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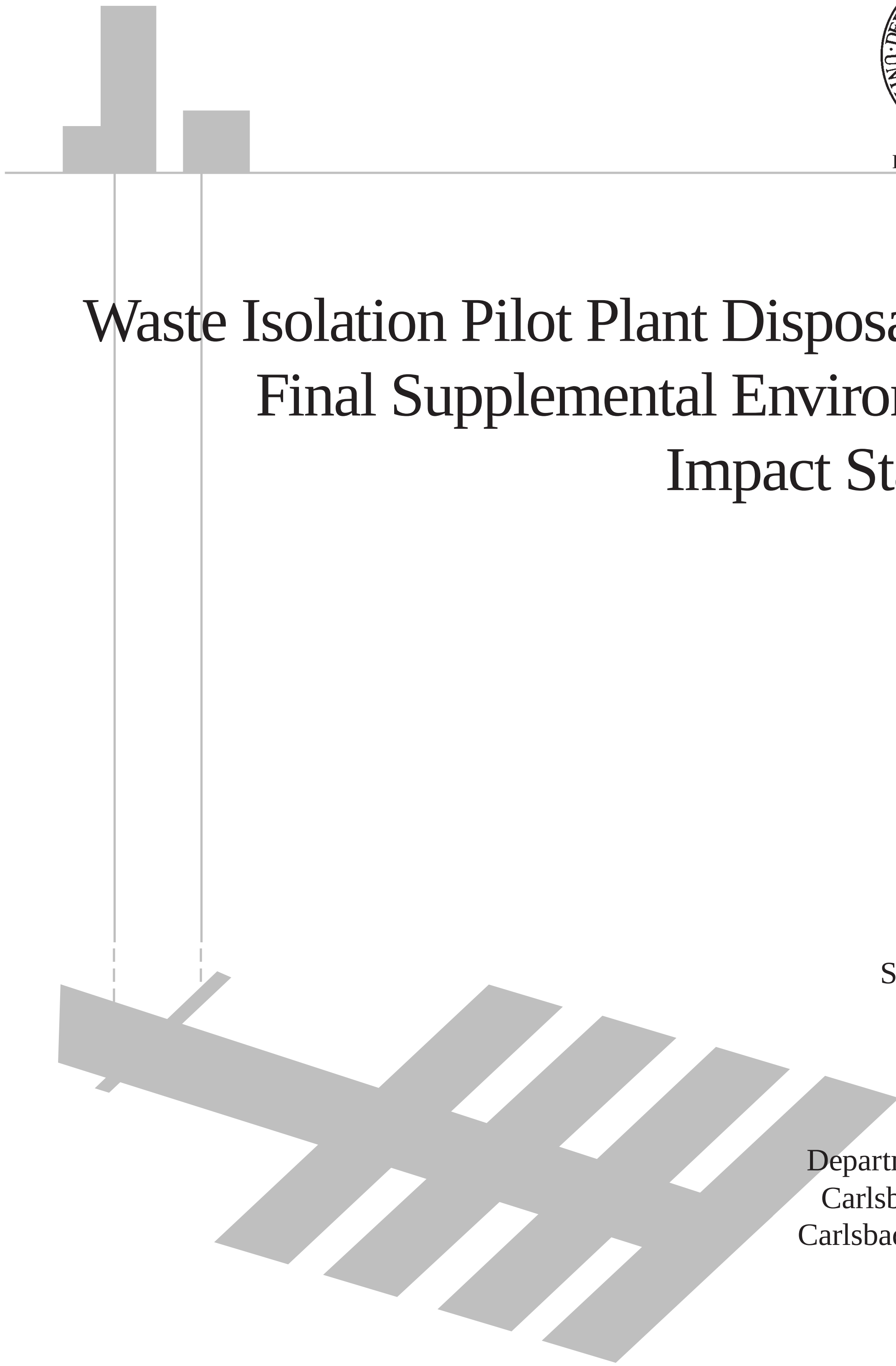

Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement

Summary

September 1997

Department of Energy
Carlsbad Area Office
Carlsbad, New Mexico

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Abstract:

The purpose of *the Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (SEIS-II) is to provide information on environmental impacts regarding the Department of Energy's (DOE) proposed disposal operations at WIPP. To that end, SEIS-II has been prepared to assess the potential impacts of continuing the phased development of WIPP as a geologic repository for the safe disposal of transuranic (TRU) waste. SEIS-II evaluates a Proposed Action, three Action Alternatives based on the waste management options presented in the *Final Waste Management Programmatic Environmental Impact Statement*, and two No Action Alternatives. The Proposed Action describes the treatment and disposal of the Basic Inventory of TRU waste over a 35-year period. The Basic Inventory is that waste currently permitted in WIPP based on current laws and agreements. The Action Alternatives propose the treatment of the Basic Inventory and an Additional Inventory as well as the transportation of the treated waste to WIPP for disposal over a 150- to 190-year period. The three Action Alternatives include the treatment of TRU waste at consolidation sites to meet WIPP planning-basis Waste Acceptance Criteria, the thermal treatment of TRU waste to meet Land Disposal Restrictions, and the treatment of TRU waste by a shred and grout process. The No Action Alternatives propose the dismantling and closure of WIPP and storage of the waste. One No Action Alternative proposes treating the waste thermally before placing it in retrievable storage.

SEIS-II evaluates environmental impacts resulting from the various treatment options; the transportation of TRU waste to WIPP using truck, a combination of truck and regular rail service, and a combination of truck and dedicated rail service; and the disposal of this waste in the repository. Evaluated impacts include those to the general environment and to human health. Additional issues associated with the implementation of the alternatives are discussed to provide further understanding of the decisions to be reached and to provide the opportunity for public input on improving DOE's Environmental Management Program.

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SUMMARY

INTRODUCTION

The U.S. Department of Energy (hereafter the Department or DOE) needs to dispose of transuranic (TRU) waste generated by its past, present, and future activities in a manner that protects public health and the environment. In previous National Environmental Policy Act (NEPA) documents, the Department examined alternatives to repository disposal at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. In this document, the *Waste Isolation Pilot Plant Disposal Phase Supplemental Environmental Impact Statement* (SEIS-II), the Department assesses whether to dispose of TRU waste at WIPP. This document also assesses reasonable options for transportation and other activities associated with disposal, as well as reasonable alternatives concerning quantities, sources, and treatment of TRU waste before disposal.

TRU waste is contaminated with alpha-emitting radionuclides that are heavier than uranium (i.e., their atomic numbers are greater than that of uranium) and that have half-lives longer than 20 years at concentrations greater than 100 nanocuries per gram of waste. Key radionuclides found in TRU waste include americium-241 and several isotopes of plutonium (Pu-238, Pu-239, Pu-240, and Pu-241). Since 1970, DOE has segregated TRU waste from other radioactive waste and stored it in a manner that allows it to be retrieved. Several types of operations (current, past, or future) have generated or will generate TRU waste: (1) nuclear weapons development and manufacturing, (2) plutonium recovery, stabilization, and management, (3) research and development, (4) environmental restoration, and decontamination and decommissioning, (5) waste management, and (6) testing at facilities that are under DOE contract.

TRU waste exists in a variety of forms ranging from unprocessed laboratory trash, such as tools, glassware, and gloves, to solidified sludges from wastewater treatment. TRU waste is classified, for handling purposes, as contact-handled (CH) TRU waste or remote-handled (RH) TRU waste depending on the radiation dose rate at the surface of the waste container. In addition, about 60 percent of TRU waste is classified as TRU mixed waste because it also contains hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). A major component of TRU mixed waste is metallic lead, which is present primarily in the form of glovebox parts and lead-lined gloves or aprons. Some TRU mixed waste contains traces of organic solvents such as methylene chloride and carbon tetrachloride, both common cleaning agents. Some TRU mixed waste also is commingled with polychlorinated biphenyls (PCBs).

A 1981 Record of Decision (ROD), based on the *Final Environmental Impact Statement for the Waste Isolation Pilot Plant* (FEIS), documented DOE's initial decision to proceed with the phased development of WIPP at a site near Carlsbad, New Mexico. In 1990, following construction of most of the WIPP facilities, the Department prepared the *Final Supplement Environmental Impact Statement for the Waste Isolation Pilot Plant* (SEIS-I) to update the environmental record established in the FEIS. In the SEIS-I ROD, published in the Federal Register on June 22, 1990, DOE chose the Proposed Action alternative, which was to continue with a phased approach to WIPP by testing TRU waste underground at the facility. DOE subsequently decided to perform the tests in aboveground laboratories instead of at WIPP.

HIGHLIGHTS OF CHANGES SINCE PUBLICATION OF THE DRAFT SEIS-II

In response to stakeholder comments and requests and in an effort to ensure that SEIS-II incorporates the Department's latest planning efforts, changes have been made throughout SEIS-II since its publication in draft form in November 1996. Sidebars are used throughout the document to indicate where changes have been made. No sidebars, though, are used to indicate changes to text boxes, figures, or tables. Below is a list of some notable modifications:

- Two sites have been removed from the tables and the maps presented throughout the document. These two sites, the Pantex Site and Teledyne Brown Engineering, have moved the small amount (less than 1 cubic meter) of TRU waste reported in the Draft SEIS-II to Los Alamos National Laboratory and Rocky Flats Environmental Technology Site, respectively. Since they no longer have TRU waste, the impacts from the waste originating at these two sites are included in the impacts for Los Alamos National Laboratory and Rocky Flats Environmental Technology Site.

- Additional text boxes have been added to Chapter 3 and Chapter 5 that discuss the impacts of waste not disposed of in WIPP under the Proposed Action. Also, additional text has been added to Chapter 3 and Chapter 5 that discusses methods of reducing the period of disposal operations for each Action Alternative to 75 years or less and how impacts would change should DOE choose to use those methods.

- The Proposed Action has been identified as DOE's Preferred Alternative, although rail transportation would continue to be an option for future transportation of TRU waste.

- Additional discussions of current socioeconomic conditions and of WIPP site geology and hydrology have been added to Chapter 4.

- All references to planning documents and to related NEPA documents have been updated. New documents have been reviewed and changes to SEIS-II have been made as needed to ensure consistency with other planning efforts.

- A new appendix (Appendix J) has been added to discuss updated TRU waste inventory estimates and current TRU waste management initiatives.

- The analyses presented in Chapter 5 and in the appendices have been reviewed, redone as necessary, and their presentation revised, based on stakeholder comments on the draft. (See the summary of comments and changes in the Summary text box titled "Issued Raised During the SEIS-II Public Comment Period.")

- Performance assessment analyses have been redone based on stakeholder comments and requests. Two particular changes should be noted. First, new analyses indicate that in this document's most conservative scenarios, radionuclides and heavy metals would reach the Culebra Dolomite should a drilling intrusion occur. Second, the performance assessment results for No Action Alternative 2 have been reduced from 2,325 fatalities to 800 fatalities during 10,000 years. Neither number, though, takes into account potential deaths due to inadvertent intrusion. Chapter 5 now includes estimates of the impacts of intrusion.

- Volume III, the *Comment Response Document*, has been added to SEIS-II. Nearly 4,000 comments were received on the Draft SEIS-II. Those comments are summarized and responses to those comments are presented in the *Comment Response Document*.

The 1990 ROD committed the Department to prepare SEIS-II prior to a decision to dispose of waste at WIPP and determined that the scope of SEIS-II would include an analysis of the long-term performance of WIPP in light of new information obtained since 1990. It also stated that DOE would study the potential impacts to generator, storage, and treatment sites throughout the country of disposing of waste at WIPP.

Since SEIS-I and its ROD, several events have occurred that could affect the treatment and handling of TRU waste and a decision concerning its disposal at WIPP. In 1992, Congress passed the WIPP Land Withdrawal Act (LWA) (Public Law 102-579), which reserves the 16-section area surrounding the WIPP site for the construction, experimentation, operation, repair, maintenance, disposal, shutdown, monitoring, and decommissioning of WIPP. The LWA also limits the radiation permitted at WIPP and the total volume of TRU waste permitted to be disposed of. Also in 1992, Congress passed the Federal Facility Compliance Act (FFCAct), requiring DOE to prepare plans for developing treatment capacities and technologies for mixed waste, including TRU mixed waste. In 1996, Congress passed the National Defense Authorization Act for Fiscal Year 1997 (Public Law 104-201), which amended the LWA. Among other things, Public Law 104-201 provides that RCRA land disposal restrictions do not apply to waste disposed of at WIPP. Other changes since SEIS-I include regulatory and statutory changes, changes in the TRU waste inventory, and the development of new hydrologic and geologic information that may help DOE understand WIPP and its ability to isolate waste. SEIS-II takes into account all of the changed circumstances that might affect potential environmental impacts of TRU waste disposal at WIPP and closure of the WIPP facility once operations cease.

