination of thermal treatments involving desorption and high- oxidation/combustion of organics, followed by stabilization of ash and sol of potential final stabilization media would be possible, such as cements, glass/ceramics. One or more may be used to produce a final solid product

- The treated solid waste products would be assayed, certified, and appropri return transport from the Private Sector Alpha-Contaminated Mixed Low-Leve Treatment to the Radioactive Waste Management Complex for storage awaiting transported directly to an approved permanent repository, if available.

Future private sector initiatives would address additional INEL waste streams. The streams will be less hazardous and of smaller volume than the alpha-contaminated mi and transuranic wastes.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.

The proposed project would involve new construction assumed to be outside major fac Figure C-1-1 for assumed location and Section C-3.2 for a discussion of new constru facility areas.)

A location outside the INEL site also might be chosen for this project. For assess air impacts, such a location was assumed because this location would be closer to o would involve both onsite and offsite transportation.

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.4.1-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - This option would be the deferral of treatment of alpha-contaminated This option corresponds to Alternative A (No Action) evaluated in this EIS. This o continued storage of the waste.

DOE Treatment - Under this option, the waste would be treated at a DOE operated f corresponds to Alternatives B (Ten-Year Plan) and D (Maximum Treatment, Storage, an evaluated in this EIS. The Idaho Waste Processing Facility (see Section C-4.4.3) w streams and achieve the same treatment requirements as the Private Sector Alpha-Con Level Waste Treatment. The primary differences between the Idaho Waste Processing Private Sector Alpha-Contaminated Mixed Low-Level Waste Treatment facility are in h and operated: The Idaho Waste Processing Facility would be DOE funded and contract Private Sector Alpha-Contaminated Mixed Low-Level Waste Treatment facility would be and operated. Upon completion of preliminary designs and associated evaluations, a chosen to process the wastes. The selection of the treatment facility is scheduled

**Table C-4.4.1-1. Summary of potential environmental impacts of the Private Sector** Contaminated Mixed Low-Level Waste Treatment Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potenti |
|---|---|---|
| Geology and soil, acres disturbed | Disturb 200 acres of previously undisturbed soil; no conflict with existing land use policies | Prevent |
| Water resources | Water use: No information<br>Effluents: construction water | Storm Wa in place |
| Wildlife and | Loss of biodiversity and habitat productivity; | Avoid we |

| | | |
|---|---|---|
| habitat | animal displacement and mortality; potential for habitat fragmentation | and crit<br>erosion;<br>Conduct<br>accordin<br>(Section<br>Facility<br>criteria<br>surveill |
| Historic, archaeological, or cultural resources | Unknown number of sites | |
| Air resources[d] | Radiological operational emissions<br>0.046% of alpha or 4.2% of transuranic NESHAP dose limits<br>Toxic Air Pollutants (TAPs)<br>86% of significance level for combined TAPs<br>68% of significance level for lead<br>60% of significance level for mercury<br>Prevention of Significant Deterioration (PSD)<br>25% 24-hr SO2 Class II, public highways | |
| Human health[d] | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>4.6 y 10-3 mrem/yr (alpha)<br>2.3 y 10-9 latent cancer fatalities/yr<br>4.2 y 10-1 mrem/yr (transuranic)<br>2.1 y 10-7 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: 0.015 person-rem (alpha)<br>8.0 y 10-6 latent cancer fatalities/yr<br>1.4 person-rem (transuranic)<br>7.0 y 10-6 latent cancer fatalities/yr<br>Year 2010: 0.017 person-rem (alpha)<br>9.0 y 10-6 latent cancer fatalities/yr<br>1.6 person-rem (transuranic)<br>8.0 y 10-4 latent cancer fatalities/yr<br>Nonradiological effects<br>Negligible impact on health effects expected | Access c<br>analysis<br>annual r |
| Transportation[e] | Construction (offsite truck trips):<br>Nonradiological - 47.6<br>Operation (offsite truck trips per year):<br>Nonradiological - 8.7<br>Radiological - 1022 | Use of a<br>and cont<br>qualifie<br>shipment |
| Waste management | Construction (m3): industrial waste - 1,750<br>Operation (m3/yr): transuranic waste - 57; low-level waste - 100; mixed low-level waste - 170; industrial waste - 320 | Waste mi<br>programs |
| Socioeconomic conditions | Construction: 532 to 768 subcontractor personnel<br>Operation: 71 subcontractor personnel | None req |

a. Definition of acronyms: NESHAP - National Emission Standards for Hazardous Air Radioactive Waste Management Complex.
b. Reference location for impact analysis except for transportation and air impact the Radioactive Waste Management Complex. For transportation and air impacts analy site was assumed. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.
d. Alpha low-level and transuranic waste would not be treated concurrently.
e. The number of shipments includes transportation of waste from the Transuranic S and Storage Project to the facility, and transportation of treated waste and minor to the TSA Enclosure and Storage Project for interim storage pending offsite dispos

**Figure. Project Data Sheet-Private Sector Alpha-Contaminated Mixed Low-Level Waste**

## C-4.4.2 RADIOACTIVE WASTE MANAGEMENT COMPLEX

MODIFICATIONS TO SUPPORT PRIVATE SECTOR TREATMENT OF

ALPHA-CONTAMINATED MIXED LOW-LEVEL WASTE

PROJECT NAME: Radioactive Waste Management Complex Modifications to Support Privat Treatment of Alpha-Contaminated Mixed Low-Level Waste

GENERAL PROJECT OBJECTIVE: The general objective of this proposed project would be Radioactive Waste Management Complex facility enhancements on a schedule that suppo treatment of alpha-contaminated mixed low-level waste and transuranic waste stored

PROJECT DESCRIPTION: Modifications to the Radioactive Waste Management Complex wou needed to support the transport of alpha-contaminated mixed low-level waste and tra privately owned and operated waste treatment facility. If such a facility were cho additional waste retrieval, venting, and examination facilities would be required t 2000, to support both sending the waste offsite for treatment and receiving it back Approval of treatment of alpha-contaminated mixed low-level waste and transuranic w facility would require that the following facilities be constructed at the Radioact Complex:

- New examination and assay facilities to supplement the Stored Waste Examin
- Transportation facilities to stage drums and boxes for transport to the pr receive returning drums of treated waste.

The new examination and assay facility built to support offsite private waste treat capabilities to examine the contents of drums and other shipping containers and to for waste acceptance analyses. It would also have assay equipment for certificatio new transportation facility would be required only if treatment services were provi from the Radioactive Waste Management Complex. It would have the capability to sta approximately 680 drum equivalents per day. It would have equipment and facilities receiving and for providing necessary administrative support to these activities.

Because sending alpha-contaminated mixed low-level waste and transuranic waste to a accelerate retrieval of these wastes from storage, air emissions of radioactive and the Transuranic Storage Area Retrieval Enclosure may increase over those expected d operations. Releases would be expected to occur because of the presence of breache Control of any such potential emissions from the Transuranic Storage Area Retrieval performed as a separate element of this project. Particulate emissions would be co Volatile organic compound emission controls may also be required to maintain applic unlikely that accelerating the schedule by one order of magnitude would exceed a li retrieval schedule may increase the emissions unless control systems are installed. The air emissions and air concentrations of hazardous constituents from the Transur Retrieval Enclosure have been compared with applicable standards and in all instanc least two orders of magnitude below the Idaho Toxic Air Pollutants Emission Limit. equivalent from radiological emissions for this project is several orders of magnit Emission Standards for Hazardous Air Pollutants. Planned high-efficiency particula accelerated retrieval would prevent exceeding regulatory limits for radionuclides.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.

The proposed project would be located within a major facility area (the Radioactive Complex) and would be integral with existing facilities. (See Figure C-1-1 for loc a discussion of new construction in a major facility area.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.4.2-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option Radioactive Waste Management Complex modifications completed. This option corresponds to Alternatives A (No Action) and C (Minimum Tr Disposal) evaluated in this EIS. Under this option, the Private Sector Alpha-Conta Waste Treatment Facility (see Section C-4.4.1) would not be constructed, and theref Waste Management Complex modifications would not be required to support this effort

**Table C-4.4.2-1. Summary of potential environmental impacts of the Radioactive Was** Management Complex Modifications to Support Private Sector Treatment of Alpha-Contaminated Mixed Low-Level Waste Project under Alternative B.

| Environmental | Potential impacta,b | Potent |
|---|---|---|

| | | |
|---|---|---|
| attribute | | |
| Geology and soil, acres disturbed | Disturb less than 1 acre of previously disturbed soil | Project area; p |
| Water resources | Construction: water use minimal<br>Effluent: construction water | Storm W Plan in |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Project area; p |
| Historic, archaeological, or cultural resources | Unknown number of sites | Conduct accordi (Sectio existin |
| Air resources | Radiological operational emissions<br>0.0077% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs) - None<br>Prevention of Significant Deterioration (PSD)<br>16% - 24-hr PM, Class II, public highways | None re |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>7.7 y 10-4 mrem/yr (alpha)<br>3.8 y 10-10 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: 2.4 y 10-3 person rem/yr<br>Year 2010: 2.6 y 10-3 person rem/yr<br>1.3 y 10-6 latent cancer fatalities/yr<br>Nonradiological effects<br>Negligible impact on health effects expected. | None re |
| Transportationd | Construction (onsite truck trips):<br>Nonradiological - 41<br>Operation (truck trips per year):<br>Nonradiological - 2.7 onsite<br>Radiological - 2.9 onsite; 1006 offsite | Use of and con qualifi shipmen |
| Waste management | Construction (m3): industrial waste - 1500<br>Operation (m3/yr): low-level waste - 50<br>mixed low-level waste - 50<br>industrial waste - 100 | Waste m program |
| Socioeconomic conditions | Construction: 60 subcontractor personnel<br>Operation: 100 existing workers | None re |

a. Definition of acronyms: NESHAP - National Emission Standards for Hazardous Air
b. Reference location for impact analysis: 4 kilometers (2.5 miles) east of the R Complex. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.
d. All offsite shipments in support of the Private Sector Alpha Mixed Low-Level Wa transported through this facility.

**Figure. Project Data Sheet-Radioactive Waste Management Complex Modifications to Su**

## C-4.4.3 IDAHO WASTE PROCESSING FACILITY

PROJECT NAME: Idaho Waste Processing Facility
GENERAL PROJECT OBJECTIVE: The general objective of the proposed Idaho Waste Proce Project would be to design, construct, and operate a facility to provide treatment level waste and transuranic waste stored at the INEL. Treatment would produce a fi acceptable for land disposal in accordance with applicable regulatory requirements. This project would involve the treatment of mixed wastes. Under the Federal Facili 1992, DOE is required to negotiate with states or the U.S. Environmental Protection to develop site treatment plans, including schedules and milestones, to develop tre construct facilities that would treat mixed wastes. Decisions on these treatment t

facilities would be made in conjunction with negotiations already underway with the to the Federal Facility Compliance Act, and after appropriate National Environmenta been completed.

PROJECT DESCRIPTION: The Idaho Waste Processing Facility would treat and process b contaminated and transuranic-contaminated wastes to meet applicable requirements fo facility would be intended to provide treatment for waste stored at the INEL, but s DOE sites and the commercial sector could be treated there. Because other availabl lack the necessary capabilities, the INEL's annually generated volume of 1600 cubic yards) of mixed low-level waste and incidental quantities of low-level beta/gamma w at the Idaho Waste Processing Facility.

The Idaho Waste Processing Facility would be constructed and operated in two phases both mixed and nonmixed alpha-contaminated low-level waste, and Phase II would add for mixed and nonmixed transuranic waste. Treatment of alpha-contaminated mixed lo be sufficient to allow land disposal in accordance with DOE Orders and Resource and Recovery Act Land Disposal Restrictions. Treatment of transuranic waste would be s disposal at the Waste Isolation Pilot Plant.

A stand-alone Idaho Waste Processing Facility located near the Radioactive Waste Ma has been postulated for planning purposes and environmental impact analyses. Indee elements and operational capabilities for the facility are still in the process of facility design may consist of a single building or several small buildings housing treatment technologies. If multiple buildings were selected, they may be located n Management Complex or at various existing plant sites on the INEL. Existing buildi house some processing and treatment technologies.

Treatment capabilities for both alpha-contaminated low-level waste and transuranic opening and sorting, pretreatment and treatment, and immobilization. The design th to 6,500 cubic meters per year (5,200 to 8,500 cubic yards per year). Each of thes briefly described below:

- Opening and Sorting: Facilities would be provided for the capability to o various sizes of barrels, boxes, and bins of waste. The waste is both con remote-handled; therefore, the systems to handle this waste will require s After opening, the waste would be inspected and sorted and segregated for

- Pretreatment and Treatment: In this part of the process, the contact-hand sized in preparation for treatment of the hazardous constituents. This tr thermal, nonthermal, or a combination of both. A thermal treatment would hazardous and toxic constituents. A nonthermal treatment could also be pr chemical wash system. Treatment would probably also consist of a decontam The decontaminated material could be recycled or sent to the immobilizatio amalgamation process would probably also be provided for some metals, such Some remote-handling capability would also be required in these processes.

- Immobilization: Immobilization processes would probably be provided where material would be converted to an environmentally stable configuration. I treatments would probably include sulfur polymer cement, portland cement, basalt. These processes would fix loose materials in place within a matri material. Immobilization is a preferred treatment for a number of waste f resin fines, and substances contaminated with heavy metals.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.

The proposed project involves new construction assumed to be outside major facility Figure C-1-1 for assumed location and Section C-3.2 for a discussion of new constru facility areas.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Tables C-4.4.3-1 (Phase I) and C-4.4.3-2 (Phase II). These table information on environmental impacts in Section C-3.2 and on mitigation of impacts applicable issues are discussed in Section C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - This option would defer treatment of alpha-contaminated low-level was corresponds to Alternative A (No Action) evaluated in this EIS. This option would storage of the waste.

Shipment Offsite - This option would provide for the transport and treatment of t site and would require construction of a treatment facility at the offsite location Alternative C (Minimum Treatment, Storage, and Disposal) evaluated in this EIS.
Private Sector Treatment - A Private Sector Alpha-Contaminated Mixed Low-Level Wa Facility (see Section C-4.4.1) would be designed and evaluated in parallel with the Facility. This option also corresponds with Alternatives B (Ten-Year Plan) and D ( Storage, and Disposal) evaluated in this EIS. The Private Sector Alpha-Contaminate Waste Treatment facility could treat the same waste streams and

**Table C-4.4.3-1. Summary of potential environmental impacts of the Idaho Waste Pro** Facility Phase I under Alternative B.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | Disturb 20 acres of previously undisturbed soil; no conflict with existing land use policies | Prevent |
| Water resources | Construction: No information<br>Operation: 20,000,000 liters/year water use<br>Effluent: construction water | Enginee<br>Storm W<br>Plan in |
| Wildlife and habitat | Loss of biodiversity and habitat productivity; animal displacement and mortality; potential for habitat fragmentation | Avoid w<br>and cri<br>erosion |
| Historic, archaeological, or cultural resources | Unknown number of sites | Conduct<br>mitigat<br>require |
| Air resources | Radiological operational emissions<br>0.046% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>86% of significance level for combined TAPs<br>31% of significance level for lead<br>60% of significance level for mercury<br>Prevention of Significant Deterioration (PSD)<br>34% 3-hr SO2 - Class I, Craters of the Moon Wilderness Area<br>Visibility: Control measures may be needed to avoid degraded visibility at Craters of the Moon Wilderness Area | Facilit<br>criteri<br>and sur |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>4.6 y 10-3 mrem/yr (alpha)<br>2.3 y 10-9 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: Not operational<br>Year 2010: 0.017 (alpha) person rem/yr<br>9 y 10-6 latent cancer fatalities/yr<br>Nonradiological effects: Negligible impact expected. | Access<br>safety<br>surveil<br>require |
| Transportationd | Construction (onsite truck trips):<br>Nonradiological - 47.6<br>Operation (onsite truck trips per year):<br>Nonradiological - 8.7<br>Radiological - 340 | Use of<br>and con<br>operato<br>manifes |
| Waste management | Construction (m3): industrial waste - 1,750<br>Operation (m3/yr): transuranic waste - 26<br>low-level waste - 20<br>mixed low-level waste - 19<br>industrial waste - 320 | Waste m<br>program |
| Socioeconomic conditions | Construction: 145 peak, 72 average subcontractor personnel<br>Operation: 167 existing workers | None re |

a. Definition of acronyms: NESHAP - National Emission Standards for Hazardous Air
b. Reference location for impact analysis: 4 kilometers (2.5 miles) east of the R Complex. Potential impacts are described further in Section C-3.2.

c. Mitigative measures are described further in Section C-3.3.
d. No offsite shipments are allocated to this project because the Transuranic Stor Project was assumed to serve as the transfer point for offsite wastes.

**Table C-4.4.3-2. Summary of potential environmental impacts of the Idaho Waste Pro** Facility Phase II under Alternative B.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | Disturb 20 acres of previously undisturbed soil; no conflict with existing land use policies | Prevent |
| Water resources | Construction: No information<br>Operation: Water use 20,000,000 liters/year<br>Effluent: construction water | Storm W<br>Prevent<br>INEL |
| Wildlife and habitat | Loss of biodiversity and habitat productivity; animal displacement and mortality; potential for habitat fragmentation | Avoid w<br>resourc<br>prevent |
| Historic, archaeological, or cultural resources | Unknown number of sites | Conduct<br>mitigat<br>require |
| Air resources | Radiological operational emissions<br>4.2% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs) parameter values<br>86% of significance level for combined TAPs<br>31% significance level for lead<br>60% significance level for mercury<br>Prevention of Significant Deterioration (PSD)<br>34% 3-hr SO2; Class I, Craters of the Moon Wilderness Area<br>Visibility: Control measures may be needed to avoid degraded visibility at Craters of the Moon Wilderness Area | Facilit<br>accepta<br>analysi<br>surveil |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>0.42 mrem/yr (transuranic)<br>2.1 y 10-7 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: Not operational<br>Year 2010:<br>1.6 (transuranic) person-rem/yr<br>8.0 y 10-4 latent cancer fatalities/yr<br>Nonradiological effects<br>Negligible impact on health effects expected | Access<br>safety<br>surveil<br>require |
| Transportationd | Construction (onsite truck trips):<br>Nonradiological - 47.6<br>Operation (onsite truck trips per year):<br>Nonradiological - 8.7<br>Radiological - 677 | Use of<br>vehicle<br>qualifi<br>and shi<br>procedu |
| Waste management | Construction (m3): industrial waste - 1,750<br>Operation (m3/yr): transuranic waste - 31<br>low-level waste - 30<br>mixed low-level waste - 24<br>industrial waste - 320 | Waste m<br>recycli<br>INEL |
| Socioeconomic conditions | Construction: 55 peak, 28 average subcontractor personnel<br>Operation: 167 existing workers | None re |

a. Definition of acronyms: NESHAP - National Emission Standards for Hazardous Air
b. Reference location for impact analysis: 4 kilometers (2.5 miles) east of the R Complex. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.
d. No offsite shipments are allocated to this project because the Transuranic Stor Project was assumed to serve as the transfer point for offsite wastes.

achieve the same treatment requirements as the Idaho Waste Processing Facility. Th between the Idaho Waste Processing Facility and the Private Sector Alpha-Contaminat Waste Treatment facility would be in how they would be funded and operated. The Id Facility would be DOE funded and contractor operated, while the Private Sector Alph Low-Level Waste Treatment facility would be privately owned and operated. Upon com preliminary designs and associated evaluations, a single facility would be chosen t selection of the treatment facility is scheduled to occur in 1997.

## Figure. (page 2) C-4.4.4 SHIPPING/TRANSFER STATION

Figure. Project Data Sheet-Idaho Waste Processing Facility. (page 1)

PROJECT NAME: Shipping/Transfer Station

GENERAL PROJECT OBJECTIVE: The general objective of the proposed INEL Shipping/Tra Project would be to provide a centralized facility to accept waste directly from st facilities for transport offsite to other DOE sites [EIS Alternative C (Minimum Tre Disposal)]. The waste types would include alpha-contaminated low-level waste that same as the transuranic wastes, low-level waste, and mixed low-level waste. The en alpha-contaminated low-level waste is presently stored at the Radioactive Waste Man This waste needs to be retrieved, inspected, and prepared for transportation before Radioactive Waste Management Complex boundary. Low-level waste and mixed low-level generated at many sites throughout the INEL.

PROJECT DESCRIPTION: This project would provide for the design, construction, and Shipping/Transfer Station. All alpha-contaminated low-level wastes, low-level wast waste would be transported from this facility to treatment, storage, and disposal f (Minimum Treatment, Storage, and Disposal). In addition, an expansion of the exist Examination Pilot Plant facility located at the Radioactive Waste Management Comple identify alpha-contaminated low-level wastes for transport.

The new Shipping/Transfer Station would be designed to receive and transport all IN low-level wastes, low-level waste, and mixed low-level waste. Waste would be recei storage, other INEL facilities, or the Stored Waste Examination Pilot Plant after c The waste would be loaded for transport offsite. The capability of loading and unl 8 semitrailer trucks (680 drum equivalents per day total) each working day would be building would have four enclosed loading/unloading bays, each about one-half the s Examination Pilot Plant bay, and office and utility spaces. The new facility would structure with a total floor area of 2,800 square meters (3,300 square yards).

Under this project the Stored Waste Examination Pilot Plant building would be expan three times) or a new, enlarged building of a similar type would be constructed. T Examination Pilot Plant facility is needed to inspect waste packages (including box waste is transuranic waste or alpha-contaminated low-level waste. The expanded Sto Pilot Plant facility would examine waste boxes that are not able to be examined in Examination Pilot Plant facility. The building would be separated into three gener and utility area, including a control room that overlooks the other two areas; an e testing area; and a large enclosed bay for transferring waste to and from the Shipp would be three cranes in the building: a 5-ton bridge crane, a 3-ton gantry crane, The shipping facility would be located at the Radioactive Waste Management Complex facility) where approximately 60 percent of the waste to be transported originates. of the waste would be accumulated in existing storage facilities until subsequent t Shipping/Transfer Station and final shipment to the offsite treatment, storage, and expanded Stored Waste Examination Pilot Plant facility would be located at the Radi Management Complex since characterization of alpha-contaminated low-level waste is transportation activities.

A similar project is considered (for transport of waste to the private sector) as p Radioactive Waste Management Complex to support Private Sector Treatment of Alpha-C Mixed Low-Level Waste (see Section C-4.4.2).

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternative C Treatment, Storage, and Disposal). The project data sheet at the end of this proje above project description.

The proposed project would be located within a major facility area (the Radioactive Complex), possibly integral to an existing facility. (See Figure C-1-1 for locatio

discussion of new construction in a major facility area.)
Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.4.4-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, the Shipping/Transfer Station would not be constru corresponds to Alternatives A (No Action), B (Ten-Year Plan), and D (Maximum Treatm Disposal) evaluated in this EIS.

Direct Shipment of Low-Level Waste and Mixed Low-Level Waste - This option locate facility (for alpha-contaminated low-level wastes only) at the Radioactive Waste Ma requires the existing sites to store and transport low-level waste and mixed low-le facilities (distributed shipping facilities). The expanded Stored Waste Examinatio be located at the Radioactive Waste Management Complex since this process is requir transportation activities. This option is bounded by the analysis in this EIS.

**Table C-4.4.4-1. Summary of potential environmental impacts of the Shipping/Transf** Project under Alternative C.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | Disturb 5 acres of previously undisturbed soil; no conflict with existing land use policies | Project facilit |
| Water resources | Construction: 3,200,000 liters<br>Operation: 2,000,000 liters/year<br>Effluents: 10,000,000 liters construction water | Enginee Storm W Plan in |
| Wildlife and habitat | Loss of biodiversity and habitat productivity; animal displacement and mortality; potential for habitat fragmentation | Avoid w and cri erosion |
| Historic, archaeological, or cultural resources | Unknown number of sites | Conduct mitigat require |
| Air resources | Radiological operational emissions<br>No information<br>Toxic Air Pollutants (TAPs)<br>None<br>Prevention of Significant Deterioration (PSD)<br>None | Depends may inc stabili |
| Human health | Radiation exposures and cancer risk<br>No information<br>Nonradiological effects<br>No information | Access safety surveil |
| Transportationd | Construction (onsite truck trips):<br>Nonradiological - 5.4<br>Operation (truck trips per year):<br>Nonradiological - 2.7 onsite<br>Radiological - 2.9 onsite; 1,459 offsite | Use of and con qualifi shipmen |
| Waste management | Construction (m3): industrial waste - 200<br>Operation (m3/yr): low-level waste - 50<br>mixed low-level waste - 50<br>industrial waste - 100 | Waste m program |
| Socioeconomic conditions | Construction: 25 workers average/50 peak subcontractor personnel<br>Operation: 12 existing, 10 new workers | None re |

a. Definition of acronyms: none.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.
d. All transportation of low-level and mixed low-level waste from the INEL under A Treatment, Processing, and Disposal) are allocated to this project.

## C-4.5 PROJECTS RELATED TO LOW-LEVEL WASTE

Figure. Project Data Sheet-Shipping/Transfer Station Project.

### C-4.5.1 WASTE EXPERIMENTAL REDUCTION FACILITY INCINERATION

PROJECT NAME: Waste Experimental Reduction Facility Incineration
PURPOSE AND NEED FOR ACTION: The general objective of this proposed project is to reduction of low-level waste and treatment of mixed low-level waste to render it no land disposal restriction regulations.
The purpose of the proposed DOE action is to provide Resource Conservation and Reco treatment capability for DOE mixed low-level waste and to reduce the volume of low-disposal. The action would reduce the volume and toxicity of mixed low-level waste Resource Conservation and Recovery Act regulations (40 CFR Part 268) and Idaho Haza Management Act requirements. In addition, the action would support continued compl following DOE Order 5820.2A (DOE 1988) requirement: "Waste treatment techniques su shredding, compaction, and solidification or other Resource Conservation and Recove treatments to reduce volume and provide more stable waste forms shall be implemente disposal facility performance requirements." The proposed action would also aid DO responsibility for providing long-term management of mixed low-level waste and low-methods that are technically and environmentally sound.
This project would involve the treatment of mixed wastes. Under the Federal Facili 1992, DOE is required to negotiate with states or the U.S. Environmental Protection to develop site treatment plans, including schedules and milestones, to develop tre construct facilities that would treat mixed wastes. Decisions on these treatment t facilities would be made in conjunction with negotiations already underway with the to the Federal Facility Compliance Act, and after appropriate National Environmenta been completed.
Disposal of mixed low-level waste is constrained because of a shortage of treatment sites. To dispose of mixed low-level waste in accordance with Resource Conservatio disposal restrictions, the hazardous constituents must be treated unless the dispos U. S. Environmental Protection Agency that migration of hazardous constituents in t not occur. No site has been approved for disposal of mixed low-level waste without of mixed low-level waste must be incinerated to comply with the U. S. Environmental technology-based treatment standards (40 CFR Part 268). Incineration is the techno standard for most of the mixed low-level waste at the INEL.
DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES: The proposed action is to perform incineration of low-level and mixed low-level waste at the Waste Experimental Reduc no action alternative, incineration of waste would not be performed at the Waste Ex Facility. Two onsite alternatives were considered: (a) treat mixed low-level wast incineration, and (b) construct and operate a new mixed low-level waste incinerator alternative involves treating low-level and mixed low-level waste at another DOE in
Proposed action: This project would provide low-level waste and mixed low-le at the Waste Experimental Reduction Facility. It will also modify the existing org system to (a) provide the capability to incinerate either organic or aqueous waste the Waste Experimental Reduction Facility incinerator and (b) provide a location fo blending, and repackaging operations.
The Waste Experimental Reduction Facility is an existing Resource Conservation and status facility. The organic liquid waste injection system at the Waste Experiment being modified as part of the Resource Conservation and Recovery Act Part B permitt Compaction and sizing of low-level waste is an ongoing activity at the Waste Experi Facility. An environmental assessment for these operations has been prepared (DOE/ 1993f).
The incinerator is a dual-chambered, controlled-air, combustion unit with a maximum capacity of 5.5 million Btu per hour. The incinerator system consists of the follo

- A solid waste feed system that automatically conveys the solid waste conta waste, hazardous waste, and mixed low-level waste
- A liquid waste feed system and a burner assembly for incinerating waste in chamber

- Automatic waste feed cutoff systems for both solid and liquid wastes
- A primary (lower) chamber, where liquid and solid wastes are introduced an takes place at starved air conditions for solid waste and excess air condi
- A secondary (upper) chamber that acts as an afterburner for the unburned v the wastes in the primary chamber, resulting in very little incomplete com emissions
- A combination of two dilution air streams and a shell-and-tube heat exchan combustion gas before it reaches the air pollution control equipment
- An air pollution control system using baghouse and high-efficiency particu
- A bottom-ash removal system to remove ash through a cooling hopper located lower chamber.