SEIS-II is an integrated part of DOE's overall decision regarding the disposal of TRU waste at WIPP. SEIS-II has been timed to take advantage of information presented in prior documents and to inform current and future planning efforts. The relationship between SEIS-II and major planning and compliance documents is as follows:

- Compliance *Certification Application:* This document, prepared in accordance with 40 CFR Part 194 and submitted to the U.S. Environmental Protection Agency (EPA) in October 1996 and accepted by the EPA in May 1997 is required by the LWA to demonstrate compliance with standards for disposal of TRU waste (40 CFR 191, Subparts B and C). Conceptual models and computer codes used for performance assessment calculations in the Compliance Certification Application (CCA) were used in SEIS-II to assess the long-term ability of WIPP to isolate radioactive waste from the accessible environment.

> ***LEGALLY BINDING ORDERS AND AGREEMENTS***
>
> DOE is subject to a number of legally binding agreements and orders concerning TRU waste. One example of such an order is the negotiated settlement agreement entered by the court in the case of *Public Service Co. v Batt*, Civil No. 91-0035-S-EJL (D. ID, October 17, 1995). DOE intends to keep its commitments pursuant to these binding agreements and orders.

- *Resource Conservation and Recovery Act Part B Permit Application:* This document, submitted April 1996, is the application to operate WIPP as a disposal facility, as defined

ISSUES RAISED DURING THE SEIS-II PUBLIC COMMENT PERIOD

During the public comment period that followed publication of the Draft SEIS-II in November 1996, stakeholders commented on a variety of issues, including the following:

- Several commenters expressed concern that the data, information, and computer codes used in SEIS-II are based on the Draft CCA and not the most current versions used in the CCA. The Draft SEIS-II used some near-final input from the CCA that underwent subsequent changes. The Final SEIS-II is consistent with the Final CCA.
- Several commenters questioned the validity of planning disposal operations for periods of time exceeding 100 years. In response, DOE has assessed the impacts of reducing the disposal periods.
- Some commenters said that SEIS-II documentation relied inappropriately on draft documents. (Many of these documents have since become final and are reflected in the Final SEIS-II.) The reliance on draft documents and the relationship between SEIS-II and other planning and compliance documents is discussed in Section 1.5 of SEIS-II and Chapter 11 of the SEIS-II *Comment Response Document*.
- Several commenters requested that the Additional Inventory (in the subsection titled "Inventories and Treatment" later in this Summary) be included in the Proposed Action. The Department has not made decisions regarding the excavation of much of this waste and would do so only following Comprehensive Environmental Response, Compensation and Liability Act or RCRA investigations and possibly following additional NEPA review. The Additional Inventory, therefore, is not part of the Proposed Action. Nevertheless, the impacts of disposition of the Additional Inventory are discussed under four scenarios.
- Numerous commenters were concerned with the level of emergency response training to communities along the WIPP transportation corridors and felt that training for first responders and medical providers must be completed before shipments begin. The Department addresses these concerns in Chapter 19 of the SEIS-II *Comment Response Document*.
- Several commenters expressed concern about the impacts of accidents and incident-free exposures if TRU waste shipments traveled through Santa Fe along St. Francis Drive or along the Pojoaque corridor. Some commenters stated that shipment of waste should be delayed until the Santa Fe bypass is complete. SEIS-II compares the impacts of shipping TRU waste down St. Francis Drive with those of shipping using the Santa Fe bypass in a text box in Section 5.1.
- Many commenters expressed concern over several issues regarding performance assessment and waste isolation, including the accuracy of predictions over 10,000 years, potential contamination of the environment over long periods of time, the use of appropriate computer codes, the use of engineered barriers, gas generation, human intrusion, and pressurized brine reservoirs. DOE has addressed these and other performance assessment issues in Appendices H and I of SEIS-II and in Chapter 13 of the SEIS-II *Comment Response Document*.
- Many commenters favored long-term monitored retrievable storage in newly designed aboveground structures at the generator sites, instead of disposal at WIPP. Some commenters favored development of transmutation technologies, treatment to reduce toxicity, and other geologic repository alternatives. DOE addresses these concerns in Chapter 3 of SEIS-II and in Chapter 1 of the SEIS-II *Comment Response Document*.
- Many commenters questioned the accuracy of knowledge of waste drum contents and the ability to characterize the waste. Concerns raised included lack of techniques to characterize waste drums, minimal sampling carried out, a lack of records, and inadequate quality assurance requirements. DOE discusses waste characterization in Appendix A of SEIS-II and in Chapter 2 of the SEIS-II *Comment Response Document*.
- Many commenters questioned the honesty, integrity, and conduct of DOE and the federal government with regard to WIPP. Examples of concerns raised included alleged lies and misinformation about the safety of WIPP and waste transportation; spending of funds to overcome opposition to WIPP; a DOE record of avoiding cleanups, contaminating land, and conducting radiation experiments on workers and the public; and seemingly schedule-driven actions of DOE and its neglect of needed site characterization work. DOE has responded to these comments in Chapter 3 of the SEIS-II *Comment Response Document*.
- Many commenters expressed concerns about the post-1970 TRU waste disposal mission of WIPP, including the possibility of expanding the mission to accommodate other types of nuclear waste or other types and amounts of TRU waste beyond current legal limits. WIPP's mission is discussed in Chapter 1 of SEIS-II and in Chapter 10 of the SEIS-II *Comment Response Document*.

under RCRA regulations (40 CFR Part 264). The application has been submitted to the New Mexico Environment Department, the state agency responsible for issuing the permit. (The New Mexico Hazardous Waste Act and its implementing regulations are the state analog to RCRA.) The application provides background information regarding the DOE proposals for operating WIPP and is, therefore, one of the foundations on which assumptions in SEIS-II concerning WIPP operations are based.

- *Final No-Migration Variance Petition:* This document, submitted to the EPA and published on June 14, 1996, is a petition to receive a variance from the RCRA Land Disposal Restrictions (LDRs) on the basis that the migration of hazardous constituents would not exceed health-based levels at the disposal unit boundary. However, such a variance is no longer required pursuant to the National Defense Authorization Act for Fiscal Year 1997, Public Law No. 104-201. The document also provides background information on the long-term ability of WIPP to isolate hazardous waste and has been summarized and incorporated by referenced throughout SEIS-II.

- *Waste Isolation Pilot Plant Safely Analysis Report (SAR), Revision 0:* The intent of this document, published in November 1995, is to examine the hazards associated with the disposal of CH-TRU and RH-TRU waste and to identify where mitigation is needed. The SAR provides accident analyses of CH-TRU and RH-TRU waste. These analyses have been incorporated into SEIS-II where appropriate.

- *Waste Isolation Pilot Plant Safety Analysis Report (SAR), Revision 1:* As with Revision 0, the intent of this document, published in March 1997, is to examine the hazards associated with the disposal of CH-TRU waste and to identify where mitigation is needed. The SAR provides accident analyses of CH-TRU waste (similar analyses for RH-TRU waste are not included). These analyses have been incorporated into SEIS-II, where appropriate.

- *Transuranic Waste Baseline Inventory Report, Revision 2 (BIR-2):* This report (as well as BIR-3, below), published in December 1995, provides the waste volumes, hazardous constituent inventories, and radionuclide data used by DOE in its regulatory compliance applications. BIR-2 (as well as BIR-3, below) is used as the basis for the SEIS-II waste volumes. SEIS-II supplements the radionuclide inventory with inventory data from the Integrated Data Base (IDB).

- *Transuranic Waste Baseline Inventory Report, Revision 3 (BIR-3):* This report, which DOE used for the WIPP CCA, includes information pertaining to waste that is currently eligible for disposal at WIPP under existing laws. BIR-3 waste volumes and hazardous constituent inventories are unchanged from BIR-2. The radionuclide inventories at some sites are changed. Also, information on complexing agents, nitrates, sulfates, phosphates, and cement was added because these components could potentially affect WIPP's ability to contain TRU waste. The information on complexing agents, nitrates, sulfates, phosphates, and cement was incorporated into the parameters used in the SEIS-II analysis of long-term performance. The adjusted volumes used for SEIS-II analyses are based upon BIR-3 inventories.

- *Remote-Handled Transuranic System Assessment:* This report, published in November 1995, discusses the disposal of DOE RH-TRU waste. The report discusses packaging RH-TRU waste at treatment sites in such a way that it could be handled as CH-TRU waste.

This would entail placing the RH-TRU waste in shielded payload containers to limit the radiation dose at the outer container surface to not more than 200 mrem/hr. This waste could then be handled and emplaced as CH-TRU waste. All other CH-TRU waste requirements would apply as well. This study also considered several options for RH-TRU waste emplacement, such as putting the waste in repository walls, in vertical boreholes in the floors of the repository, or in trenches mined in the repository floor. These considerations were used to determine the number of repository panels needed under the Proposed Action and the action alternatives in SEIS-II.

- *Remote-Handled Transuranic Waste Study:* This study was conducted, as required by the LWA, to evaluate the impacts of RH-TRU waste on the performance assessment of the repository and to determine the effects of RH-TRU waste as a part of the WIPP Total Inventory. Also, this study conducted a comparison of CH-TRU and RH-TRU waste to assess differences and similarities for gas generation, flammability and explosiveness, solubility, and brine and geotechnical interactions. The conclusions and findings of this study were considered when addressing TRU waste handling and performance assessment concerns in SEIS-II.

- *The National Transuranic Waste Management Plan:* This plan, published in September 1996, presents a TRU waste management system for the DOE Complex. The system maintains compliance with all binding consent orders, unilateral orders, and regulatory agreements concerning TRU waste and creates a management system that is consistent with the June 1997 Discussion Draft of the DOE Office of Environmental Management's *Accelerating Cleanup: Focus on 2006*. (New TRU waste volume estimates presented in the 2006 Plan Discussion Draft are discussed in Appendix J and Section 5.13.)

The Proposed Action, three action alternatives, two no action alternatives, and the subalternatives considered in SEIS-II comprise a wide range of options on which the Department can base the following decisions:

- Whether to open WIPP for disposal of TRU waste or continue to maintain the waste in storage. The two no action alternatives examine the impacts of not opening WIPP.

- Which types and quantities of TRU waste should be disposed of at WIPP or continued in storage. SEIS-II includes analyses of CH-TRU waste, RH-TRU waste, post-1970 defense TRU waste, nondefense TRU waste, commercial TRU waste, pre-1970 buried TRU waste, and PCB-commingled TRU waste. The alternatives differ in the waste types and quantities involved. For all alternatives, SEIS-II analyzes CH-TRU and RH-TRU waste, both separately and together.

- Which level of waste treatment should be required for disposal or storage. The three action alternatives differ in the treatment involved, as do the two no action alternatives. [1]

- Whether to transport TRU waste primarily by truck or by rail and truck (using rail as much as practical). Three transportation options (truck, commercial rail and truck, and dedicated

[1] DOE may decide, for site-specific reasons (e.g., volume reduction), to further treat TRU waste beyond the level required in the planning-basis WIPP Waste Acceptance Criteria (WAC), even under those alternatives that propose treatment to the WAC. For example, DOE may incinerate or thermally treat TRU waste at some sites, even though thermal treatment is not required by the current planning-basis WAC. Such decisions would be based on site-specific NEPA reviews.

rail and truck) are assessed for all alternatives except two: the Proposed Action, for which transportation by truck is proposed (although DOE's Preferred Alternative reserves the rail transportation option); and No Action Alternative 2, for which there would be no transportation. Decisions based on SEIS-II may combine the transportation options.

Portions of two or more of the alternatives analyzed in SEIS-II may be combined and used by the Department. For this reason, results in SEIS-II are presented separately for RH-TRU waste and CH-TRU waste, by each transportation option, and by inventory type. The impacts of numerous combinations of the options can be calculated by summing the impacts of the various analyses.

BACKGROUND

WIPP is located in Eddy County in southeastern New Mexico. It is about 50 kilometers (30 miles) east of Carlsbad, New Mexico, in an area known as Los Medaños ("the dunes"), a relatively flat, sparsely inhabited plateau with little surface water. The land is mainly used for grazing; other uses include potash mining and oil and gas exploration and development.

WIPP was authorized by Public Law 96-164 to provide a research and development facility for demonstrating the safe disposal of radioactive waste produced by national defense activities. DOE's decision to proceed with WIPP at the southeastern New Mexico site followed a thorough NEPA review and was announced in the 1981 ROD. The decision called for the phased development of WIPP for the disposal of TRU waste generated since 1970. The WIPP facility was originally designed to dispose of approximately 175,600 cubic meters (6.2 million cubic feet) of CH-TRU waste and 7,080 cubic meters (250,000 cubic feet) of RH-TRU waste in a 40-hectare (100-acre) excavated repository. Under the LWA, the total capacity has been reduced to 175,000 cubic meters (6.2 million cubic feet).

The major construction activities at WIPP have been completed. Surface facilities have been constructed, including the Waste Handling Building (WHB) where TRU waste would be received, inspected, and moved to the waste handling shaft for transfer underground. The constructed underground facilities include four shafts, the waste disposal area, an experimental area (now closed), an equipment and maintenance area, and connecting tunnels. These underground

LWA LIMITS

The LWA limits the amount and types of TRU waste that can be emplaced at WIPP. The limits include the following:

- WIPP capacity is limited to 175,600 cubic meters (6.2 million cubic feet) total TRU waste by volume.
- No more than 5 percent by volume of RH-TRU waste may have a surface dose rate in excess of 100 rem per hour.
- No RH-TRU waste may have a surface dose rate in excess of 1,000 rem per hour.
- RH-TRU waste containers shall not exceed 23 curies per liter maximum activity level averaged over the volume of the container.
- The total curies of RH-TRU waste shall not exceed 5,100,000 curies.

In addition, the Consultation and Cooperation Agreement (C&C Agreement) with the State of New Mexico limits the volume of RH-TRU waste to 7,080 cubic meters (250,000 cubic feet).

facilities were excavated in the Salado Formation, 655 meters (2,150 feet) beneath the land surface. DOE also has excavated the first panel, which consists of seven disposal rooms. This panel is currently ready to receive waste.

STAKEHOLDER OUTREACH AND INVOLVEMENT ACTIVITIES

DOE conducted several activities prior to the SEIS-II public scoping period to inform the public of the Department's intent to prepare SEIS-II. Letters were sent to SEIS-II stakeholders, including private citizens, elected officials, tribal leaders, and public affairs officers, announcing the Department's plan to prepare SEIS-II. A Fact Sheet and the DOE Carlsbad Area Office Monthly Stakeholder Calendar for August 1995 were also distributed to stakeholders to notify the public of the upcoming SEIS-II scoping activities. In addition, an informal telephone survey was conducted to gather stakeholder suggestions about the structure of the SEIS-II scoping meetings.

SEIS-II public scoping activities included the following:

- A Notice of Intent (NOI) published in the Federal Register on August 23, 1995 (60 FR 43779), and a notice reopening the comment period published in the Federal Register on October 13, 1995

- A public comment period from August 23, 1995, to October 16, 1995

- Public scoping meetings held in Carlsbad, New Mexico, on September 7, 1995; Albuquerque, New Mexico, on September 12, 1995; Santa Fe, New Mexico, on September 14, 1995; Denver, Colorado, on September 19, 1995; Boise, Idaho, on September 20, 1995; and a second meeting in Denver, Colorado, on October 11, 1995

The NOI listed the times and locations of the public scoping meetings and the length of the public scoping period.

The Department issued the Implementation Plan for SEIS-II in May 1996. The Implementation Plan provides background information on WIPP, describes the Department's purpose and need for the WIPP project, and describes the SEIS-II work plan. It also describes the scoping process, major issues identified during the scoping process, and contains a brief discussion of how major scoping issues will be addressed in SEIS-II. Copies of the Implementation Plan were distributed to state, tribal and local governments, U.S. Congressional delegates from states with an interest in the WIPP project, all parties who provided scoping comments, and other interested parties.

Fact Sheets were prepared by the Department to provide stakeholders with additional information on topics related to SEIS-II. Two Fact Sheets, one on prescoping activities and the other on postscoping activities, have been distributed to parties on the SEIS-II mailing list. Fact Sheets were also distributed at the public scoping meetings. These sheets provided information on the NEPA process, the WIPP project, the DOE reading rooms, the role of public participation in the decision process, and other topics relevant to SEIS-II. The Department also will distribute Fact Sheets upon completion of the Final SEIS-II and publication of the ROD to all parties on the SEIS-II mailing list.

DOE published the Draft SEIS-II Notice of Availability (NOA) in the FR on November 29, 1996 (61 FR 60690). The NOA provided information on how the public could obtain copies and provide comments on the Draft SEIS-II, and the locations, dates, and times of the Draft SEIS-II hearings.

More than 900 copies of the Draft SEIS-II and 1,200 copies of the Draft SEIS-II Summary were distributed to federal, state, local, Tribal officials, and the general public. Three fact sheets were distributed along with the Draft SEIS-II and the Summary: an overview of how the public could provide comments on the Draft SEIS-II and the public hearing schedule; a list of the SEIS-II reading rooms and a list of the alternatives analyzed in the Draft SEIS-II.

DOE had initially established a 60-day public comment period that included the public hearing process. In response to public requests for more time to study the Draft SEIS-II, DOE subsequently extended the public comment period to 90 days (62 FR 4989). The public was also provided the opportunity to comment at a series of public hearings held in the following locations: Albuquerque, New Mexico on January 6 and 7, 1997; Santa Fe, New Mexico on January 8, 9, 10, 1997; Carlsbad, New Mexico and Denver, Colorado on January 13, 1997; Richland, Washington and Boise, Idaho on January 15, 1997; Oak Ridge, Tennessee on January 21, 1997; and North Augusta, South Carolina on January 23, 1997.

More than 700 individuals attended the hearings and more than 300 individuals provided oral testimony. The SEIS-II public hearings were scheduled after the holiday season to afford more people the opportunity to attend them. In addition, DOE staff attended meetings in New Mexico, Oregon, and Idaho to give presentations on SEIS-II. Recognizing that not every individual, organization, or agency could or would attend a public hearing, DOE invited comments on the Draft SEIS-II by mail, facsimile, and the Internet and received more than 150 letters.

DESCRIPTION OF THE ALTERNATIVES

SEIS-II analyzes six alternatives: the Proposed Action; Action Alternatives 1, 2, and 3; and No Action Alternatives 1 and 2. Action Alternatives 1, 2, and 3, and No Action Alternative 1 have one or more subalternatives and transportation options. These alternatives, subalternatives, and options vary in the waste inventory considered, the type of treatment, and the type of transportation.

Inventories and Treatment

For SEIS-II, the Basic Inventory includes the defense TRU waste that has been placed in retrievable storage since 1970 and the defense TRU waste that would continue to be generated through 2033 from plutonium stabilization and management activities, environmental restoration, decontamination and decommissioning, waste management, and defense testing and research. Table S-1 shows the TRU waste that comprises this inventory and its location. Such defense TRU waste can be disposed of at WIPP under the LWA, up to the capacity limits in the LWA and the Consultation and Cooperation Agreement with New Mexico (C&C Agreement). (A discussion of updated volumes and TRU waste locations from the 1997 *National Transuranic Waste Management Plan* is presented later in this Summary, throughout SEIS-II, and in Appendix J.)

DOE also owns or controls other TRU waste including nondefense, commercial, and previously disposed of waste. The previously disposed of waste includes waste buried prior to the 1970 decision to keep TRU waste in a retrievable manner. In SEIS-II, this waste is referred to as the

Additional Inventory. The Additional Inventory also includes all nondefense or commercial waste that DOE believes will be generated through 2033. Currently, the commercial and nondefense waste is not permitted at WIPP under the terms of the LWA. Table S-2 presents the volumes and locations of this waste. Included in the Additional Inventory is a small amount of waste (720 cubic meters or 25,430 cubic feet) that has been commingled with PCBs. The impacts of disposing of this small amount of waste are estimated in SEIS-II for alternatives that include thermal treatment of waste.

Table S-1
Basic Inventory TRU Waste Volumes [a]

	Stored (1995) (cubic meters)		**Estimated Total through 2022 [b] (cubic meters)**		**Projected Total through 2033 [c] (cubic meters)**	
Site [d]	**CH-TRU**	**RH-TRU**	**CH-TRU**	**RH-TRU**	**CH-TRU**	**RH-TRU**
Hanford Site (Hanford)	12,000	200	46,000	22,000	57,000	29,000
Los Alamos National Laboratory (LANL)	11,000	94	18,000	190	21,000	230
Idaho National Engineering and Environmental Laboratory (INEEL)	28,000	220	28,000	220	28,000	220
Argonne National Laboratory - West (ANL-W)	7	19	750	1,300	1,000	1,700
Argonne National Laboratory - East (ANL-E)	25	--- [e]	150	---	200	---
Savannah River Site (SRS)	2,900	---	9,600	---	12,000	---
Rocky Flats Environmental Technology Site (RFETS)	4,900	---	9,300	---	11,000	---
Oak Ridge National Laboratory (ORNL)	1,300	2,500	1,600	2,900	1,700	3,100
Lawrence Livermore National Laboratory (LLNL)	230	---	940	---	1,200	---
Nevada Test Site (NTS)	620	---	630	---	630	---
Mound Plant (Mound)	300	---	300	---	300	---
Bettis Atomic Power Laboratory (Bettis)	---	---	120	7	170	9
Sandia National Laboratories - Albuquerque (SNL)	7	---	14	---	17	---
Paducah Gaseous Diffusion Plant (PGDP)	---	---	6	---	8	---
U.S. Army Materiel Command (USAMC)	3	---	3	---	3	---
Energy Technology Engineering Center (ETEC)	2	6	2	7	2	7
University of Missouri Research Reactor (U of Mo)	1	---	1	---	1	---
Ames Laboratory - Iowa State University (Ames)	---	---	1	---	1	---
Battelle Columbus Laboratories (BCL)	---	580	---	580	---	580
Totals	**62,000**	**3,600**	**116,000**	**27,000**	**135,000**	**35,000**

[a] The inventory for SEIS-II is based on BIR-3, which takes into account potential thermal treatment at some sites. The thermal treatment, though, is not necessarily for PCB-commingled waste. TRU waste containing more than 50 parts per million of PCBs cannot be disposed of at WIPP without applicable permits. The Basic Inventory is waste that resulted from defense activities and that was placed in retrievable storage pursuant to the Atomic Energy Commission policy of 1970 and TRU waste reasonably expected to be generated by these ongoing activities. Volumes have been rounded. Actual totals may differ due to rounding. Projected totals have not been adjusted in anticipation of disposal. A discussion of updated volumes and TRU waste locations presented in the *National Transuranic Waste Management Plan* is presented in Appendix J, throughout SEIS-II, where appropriate, and later in this Summary.

[b] Post-1970 defense TRU waste volumes through 2022 are estimated in BIR-2.

[c] The Proposed Action, described in Chapter 3, is based on operation of WIPP for 35 years through 2033. Total includes TRU waste to be generated for 35 years.

[d] Sites in boldface were included in SEIS-I. INEEL and ANL-W are located near each other and are counted as a single site in SEIS-II; however, ANL-W is listed separately to indicate its contribution to the inventory.

[e] Dashes indicate no TRU waste.

Table S-2
Additional Inventory TRU Waste Volumes [a, b, c]

Site [d]	PCB-Commingled (cubic meters)		Commercial/Nondefense (cubic meters)		Previously Disposed of (cubic meters)		Total (cubic meters)	
	CH-TRU	RH-TRU	CH-TRU	RH-TRU	CH-TRU	RH-TRU	CH-TRU	RH-TRU
Hanford Site (Hanford)	240	--- [e]	---	---	63,000	1,000	63,000	1,000
Los Alamos National Laboratory (LANL)	---	---	---	---	14,000	120	14,000	120
Idaho National Engineering and Environmental Laboratory (INEEL)	460	---	---	---	57,000	440	57,000	440
Savannah River Site (SRS)	---	---	---	---	4,900	---	4,900	---
Oak Ridge National Laboratory (ORNL)	---	---	5	---	61	120	66	120
Mound Plant (Mound)	19	---	---	---	---	---	19	---
Sandia National Laboratories - Albuquerque (SNL)	---	---	---	---	1	---	1	---
ARCO Medical Products Company (ARCO)	---	---	1	---	---	---	1	---
Knolls Atomic Power Laboratory (Knolls)	---	---	---	81	---	---	---	81
Lawrence Berkeley Laboratory (LBL)	---	---	2	---	---	---	2	---
West Valley Demonstration Project (WVDP)	---	---	190	370	---	1,400	190	1,700
Totals	**720**	**---**	**200**	**450**	**138,000**	**3,100**	**139,000**	**3,500**

[a] The inventory for SEIS-II is based on BIR-3, which takes into account potential thermal treatment at some sites. The thermal treatment, though, is not necessarily for PCB-commingled waste. The Additional Inventory includes PCB-commingled TRU waste, commercial TRU waste, nondefense TRU waste, and TRU waste disposed of prior to the Atomic Energy Commission policy of 1970. A discussion of updated volumes and TRU waste locations presented in the *National Transuranic Waste Management Plan* is presented in Appendix J, throughout SEIS-II, where appropriate, and later in this Summary.