Solid wastes would be charged from a conveyor system. The wastes would be packed i to 2 by 2 by 2 feet. Boxes typically contain clothing, rags, plastics, and other c Liquid wastes would be fed to the incinerator through above-ground piping that is c in the liquid waste feed shelter. The injection nozzle is designed to provide high atomizing the liquid waste into fine droplets.

Liquid wastes would be repackaged in boxes before incineration, as appropriate. Th done for wastes that cannot be fed through the liquid feed system. The in-box meth incineration would consist of placing liquids in an approved absorbent and then pro waste.

To provide a greater capability for processing not only hazardous and mixed organic aqueous wastes, modifications to the existing organic liquid injection system would modifications would include (a) a dedicated ventilation system with redundant blowe Waste Experimental Reduction Facility north stack; (b) the capability to process fl defined in 29 CFR 1910.106); (c) the capability to sample, blend, and/or repackage of waste management/processing activities; (d) the capability to inject up to 30 ga wastes as a finely atomized stream into the lower chamber of the Waste Experimental incinerator; and (e) the capability to install blend and hold tanks.

The automatic waste feed cutoff system would prevent the feeding of waste into the chamber when key incineration conditions fall outside the predetermined range. The automatically lock out operation of the solid feed system and close valves in the l proper operating conditions are restored. All automatic waste feed cutoff paramete cause solid and liquid waste feed to be interrupted. Additionally, parameters that reduction in heat and/or offgas generation could be set up to also interrupt auxili parameters chosen for the automatic waste feed cutoff system are those listed as "G Environmental Protection Agency's Hazardous Waste Incinerator Guidance. The operat automatic waste feed cutoff system (parameter set points) would be determined from in the trial burn.

Waste Experimental Reduction Facility operations were suspended in February 1991 to documentation, operating procedures, and management systems. The documentation is reflect actual Waste Experimental Reduction Facility configurations and to comply w orders. The documentation and facility operational readiness would be evaluated an contractor oversight teams before waste reduction operations are resumed.

DOE needs to treat mixed low-level waste to comply with Resource Conservation and R requirements for storage and disposal, and to provide support for ongoing DOE activ low-level waste. The INEL generates and, under all alternatives, is expected to co waste and mixed low-level waste during energy, defense, and environmental restorati the Waste Experimental Reduction Facility was established to develop and demonstrat volume reduction and stabilization processes. The Waste Experimental Reduction Fac waste incineration in 1984. Most of the waste processed at the Waste Experimental been low-level waste; however, a trial burn was conducted in 1986 for mixed low-lev the Waste Experimental Reduction Facility's ability to meet Resource Conservation a incineration requirements, and eight pilot mixed low-level waste incineration campa during 1989 and 1990. No incineration is currently being done. The facility has a not expected to be evaluated under the EPA's new "combustion strategy." Incinerati Experimental Reduction Facility has been deferred pending the Record of Decision fo waste volume reduction activities are ongoing and are part of Alternative A (No Act

Mixed low-level waste is generated at Test Area North, Test Reactor Area, Idaho Che Central Facilities Area, Power Burst Facility, Radioactive Waste Management Complex Facility, Argonne National Laboratory-West, and the Idaho Falls Facilities. Source restoration, production operations, laboratory activities, construction, maintenanc development activities. The wastes consist of paint stripper and paint chips, prot absorbent, filters, solvents, oils, sludges, and laboratory wastes. The hazardous Resource Conservation and Recovery Act characteristic materials and listed material inorganics, and metals.

Mixed low-level waste is currently stored at various INEL facilities. The current cubic meters (130 cubic yards) of incinerable mixed low-level waste. Based on Land requirements, this waste may be stored solely for the purpose of accumulating quant facilitate treatment. Currently, the Waste Experimental Reduction Facility is the capable of incinerating INEL mixed low-level waste; commercial incineration of INEL is not available. Future INEL activities are expected to generate approximately 1, cubic yards) of incinerable mixed low-level waste each year. Existing permitted st cubic meters (2,300 cubic yards). Treatment capacities must be available for this low-level waste.

The proposed action would involve incinerating mixed low-level waste at the Waste E Facility incinerator beginning in 1996. With the incinerator operational treatment meters per year (2,200 cubic yards per year), the INEL permitted storage capacity f level waste would not be exceeded through the year 2005 (Figure C-4.5.1-1).

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.

Project-Specific Alternatives: The alternatives to the proposed action are desc sections

**Figure C-4.5.1-1. Incinerable mixed low-level waste volumes stored at the Idaho Nat**

No Action - The no action alternative would be to continue storing INEL mix INEL and process incinerable low-level waste at a commercial facility. Incineratio mixed low-level waste would not be performed at the Waste Experimental Reduction Fa existing and future generated INEL mixed low-level waste and small quantities (less offsite-generated mixed low-level waste would require continued storage. Through 1 cubic meters (140 cubic yards) of incinerable mixed low-level waste would be stored projected generation rates, the INEL would exceed mixed low-level waste storage cap year 2005, approximately 12,000 cubic meters (15,700 cubic yards) of incinerable mi would be stored in noncompliance with the Resource Conservation and Recovery Act un alternative (Figure C-4.5.1-1).

Treat Incinerable Mixed Low-Level Waste by Methods Other than Incineration - standards for most mixed low-level waste that have been established by the U.S. Env Agency are based upon the demonstrated capabilities of incineration. Incineration treatment standard for most of the mixed low-level waste on the INEL. Few other te demonstrated that meet the standards. Therefore, the application of other technolo and biological or chemical treatments) would require a period of time (assumed to b for testing, demonstration, and implementation on a production scale. The incinera volumes requiring storage would be similar to Alternative A (Figure C-4.5.1-1). Th impacts for treatment of nonincinerable mixed low-level waste are described in Appe C.4.6.4).

Construct and Operate a New Mixed Low-Level Waste Incinerator - This altern constructing a new incinerator to provide production-scale treatment of INEL mixed incinerator would treat characteristic and listed hazardous constituents in mixed l level waste would continue to be stored until the incinerator is operational, and t waste would be stored for a short time until sufficient quantities were accumulated term storage of mixed low-level waste would not be necessary after the incinerator incinerator would require an approved Resource Conservation and Recovery Act Part B trial burn, before mixed low-level waste treatment operations commence. Constructi was included as part of Alternative D (Maximum Treatment, Storage, and Disposal). and impacts of the new mixed low-level waste incinerator are described in Appendix However, the new facility is not planned to begin treating mixed low-level waste un Therefore, if the Waste Experimental Reduction Facility is not operated, the incine waste volumes requiring storage would be similar to Alternative A (Figure C-4.5.1-1 (Maximum Treatment, Storage, and Disposal), where additional mixed low-level waste new facility is proposed and the Waste Experimental Reduction Facility incinerator

interim. Additional mixed low-level waste storage similar to the transuranic stora Section C-2.8) may be needed on an interim basis under Alternative D, pending compl facilities.

Treat Mixed Low-Level Waste and Low-Level Waste at Another DOE Incinerator - the Waste Experimental Reduction Facility, DOE has several existing or planned radi incinerators at defense program sites throughout the U.S. that could potentially be wastes proposed for the Waste Experimental Reduction Facility. Incinerators are lo Plant in Colorado, Los Alamos National Laboratory in New Mexico, and Oak Ridge Rese Tennessee. Currently, the Waste Experimental Reduction Facility incinerator at the Substance Control Act incinerator at the Oak Ridge Reservation K-25 site are the on in the DOE system capable of treating many forms of mixed low-level waste. The Roc Alamos National Laboratory incinerators are not presently operating. The Oak Ridge is not suitable for beta/gamma-contaminated wastes and is scheduled to operate at o wastes. DOE has also prepared an Environmental Assessment and issued a Finding of Impact for the Consolidated Incineration Facility, a proposed hazardous and mixed w Savannah River Site. However, DOE will not operate the Consolidated Incineration F decisions on its future mission are made based on the Savannah River Site Specific The designated missions and Resource Conservation and Recovery Act permits for othe generally prohibit receiving and treating INEL-generated wastes. This alternative included as part of Alternative C (Minimum Treatment, Storage, and Disposal at INEL volumes of mixed low-level waste stored at the INEL under this option would be negl Figure C-4.5.1-1.

DESCRIPTION OF THE AFFECTED ENVIRONMENT: The proposed action would be located in a existing facility within a major facility area, the Power Burst Facility/Auxiliary (Figure C-1-1). Other information regarding the affected environment of the Power Reactor Area, INEL site, and surrounding area is covered by other sections of this referenced in Section C-3.1.

ENVIRONMENTAL EFFECTS: The potential environmental effects associated with the pro other than those identified below are summarized in Table C-4.5.1-1. This table is information on environmental impacts in Section C-3.2 and on mitigation of impacts applicable issues are discussed in Section C-3.4. Impacts from alternatives to the summarized in Table C-4.5.1-2.

Atmospheric Emissions During Operations - Projected air emissions from the Was Reduction Facility would result in air pollutant loading of both radiological and n The projected dose to the maximally exposed individual due to Waste Experimental Re emissions is less than 0.01 mrem per year, below the applicable National Emission S Air Pollutants limit of 10 mrem per year. Nonradiological pollutant levels are bel A detailed listing (based on historical emissions) of the nonradiological criteria pollutant constituents analyzed and the resulting air concentrations is provided in of this EIS.

Transportation Impacts - The potential impacts of the proposed low-level waste the Waste Experimental Reduction Facility would be extremely small. The maximum cu health risk to transportation workers from incident-free waste transport over the 2 estimated to be 0.09 deaths. The maximum radiological and nonradiological health r incident-free waste transport over 20 years is estimated to be 0.82 deaths. Up to from transportation accidents. The analysis is considered conservative; actual eff Because these shipments would involve very small quantities of mixed low-level wast radiological impacts from transporting mixed low-level waste would be bounded by ra from transporting low-level waste. Transportation impacts from the hazardous (nonr of mixed low-level waste would result only if an accident involving a spill were to accidents per year, or one accident in 50 years, would be expected

**Table C-4.5.1-1. Summary of potential environmental impacts of the Waste Experimen** Reduction Facility Incineration Project under Alternative B.

| Environmental attribute | Potential impact | Potent |
|---|---|---|
| Geology and soil, acres disturbed | None (no disturbed soil) | Project f |
| Water resources | Operation: water use 600,000 liters/year<br>Effluent: None | Storm W Plan in |
| Wildlife and habitat | None | Project |
| Historic, archaeological, or | None | Project facilit |

| | | |
|---|---|---|
| cultural resources | | |
| Air resources | Radiological operational emissions<br>0.3% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>46% of significance level for combined TAPs<br>Prevention of Significant Deterioration (PSD)<br>1.5 % of 24-hr S02 - Class II, public highway<br>Visibility: Control measures may be needed to avoid degraded visibility at Craters of the Moon Wilderness Area | Primary be cont feed th Criteri Protect offgas HEPA fi monitor radiolo permitt require Access analysi annual |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>0.029 mrem/yr<br>1.4 y 10-7 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: 0.21 person-rem/yr<br>1.1 y 10-4 latent cancer fatalities/yr<br>Year 2010: 0.23 person-rem/yr<br>1.2 y 10-4 latent cancer fatalities/yr<br>Nonradiological Effects<br>Negligible impact on human health expected | |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 0.3<br>Operation (onsite truck trips per year):<br>Nonradiological - 2.7<br>Radiological - 97.3 | Use of and con operato procedu |
| Waste management | Construction (m3): industrial waste - 10<br>Operation (m3/yr):<br>low-level waste - 15<br>mixed low-level waste - 15<br>industrial waste - 100 | Waste m program |
| Socioeconomic conditions | Construction: Not applicable<br>Operation: No additional workers | None re |

a. Definition of acronyms: HEPA - high-efficiency particulate air; NESHAP - Natio Hazardous Air Pollutants; RCRA - Resource Conservation Recovery Act.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