[b] The volume of TRU waste includes the 1995 existing and projected waste through 2033.

[c] Actual totals may differ due to rounding.

[d] Sites in boldface also store post-1970 defense TRU waste, see Table S-1. The remaining four sites currently have no post-1970 defense TRU waste.

[e] Dashes indicate no TRU waste.

CONSERVATISM OF TRU WASTE VOLUME ESTIMATES

TRU waste inventory estimates, as used throughout SEIS-II, embody many conservative assumptions to ensure bounding analyses of maximum, reasonably foreseeable impacts. The following reflect some of the conservative assumptions.

- The BIR-3 estimates of TRU waste volumes include projections that may overestimate TRU waste volumes. For instance, in both the Basic Inventory and the Additional Inventory, volume estimates include projections of waste yet to be generated. Though the Department's TRU waste generation due to defense activities has decreased because of a change in the nation's nuclear weapons needs, the projections of future waste also include waste anticipated by activities such as decontamination and decommissioning. These activities, which would include cleaning and disassembling facilities, can generate a great deal of TRU waste, but whether that waste will actually be generated and whether it will be CH-TRU or RH-TRU waste is uncertain. For the purposes of analyses, SEIS-II has used the estimates included in BIR-3, even though the volume of such future-generated waste may be lower.

- The Additional Inventory includes estimates of TRU waste produced prior to 1970 and believed to have been disposed of in trenches at some of the sites. Since DOE's definition of TRU waste has changed and some of the buried waste would probably be classified as low-level waste under current definitions, the amount that is actually TRU waste is unknown. For the purposes of analyses, all of this waste, as estimated in BIR-3, is considered part of the Additional Inventory and the effects of its disposal at WIPP are assessed in the SEIS-II action alternatives. SEIS-II analyzes 141,000 cubic meters (5 million cubic feet) of TRU waste that has been previously disposed of. Currently, though, DOE estimates that only 80,000 cubic meters (2.8 million cubic feet) of this waste would be excavated.

- The C&C Agreement between the State of New Mexico and DOE limits the amount of RH-TRU waste allowable at WIPP to 7,080 cubic meters (250,000 cubic feet). The Department's Proposed Action proposes disposing of this amount of RH-TRU waste, although the actual amount may be as low as 4,300 cubic meters (150,000 cubic feet). The lower figure reflects the current plans for disposing of this waste in the walls of WIPP panel rooms before emplacement of CH-TRU waste in the rooms. At startup, delays in preparing the RH-TRU waste for shipment are anticipated, which would result in the emplacement of some CH-TRU waste before RH-TRU waste is ready for WIPP. To ensure that SEIS-II disposal analyses are conservative, the analyses for the Proposed Action were conducted as if the full 7,080 cubic meters of RH-TRU waste would be emplaced.

- Application of the LWA and the C&C Agreement would limit the amount of CH-TRU waste allowable under the Proposed Action to 168,500 cubic meters (5,950,000 cubic feet), but only 143,000 cubic meters (5,050,000 cubic feet) is estimated to be in the Basic Inventory. Still, because of the potential for excavation of previously disposed of waste (which would then be classified as newly generated) and the potential for treatment of alpha-emitting, low-level waste that could convert currently non-TRU waste forms into TRU waste by concentrating transuranic radionuclides (as discussed in the cumulative impacts analysis), and repackaging of RH-TRU waste to meet the criteria of CH-TRU waste, SEIS-II analyses consider the effects of filling WIPP to its allowable capacity.

- While the LWA and C&C Agreement include limits on the volume of TRU waste that can be emplaced, there is considerable uncertainty concerning how much of a container's volume is made up of TRU waste and how much is void space. Many of the containers would include a great deal of void space, particularly for RH-TRU waste; the actual volume of waste in a drum or cask, therefore, may be much less than the volume of the drum or cask. For the purposes of analyses in SEIS-II, the volume of the drum or cask is used, as if the drum or cask were full without void space.

While volume changes to the TRU waste inventory could reduce or increase the effects calculated in SEIS-II, the best estimates available have been used and conservative assumptions have been incorporated to ensure that the results would actually be less than those presented. A text box entitled "Factors to Consider in Combining Alternatives" (presented in Chapter 5) explains in more detail how the results would change as inventory volumes change.

When both the Basic Inventory and Additional Inventory are considered together, the combined volume is called the Total Inventory in SEIS-II. The Total Inventory, therefore, includes all of the TRU waste that DOE is currently responsible for and all DOE TRU waste anticipated through 2033. The waste in the Total Inventory is stored or would be generated at the 22 sites shown on Figure S-1. (Certain alternatives involve the Total Inventory excluding TRU waste commingled with PCBs.)

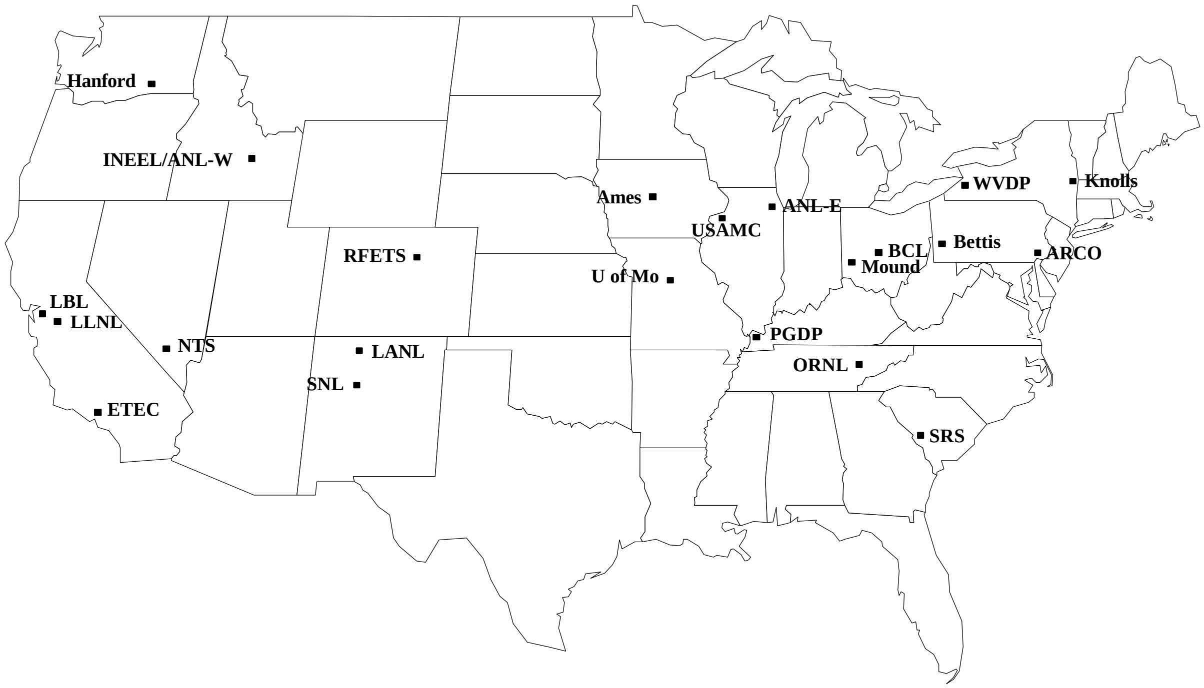
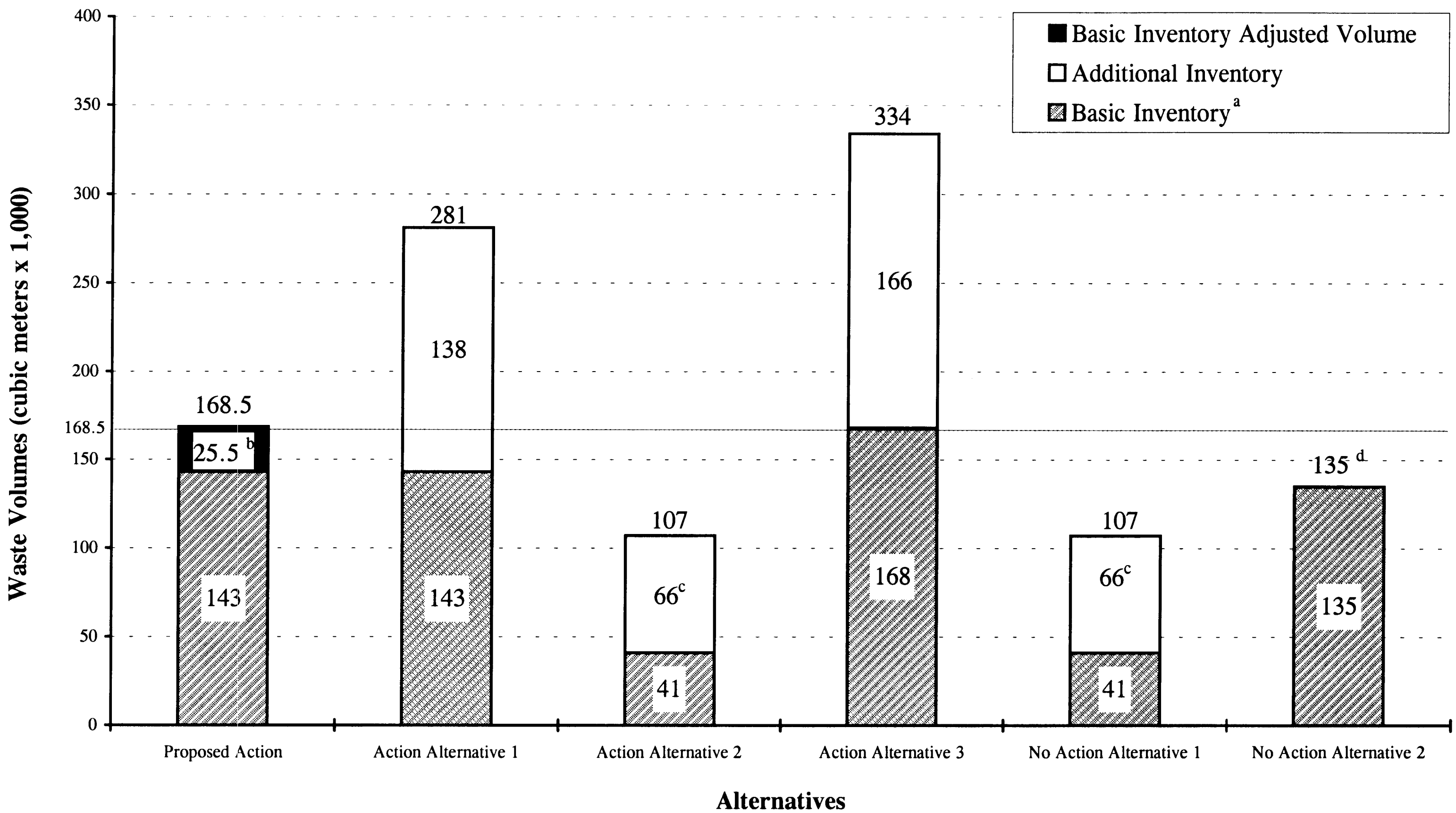


Figure S-1
Approximate Location of the SEIS-II TRU Waste Sites [a]

[a] Although Pantex currently has no TRU waste, future decisions by the Department may result in TRU waste generation at Pantex.

The waste volumes presented in Tables S-1 and S-2 are not the volumes that would be emplaced at WIPP under the Proposed Action or the action alternatives. The emplaced volumes would be different due to three factors. First, the LWA and agreements with the State of New Mexico limit the volumes of CH-TRU and RH-TRU defense waste permitted at WIPP. These limits establish the maximum volume of defense TRU waste that would be disposed of at WIPP under the Proposed Action.