**Table C-4.5.1-2. Impacts of the project-specific options.**

| Impact | Option 1<br>Continue to store INEL-generated mixed low-level waste | Option 2<br>Treat mixed low-level waste incineration |
|---|---|---|
| Environmental compliance | Existing and future generated INEL mixed low-level waste would require continued storage | Treatments other than incine RCRA standards for mixed low During the U.S. Environmenta approval process, INEL- gene level waste would require co |
| Socioeconomic conditions | Small work force needed to operate mixed low-level waste storage facilities | Similar work force to incine |
| Land use, | Possible increase for storage of mixed low-level waste awaiting treatment | Possible increase for storag waste awaiting treatment |
| Health effects | Near-term risks would be less than for incineration; long-term risks would be higher than for incineration | Near-term risks would be les Due to the possibility of re term risks would be higher t |
| Wildlife and habi | Possible expanded mixed low-level waste storage in previously | Possible expanded mixed low- in previously disturbed area |

| | | |
|---|---|---|
| | disturbed areas | |
| Archaeological an historical sites | Possible impacts due to expanded mixed low-level waste storage | Possible impacts due to expa waste storage |
| Accidents and occupational risk | Mixed low-level waste near-term risk is less than for incineration; long-term risk is greater due to extended storage | Mixed low-level waste near-t for incineration; long-term extended storage |

a. With respect to Waste Experimental Reduction Facility incineration, any discuss

**table encompasses low-level waste except where the Resource Conservation and Recove**
involving mixed low-level waste shipments to the INEL. This low frequency, along w quantities, makes the likelihood of injuries from hazardous material releases in an

Impact of Accidents - DOE considered a range of reasonably foreseeable acciden Experimental Reduction Facility, including earthquakes, an ash spill, a compactor f efficiency particulate air filter fire (DOE/EA-0843) (DOE 1993f). The maximum reas accident associated with Waste Experimental Reduction Facility operations would be end of an incineration campaign. The probability of occurrence is estimated to be conservative estimates, a nearby worker would receive a dose of 1.3 rem, and doses 2.7 mrem. No health effects are expected to anyone onsite or offsite resulting fro Concentrations of metals would be less than levels that would be immediately danger Workers would be expected to exit the area before exposure levels above occupationa reached. No health effects would result to other individuals onsite or offsite. T Reduction Facility mixed low-level waste incineration campaigns have treated approx of flyash from previous campaigns, 11 cubic meters of waste from the Mixed Waste St cubic meters of classified waste from offsite. These campaigns were conducted effi unusual events or system upsets.

Cumulative Impacts - The cumulative impacts of the proposed Waste Experimental R incineration project and other existing and proposed actions are described in Secti Considering reasonably foreseeable actions for each alternative, less than one fata radiation dose or toxic chemical exposure received by the population within 50 mile site from 1995 to 2005.

Decontamination and Decommissioning and Resource Conservation and Recovery Act C Waste Experimental Reduction Facility incinerator facility would eventually require decommissioning and Resource Conservation and Recovery Act closure. The decontamin decommissioning and Resource Conservation and Recovery Act closure would be covered National Environmental Policy Act (NEPA) review.

REQUIRED PERMITS, APPROVALS, AND CONSULTATIONS

The Waste Experimental Reduction Facility incinerator is a Resource Conservation an status unit (40 CFR 265). A Resource Conservation and Recovery Act Part B applicat the State of Idaho in October 1992 (DOE-ID 1992). The Idaho Department of Health a Regulations for the Control of Air Pollution in Idaho require owners or operators o sources to obtain a permit to construct and/or a permit to operate. An application Reduction Facility was submitted June 1993 (Grey et al. 1993). Approval from the U Protection Agency under the National Emission Standards for Hazardous Air Pollutant required for the Waste Experimental Reduction Facility incinerator. The risk asses Conservation and Recovery Act Part B Permit Application was based on adjusted Tier Consultations with Federal and state agencies have been initiated by the U.S. Depar to the preparation of this EIS. Letters regarding consultation under the Endangere Historic Preservation Act have been received (see Appendix B, Consultation Letters) 1993, review by the State of Idaho and the Shoshone-Bannock Tribes was performed on Experimental Reduction Facility environmental assessment (DOE/EA-0843) (DOE 1993f). have been considered in the preparation of this project summary.

## C-4.5.2 Idaho Waste Processing Facility

Figure. Project Data Sheet-Waste Experimental Reduction Facility Incineration Proje
See discription in Section C-4.4.3.

## C-4.5.3 MIXED/LOW-LEVEL WASTE TREATMENT FACILITY

PROJECT NAME: Mixed/Low-Level Waste Treatment Facility
GENERAL PROJECT OBJECTIVE: The general objective of this proposed project would be the design, construction, and operation of a new facility to treat low-level wastes (Resource Conservation and Recovery Act wastes mixed with low-level beta-gamma wast would be treated before disposal at the Radioactive Waste Management Complex or oth project is proposed under Alternative D (Maximum Treatment, Storage, and Disposal). This project would involve the treatment of mixed wastes. Under the Federal Facili 1992, DOE is required to negotiate with states or the U.S. Environmental Protection to develop site treatment plans, including schedules and milestones, to develop tre construct facilities that would treat mixed wastes. Decisions on these treatment t facilities would be made in conjunction with negotiations already underway with the to the Federal Facility Compliance Act, and after appropriate National Environmenta been completed.
PROJECT DESCRIPTION: The Mixed/Low-Level Waste Treatment Facility would provide a treatment facility that would treat both mixed low-level waste and low-level waste Mixed low-level waste has both a radioactive constituent and a Resource Conservatio hazardous constituent. This waste is generated during operations at the INEL and i treatment. Under Alternative D (Maximum Treatment, Storage, and Disposal), mixed l be received from other DOE sites. Mixed wastes are required to be treated before d U.S. Environmental Protection Agency Land Disposal Restrictions regulations. U.S. Protection Agency regulations prohibit storage of Land Disposal Restrictions waste the sole purpose of accumulating sufficient quantities to facilitate proper recover Under Alternative D (Maximum Treatment, Storage, and Disposal), the needed treatmen exceed currently planned low-level waste and mixed low-level waste treatment facili of the Mixed/Low-Level Waste Treatment Facility.
The Mixed/Low-Level Waste Treatment Facility would include several processes to tre mixed low-level waste, including incineration, thermal desorption, stabilization, d macroencapsulation, chemical precipitation, neutralization, and amalgamation.

- Incineration: A process that consumes combustible waste materials. It ca biological components and minimize organic content in the noncombustible r Incineration can greatly reduce the mass and volume of waste. This is the for many organic solvents, aqueous solutions, material contaminated with o and combustible debris.

- Thermal Desorption: A process that consists of heating the feed material chamber of a two-chamber device. Water and volatile (usually organic) com vaporized in the primary chamber and flow to the secondary chamber where t combusted. The feed usually consists of inert material like soil, contami volatile substances. This is the proposed treatment for mixed low-level w pipes, glass, bricks, pieces of concrete, soil) contaminated with toxic or

- Stabilization: A process where waste is converted to a more stable or env configuration. This can include chemical reaction, to transform the waste active form; solidification, to make a liquid into a solid; and immobiliza material and fixes it in place within a matrix of inert material. This is for ash, resin fines, and substances contaminated with heavy metals not am treatments.

- Decontamination: A process that removes radioactive, toxic, or organic su surfaces of structures, parts, components, or debris. Waste stream decont deals with debris and rubble composed of metal, plastics, concrete, rubber material.

- Macroencapsulation: A process where a waste piece or agglomerate is isola another substance such as a polyethylene epoxy. This is the proposed trea cadmium solids, and debris that cannot be decontaminated.

- Chemical Precipitation: A process where a soluble substance is converted by a chemical reaction or by changes in the solvent. The precipitated sol process is applied to the removal of toxic metals from aqueous wastes. Su

mercury, lead, arsenic, and cadmium.

- Neutralization: A process where corrosive wastes, both acidic and caustic deactivated to meet pH standards.
- Amalgamation: A process where a base metal such as zinc or copper is blen elemental mercury to form a solid alloy. Amalgamation is the specified tr mercury containing waste.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternative D Treatment, Storage, and Disposal). The project data sheet at the end of this proje above project description.

The proposed project might be located at an existing site or at a previously undist purposes, a typical location was assumed about 2.5 miles east of the Radioactive Wa Complex, thus would involve new construction assumed to be outside major facility a for assumed location and Section C-3.2 for a discussion of new construction outside Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.5.3-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

**Table C-4.5.3-1. Summary of potential environmental impacts of the Mixed/Low-Level**

PROJECT-SPECIFIC OPTIONS:
No Action - This option would defer construction of the Low-Level Waste and Mixed Treatment Facility. This option corresponds to Alternatives A (No Action) and C (M Storage, and Disposal) evaluated in this EIS.
Modify and Operate the Waste Experimental Reduction Facility - This option would Experimental Reduction Facility. This option corresponds to Alternative B (Ten-Yea Alternative D (Maximum Treatment, Storage, and Disposal) evaluated in this EIS.
Offsite Treatment - This option would provide for the private sector treatment of low-level waste. This option corresponds to Alternatives B (Ten-Year Plan) and D ( Storage, and Disposal) evaluated in this EIS.

## C-4.5.4 MIXED/LOW-LEVEL WASTE DISPOSAL FACILITY

**Figure. Project Data Sheet-Mixed/Low-Level Waste Treatment Facility Project.**

PROJECT NAME: Mixed/Low-Level Waste Disposal Facility
GENERAL PROJECT OBJECTIVE: The Mixed/Low-Level Waste Disposal Facility would meet INEL disposal needs for low-level waste, mixed low-level waste, and alpha-contamina addition, under Alternative D (Maximum Treatment, Storage, and Disposal), the Mixed Disposal Facility would provide disposal for selected DOE complex low-level waste, and alpha-contaminated low-level waste.
PROJECT DESCRIPTION: This project would provide for the design, construction, and permanent radioactive waste disposal facility. The facility would provide permanen waste generated from routine operations, waste generated from environmental restora generated from decontamination and decommissioning activities, and waste that is in Under EIS Alternative D (Maximum Treatment, Storage, and Disposal), the Mixed/Low-L Disposal Facility would receive waste for disposal from other DOE sites.
The proposed facility would be designed and permitted to accept low-level waste; tr waste, which is low-level waste mixed with hazardous contaminants, as defined by th Conservation and Recovery Act; and alpha-contaminated low-level waste, which is low low-level waste) that contains transuranic isotopes at concentrations ranging from gram of waste.
The Resource Conservation and Recovery Act requires that waste containing hazardous treated to meet certain criteria before it can be accepted for disposal.
The Mixed/Low-Level Waste Disposal Facility would have acceptance criteria establis All wastes accepted for disposal would have to meet applicable parts of the accepta would include the Resource Conservation and Recovery Act criteria for mixed low-lev treatment that could be required before acceptance include sorting and segregation,

repackaging, macroencapsulation, melt recycling, decontamination, chemical precipit reduction, and incineration.

The facility would use a combination of waste forms (such as immobilized in calcine engineered barriers (such as enclosures, pads, layers of clay, or uses of other non hydrogeologic setting (soil characteristics, distance above aquifer, and area of lo isolation of waste.

As the Mixed/Low-Level Waste Disposal Facility would be starting up, the current di Waste Management Complex) would be reaching capacity and cutting back. The Radioac Management Complex is currently accepting low-level waste for disposal. Even thoug amount of mixed waste and alpha-contaminated low-level waste, the Radioactive Waste Complex is no longer accepting mixed low-level waste or alpha-contaminated low-leve

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternative B expanded under Alternative D (Maximum Treatment, Storage, and Disposal). The proje end of this project summary support the above project description.

The proposed project might be located at an existing site or at a previously undist purposes, a typical location was assumed about 2.5 miles east of the Radioactive Wa Complex, thus would involve new construction assumed to be outside major facility a for assumed location and Section C-3.2 for a discussion of new construction outside

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as under Alternative B are summarized in Table C-4.5.4-1. This table is complemented environmental impacts in Section C-3.2 and on mitigation of impacts in Section C-3. issues are discussed in Section C-3.4.

**Table C-4.5.4-1. Summary of potential environmental impacts of the Mixed/Low-Level** Disposal Facility Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | Disturb 200 acres previously undisturbed soil; no conflict with existing land use policies | Prevent |
| Water resources | Construction: 2,000,000 liters<br>Operation: 2,500,000 liters/year<br>Effluents: 2,000,000 liters construction water; 2,500,000 liters/year operation water | Enginee Storm W in plac |
| Wildlife and habitat | Loss of biodiversity and habitat productivity; animal displacement and mortality; potential for habitat fragmentation | Avoid w and cri erosion |
| Historic, archaeological, or cultural resources | Unknown number of sites, located in archaeologically sensitive area, known site in vicinity. | Conduct accordi C-3.3.4 |
| Air resources | Radiological operation emissions<br>No information available. (Implementation not until after 2004)<br>Toxic Air Pollutants (TAPs)<br>None<br>Prevention of Significant Deterioration (PSD)<br>None | TBD |
| Human health | No information available.<br>Implementation not until after 2004 | TBD |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 27<br>Operation (onsite truck trips per year):<br>Nonradiological - 4<br>Radiological - 206 | Use of and con operato procedu |
| Waste management | Construction (m3): industrial waste - 1,000<br>Operation (m3/yr): low-level waste - 17<br>industrial waste - 150 | Waste m program |
| Socioeconomic conditions | Construction: 174 subcontractor personnel<br>Operation: 50 existing workers | None re |

a. Definition of acronyms: TBD - to be determined.

b. Reference location for impact analysis: 4 kilometers (2.5 miles) east of the R Complex. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

PROJECT-SPECIFIC OPTIONS:
No Action - Under this option, no changes would be made to current low-level wast the INEL. This option corresponds to Alternative A evaluated in this EIS. Shallow waste would continue until all available space at the Radioactive Waste Management Once available space at the Radioactive Waste Management Complex was used up, eithe waste would have to cease, or alternative storage or disposal practices would have alternative would not provide Resource Conservation and Recovery Act permitted disp treated mixed low-level waste, and would not allow disposal of the INEL's inventory low-level waste. This alternative also would not provide for projected low-level w waste inventories generated from potential decontamination and decommissioning acti
Expand Radioactive Waste Management Complex - Under this option, the boundaries o Waste Management Complex would be expanded. This option is not evaluated in this E would include additional space for future quantities of low-level waste, permitted low-level waste, and space for alpha-contaminated low-level waste. This alternativ same programmatic steps as the proposed action, including National Environmental Po analysis, Resource Conservation and Recovery Act permitting, and performance assess would allow use of the existing Radioactive Waste Management Complex infrastructure facilities, utilities, and roads, but would not allow potential benefits of a diffe hydrogeologic characteristics, such as flooding elevation with respect to the 100-y distance from basalt formations.
Transport to Offsite Facility for Disposal - Under this option, INEL low-level wa waste would be packaged and transported to a non-INEL facility for disposal. This Alternative C (Minimum Treatment, Storage, and Disposal) evaluated in this EIS. Th acceptance by the "host" state and would require transporting the waste across hund roads, introducing some new health and safety risks to the public. This option wou current restrictions that DOE-generated waste be disposed of at the site where gene site.
Indefinite Storage Onsite - Under this option, the waste would be put into monito permanent disposal option is identified. The monitoring would check the integrity configuration and verify compliance with a large number of recent requirements appl This option would require design and construction of monitored storage buildings at INEL. Impacts from construction would be similar to those anticipated for the prop allows additional time to implement permanent disposal of the waste.