The action alternatives consider larger volumes and additional types of waste and may require amendment of the LWA and/or the C&C Agreement to be fully implemented. Second, packaging waste for emplacement changes its volume; in particular, the volume of RH-TRU waste increases by 43 percent once the volume of its containers is considered. Finally, three different methods of treating the waste are considered in SEIS-II alternatives; two of these treatment methods (thermal treatment and shred and grout treatment) substantially change the volume of waste. The volumes of TRU waste that would be emplaced under each SEIS-II action alternative, after adjustment for the three factors described above, are presented in Figures S-2 and S-3 and in Table S-3.



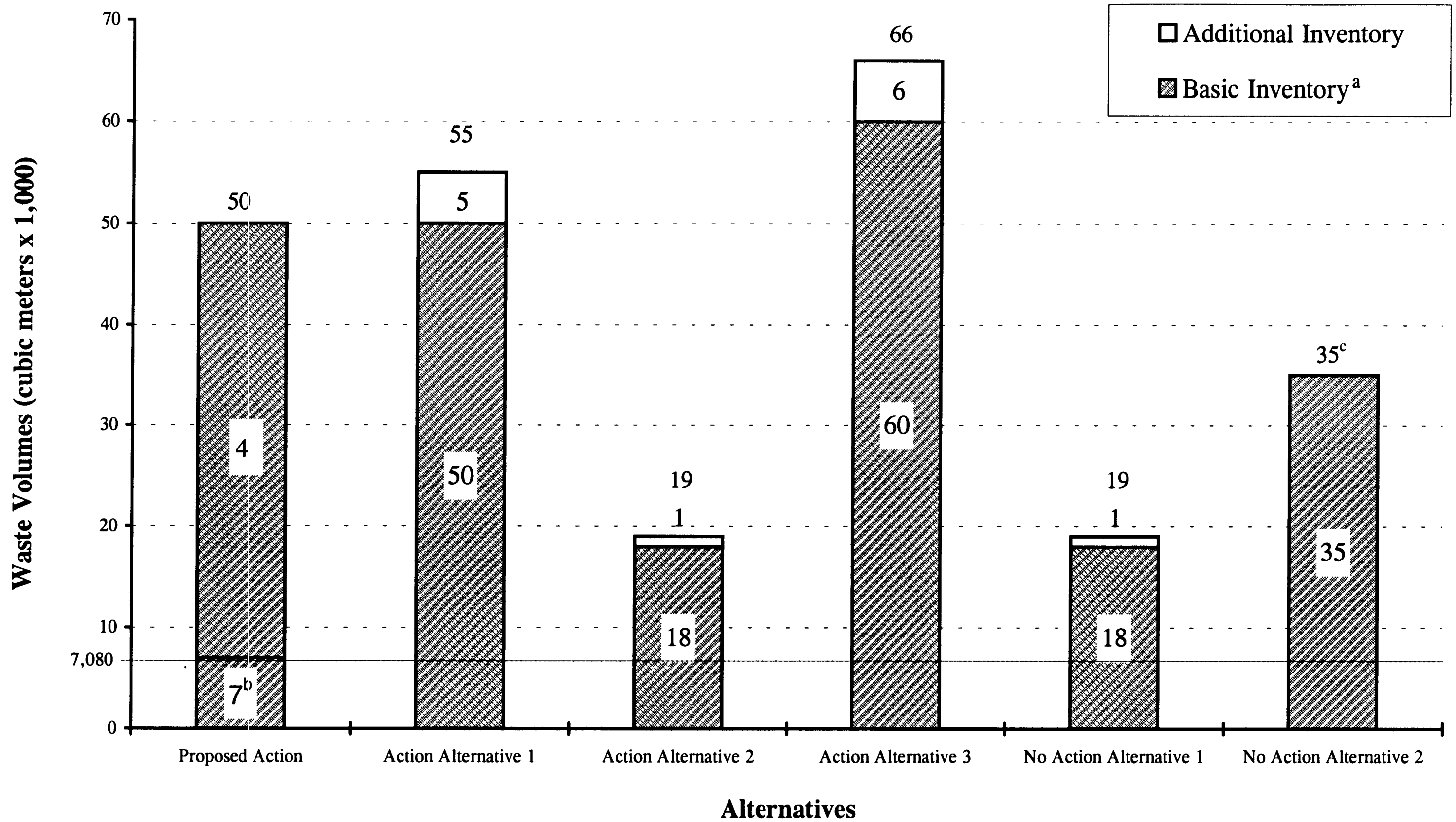
[a] The Basic Inventory consists of post-1970 and newly generated defense waste. The Basic Inventory for all alternatives has the same radionuclide inventory.

[b] The CH-TRU waste Basic Inventory is adjusted from approximately 143,000 cubic meters to 168,500 cubic meters in order to evaluate the total volume of CH-TRU waste allowable at WIPP under current laws and agreements.

[c] Includes TRU waste commingled with PCBs.

[d] Only 73,000 cubic meters of newly generated defense waste would be treated. Existing stored waste would not be treated. Therefore, the post-treatment waste volume of the Basic Inventory is not the same as for the Proposed Action and Action Alternative 1.

Figure S-2
CH-TRU Post-Treatment Waste Volumes by Alternative



[a] The Basic Inventory consists of post-1970 and newly generated defense waste. The Basic Inventory for all alternatives has the same radionuclide inventory.

[b] Only 7,080 cubic meters of the Basic Inventory (14 percent of the Basic RH-TRU inventory) was evaluated for WIPP disposal under the Proposed Action because of the WIPP disposal limit established under the C&C Agreement with the State of New Mexico. The excess RH-TRU waste would be treated to WAC and stored at non-WIPP treatment sites.

[c] Only 32,000 cubic meters of newly generated defense waste would be treated. Existing stored waste would not be treated. Therefore, the post-treatment waste volume of the Basic Inventory is not the same as for the Proposed Action and Action Alternative 1.

Figure S-3
RH-TRU Post-Treatment Waste Volumes by Alternative

Table S-3
TRU Waste Post-Treatment Volumes (in cubic meters) [a]

Proposed Action		Action Alternative 1		Action Alternative 2 (All Subalternatives)	
CH-TRU Waste	RH-TRU Waste	CH-TRU Waste	RH-TRU Waste	CH-TRU Waste	RH-TRU Waste
168,500	7,080	281,000	55,000	107,000	19,000
Action Alternative 3		**No Action Alternative 1 (Both Subalternatives)**		**No Action Alternative 2 [b]**	
CH-TRU Waste	**RH-TRU Waste**	**CH-TRU Waste**	**RH-TRU Waste**	**CH-TRU Waste**	**RH-TRU Waste**
334,000	66,000	107,000	19,000	135,000	35,000

[a] SEIS-II is based on BIR-3, which incorporates the volumes in BIR-2. These estimates have been adjusted to emplacement volumes, though no waste would be emplaced under the no action alternatives. For most recent waste volume projections, see Appendix J.
[b] Only 73,000 cubic meters of CH-TRU waste and 32,000 cubic meters of RH-TRU waste would be treated.

The three treatment methods considered in SEIS-II are treatment to meet the current planning-basis WIPP Waste Acceptance Criteria (WAC), treatment by a shred and grout process, and treatment by a thermal process to meet the RCRA LDRs. Each is discussed below:

- The treatment method that changes the waste volume the least is treatment to meet the planning-basis WAC. The WAC are based on the level of treatment that is currently required by applicable regulations (such as U.S. Department of Transportation regulations) or current DOE policies. The current planning-basis WAC, the fifth revision of the WAC, was the basis for SEIS-II analyses. The WAC may be revised again in the future. In particular, if DOE decides to treat the waste using a shred and grout or thermal process, using that process would become part of the WAC.

- One SEIS-II action alternative (Action Alternative 3) considers treatment of the waste by shredding it and sealing it in grout. This method of treatment reduces the gas generation potential of the waste; however, it also substantially increases the volume of waste.

- Another method of treating waste uses a thermal process that would substantially condense the waste and remove many of the hazardous constituents of the TRU mixed waste. Waste commingled with PCBs could be treated using a thermal process and then disposed of at WIPP. Action Alternatives 2A, 2B, and 2C and No Action Alternatives 1A and 1B consider treatment using a thermal process.

Where appropriate, SEIS-II incorporates and expands upon the analyses in the *Final Waste Management Programmatic Environmental Impact Statement* (WM PEIS), published in May 1997, which analyzed the impacts of centralizing, regionalizing, and decentralizing treatment of TRU waste at various sites throughout the nation and used the three treatment methods being considered in SEIS-II. For the WM PEIS alternatives, three basic consolidation options were considered. For its Decentralized Alternative, the WM PEIS estimated impacts of treating TRU waste primarily where it is currently stored or where it would be generated. For its Regionalized Alternatives, the

WM PEIS analyzed the impacts of transporting waste to regional sites and treating it there. For its Centralized Alternative, the WM PEIS considered shipping the CH-TRU waste to WIPP and treating it at a new treatment facility that would be built there and shipping the RH-TRU waste to two centralized RH-TRU waste treatment facilities.

The WM PEIS preferred alternative would treat TRU waste at the facilities where that waste currently is stored or would be generated except that waste at Pantex and Sandia National Laboratories (SNL) would be shipped to Los Alamos National Laboratory (LANL) for treatment, a portion of the TRU waste at the Rocky Flats Environmental Technology Site (RFETS) would be sent to Idaho National Engineering and Environmental Laboratory (INEEL) for treatment, Savannah River Site (SRS) may send its RH-TRU waste to Oak Ridge National Laboratory (ORNL) for treatment, and the ORNL may send its CH-TRU waste to SRS for treatment.

SEIS-II uses and builds upon the WM PEIS analyses of potential waste treatment locations under these consolidation schemes. Each SEIS-II alternative is based on a similar alternative presented in the WM PEIS. (See Appendix B for details on each WM PEIS alternative; see the text box later in this summary for details on which SEIS-II alternative matches which WM PEIS alternative; see the text box later in this summary on the impacts of the WM PEIS preferred alternative.)

Although SEIS-II incorporates by reference, and where appropriate, updates and adjusts information from the WM PEIS, the potential actions analyzed in SEIS-II are not connected to the potential actions analyzed in the WM PEIS. To further explain, the WM PEIS evaluates alternative configurations for managing five types of waste, including TRU waste, that are at DOE sites or are otherwise under DOE’s control or responsibility. The alternative configurations range from managing the wastes where they are presently located to transporting them to one centralized site for management. The WM PEIS evaluates trends in various impacts as alternative configurations become more or less centralized. The WM PEIS postulates three generic types of treatment for TRU waste, in order to analyze the impacts of treating and storing TRU waste under the various alternative configurations. These generic treatments allow DOE, in the WM PEIS, to compare the relative impacts of centralized, regionalized, and decentralized treatment and storage. To reduce the potential impacts of storing untreated wastes, DOE must decide, pursuant to the WM PEIS, the most cost-effective and environmentally preferable configuration to treat and store TRU waste, regardless of whether the Department decides to dispose of this waste at WIPP.

In addition to TRU waste, the WM PEIS analyzes four other types of waste: high-level waste, low-level waste, low-level mixed waste, and hazardous waste. These wastes would not be disposed of at WIPP, and management of these wastes is unrelated to, and outside the scope and purpose of, SEIS-II.

SEIS-II, in contrast, is the third in a series of staged NEPA reviews of the WIPP proposal and focuses on WIPP disposal of TRU waste. SEIS-II analyzes impacts and alternatives for disposal at WIPP, transportation to WIPP, and associated activities not addressed in, and not within the scope of, the WM PEIS. SEIS-II involves additional and different workers, time frames, transportation modes, alternatives, and affected environments. SEIS-II inventories include TRU waste buried prior to 1970 and projections of TRU waste that may be generated during the next 35 years.

Decisions associated with whether to dispose of TRU waste at WIPP can and should be made regardless of any decisions made pursuant to the WM PEIS. Furthermore, decisions for TRU waste disposal are far removed from decisions on management of the other types of waste analyzed in the WM PEIS. Decisions concerning WIPP pursuant to SEIS-II will not automatically trigger or prejudice decisions for high-level waste, low-level waste, hazardous waste, and low-level mixed waste that may be made pursuant to the WM PEIS. As such, SEIS-II and the WM PEIS have different purposes, meet different needs, and are independently justified.[1]

Proposed Action: Basic Inventory, Treat to WAC, Dispose of at WIPP (Preferred Alternative, Reserving Rail Transportation for Future Consideration)

Under the Proposed Action, DOE would continue with the phased development of WIPP by disposing of post-1970 defense TRU waste in the WIPP repository. This action would dispose of 175,600 cubic meters (6.2 million cubic feet) of the Basic Inventory. Because only 7,080 cubic meters (250,000 cubic feet) of RH-TRU waste can be disposed of at WIPP (under current laws and agreements), additional RH-TRU waste in this inventory (43,000 cubic meters [1.5 million cubic feet]) would be treated to the planning-basis WAC and kept in storage until another disposal solution is found. (Under the revised estimates in the *National Transuranic Waste Management Plan*, there would not be such “excess” RH-TRU waste. See Appendix J.) For the purposes of analysis in SEIS-II, disposal is assumed to begin by 1998.

Current data and projections indicate that 18 sites would generate Basic Inventory waste or currently have it in storage. TRU waste would first be treated at the 18 sites as necessary to meet planning-basis WAC. Any consolidation would occur in the manner described in the ROD to be issued for the WM PEIS. Such consolidation could be at the 10 largest generator-storage sites (as in the WM PEIS Decentralized Alternative) or at fewer sites (as in the WM PEIS preferred alternative). For purposes of analysis, SEIS-II assumed consolidation at the 10 largest generator-storage sites; not consolidating the waste, and consolidating it in a manner similar to the WM PEIS preferred alternative, are also discussed in SEIS-II.[2]

Under the Proposed Action, only trucks would transport the TRU waste. CH-TRU waste would be transported in TRUPACT-II containers, which have been certified by the U.S. Nuclear Regulatory Commission (NRC). RH-TRU waste would be transported in RH-72B casks, which are currently awaiting NRC certification. Potentially, some CH-TRU waste may be transported in HALFPACKs, which are smaller TRUPACT-IIs that are being designed by DOE and have yet to be certified by NRC. The currently designated truck routes are somewhat different from those presented in SEIS-I, in part because states have modified the state-designated routes; however, the routes comply with U.S. Department of Transportation requirements and use the Interstate Highway System or state-designated alternate routes. Transportation could include shipments between the generator-storage sites and would involve shipments from generator-storage sites (potentially the 10 largest) to WIPP. Rail transportation is analyzed as part of the action alternatives and is reserved for further consideration under the Preferred Alternative.

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[1] The analyses presented in the WM PEIS and SEIS-II are more understandable and useful for decision making and for informing the public than they would be if combined in a single, less focused document.

[2] The consolidation scheme presented in SEIS-II is intended for the purpose of analyzing the impacts and may not reflect the actual movement of waste that will occur.

Each truck transporting CH-TRU waste would carry as many as three TRUPACT-IIs, containing a total load of up to forty-two 55-gallon drums or six standard waste boxes. At WIPP, the waste packages would be removed from the transport pallets and stacked three high in the disposal panels. Each disposal panel would accommodate approximately 81,000 55-gallon drum equivalents (both drums and waste boxes would be used for disposal) approximately equal to 16,700 cubic meters (590,000 cubic feet) of CH-TRU waste. Each truck transporting RH-TRU waste would carry one RH-72B cask within which would be a single canister containing up to three 55-gallon drums of RH-TRU waste. The process of filling the disposal rooms with RH-TRU waste would be coordinated between the generator-storage sites and WIPP, because the RH-TRU waste would be placed in the walls of the panel rooms and in the walls of the access tunnels before they were filled with CH-TRU waste. Sacks of magnesium oxide backfill would be placed around the emplaced CH-TRU waste as an engineered barrier to provide chemical control over the solubility of actinides in the post-closure repository environment. Each disposal panel would accommodate 730 canisters, equivalent to 650 cubic meters (22,950 cubic feet) of RH-TRU waste. On average, personnel at WIPP could unload and dispose of the waste in about 50 TRUPACT-IIs and about eight RH-72B casks per week.

Under the Proposed Action, WIPP would receive and dispose of the Basic Inventory for 35 years. DOE would close the repository when all waste disposal areas were filled or when WIPP would achieve a capacity of 175,600 cubic meters (6.2 million cubic feet) of TRU waste. Final facility closure would include the placement of a repository sealing system. As explained in more detail in the RCRA Part B Permit Application, the planned repository sealing system would consist of natural and engineered barriers within the WIPP repository that would prevent water from entering it and impede the gases or brines from migrating out. The seal design for the repository shafts would use materials that may include highly compacted crushed salt, clay, concrete, and asphalt. The salt, when consolidated over time, would preclude the downward flow of groundwater into the repository and the upward movement of brine or gas that may be contaminated. The Department would decommission the WIPP site in a manner that would allow for safe, permanent disposition of surface and underground facilities and that would be consistent with then-applicable regulations. Little or no contamination of facilities would be expected. Usable equipment would be removed and surface facilities would be dismantled. A berm would be constructed around the perimeter of the waste panel footprint. DOE would restore the areas occupied by the salt pile (generated during excavation of the repository) and surface facilities, and, if necessary, any of the area overlying the repository, although surface disturbance of this area would be minimal. This decommissioning period is anticipated to take up to 10 years. There are no changes since SEIS-I to the proposed long-term controls for WIPP, which would include active controls, monitoring, and permanent markers or signs and other passive controls.

The Department's Preferred Alternative is to proceed with WIPP disposal of defense TRU waste treated to planning-basis WAC under the Proposed Action. Under the Preferred Alternative, the Department would initially transport waste by truck and would continue to explore the availability of safe and cost-effective commercial rail transportation.

The Department has identified the Proposed Action (reserving the option of future rail transportation) as its Preferred Alternative for a number of reasons, including the following: the Proposed Action would provide long-term isolation of TRU waste from the accessible environment, and the Proposed Action is consistent with DOE's obligations under agreements and court orders and with the LWA.

THE PROPOSED ACTION AND THE ADDITIONAL INVENTORY

During the public comment period that followed publication of the Draft SEIS-II in November 1996, stakeholders requested that the Department discuss, as part of the Proposed Action, the impacts of leaving in place or treating and storing the Additional Inventory. The Additional Inventory, as shown in Table 2-3, largely comprises TRU waste disposed of prior to 1970 by burying the waste near the surface. The Department currently has no plans to excavate, treat, and store all of this waste. Such a decision would be made on a site-by-site basis, following RCRA and Comprehensive Environmental Response, Compensation and Liability Act investigations, and probably following additional NEPA review. The Additional Inventory, therefore, is not a part of the Proposed Action. Nevertheless, in response to stakeholders' requests, Chapter 5 now includes text boxes like this one that present an assessment of human health impacts based on analyses done for the action alternatives and no action alternatives described in Chapter 3 of SEIS-II. The scenarios on which these impacts are based include the following:

- All Additional Inventory would be left as currently stored or buried. The impacts for this scenario would be similar to the Additional Inventory impacts of No Action Alternative 2.

- All Additional Inventory would be excavated, treated to planning-basis WAC, and stored at current locations for approximately 70 years. During the 70 years, the Department would look for a disposal solution. The impacts for this scenario would be very similar to the Additional Inventory treatment and storage impacts presented for Action Alternative 1.

- All Additional Inventory would be excavated, shipped to six thermal treatment facilities, treated, and then stored for approximately 70 years. During the 70 years, the Department would look for a disposal solution. The impacts for this scenario would be very similar to the Additional Inventory treatment and storage impacts presented for Action Alternative 2A.

- All Additional Inventory would be excavated, shipped to four thermal treatment facilities, treated, and then stored for 70 years. The impacts for this scenario would be very similar to the Additional Inventory treatment and storage impacts presented for Action Alternative 2B.

In contrast, the action alternatives would require amendments to the LWA and/or the C&C Agreement with New Mexico. The no action alternatives would not meet the Department's purpose and need for action, would not meet court orders and treatment plans, and would result in long-term impacts that would be avoided under the Proposed Action.

Action Alternative 1: Total Inventory (Except PCB-Commingled TRU Waste), Treat to WAC, Dispose of at WIPP

Under Action Alternative 1, DOE would dispose of nearly all TRU waste at WIPP. The Total Inventory would include both the Basic Inventory and the Additional Inventory, but it would not include TRU waste commingled with PCBs. This alternative would dispose of 336,000 cubic meters (11.9 million cubic feet) of treated TRU waste, nearly twice the volume of the Proposed Action. All 22 sites shown on Figure S-1 currently store or would generate this waste over a 35-year period. The waste would be treated to planning-basis WAC at the sites where it is located

SEIS-II AND THE WM PEIS ALTERNATIVES

Each SEIS-II alternative reflects an alternative in the WM PEIS in the way consolidation of waste is assumed.

The SEIS-II Proposed Action assumes, for the purposes of analyses, consolidation similar to the WM PEIS Decentralized Alternative, which was the basis for the WM PEIS preferred alternative. As in the WM PEIS Decentralized Alternative, the Proposed Action assumes that TRU waste would be treated to WAC at the facility where it currently is stored or would be generated. The waste would then be consolidated at the 10 facilities with the largest volume of waste to await disposal at WIPP. Those 10 sites are Hanford, LANL, INEEL, Argonne National Laboratory – East (ANL-E), SRS, RFETS, ORNL, Lawrence Livermore National Laboratory (LLNL), Nevada Test Site (NTS), and the Mound Plant (Mound). The SEIS-II inventory includes small quantities of TRU waste from several sites that were not considered for the WM PEIS. Waste from these sites would be consolidated at the closest site with larger volumes, if necessary.

The SEIS-II Action Alternative 1 also assumes, for analysis purposes, consolidation similar to the WM PEIS Decentralized Alternative. TRU waste would be treated to WAC at the facility where it currently is stored or would be generated. The waste would then be consolidated at the same 10 facilities as assumed for the Proposed Action. (The major difference between the SEIS-II Proposed Action and the SEIS-II Action Alternative 1 is the amount of waste to be disposed of.)

The three SEIS-II Action Alternative 2 subalternatives assume, for analysis purposes, consolidation similar to the WM PEIS Regionalized 2, Regionalized 3, and Centralized Alternatives. In each, the TRU waste would be consolidated at treatment sites where it would be treated by a thermal process to meet the RCRA LDRs. The three different consolidation options considered under Action Alternative 2 are:

- **Action Alternative 2A:** Assumes for analysis that CH-TRU waste would be treated at Hanford, SRS, RFETS, LANL, and INEEL/Argonne National Laboratory – West (ANL-W). Assumes that RH-TRU waste would be treated at Hanford and ORNL. The consolidation used for analysis is similar to the WM PEIS Regionalized 2 Alternative.

- **Action Alternative 2B:** Assumes for analysis that CH-TRU waste would be treated at Hanford, SRS, and INEEL/ANL-W. Assumes that RH-TRU waste would be treated at Hanford and ORNL. The consolidation used for analysis is similar to the WM PEIS Regionalized 3 Alternative.

- **Action Alternative 2C:** Assumes for analysis that CH-TRU waste would be treated at WIPP. Assumes that RH-TRU waste would be treated at Hanford and ORNL. The consolidation used for analysis is similar to the WM PEIS Centralized Alternative.

The SEIS-II Action Alternative 3 is similar to the WM PEIS Regionalized 1 Alternative. For both alternatives, TRU waste would be consolidated at regional sites throughout the country and treated by a shred and grout process before shipping the TRU waste to WIPP. CH-TRU waste would be treated at Hanford, LANL, RFETS, SRS, and INEEL/ANL-W. RH-TRU waste would be treated at Hanford and ORNL.

The two SEIS-II No Action Alternative 1 subalternatives are similar to the WM PEIS Regionalized 2 and Regionalized 3 Alternatives. The waste would be treated at the same sites described above for the SEIS-II Action Alternatives 2A, 2B, and 2C. SEIS-II No Action Alternative 1A is similar to the WM PEIS Regionalized 2 Alternative; SEIS-II No Action Alternative 1B is similar to the WM PEIS Regionalized 3 Alternative.

The SEIS-II No Action Alternative 2 is similar to both the WM PEIS Decentralized and No Action Alternatives. The currently stored waste would be left untreated. Newly generated waste would be treated to WAC. All waste would be stored at the sites where it is currently stored or would be generated.

or would be generated. It is assumed that the waste would then be consolidated at the 10 sites with the largest volumes until its disposal. This storage is referred to as lag storage throughout SEIS-II.