### Figure. (page 2) C-4.5.5 SHIPPING/TRANSFER STATION

Figure. Project Data Sheet-Mixed/Low-Level Waste Disposal Facility Project. (page 1
See desription in Section C-4.4.4.

## C-4.6 PROJECTS RELATED TO MIXED LOW-LEVEL WASTE

### C-4.6.1 WASTE EXPERIMENTAL REDUCTION FACILITY INCINERATION

See description in Section C-4.5.1.

### C-4.6.2 IDAHO WASTE PROCESSING FACILITY

See description in Section C-4.4.3.

### C-4.6.3 MIXED/LOW-LEVEL WASTE TREATMENT FACILITY

See description in Section C-4.5.3.

## C-4.6.4 NONINCINERABLE MIXED WASTE TREATMENT

PROJECT NAME: Nonincinerable Mixed Waste Treatment
GENERAL PROJECT OBJECTIVE: The general objectives of this project would be to upgr facilities at the Waste Engineering Development Facility and provide treatment capa mixed low-level wastes that are not suitable for incineration. Mixed low-level was treated before disposal in accordance with U.S. Environmental Protection Agency Lan regulations. Quantities and types of specific waste streams that would be treated on the outcome of the Federal Facility Compliance Act process.
This project would involve the treatment of mixed wastes. Under the Federal Facili 1992, DOE is required to negotiate with states or the U.S. Environmental Protection to develop site treatment plans, including schedules and milestones, to develop tre construct facilities that would treat mixed wastes. Decisions on these treatment t facilities would be made in conjunction with negotiations already underway with the to the Federal Facility Compliance Act, and after appropriate National Environmenta been completed.
DOE needs to treat specific waste types that cannot be treated at the Waste Experim because they don't meet the Waste Acceptance Criteria for the facility. Also, inci appropriate for all waste types such as soils. U.S. Environmental Protection Agenc storage of Land Disposal Restrictions waste unless the storage is for the sole purp sufficient quantities to facilitate proper recovery, treatment, or disposal. Mixed operations at the INEL, and is being stored. Under Alternative D (Maximum Treatmen Disposal), similar waste would be received from other DOE sites and increase the wa be treated.
PROJECT DESCRIPTION: Treatment developed to meet Land Disposal Restrictions standa implemented at the Waste Engineering Development Facility near the Power Burst Faci these modules would be of modest size. The Waste Engineering Development Facility modified to implement new technology as larger treatment facilities are constructed Alternative D (Maximum Treatment, Storage, and Disposal).
The Waste Engineering Development Facility is located at the Power Burst Facility i Power Excursion Reactor Test-II reactor building. The building is a two-story stru exterior walls, and a concrete and steel frame. The reactor high bay area is about The facility was previously used for severe-damage testing of nuclear fuels and mat reactors.
The main floor would be used for receiving, storage, and inspection areas. The var Development Facility processes would be installed in the basement as the processes implemented. The main floor is approximately 510 square meters (600 square yards), space is about 320 square meters (400 square yards). There is an 11-foot, 10-inch the building. A 10-ton overhead bridge crane is already installed in the Special P Test-II building and is being used to lower drums into the basement through access Approximately 880 cubic meters (1,100 cubic yards) of the total mixed low-level was treated under this program; 290 cubic meters (380 cubic yards) would be solidified. (720 cubic yards) would be decontaminated or macroencapsulated; ten cubic meters wo deactivated; 40 cubic meters (50 cubic yards) would be processed by ion-exchange. waste would be processed by mercury roast or retorting. Mercury roasting, retortin is heated to evaporate the mercury that is condensed and recovered for reuse.
Treatment processes for this type of stored waste and for similar mixed low-level w the future are being developed and would be implemented at the Waste Engineering De These U.S. Environmental Protection Agency-approved treatment processes include ion stabilization, macroencapsulation, gamma-ray degradation treatment for polychlorina neutralization, and amalgamation.

- Ion exchange: This process removes dissolved ions from aqueous wastes. I treatment is provided by the existing processes at the Portable Water Trea

- Stabilization: In this process, waste is converted to a more stable or en configuration. This process can include chemical reaction to transform th chemically active form; solidification to make a liquid into a solid; and loose material in place within a matrix of inert material. Immobilization treatment for ash, resin fines, and substances contaminated with heavy met

amenable to other treatments.

- Lead Decontamination: Several decontamination techniques are being evalua insufficient data are available at this time to select a specific option. expected to be available by the time this EIS is submitted.
- Macroencapsulation: In this process, a waste piece or agglomerate is isol another substance such as polyethylene epoxy. This treatment is proposed solids, and debris that cannot be decontaminated.
- Gamma-ray Degradation for Polychlorinated Biphenyls Compounds: This proce polychlorinated biphenyls contaminated mixed waste to gamma-rays from spen
- Neutralization: In this process, corrosive wastes, both acidic and causti deactivated to meet pH standards.
- Amalgamation: In this process a base metal, such as zinc or copper, is bl elemental mercury to form a solid alloy. Amalgamation is the specified tr mercury containing waste.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternative B expanded under Alternative D (Maximum Treatment, Storage, and Disposal). The proje end of this project summary support the above project description.
The proposed project would be located in an existing facility within a major facili Facility/Auxiliary Reactor Area). (See Figure C-1-1 for location and Section C-3.2 projects within an existing facility.)
Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as under Alternative B are summarized in Table C-4.6.4-1. This table is complemented environmental impacts in Section C-3.2 and on mitigation of impacts in Section C-3. issues are discussed in Section C-3.4.
PROJECT-SPECIFIC OPTIONS:
No Action - Under this option, the Nonincinerable Mixed Waste Treatment project w constructed. This option corresponds to Alternatives A (No Action) and C (Minimum and Disposal) evaluated in this EIS. Resource Conservation Recovery Act regulation be developed for mixed low-level wastes in storage. Not performing this project wo U.S. Environmental Protection Agency regulations.
Offsite Treatment at Another DOE Facility - Under this option, the waste would be DOE facility. This option is not evaluated in this EIS. At this time, no offsite treatment of the mixed low-level wastes in storage is available. These plans would developed through ongoing efforts under the Federal Facility Compliance Act, at oth DOE Headquarters. Several sites have announced plans to construct facilities with capability. Transportation of the waste offsite is evaluated in Alternative C (Min and Disposal).
Offsite Treatment at a Private Sector Facility - Under this option, stabilization private sector treatment unit. Available treatment capabilities would not meet the waste types; therefore, this specific option was not analyzed. However this option performed for the Idaho Waste Processing Facility and the Private Sector Alpha-Cont Level Waste Treatment facilities.

**Table C-4.6.4-1. Summary of potential environmental impacts of the Nonincinerable** Waste Treatment Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | None (no disturbed acreage) | Project facilit |
| Water resources | Construction: water use minimal<br>Operation: 200,000 liters/yr | Storm W<br>Prevent |
| Wildlife and habitat | None | Project facilit |
| Historic, archaeological, or cultural resources | None | Project facilit |

| | | |
|---|---|---|
| Air resources | Radiological operational emissions<br>9.9 y 10-3% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>9.7 y 10-8% of significance level for combined TAPs<br>Prevention of Significant Deterioration (PSD): None | Facilit criteri inspect annual |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>9.9 y 10-4 mrem/yr<br>5.0 y 10-10 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: 7.5 y 10-3 person-rem/yr<br>3.8 y 10-6 latent cancer fatalities/yr<br>Year 2010: 8.3 y 10-3 person-rem/yr<br>4.2 y 10-6 latent cancer fatalities/yr<br>Nonradiological effects<br>Negligible impact on health effects expected | Access safety surveil require |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 11.7<br>Operation (onsite truck trips per year):<br>Nonradiological - 2.8<br>Radiological - 147.1 | Use of vehicle equipme shipmen |
| Waste management | Construction (m3): industrial waste - 430<br>Operation (m3/yr): low-level waste - 4<br>mixed low-level waste - 5<br>industrial waste - 100<br>hazardous waste - <1 | Waste m recycli INEL |
| Socioeconomic conditions | Construction: 4 to 6 existing workers<br>Operation: 4 to 6 existing workers | None re |

a. Definition of acronyms: NESHAP - National Emission Standards for Hazardous Air
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

Use Other Technologies at Waste Engineering Development Facility - A number of te considered for implementation at the INEL. Technologies were ranked based on their their level of development, and their amenability to variations in waste. Based on three of these areas, the proposed technologies were selected. As options for stab technologies such as chemical extraction, precipitation, chemical reduction, and bi considered. As alternatives for carbon absorption and gamma degradation, thermal d biodegradation, wet oxidation, ozone and ultra-violet radiation oxidation were cons Macroencapsulation, amalgamation, and neutralization are specified technologies. S technologies would require additional U.S. Environmental Protection Agency approval not considered.

Locate the Proposed Activities or Other Technologies Onsite at Facilities Other tha Development Facility - Other onsite locations considered for permitted treatment Engineering Development Facility; Power Burst Facility; Manufacturing, Assembly, an Test Area North; New Waste Calcining Facility at the Idaho Chemical Processing Plan Facility and Hot Fuel Examination Facility at Argonne National Laboratory-West. Th deemed as available for these proposed activities.

**Figure. (page 2) C-4.6.5 Mixed/Low-Level Waste Disposal Facility**

Figure. Project Data Sheet-Nonincinerable Mixed Waste Treatment Project. (page 1)
See description in Section C-4.5.4.

## C-4.6.6 REMOTE MIXED WASTE TREATMENT FACILITY

PROJECT NAME: Remote Mixed Waste Treatment Facility
GENERAL PROJECT OBJECTIVE: The general objective of the proposed Remote Mixed Wast Treatment Facility Project would be to construct and operate a facility to remove s radioactive wastes and convert the sodium to a disposable waste form.
PROJECT DESCRIPTION: This project would design, construct, and operate a new facil convert sodium and other hazardous waste from radioactive scrap and waste component and handling capabilities would meet all requirements for removing sodium metal fro Breeder Reactor-II components (up to the size of a coldtrap), items stored at the R Facility, and items stored at the Hot Fuel Examination Facility. The method propos sodium from the scrap and waste is the melt-drain-evaporation-carbonation process. remove sodium metal from components by melting and draining bulk sodium, followed b residual sodium under vacuum conditions, and finally, by converting the removed sod carbonate ($Na_2CO_3$).
Waste disposal and storage sites, including the Radioactive Waste Management Comple do not accept sodium-containing wastes. The same policy also exists for the storag the Waste Isolation Pilot Plant.
Reprocessing sites do not accept sodium-containing fissile materials. Savannah Riv plutonium fuel fused with sodium, and the Idaho Chemical Processing Plant does not fused with sodium. Therefore, a facility is needed to remove sodium from transuran waste and scrap so that it can be handled and processed.
The waste sodium carbonate from the proposed process could be discarded at a dispos into a glass or other form suitable for storage. The sodium-free low-level radioac for disposal at the Radioactive Waste Management Complex and the sodium-free fissil stored or reprocessed. Until final repositories become available, contact-handled shipped to the Radioactive Waste Management Complex, and remote-handled transuranic stored at Argonne National Laboratory-West in the Radioactive Scrap/Waste Facility.
The proposed facility would be 50 meters (55 yards) long, 26 meters (30 yards) wide yards) high. The Remote Mixed Waste Treatment Facility would have an inert-atmosph area, covered truck loading area, equipment access area, control room and operating transfer tunnel, and a decontamination cell. The use of existing Argonne National capabilities, such as shielded radioactive material shipping casks in conjunction w Waste Treatment Facility and the Radioactive Liquid Waste Treatment Facility, would facility.
The inert-atmosphere cell would be gas-tight and would contain the sodium process e atmosphere. Some of the nine standard hot-cell work stations in the cell would be viewing window and master-slave manipulators. The remaining stations would be avai other forms of mixed waste debris. Functions for these stations would include wast sorting, fuel subassembly dismantling, fuel-rod decanning, and waste packaging.
Direct transfers could be made to and from this cell from either top- or bottom-loa transfers could be made between the hot cell and the decon cell for decontamination contact maintenance in the hot-repair area or packaging for transport.
The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.
The proposed project would be located within a major facility area (Argonne Nationa (See Figure C-1-1 for location and Section C-3.2 for a discussion of new constructi area.)
Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.6.6-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.
PROJECT-SPECIFIC OPTIONS:
No Action - Under this option, a remote mixed waste treatment facility would not option corresponds to Alternatives A (No Action) and C (Minimum Treatment, Storage, evaluated in this EIS.
Offsite Treatment - This option would provide for the transport of mixed low-leve treatment facility. This option corresponds to Alternative C (Minimum Treatment, S evaluated in this EIS. A treatment facility would need to be constructed at an off
Modify Existing Facility - This option would modify an existing facility to treat This option corresponds to Alternatives B (Ten-Year Plan) and D (Maximum Treatment, Disposal) evaluated in this EIS.