For the purposes of analysis, waste disposal at WIPP is assumed to begin in 1998; disposal would extend over a 160-year period, until 2158. The 160-year period is anticipated due to the greater volume of waste, the expected throughput rate anticipated at WIPP, and the time needed to excavate additional waste panels. Shipment of waste to WIPP would have three options: by truck only, by regular rail and truck (from those sites that do not have rail access), or by dedicated rail and truck. The impacts of each of these transportation options are estimated in SEIS-II.

Commenters requested that DOE include information in the Final SEIS-II on how operation periods under the action alternatives could be reduced and how such reduced operation periods would change the impacts presented in Chapter 5. To reduce the operation time under Action Alternative 1 to 60 years from 160 years, DOE would construct an additional RH-TRU WHB and four new shafts. Additional employees would be hired to operate the new building; additional excavation and emplacement crews also would be employed. The excavation rate for new panels would increase, although the number of panels would remain the same as for the 160-year period discussed above. Capital costs and annual operating costs would increase. All transportation to WIPP would occur during 53 years of operation. Further NEPA review may need to be conducted, as appropriate, before any new facilities would be built.

Action Alternative 2: Total Inventory (Including PCB-Commingled Waste), Treat Thermally to Meet LDRs, Dispose of at WIPP

Under Action Alternative 2, DOE would dispose of TRU waste at WIPP after thermally treating it to meet the LDRs. This alternative would dispose of 126,000 cubic meters (4.5 million cubic feet) of TRU waste and would include both the Basic Inventory and the Additional Inventory. TRU waste containing PCB-commingled material is included in the inventory for this alternative. All 22 sites shown in Figure S-1 would either generate this waste over a 35-year period or currently have it in storage.

For Action Alternative 2, three different consolidation and treatment subalternatives are considered[1]:

- Action Alternative 2A. DOE would treat CH-TRU waste at the Hanford Site (Hanford), SRS, RFETS, LANL, and INEEL/Argonne National Laboratory – West (ANL-W). RH-TRU waste would be treated at Hanford and ORNL.

- Action Alternative 2B. DOE would treat CH-TRU waste at Hanford, SRS, and INEEL/ANL-W. RH-TRU waste would be treated at Hanford and ORNL.

- Action Alternative 2C. DOE would treat CH-TRU waste at WIPP. RH-TRU waste would be treated at Hanford and ORNL.

[1] Decisions on whether and how waste would be consolidated and, if so, the treatment locations would be made in the TRU waste ROD for the WM PEIS.

Waste treatment would begin in 2010, after the treatment facilities had been constructed, and would continue for 35 years. Waste disposal also would begin in 2010 and would continue over a 150-year period, until 2160. Thermal treatment concentrates the waste, which is itself a long-term source of energy produced by radioactive decay. In order to satisfy thermal loading requirements that are part of WIPP's basic design criteria, thermally treated waste would require approximately the same number of panels (i.e., approximately 75) as other methods of treating the same quantities of waste. The 150-year period would be necessary because of the time needed to excavate the required waste panels. Between treatment and disposal of the waste, lag storage would be conducted at the treatment sites. Shipment of waste to WIPP would be by truck only, by regular rail and truck, or by dedicated rail and truck. The impacts of each of these transportation options are estimated in SEIS-II.

To reduce the operation period under Action Alternative 2 to 70 years from 150 years, DOE would construct three additional shafts early in the operation period to enable faster excavation and emplacement. This would result in higher capital costs, although annual operating costs would remain essentially the same. Additional excavation crews would be hired. The excavation rate for new panels and the emplacement rate of waste canisters would increase. All transportation of waste to WIPP would occur during 58 years of operation. Further NEPA review may need to be conducted, as appropriate, before any new facilities would be built.

Action Alternative 3: Total Inventory (Except PCB-Commingled Waste), Treat by Shred and Grout, Dispose of at WIPP

Under Action Alternative 3, DOE would dispose of TRU waste at WIPP after treating it by a shred and grout process. This alternative would dispose of 400,000 cubic meters (14.1 million cubic feet) of TRU waste and would include both the Basic Inventory and most of the Additional Inventory. TRU waste containing PCB-commingled material is excluded from this alternative. All 22 sites shown in Figure S-1 would either generate this waste over a 35-year period or currently have it in storage. The CH-TRU waste would be treated at Hanford, LANL, RFETS, SRS, and INEEL/ANL-W. The RH-TRU waste would be treated at Hanford and ORNL.

Waste treatment would begin in 2010, after the treatment facilities had been constructed, and would continue for 35 years. Following treatment, lag storage would be conducted at the treatment sites. Waste disposal would begin in 2010 and would continue until 2200. The 190-year period is anticipated due to the greater volume of waste, the expected throughput rate at WIPP, and the time needed to excavate additional waste panels. Shipment of waste to WIPP would be by truck only, by regular rail and truck, or by dedicated rail and truck. The impacts of each of these transportation options are estimated in SEIS-II.

To reduce the operation time under Action Alternative 3 to 75 years from 190 years, DOE could construct a new RH-TRU Waste Handling Building and four new shafts. Two additional excavation crews would be hired, increasing the excavation rate for panels. Capital costs and annual operating costs would increase. All transportation of waste to WIPP would occur during the final 63 years of the reduced operation period because 12 years would still be needed to design and construct treatment facilities. Further NEPA review may need to be conducted, as appropriate, before any new facilities would be built.

No Action Alternative 1: Total Inventory (Including PCB-Commingled Waste), Treat Thermally to Meet LDRs, Store Indefinitely, Dismantle WIPP

Under No Action Alternative 1, DOE would dismantle and close WIPP beginning in 1998. Closure of the facility would take 10 years. Under this alternative, DOE also would treat all DOE TRU waste by a thermal process to meet the LDRs and store it for an indefinite period at the treatment sites. About 126,000 cubic meters (4.5 million cubic feet) of TRU waste would be treated and stored; this includes both the Basic Inventory and the Additional Inventory and includes TRU waste commingled with PCBs. All 22 sites shown in Figure S-1 would either generate this waste over a 35-year period or currently have it in storage. Waste treatment would begin in 2010 after treatment facilities and newly engineered storage facilities had been constructed at the treatment sites. Two consolidation and treatment subalternatives are considered for No Action Alternative 1:

- No Action Alternative 1A. DOE would treat CH-TRU waste at Hanford, LANL, SRS, and INEEL/ANL-W. RH-TRU waste would be treated at Hanford and ORNL. These sites would then store the waste indefinitely.

- No Action Alternative 1B. DOE would treat CH-TRU waste at Hanford, SRS, and INEEL/ANL-W. RH-TRU waste would be treated at Hanford and ORNL. These sites would then store the waste indefinitely.

Shipment of waste to the treatment sites would be by truck only, by regular rail and truck, or by dedicated rail and truck. For the purpose of analyses, it was assumed that CH-TRU waste packaging (standard 55-gallon drums) would last 20 years; therefore, the waste would be overpacked at 20-year intervals. RH-TRU waste would not be repackaged because its specially designed containers would last much longer than 20 years.

No Action Alternative 2: Basic Inventory, Treat Newly Generated Waste to WAC, Store at Generator Sites, Dismantle WIPP

Under No Action Alternative 2, DOE would dismantle and close WIPP, leave existing TRU waste as it is, treat newly generated waste to meet WAC, and store all waste. This alternative would store 105,000 cubic meters (3.7 million cubic feet) of TRU waste. Twenty-two sites would either generate this waste over a 35-year period or currently have it in storage. Each site would be responsible for storage of its current and newly generated TRU waste. New facilities may be constructed if necessary, pursuant to future NEPA reviews, but the analyses consider storage only in existing facilities. There would be no planned shipment of waste to consolidation sites unless it was deemed necessary in the future to ensure the safe storage of TRU waste.

Table S-4 gives a tabular comparison of the major features of the Proposed Action and the alternatives.

Alternatives Considered But Not Analyzed

SEIS-II does not include detailed analyses of several alternatives discussed during the public scoping process and the comment period for the Draft SEIS-II. These alternatives were not analyzed in detail because — depending on the alternative and as discussed in Chapter 3 — they are

Table S-4
Summary of WIPP SEIS-II Alternatives

Comparison Parameters	*Proposed Action (Preferred Alternative):* Basic Inventory, Treat to WAC, Dispose of at WIPP	*Action Alternative 1:* Total Inventory (Except PCB-Commingled TRU Waste), Treat to WAC, Dispose of at WIPP	*Action Alternative 2:* Total Inventory (Including PCB-Commingled TRU Waste), Treat Thermally to Meet LDRs, Dispose of at WIPP	*Action Alternative 3:* Total Inventory (Except PCB-Commingled TRU Waste), Treat by Shred and Grout, Dispose of at WIPP	*No Action Alternative 1:* Total Inventory (Including PCB-Commingled TRU Waste), Treat Thermally to Meet LDRs, Store Indefinitely, Dismantle WIPP	*No Action Alternative 2:* Basic Inventory, Treat Newly Generated TRU Waste to WAC, Store at Generator Sites, Dismantle WIPP [a]
Waste Type	Defense-related, post-1970 TRU waste in retrievable storage and newly generated through the year 2033 (Basic Inventory).	Basic Inventory plus other DOE-owned or controlled waste including non-defense, commercial, previously disposed of waste, and excluding PCB-commingled waste (Additional Inventory).	Basic Inventory plus Additional Inventory (including PCB-commingled waste).	Basic Inventory plus Additional Inventory (excluding PCB-commingled waste).	Basic Inventory plus Additional Inventory (including PCB-commingled waste).	Same as Proposed Action.
Post-Treatment Volume[b] to be Disposed of at WIPP, or Stored	CH-TRU: 168,500 m^3 (5,950,000 ft^3) RH-TRU: 7,080 m^3 (250,000 ft^3) Excess Waste[c] RH-TRU 43,000 m^3 (1,500,000 ft^3)	CH-TRU: 281,000 m^3 (9,900,000 ft^3) RH-TRU: 55,000 m^3 (2,000,000 ft^3)	CH-TRU: 107,000 m^3 (3,800,000 ft^3) RH-TRU: 19,000 m^3 (690,000 ft^3)	CH-TRU: 334,000 m^3 (11,800,000 ft^3) RH-TRU: 66,000 m^3 (2,300,000 ft^3)	CH-TRU: 107,000 m^3 (3,800,000 ft^3) RH-TRU: 19,000 m^3 (690,000 ft^3)	CH-TRU: 135,000 m^3 (4,800,000 ft^3) RH-TRU: 35,000 m^3 (1,200,000 ft^3)
Waste Consolidation Locations (assumed for purposes of analyses; actual consolidation would be in accordance with the ROD for the WM PEIS)	18 sites total - WAC treatment of CH-TRU at the largest sites and store at 10 largest sites[d]. Ship to WIPP. - WAC treatment of RH-TRU at Hanford, INEEL/ANL-W, ORNL, and LANL. Ship to WIPP.	22 sites total - Same as Proposed Action except two other sites (LBL, WVDP) consolidate and treat CH-TRU at Mound and Hanford.	22 sites total Action Alternative 2A - LDR treatment of CH-TRU at Hanford, INEEL, LANL, SRS, and RFETS. - LDR treatment of RH-TRU at Hanford and ORNL. Action Alternative 2B - LDR treatment of CH-TRU at Hanford, INEEL, and SRS. - LDR treatment of RH-TRU at Hanford and ORNL. Action Alternative 2C - LDR treatment of CH-TRU at WIPP. - LDR treatment of RH-TRU at Hanford and ORNL.	22 sites total - Shred and grout treatment of CH-TRU at Hanford, INEEL, LANL, SRS, and RFETS. - Shred and grout RH-TRU at Hanford and ORNL.	22 sites total No Action Alternative 1A - LDR treatment of CH-TRU at Hanford, INEEL, LANL, SRS, and RFETS. - LDR treatment of RH-TRU at Hanford and ORNL. No Action Alternative 1B - LDR treatment of CH-TRU at Hanford, INEEL, and SRS. - LDR treatment of RH-TRU at Hanford and ORNL.	Minimal consolidation to ensure safe storage; however, no sites would ship to WIPP.
Waste Treatment	Treat to meet WAC.	Treat to meet WAC.	Thermal treatment to meet the LDRs (including PCB-commingled waste).	Treatment by shred and grout.	Thermal treatment to meet the LDRs (including PCB-commingled waste). Package every 20 years indefinitely.	Newly generated waste treated to WAC.