**Table C-4.6.6-1. Summary of potential environmental impacts of the Remote Mixed Wa**
Treatment Facility Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | Disturb 1 acre of previously disturbed soil | Project area; p |
| Water resources | Construction: water use minimal<br>Operation: [unknown]<br>Effluent: construction water; operation (cleaning solutions to RLWTF) | Storm W Plan in |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Previou soil er |
| Historic, archaeological, or cultural resources | Unknown number of sites | Conduct mitigat require |
| Air resources | Radiological operational emissions<br>0.17% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>None<br>Prevention of Significant Deterioration (PSD)<br>None | Facilit criteri and sur |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>0.017 mrem/yr<br>9.0 y 10-9 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: 0.25 person-rem/yr<br>1.2 y 10-4 latent cancer fatalities/yr<br>Year 2010: 0.27 person-rem/yr<br>1.4 y 10-4 latent cancer fatalities/yr<br>Nonradiological effects - No emissions | Access analysi annual |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 54<br>Operation (onsite truck trips per year):<br>Nonradiological - 0.6<br>Radiological - 0.3 | Use of and con operato procedu |
| Waste management | Construction (m3): industrial waste - 2,000<br>Operation (m3/yr): low-level waste - 7<br>mixed low-level waste - 3<br>industrial waste - 25 | Waste m program |
| Socioeconomic conditions | Construction: 300 peak/160 average subcontractor personnel<br>Operation: 12 existing workers | None re |

a. Definition of acronyms: National Emission Standards for Hazardous Air Pollutan
Waste Management Complex; RLWTF - Radioactive Liquid Waste Treatment Facility.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

## C-4.6.7 SODIUM PROCESSING PROJECT

**Figure. Project Data Sheet-Remote Mixed Waste Treatment Facility Project.**
PROJECT NAME: Sodium Processing Project
GENERAL PROJECT OBJECTIVE: The general objective of this proposed project would be and operate a process system to convert sodium hydroxide to a disposable waste form This project would involve the treatment of mixed wastes. Under the Federal Facili 1992, DOE is required to negotiate with states or the U.S. Environmental Protection to develop site treatment plans, including schedules and milestones, to develop tre construct facilities that would treat mixed wastes. Decisions on these treatment t

facilities would be made in conjunction with negotiations already under way with th to the Federal Facility Compliance Act, and after appropriate National Environmenta been completed.

PROJECT DESCRIPTION: This project would provide for the modification of the Sodium Facility to provide a system to convert sodium hydroxide to sodium carbonate. The system would be sized to process sodium hydroxide at the equivalent rate that eleme to sodium hydroxide in the Sodium Processing Facility.

The Sodium Processing Facility was designed and built to convert the FERMI Reactor percent sodium hydroxide, which would be used for neutralizing acidic plutonium, ur at the Hanford Site. DOE terminated all plutonium, uranium extraction operations b FERMI sodium could be accomplished. This facility could be used to convert sodium carbonate from other sources. In 1994 DOE terminated operation of the Experimental power plant at the INEL. The Sodium Processing Facility would be used to treat the from the primary and secondary systems of the Experimental Breeder Reactor-II.

Sodium hydroxide is considered a "characteristic hazardous waste" for disposal by t Protection Agency. Therefore, it is desirable to convert the sodium hydroxide to a disposal. This could be accomplished by modifying the Sodium Processing Facility t system to perform the necessary conversion.

The process for the conversion would consist of a system to process the sodium hydr evaporator operating under a carbon dioxide atmosphere. The sodium hydroxide upon dioxide atmosphere would be converted to a sodium carbonate compound. The excess w evaporated in the thin-film evaporator and the sodium carbonate would be discharged as a solid. The water would be condensed and recovered for reuse in the conversion hydroxide.

The process system would be located in the Sodium Processing Facility caustic loadi space were available. If not, it would be located on the south side of the Sodium proposed facility would be approximately 8 meters (8.7 yards) wide, 8 meters (8.7 y (5.5 yards) high. The facility would contain all the equipment for converting sodi carbonate, for packaging the sodium carbonate for disposal, and for recovering the and transferring the water to the sodium-sodium hydroxide process.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.

The proposed project may be located in an existing facility within a major facility Laboratory-West). (See Figure C-1-1 for location and Section C-3.2 for a discussio existing facility.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.6.7-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

**Table C-4.6.7-1. Summary of potential environmental impacts of the Sodium Processi** under Alternative B.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | Disturbs 0.03 acres of previously disturbed soil | Project facilit soil |
| Water resources | Water use minimal | Storm W Plan in |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Previou soil ero |
| Historic, archaeological, or cultural resources | Survey conducted, no sites identified | None re |
| Air resources | Radiological operational emissions 2.2 y 10-3% of NESHAP dose limit Toxic Air Pollutants (TAPs) None | Facilit criteri and sur |

| | | |
|---|---|---|
| | Prevention of Significant Deterioration (PSD)<br>None | |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>2.2 y 10-4 mrem/yr<br>1.1 y 10-10 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: 1.4 y 10-3 person-rem/yr<br>7.0 y 10-7 latent cancer fatalities/yr<br>Year 2010: 1.5 y 10-3 person-rem/yr<br>7.5 y 10-7 latent cancer fatalities/yr<br>Nonradiological effects - No emissions | Access safety surveil require |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 1<br>Operation (onsite truck trips per year):<br>Nonradiological - 0.1<br>Radiological - 0.8 | Use of and con equipme shipmen |
| Waste management | Construction (m3): industrial waste - 30<br>Operation (m3/yr): low-level waste - 30<br>industrial waste - 2 | Waste m program |
| Socioeconomic conditions | Construction: 6 existing workers<br>Operation: 20 existing workers | None re |

a. Definition of acronyms: NESHAP - National Emission Standards for Hazardous Air
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.
PROJECT-SPECIFIC OPTIONS:
No Action - Under this option, the sodium processing project would not be impleme corresponds to Alternatives A (No Action) and C (Minimum Treatment, Storage, and Di this EIS.

### C-4.6.8 Shipping/Transfer Station

**Figure. Project Data Sheet-Sodium Processing Project.**
See discription in Section C-4.4.4.

## C-4.7 Project Related to Greater-than-Class-C Waste

### C-4.7.1 GREATER-THAN-CLASS-C DEDICATED STORAGE

PROJECT NAME: Greater-Than-Class-C Dedicated Storage
GENERAL PROJECT OBJECTIVE: The objective of this proposed project would be to prov DOE receipt and storage of greater-than-Class-C low-level waste sealed radiation so commercial sector. Other greater-than-Class-C low-level waste would also be receiv basis.
Under the Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99- government is responsible for the disposal of greater-than-Class-C low-level waste the U.S. Nuclear Regulatory Commission and Agreement States. DOE was identified as responsible for this effort. In February 1989, a report to Congress (DOE/LLW-77T) that DOE plans to accept and manage limited quantities of greater-than-Class-C low- disposal facility is developed. DOE has assigned the management responsibility for low-level waste to the INEL.
PROJECT DESCRIPTION: This project would provide for the design, construction, and Greater-Than-Class-C Low-Level Waste Dedicated Storage Facility. The Greater-Than- Facility would provide for the consolidated management and storage of the greater-t waste at one centralized storage location.
Greater-than-Class-C low-level waste is low-level waste that contains long-lived an

radionuclides in concentrations greater than the Class C concentrations as specifie C is the most radioactive low-level waste that is acceptable for disposal by shallo than-Class-C low-level waste is generally unacceptable for shallow land burial.

DOE plans to accept and manage greater-than-Class-C low-level waste only on an as-n time that a greater-than-Class-C low-level waste disposal facility becomes availabl only a small fraction of the projected greater-than-Class-C low-level waste invento transfer to DOE before disposal. However, a need for DOE acceptance of excess seal been stated by the U.S. Nuclear Regulatory Commission, based on public health and s receipt and management of these sources would be the primary near-term function of the sealed sources to be received would be classified as greater-than-Class-C low-l intended. However, nearly all of these sealed sources would be received and manage suitable for recycle and reuse, rather than as greater-than-Class-C low-level waste continuing functionality and value.

The U.S. Nuclear Regulatory Commission has estimated that DOE acceptance of up to 2 over a five-year period may be required. Under this limited receipt scenario, any or expansions would be much less extensive than the estimates presented in this pro these sealed sources are now planned to be managed as reusable material rather than stored in existing facilities without special pre-storage packaging operations. Ov sources are already being managed and stored at the INEL.

For conservatism in assessing the environmental impacts of this project, a receipt sources over a 30-year period was assumed, for a baseline rate of 1,000 sources per considered to be a bounding case because it represents approximately the total inve held sealed sources that would be classified as greater-than-Class-C low-level wast waste.

The sealed sources would be received inside the devices in which they were used. T small leaktight capsules containing Sr-90, Cs-137, AmBe, PuBe, or other radionuclid planned to be stored in existing facilities without further dismantling or packagin conservative bounding case for the environmental impact assessments, the design bas includes a repackaging operation and storage in casks on a concrete pad.

The design basis for the Greater-Than-Class-C Storage Facility would be an outdoor laydown pad on which appropriately shielded casks would be placed. For storage, th the expansion of an existing concrete pad, or the construction of a new concrete pa numerous concrete storage casks. Existing facilities and grounds could be modified receiving and handling operations; for example, the Test Area North or Test Reactor used for the waste handling operations.

One cask design adapted from the Test Area North Pool Fuel Transfer Project (see Se nominally be 9 feet outside diameter by 16 feet high. It has an internal cavity 7 high. Ninety-four (94) casks would be needed if each one holds thirty-two (32) 55- of eight drums each). Each drum would hold an average of ten (10) sealed sources/d appropriate packaging medium.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.

The proposed project would be located within a major facility area (either the Test Reactors Area). (See Figure C-1-1 for location and Section C-3.2 for a discussion major facility area.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.7.1-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, DOE would continue to store the greater-than-Class variety of sites. This option corresponds to Alternative A (No Action) evaluated i option, no new storage facilities would be constructed, nor would any existing faci storage.

Offsite Storage - Under this option, DOE would transport all greater-than-Class-C another DOE site. This option corresponds with Alternative C (Minimum Treatment, S evaluated in this EIS.

**Table C-4.7.1-1. Summary of potential environmental impacts of the Greater-Than-Cl** Dedicated Storage Project under Alternative B.

| Environmental | Potential impacta,b | Potent |
|---|---|---|

| | | |
|---|---|---|
| attribute | | |
| Geology and soil, acres disturbed | Disturb 1.7 acres of previously disturbed soil | Projec facili soil |
| Water resources | Operations effluents: No information | Storm Plan i |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Previo soil e |
| Historic, archaeological or cultural resources | Survey conducted, no sites identified | None re |
| Air resources | Radiological operational emissions<br>6.3 y 10-3% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>None<br>Prevention of Significant Deterioration (PSD)<br>None | Facili criter and su |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>6.3 y 10-4 mrem/yr<br>3.2 y 10-10 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: 0.019 person-rem/yr<br>9.5 y 10-6 latent cancer fatalities/yr<br>Year 2010: 0.021 person-rem/yr<br>1.0 y 10-5 latent cancer fatalities/yr<br>Nonradiological effects - No emissions | Access safety survei requir |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 0.8<br>Operation (truck trips per year):<br>Nonradiological - 3 onsite<br>Radiological - 0.7 onsite; 200 offsite | Use of and co necess operat manife |
| Waste management | Construction (m3): industrial - 28<br>Operation (m3/yr): low-level waste - 25<br>industrial waste - 100 | Waste progra |
| Socioeconomic conditions | Construction: 15 subcontractor personnel<br>Operation: 20 part-time existing workers | None r |

a. Definition of acronyms: NESHAP - National Emission Standards for Hazardous Air
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

Multiple Storage Sites - Under this option, DOE would transfer greater-than-Class regional storage locations created at two to five DOE sites. New storage facilitie each regional site as required. If the INEL were selected as one of the sites, thi Alternatives B (Ten-Year Plan) and D (Maximum Treatment, Storage, and Disposal) eva

## C-4.8 Project Related to Hazardous Waste

**Figure. Project Data Sheet-Greater-Than-Class-C Dedicated Storage Project.**

### C-4.8.1 HAZARDOUS WASTE TREATMENT, STORAGE,

AND DISPOSAL FACILITIES

PROJECT NAME: Hazardous Waste Treatment, Storage, and Disposal Facilities

GENERAL PROJECT OBJECTIVE: The general objective of this proposed project would be facilities necessary to treat, store, and dispose of hazardous waste generated onsi

operations [Alternative D (Maximum Treatment, Storage, and Disposal)].
PROJECT DESCRIPTION: Facilities would consist of a modern hazardous waste storage treatment facilities capable of treating INEL Resource Conservation and Recovery Ac waste streams so that onsite disposal can be achieved at a Resource Conservation an INEL facility.
The storage facility would be a Resource Conservation and Recovery Act permitted fa compliance with all applicable DOE orders and guidance. The facility would include not in the present facility: eight segregation areas separated by fire walls, cont leaks, fire protection areas, collection systems for firewater in the event of syst ventilated spaces for sampling and inspection, safety showers, change rooms, and sa The treatment facility would use organic destruction stabilization, neutralization, removal/recovery technologies to treat approximately 80 percent of INEL-generated h (100 percent of organic hazardous waste).
The disposal facility would use a combination of waste form (such as immobilization barriers (such as enclosures, pads, layers of clay, or uses of other nonpermeable m setting (soil characteristics, distance above aquifer, and area of low rainfall) to The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternative D Treatment, Storage, and Disposal). The project data sheet at the end of this proje above project description.
The proposed project would involve new construction assumed to be outside major fac Figure C-1-1 for assumed location and Section C-3.2 for a discussion of new constru facility areas.)
Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.8.1-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu Section C-3.4.
PROJECT-SPECIFIC OPTIONS:
No Action - Under this option, the Hazardous Waste Treatment, Storage, and Dispos constructed. This option corresponds to Alternatives A (No Action), B (Ten-Year Pl Treatment, Storage, and Disposal) evaluated in this EIS. This option would involve Hazardous Waste Storage Facility, and the continued transport of the waste to an of

**Table C-4.8.1-1. Summary of potential environmental impacts of the Hazardous Waste** Treatment, Storage, and Disposal Facilities Project under Alternative D.

| Environmental attribute | Potential impacta | Potent |
|---|---|---|
| Geology and soil, acres disturbed | Disturb 5 acres of previously undisturbed soil; no conflict with existing land use policies | Prevent |
| Water resources | Construction: 10,000,000 liters usage<br>Operation: None<br>Effluents: 2,000,000 liters construction water | Storm W in plac |
| Wildlife and habitat | Loss of biodiversity and habitat productivity; animal displacement and mortality; potential for habitat fragmentation | Avoid w and cri erosion |
| Historic, archaeological, or cultural resources | Unknown number of sites | Conduct accordi (Sectio |
| Air resources | No information available.<br>Implementation not until after 2005 | Facilit criteri surveil |
| Human health | No information available; Implementation not until after 2005 | Access analysi annual |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 14<br>Operation (onsite truck trips per year):<br>Nonradiological - 58 | Use of and con operato procedu |
| Waste management | Construction (m3): industrial waste - 500<br>Operation (m3/yr): industrial waste - 500<br>hazardous waste - 5 | Waste m program |
| Socioeconomic conditions | Construction: 50 peak/15 average subcontractor personnel | None re |

Operation: 15 new workers

a. Reference location for impact analysis: 4 kilometers (2.5 miles) east of the R Complex. Potential impacts are described further in Section C-3.2.
b. Mitigative measures are described further in Section C-3.3.

## C-4.9 Projects Related to Infrastructure

Figure. Project Data Sheet-Hazardous Waste Treatment, Storage, and Disposal Facilit

### C-4.9.1 INDUSTRIAL/COMMERCIAL LANDFILL EXPANSION

PROJECT NAME: Industrial/Commercial Landfill Expansion
GENERAL PROJECT OBJECTIVE: The general objective of this proposed project is to pr solid waste disposal for the INEL for a 30-year landfill life by (a) disposing the with regulatory requirements, (b) monitoring for hazardous and radioactive contamin closing and monitoring for the existing INEL sanitary landfill. The Landfill Compl Federal regulations 40 CFR Parts 257 and 258 as applicable, and the State of Idaho and Welfare regulations.
PROJECT DESCRIPTION: This project would extend the boundaries of the Central Facil Complex to provide 91 additional hectares (225 acres) of land for INEL industrial s operations through the year 2025 as a minimum. The complex would use the existing facilities. The landfill complex extension would encompass activities and operatio solid waste disposal including recycling. The facility would accommodate at least year (63,000 cubic yards per year) of waste.
The Landfill Complex extension would provide a centralized area for the following f

- Landfill operations with disposal cells for nonradioactive, nonhazardous solid waste and asbestos
- Waste minimization area including recycling and volume reduction operatio
- Ancillary operations functions including construction/maintenance of road utilities; cover and closure of completed landfill cells; drainage contro erosion control; and traffic control
- Treatment and disposal of petroleum-contaminated media
- Waste or recyclable collection/transportation to and from the landfill co

The previous project description was used for the analysis of potential consequence Volume 2 of the SNF and INEL EIS where the project would be implemented under Alter Plan), C (Minimum Treatment, Storage, and Disposal), and D (Maximum Treatment, Stor The project data sheet at the end of this project summary supports the above projec The proposed project would be integral to an existing facility within a major facil Facilities Area). (See Figure C-1-1 for location and Section C-3.2 for a discussio major facility area.)
Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.9.1-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.
PROJECT-SPECIFIC OPTIONS:
No Action - Under this option, an Industrial/Commercial Landfill Expansion would landfill needs would continue with incremental assessments under the National Envir is the current practice. This option corresponds to Alternative A (No Action) eval existing solid waste disposal cells would continue to operate for this option. Und cells would fill to capacity during 1998, thus leaving the INEL without a waste dis
Transfer Station - Under this option, a waste transfer station would be construct

prior to transport to an offsite landfill. This option is not evaluated in this EI would continue to be operated for disposal of bulky waste items such as concrete an engineered metal buildings would be constructed to house the waste transfer operati and support facilities. The transfer station would be designed to receive 48,600 c yards) of solid waste annually, of which 20 percent would be recycled or disposed o landfill with the remainder to be consolidated for

**Table C-4.9.1-1. Summary of potential environmental impacts of the Industrial/Comm** Landfill Expansion Project under Alternative B.

| Environmental attribute | Potential impacta | Potent |
|---|---|---|
| Geology and soil, acres disturbed | Disturb 112 acres of previously undisturbed soil (no conflict with existing land use policies); disturb 168 acres of previously disturbed soil | Prevent previou |
| Water resources | None | None re |
| Wildlife and habitat | For previously undisturbed soil: Loss of biodiversity and habitat productivity; animal displacement and mortality; potential for habitat fragmentation<br>For previously disturbed soil: Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Previou wetland critica reseed.<br>Previou erosion |
| Historic, archaeological, or cultural resources | Unknown number of sites, located in an archaeologically sensitive area, known sites in the vicinity | Conduct accordi (Sectio |
| Air resources | Radiological operational emissions - None<br>Nonradiological emissions - No increase in emissions over present operation | Unknown |
| Human health | No information | Unknown |
| Transportation | Construction (onsite truck trips): None<br>Operation (onsite truck trips per year):<br>Nonradiological - 1630 | Use of and con equipme |
| Waste management | None (no waste generated) | None re |
| Socioeconomic conditions | Operation: 9 existing workers | None re |

a. Potential impacts are described further in Section C-3.2.
b. Mitigative measures are described further in Section C-3.3.

transport to a licensed offsite landfill operated by others. This option would be availability of an offsite landfill. The 30-year cost for construction and operati at $105 million.

Municipal Landfill - Under this option, a municipal landfill would be provided in landfill. The environmental impacts of this option are bounded by the proposed pro This option would be similar to the proposed action for operations and extension of However, the landfill would be operated in compliance with additional regulatory re "Criteria for Municipal Solid Waste Landfills"). The 30-year cost for construction option is estimated at $180 million.

Incineration - Under this option, a solid waste incinerator would be constructed not evaluated in this EIS. This option was eliminated from further study because t generated at the INEL is too low to efficiently operate an incinerator. The volume increased by transporting solid waste from the surrounding communities to the INEL, waste would have potential environmental and liability issues because it contains h

Shipment to Another DOE Site - Under this option, the INEL solid waste would be t DOE site for disposal. This option is not evaluated in this EIS. This option was study because of the high cost of constructing a transfer station and transporting

## C-4.9.2 GRAVEL PIT EXPANSIONS

**Figure. Project Data Sheet-Industrial/Commercial Landfill Expansion Project.**

PROJECT NAME: Gravel Pit Expansions

GENERAL PROJECT OBJECTIVE: The general objective of this proposed project would be existing gravel borrow pit operations to provide gravel and fill material for exist construction activities at the INEL during the ten-year period of June 1995 to June The pits provide sand, gravel, and aggregate for construction and maintenance, and provides borrow material consisting primarily of soil, silt, and sand for lining po as Radioactive Waste Management Complex Pad A and landfills.

PROJECT DESCRIPTION: This project would reopen and/or expand the use of natural re within several gravel pits and one borrow area on the INEL. These natural resource aggregate, and borrow (eolian and alluvial sediments). Future operations would be "Infrastructure" and "Excavation" programs that would be managed by facility landlo contractors, and waste management and environmental restoration organizations. The gravel pits and borrow area that are located on the INEL:

1. Test Area North gravel pit - This pit is located approximately 1.2 kilom north of the Test Area North Containment Test Facility. The excavation ha area of 60 acres. The pit would be expanded approximately 0.4 acres.

2. Lincoln Boulevard pit - This pit is located along Lincoln Boulevard appr kilometers (8 miles) north of the Naval Reactors Facility. The excavation approximate area of 70 acres. The pit would be expanded approximately 0.3

3. Naval Reactors Facility pit - There are three small pits in the Naval Re #1 is located near the intersection of Lincoln Boulevard and Washington Bo located just south of the Naval Reactors Facility fence adjacent to the ra located approximately 0.4 kilometer (0.25 mile) west of Washington Bouleva excavations at these pits have a total approximate area of 5 acres. No ex Reactors Facility pits is proposed.

4. Test Reactor Area/Idaho Chemical Processing Plant pit - This pit is loca intersection of Lincoln Boulevard and Monroe Street between the Test React Idaho Chemical Processing Plant. The excavation at this pit has an approx acres. The pit would be expanded approximately 0.65 acres.

5. Central Facilities Area pit - This pit is located east of Lincoln Boulev kilometer (0.5 mile) north of the intersection with Portland Ave. The exc an area of less than 10 acres. The pit would be expanded approximately 2.

6. Boiling Water Reactor Experiment pit - This pit is located north of Adam approximately 0.6 kilometer (0.4 mile) west of the intersection with Van B excavation of this pit has an approximate area of 30 acres. The pit would approximately 3.7 acres.

7. Radioactive Waste Management Complex pit - This pit is located approxima (3 miles) west of Radioactive Waste Management Complex on the T-12 road. of this pit has an approximate area of 30 acres. The pit would be expande acres.

8. Radioactive Waste Management Complex Spreading Area B - This spreading a approximately 5 kilometers (3 miles) south of Radioactive Waste Management excavation has an approximate area of 200 acres. The pit would be expande 120 acres.

Under all alternatives, minor fugitive dust emissions would be produced during onsi gravel/borrow and transportation on unpaved roads. Expansion of existing gravel pi gravel/borrow area would not impact INEL wetlands, floodplains, surface water, or g stormwater discharge plan would be prepared for all active gravel/borrow pits. DOE Water Act Section 404 permit application for the continued removal of borrow materi Spreading Area B. These activities become subject to Section 404 permitting requir as a result of regulations that modified the definition of discharge of dredged mat No known critical wildlife habitats are located on the INEL, but there are occasion threatened species on the INEL. An additional 40 acres at each gravel pit and 60 a have been intensively surveyed for cultural resources. The results of these cultur

review, and any questions or concerns after reviewing the results may be discussed of resources from existing gravel pits under all alternatives within the surveyed a significant cultural resources. However, nine prehistoric resources were identifie Therefore, as recommended by the Idaho State Historic Preservation Office, a progra archaeological testing has been initiated to formally determine the National Regist resources and thereby assess the effects of borrow activities within Spreading Area Under all alternatives, excavation from gravel/borrow pits would be sloped in accor Safety and Health Administration regulations. Soil erosion and stormwater discharg identified in a stormwater discharge plan written to address a consolidated source for gravel/borrow users and for all active gravel/borrow pits.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternative B expanded under Alternative D (Maximum Treatment, Storage, and Disposal). The proje end of this project summary supports the above project description.

The proposed project would involve new construction outside major facility areas. assumed location and Section C-3.2 for a discussion of new construction outside maj Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.9.2-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - This alternative (A) is evaluated because it represents baseline cond potential impacts of the other alternatives are compared. Under this alternative, projects would maintain schedule, cost, and staffing at current levels. These oper approximately 158,000 cubic meters (207,000 cubic yards) gravel/borrow onsite.

Ten-Year Plan - Under this alternative (B) and in support of SNF and INEL ER&WM a infrastructure, and excavation projects would increase schedule, cost, and staffing These operations would require approximately 392,000 cubic meters (513,000 cubic ya onsite through project life cycles.

Minimum Treatment, Storage, and Disposal - Under this alternative (C) and in supp ER&WM activities, infrastructure and excavation projects would maintain schedule, c nearly current levels. These operations would require approximately 296,000 cubic yards) gravel/borrow onsite through project life cycles.

Maximum Treatment, Storage, and Disposal - Under this alternative (D) and in sup nuclear fuel and ER&WM activities, infrastructure and excavation projects would req modifications and an increase in cost and staffing levels above Alternatives A (No Plan), and C (Minimum Treatment, Storage, and Disposal). These operations would re 1,772,000 cubic meters (2,317,000 cubic yards) gravel/borrow onsite through project necessitate the expansion of existing pits and the opening of a new borrow area. T water pollution prevention plan, and the determination of an air permitting action gravel pit and borrow area before proposed actions commence.

**Table C-4.9.2-1. Summary of potential environmental impacts of the Gravel Pit Expa** Project.

| Environmental attribute | Potential impacta | Potent |
|---|---|---|
| Geology and soil, acres disturbed | Disturb 20.12 acres of previously undisturbed soil; no conflict with existing land use policies | Prevent |
| Water resources | None | None re |
| Wildlife and habitat | Loss of biodiversity and habitat productivity; animal displacement and mortality; potential for habitat fragmentation | Avoid w and cri erosion |
| Historic, archaeological, or cultural resources | 23 sites have been partially surveyed | Complet accordi (Sectio |
| Air resources | Radiological operational emissions - None<br>Nonradiological emissions - No net increase in emission rate over current gravel pit operations | None re |
| Human health | Radiation exposures and cancer risk - None<br>Nonradiological effects - No emissions | None re |
| Transportation | Truck trips included in individual projects | Excavat equipme |

| | | |
|---|---|---|
| Waste management | None (no waste generated) | None re |
| Socioeconomic conditions | Construction: No additional workers | None re |

a. Potential impacts are described further in Section C-3.2.
b. Mitigative measures are described further in Section C-3.3.

Cease Use of Gravel/Borrow - This option would cease use of gravel/borrow resourc option was not evaluated in this EIS. Maintenance of the INEL infrastructure and p environmental restoration and waste management activities require these resources, alternative.
Obtain Gravel/Borrow from an Offsite Commercial Source - Under this option, DOE w import 3,800 cubic meters (5,000 cubic yards) or less of crushed gravel for roadbas aggregate (screened), and gravel for plant mix from an outside source. Over 5,000 cost efficient to allow subcontractor access to INEL gravel and an onsite crusher.
Identify New, Onsite Sources of Gravel/Borrow - This option would allow DOE to de source. Terreton Lake beds south of Test Area North are an example. These lake be clayey silt, with lesser amounts of relatively pure clay and would suffice as an a B.

## C-4.9.3 CENTRAL FACILITIES AREA CLEAN LAUNDRY

Figure. Project Data Sheet-Gravel Pit Expansion Project.

AND RESPIRATOR FACILITY
PROJECT NAME: Central Facilities Area Clean Laundry and Respirator Facility
GENERAL PROJECT OBJECTIVE: The general objective of this proposed project would be existing facility for a new use, continue use as intended, or to decontaminate and
PROJECT DESCRIPTION: This project would provide several alternatives for the exist CFA-617, Clean Laundry and Respirator Facility, located in the northeast part of th at the INEL. Other than for No Action, the selection of an appropriate alternative "proposed action." This project would implement one of the following five alternat

1. Hazardous Waste Storage Facility
2. Quality Assurance Testing Facility
3. Radiological Development & Research Laboratory Facility
4. Decontaminate and decommission the Facility
5. Resume operation of the Clean Laundry and Respirator Facility.

The Clean Laundry and Respirator Facility is a one-story, cement block building bui 1,067 square meters (11,494 square feet). Seven functional areas are within this a

1. Respirator processing
2. Hot laundry processing
3. Special hot laundry monitoring
4. Health Physics office and monitoring area
5. Cold laundry processing
6. Office, lunch room, and rest rooms
7. Mechanical system room.

A parking lot is on the west side of the building, with three loading docks on the facility is presently not operating and is in an interim shutdown condition per a N Policy Act categorical exclusion.
The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.
The proposed project would be located in an existing facility within a major facili Facilities Area). (See Figure C-1-1 for location and Section C-3.2 for a discussio existing facility.)
Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.9.3-1. This table is complemented by information on en Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable issu C-3.4.

PROJECT-SPECIFIC OPTIONS:
No Action - Under this option, the Central Facilities Area Clean Laundry and Resp be reused. This option corresponds to Alternatives A (No Action) and C (Minimum Tr Disposal) evaluated in this EIS. This option would involve continued surveillance existing facility under a National Environmental Policy Act categorical exclusion s Environmental Policy Act categorical exclusion was not written to support such a lo
Build Treatment, Storage, and Disposal Facility - Under this option, the facility (except possibly on an interim basis) for use as a Hazardous Waste Storage Facility Treatment and Storage and Disposal Facility were to be built. This option correspo (Maximum Treatment, Storage, and Disposal) evaluated in this EIS.

**Table C-4.9.3-1. Summary of potential environmental impacts of the Central Facilit** Clean Laundry and Respirator Facility Project under Alternative B.

| Environmental attribute | Potential impacta,b | Potenti |
|---|---|---|
| Geology and soil, acres disturbed | None (no disturbed soil) | Project |
| Water resources | Depends on option selected | Storm Wa in place |
| Wildlife and habitat | None | Project |
| Historic, archaeological, or cultural resources | None | Project |
| Air resources | Radiological operational emissions<br>None<br>Nonradiological emissions<br>None | Measures emission filtrati |
| Human health | No information | TBD |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 11<br>Operation onsite truck trips per year):<br>Nonradiological - 3 | Use of a containe operator procedur |
| Waste management | Construction (m3): industrial waste - 400<br>low-level waste - (depends on option)<br>Operation (m3/yr): industrial waste - 100 | Waste mi programs |
| Socioeconomic conditions | Operation: No additional workers | None req |

a. Definition of acronyms: TBD - to be determined.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

# C-4.10 PROJECTS RELATED TO TECHNOLOGY DEVELOPMENT

<u>**Figure. Project Data Sheet-Central Facilities Area Clean Laundry and Respirator Fac**</u>

## C-4.10.1 CALCINE TRANSFER PROJECT (BIN SET #1)

PROJECT NAME: Calcine Transfer Project (Bin Set #1)
GENERAL PROJECT OBJECTIVE: The general objective of this proposed project is to pr and equipment for the safe retrieval and transport of high-level waste calcine from Set #1 to a fully qualified storage facility.
PROJECT DESCRIPTION: Retrieval of calcine from Bin Set #1 is necessary to comply w Federal Court Order, Federal laws, and DOE orders governing the handling, storage, level waste. The retrieval of calcine from Bin Set #1 and transport to a fully qua

the following tasks. The top of the vault chamber would be accessed by removing th backfilled soil, and equipment housed above the vault. The vault roof would be thi reinforced concrete slab for shielding and increased support capacity. A containme placed over the vault. A pneumatic transport line and support facilities at the re constructed concurrently. Within the containment structure, penetrations would be roof and access risers would be remotely attached at appropriate locations to the e tested. The bins would then be penetrated through the riser, and retrieval devices riser to remove the 8,000 cubic feet of calcine. The components would be designed compatible with all bin sets at the Idaho Chemical Processing Plant as these calcin and treated as part of the Idaho Chemical Processing Plant High-Level Waste Calcine Program.

The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.

The proposed project would be located within a major facility area (the Idaho Chemi (See Figure C-1-1 for location and Section C-3.2 for a discussion of projects withi Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.10.1-1. This table is complemented by information on e in Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable i Section C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, the technology to transfer calcine from older bin demonstrated. This option corresponds to Alternatives A (No Action) and C (Minimum and Disposal) evaluated in this EIS.

**Table C-4.10.1-1. Summary of potential environmental impacts of the Calcine Transf**
(Bin Set # 1) under Alternative B.

| Environmental attribute | Potential impacta,b | Potenti |
|---|---|---|
| Geology and soil, disturbed area | Disturb 0.5 acre of previously disturbed soil | Project facility soil |
| Water resources | Construction/operation: water use minimal<br>Effluent: construction water | Storm Wa Plan in |
| Wildlife and habitat | Minimal short-term impact on biodiversity, productivity, and animal displacement and mortality within major facility area | Previous soil ero |
| Historic, archaeological, or cultural resources | No sites identified | None req |
| Air resources | Radiological operational emissions<br>1.0 y 10-4% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>None<br>Prevention of Significant Deterioration (PSD)<br>None | Facility inspecti reportin |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>1.0 x 10-5 mrem/yr<br>5 y 10-12 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: 8.4 x 10-5 person rem/yr<br>4.2 y 10-8 latent cancer fatalities/yr<br>Year 2010: 9.3 x 10-5 person rem/yr<br>4.6 y 10-8 latent cancer fatalities/yr<br>Nonradiological effects - No emissions | Access c safety a surveill requirem construc |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 3<br>Operation (onsite truck trips per year): None | Use of a and cont operator manifest |

| | | |
|---|---|---|
| Waste management | Construction (m3): industrial waste - 100 | Waste mi programs |
| Socioeconomic conditions | Construction: 15 subcontractor personnel<br>Operation: No additional workers | None req |

a. Definition of acronyms: ECA - environmentally controlled area; NESHAP - Nation Hazardous Air Pollutants.
b. Potential impacts are described further in Section C-3.2.
c. Mitigative measures are described further in Section C-3.3.

## C-4.10.2 PLASMA HEARTH PROCESS PROJECT

**Figure. Project Data Sheet-Calcine Transfer Project.**

PROJECT NAME: Plasma Hearth Process Project
GENERAL PROJECT OBJECTIVE: The general objective of this proposed project is to de full-scale Plasma Hearth Process on actual mixed low-level waste that is difficult thermal technologies.
PROJECT DESCRIPTION: The Plasma Hearth Process is a high-temperature thermal treat using a plasma arc torch in a refractory-lined chamber that destroys organics and s nonleaching, vitrified waste form. Plasma arc technology is used commercially, pri high purity alloys. This project would involve the adaptation of that existing, co technology. The key elements of this technology are (a) extremely high temperature completely destroys organics while stabilizing inorganics; (b) the ability to accep types without pretreatment; (c) the ability to treat waste without removing it from generation of separate slag and metallic phases, allowing segregation and possible (e) the preference of many radionuclides (especially the actinides) and toxic heavy stable slag phase.
The term "plasma" refers to a highly ionized gas. The type of plasma that would be application is known as a direct-current arc-generated plasma. This type of plasma plasma "torch." Basically, the torch uses a flowing gas to stabilize an electrical electrodes. One or both of these electrodes is contained within the torch. For tr second electrode is usually the material being processed. Energy is dissipated in the electrical current flows through the gas. Through resistance heating (Joule he high-temperature gas as well as directly heating the work piece.
The plasma hearth process system would consist of the following functional units: plasma chamber, a secondary combustion chamber, an offgas treatment system, and a s Waste would be fed to the primary chamber where heat from the plasma torch would be variety of chemical and physical changes. Organic compounds in the waste would be volatilized, pyrolized, and/or oxidized. The remaining inorganic material in the w high temperature where it would melt and separate into molten slag and metal phases heavy metals would migrate to the slag phase; cooling and solidification of this ma final waste form.
Offgas from the primary process chamber would be transported to a secondary chamber temperature, excess oxygen, turbulence, and delay time of the offgas in the seconda 99.99 percent destruction and removal efficiency of any remaining organic compounds then be cooled by use of an evaporative cooler before entry into the system baghous particulate air filters where particulates would be filtered from the offgas at an filter.
The Plasma Hearth Process technology is chiefly applicable to solid or sludge waste byproduct is required for disposal. The application for which the Plasma Hearth Pr developed is both solid mixed low-level waste and transuranic waste.
The Transient Reactor Test reactor building (Building 720) is a metal-sided, steel- features two high bay sections (north and south) and two low bay sections (east and Hearth Process field-scale unit (that is, plasma furnace system, offgas system, and be sized and configured for installation in the south high bay area (70 feet wide b high) of the building and would tie into the reactor offgas system at a location no unit experiments would be conducted as nonreactor experiments in the Transient Reac
The above project description was used for the analysis of potential consequences i of the SNF and INEL EIS where the project would be implemented under Alternatives B D (Maximum Treatment, Storage, and Disposal). The project data sheet at the end of supports the above project description.

The proposed project would be located in an existing facility within a major facili Laboratory-West). (See Figure C-1-1 for location and Section C-3.2 for a discussio existing facility.)

Information regarding the environment affected by this project is covered by other summarized and referenced in Section C-3.1. The potential environmental effects as are summarized in Table C-4.10.2-1. This table is complemented by information on e in Section C-3.2 and on mitigation of impacts in Section C-3.3. Other applicable i Section C-3.4.

PROJECT-SPECIFIC OPTIONS:

No Action - Under this option, the Plasma Hearth Process would not be developed. to Alternatives A (No Action) and C (Minimum Treatment, Storage, and Disposal) eval

**Table C-4.10.2-1. Summary of potential environmental impacts of the Plasma Hearth** Project under Alternatives B and D.

| Environmental attribute | Potential impacta,b | Potent |
|---|---|---|
| Geology and soil, acres disturbed | None expected | Project facilit |
| Water resources | Construction: 30,000 liters<br>Operation: 70,855 liters/year | Storm W in plac |
| Wildlife and habitat | None | Project facilit |
| Historic, archaeological, or cultural resources | None | Project facilit |
| Air resources | Radiological operational emissions<br>5.7 y 10-6% of NESHAP dose limit<br>Toxic Air Pollutants (TAPs)<br>0.62% of significance level for combined TAPs<br>Prevention of Significant Deterioration (PSD)<br>0.01% 24-hr SO2 - Class I, Craters of the Moon Wilderness Area | Facilit criteri surveil |
| Human health | Radiation exposures and cancer risk<br>Maximally exposed individual:<br>5.7 y 10-7 mrem/yr<br>2.8 y 10-13 latent cancer fatalities/yr<br>80-km (50-mile) population:<br>Year 2000: 7.5 y 10-6 person-rem/yr<br>4.0 y 10-8 latent cancer fatalities/yr<br>Year 2010: Not operational<br>Nonradiological effects<br>Negligible impact on health effects expected | Access analysi annual |
| Transportation | Construction (onsite truck trips):<br>Nonradiological - 0.5<br>Operation (onsite truck trips per year):<br>Nonradiological - 1.4<br>Radiological - 37.6 | Use of and con operato procedu |
| Waste management | Construction (m3): industrial waste - 20<br>Operation (m3/yr): low-level waste - 23<br>industrial waste - 50 | Waste m program |
| Socioeconomic conditions | Construction: 5 to 10 subcontractor personnel for 3 months<br>Operation: 6 subcontractor personnel | None re |

a. Definition of acronyms: NESHAP - National Emission Standards for Hazardous Air

b. Potential impacts are described further in Section C-3.2.

c. Mitigative measures are described further in Section C-3.3.

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