Table S-4
Summary of WIPP SEIS-II Alternatives — Continued

Comparison Parameters	*Proposed Action (Preferred Alternative):* Basic Inventory, Treat to WAC, Dispose of at WIPP	*Action Alternative 1:* Total Inventory (Except PCB-Commingled TRU Waste), Treat to WAC, Dispose of at WIPP	*Action Alternative 2:* Total Inventory (Including PCB-Commingled TRU Waste), Treat Thermally to Meet LDRs, Dispose of at WIPP	*Action Alternative 3:* Total Inventory (Except PCB-Commingled TRU Waste), Treat by Shred and Grout, Dispose of at WIPP	*No Action Alternative 1:* Total Inventory (Including PCB-Commingled TRU Waste), Treat Thermally to Meet LDRs, Store Indefinitely, Dismantle WIPP	*No Action Alternative 2:* Basic Inventory, Treat Newly Generated TRU Waste to WAC, Store at Generator Sites, Dismantle WIPP [a]
Transportation Mode	Truck. The Preferred Alternative reserves the option of rail transportation.	Three options: - Truck only - Maximum[e] commercial rail - Maximum dedicated rail	Three options: - Truck only - Maximum[e] commercial rail - Maximum dedicated rail	Three options: - Truck only - Maximum[e] commercial rail - Maximum dedicated rail	Three options: - Truck only - Maximum[e] commercial rail - Maximum dedicated rail	Truck only.
Disposal Operations	CH-TRU stacked in disposal rooms. RH-TRU placed in horizontal boreholes. RH-TRU disposal would start 6 years after CH-TRU and 7,080 m^3 (250,000 ft^3) of RH-TRU can be disposed of. 10 panel equivalents required at WIPP.[f]	CH-TRU stacked in disposal rooms. RH-TRU would be placed in either of horizontal and vertical boreholes, and/or provided extra shielding to CH-TRU levels. 68 panel equivalents required at WIPP.	CH-TRU stacked in disposal rooms. RH-TRU would be placed in either of horizontal and vertical boreholes, and/or provided extra shielding to CH-TRU levels. 75 panel equivalents required at WIPP.	CH-TRU stacked in disposal rooms. RH-TRU would be placed in either of horizontal and vertical boreholes, and/or provided extra shielding to CH-TRU levels. 71 panel equivalents required at WIPP.	No disposal. CH-TRU and RH-TRU would be in newly engineered, monitored storage at treatment sites.	No disposal. CH-TRU and RH-TRU continue to use existing storage.
WIPP Operations Time Frame [g]	Receive and emplace waste beginning 1998 for 35 years. Decommissioning for 10 years and active institutional control for 100 years, ending in 2143.	Same as Proposed Action, lag storage for 125 years and disposal would be for 160 years, until 2158; active institutional control ending in 2268.	Waste disposal and thermal treatment to meet the LDRs would begin in 2010 after treatment facility construction. Lag storage for 115 years. Disposal would be for 150 years, until 2160. Decommissioning and active institutional control would be the same as the Proposed Action, ending in 2270.	Waste disposal and shred and grout treatment would begin in 2010 after treatment facility construction Lag storage for 155 years. Disposal would be for 190 years, until 2200. Decommissioning and active institutional control would be the same as the Proposed Action, ending in 2310.	Dismantle and close WIPP in 10 years. Thermal treatment to meet the LDRs would begin in 2010 after treatment facility construction. Package and manage indefinitely at treatment sites.	Dismantle and close WIPP. Sites generate waste for 35 years beginning in 1998. Storage at the generator-storage sites evaluated for 35 years, ending in 2033. Active institutional control at generator-storage sites until 2133.
WIPP Institutional Control Site Area	70 hectares (175 acres)	360 hectares (890 acres)	395 hectares (976 acres)	375 hectares (927 acres)	20 hectares (50 acres) (Only for 10 years during decommissioning)	20 hectares (50 acres) (Only for 10 years during decommissioning)

[a] New facilities may be constructed in the future pursuant to future NEPA review.
[b] These values correspond to the Post-Treatment Consolidated Volume and Post-Treatment Disposal Volume data in Tables 3-1 through 3-16; differences in the numbers are due to rounding. The inventory for SEIS-II is based on BIR-3, which takes into account potential thermal treatment at some sites.
[c] Recent estimates in the *National Transuranic Waste Management Plan* indicate there would be no excess RH-TRU waste; see Appendix J and information later in this summary.
[d] The 10 largest generator-storage sites are ANL-E, Hanford, INEEL/ANL-W, LANL, LLNL, Mound, NTS, ORNL, RFETS, and SRS.
[e] Maximum rail is used to denote that 18 of the 22 sites have rail facilities nearby; the remaining sites would ship by truck. Areas and volumes have been rounded.
[f] Under the Proposed Action, the consequence analysis for RH-TRU waste is based on 7,080 cubic meters (250,000 cubic feet), the maximum disposal volume of RH-TRU waste that is allowable at WIPP under the Consultation and Cooperation Agreement. The disposal strategy is to emplace RH-TRU waste canisters in the panel room walls prior to stacking CH-TRU waste in the rooms. At startup, however, a lag in RH-TRU waste availability is anticipated that would result in only CH-TRU waste initially being disposed of. The actual amount of RH-TRU waste disposed of, therefore, may be as low as 4,300 cubic meters.
[g] These time frames are those presented in the Draft SEIS-II. For reduced time frames, see Sections 3.2.2.4, 3.2.3.4, and 3.2.4.4.

not technically viable, would not adequately or economically meet DOE's need to safely dispose of TRU waste in a timely manner, involve additional environmental and policy concerns that would need to be accommodated, or are otherwise unreasonable in the present context. The following alternatives were not analyzed in detail: transmutation, co-processing TRU waste with high-level waste and vitrifying it, disposal in space, underground detonation, subseabed disposal, deep borehole disposal, greater confinement (shallow borehole disposal), geologic repositories at sites other than WIPP, the use of developing technologies to neutralize or change the natural rate of radioactive decay, and alternative engineered barriers (in lieu of magnesium oxide backfill).

AFFECTED ENVIRONMENT AT WIPP

The environment that would be affected by activities described in SEIS-II is essentially the same as that presented in the FEIS in 1980 and SEIS-I in 1990. A few changes have occurred, though, and some new information is now available. The following sections discuss the more notable of these changes and the sources of some of the new information.

Land Use

Since SEIS-I, a multi-year research effort has been initiated to document the population and ecology of several species. Additional seeding of reclamation sites has been undertaken. A comprehensive WIPP archeological database has been created. Vegetation is now monitored for evidence of stress induced by climate and salt tailings. In 1994, DOE requested and was granted permission by the U.S. Bureau of Land Management to construct a short access road. Three plans have been published on emergency and facility security. Seven new wells have been installed to monitor water quality.

Air Quality

Since publication of SEIS-I, activities conducted at the WIPP site have had little effect on the air quality at the site. Two changes have occurred to air monitoring programs. In 1991, a volatile organic compound (VOC) monitoring program was established at WIPP after the EPA determined that migration of VOCs might be a concern in conjunction with the then-planned test phase at WIPP. On October 30, 1994, after DOE decided not to conduct underground experiments at WIPP and after DOE notified the EPA, monitoring of pollutant gases at the WIPP Ambient Air Monitoring Station was discontinued.

Geology and Hydrology

Additional studies and analyses have provided new information regarding geology and hydrology since publication of SEIS-I. Several examples are listed below:

- Extensive testing of the Salado Formation's salt beds and interbeds has resulted in confirmation of the Salado's extremely low permeability.
- Recent test data have enabled improved predictions of pressures at which Salado interbeds will likely fracture and relieve elevated gas pressures within the repository.
- Refined modeling of gas generation suggests that elevated gas pressure may slow down or stop brine inflow, thereby slowing gas-generation processes.

- Three-dimensional modeling of groundwater flow in the Rustler Formation suggests a very small amount of vertical flow and a preponderance of horizontal flow within the Culebra Dolomite.

- Recent tests on the Culebra Dolomite have provided new data on contaminant transport in the Culebra and on the Culebra's potential to retard radionuclides. Geophysical surveys have indicated that pressurized brine occurs in three or four discrete areas of the Castile Formation, which is located below the Salado.

Rare, Threatened, and Endangered Species

The threatened, endangered, candidate, and proposed species present in Eddy County, New Mexico, have changed since SEIS-I. In 1995, DOE obtained new lists from the U.S. Fish and Wildlife Service, the New Mexico Department of Game and Fish, and the New Mexico Energy, Minerals, and Natural Resources Department regarding the presence of federally threatened, endangered, and candidate species, state-listed rare and endangered animals, and state-listed rare and endangered plant species in Eddy County, New Mexico. Since SEIS-I, more than 60 new species have been added to these lists, none of which have been found within the WIPP Land Withdrawal Area during preparation of DOE's biennial surveys. No threatened and endangered species and no critical habitat for these species were found in a 1996 survey of the WIPP Land Withdrawal Area.

Cultural Resources Management

In 1994, a memorandum of understanding between DOE and the Department of the Interior transferred management responsibility for cultural resources at WIPP to DOE. Also, since publication of SEIS-I in 1990, additional cultural resource surveys have been conducted at WIPP. Based on inventory data and assuming environmental homogeneity and a fairly even distribution of archaeological sites, DOE estimates that the WIPP site may contain about 99 archaeological sites and 153 locations where isolated artifacts may be found. There are no known Native American sacred sites or burials in the Land Withdrawal Area. DOE and the State of New Mexico have signed a Joint Powers Agreement that includes provisions specifying how DOE will satisfy its obligations regarding cultural resources under Sections 106 and 110 of the National Historic Preservation Act.

Socioeconomics

Since publication in 1990 of SEIS-I, the following changes have occurred:

- Census information from the 1990 census has become available. Demographic characteristics in SEIS-II are based on 1990 U.S. Bureau of the Census information as well as more recent data.

- Recent employment and wage information has become available. SEIS-II uses 1994 information provided by the New Mexico Department of Labor and the University of New Mexico Bureau of Business and Economic Research, as well as more recent data.

Transportation

Some transportation routes have been modified since SEIS-I. The current primary truck transportation routes are indicated in Figure S-4.

AFFECTED ENVIRONMENTS AT THE TEN MAJOR GENERATOR-STORAGE SITES

The following sections briefly summarize the affected environments at the 10 major generator-storage sites. These 10 sites account for more than 99 percent of the Total Inventory.

Argonne National Laboratory-East (ANL-E)

ANL-E occupies 690 hectares (1,700 acres) in northeast Illinois, approximately 35 kilometers (22 miles) southwest of downtown Chicago, Illinois. Only 80 hectares (200 acres) of the site are used for DOE activities; the rest is devoted to forest and landscape areas.

ANL-E is located in a Class II Prevention of Significant Deterioration (PSD) air quality area. The site and the surrounding counties are classified by the EPA as severe nonattainment areas for the criteria pollutant ozone. ANL-E uses two principal aquifers for its water supply. The upper aquifer is about 60 meters (200 feet) thick and supplies potable water. The other aquifer is below the first, lying between 150 and 460 meters (500 and 1,500 feet) beneath the surface.

Species listed by the federal government as threatened or endangered are not known to reside on the ANL-E site. The site is frequented by one bird species listed as endangered by the state. As of 1994, with ANL-E completely surveyed, 43 prehistoric and six historic archeological properties had been discovered and recorded, and no sites had been listed with the National Register of Historic Places (NRHP) or designated as National Historic Landmarks. Three sites were potentially eligible for the NRHP.

The region of influence (ROI) accounts for 95.4 percent of the site's employee residential distribution. The ROI total population in 1992 was 6,568,800. Within the ROI, Whites comprise approximately 68.5 percent of the population, Blacks comprise 21.2 percent, and Hispanics comprise 12.1 percent. In 1989, about 9 percent of all families were below the poverty level. About 4,500 persons were employed at ANL-E.

The radiation dose from normal accident-free operations in 1994 would result in 3×10^{-3} latent cancer fatalities (LCF) to the population that resided within 80 kilometers (50 miles) of the site. The population within this area was 7,900,000. The annual dose from airborne radionuclides to the maximally exposed individual (MEI) during 1994 would result in an 8×10^{-9} probability of an LCF. The corresponding dose is far below the National Emission Standard for Hazardous Air Pollutants (NESHAP) limit.

Hanford Site (Hanford)

Hanford covers about 1,450 square kilometers (560 square miles) of the southeastern part of the State of Washington. The nearest city, Richland, Washington, borders the site on its southeast corner.

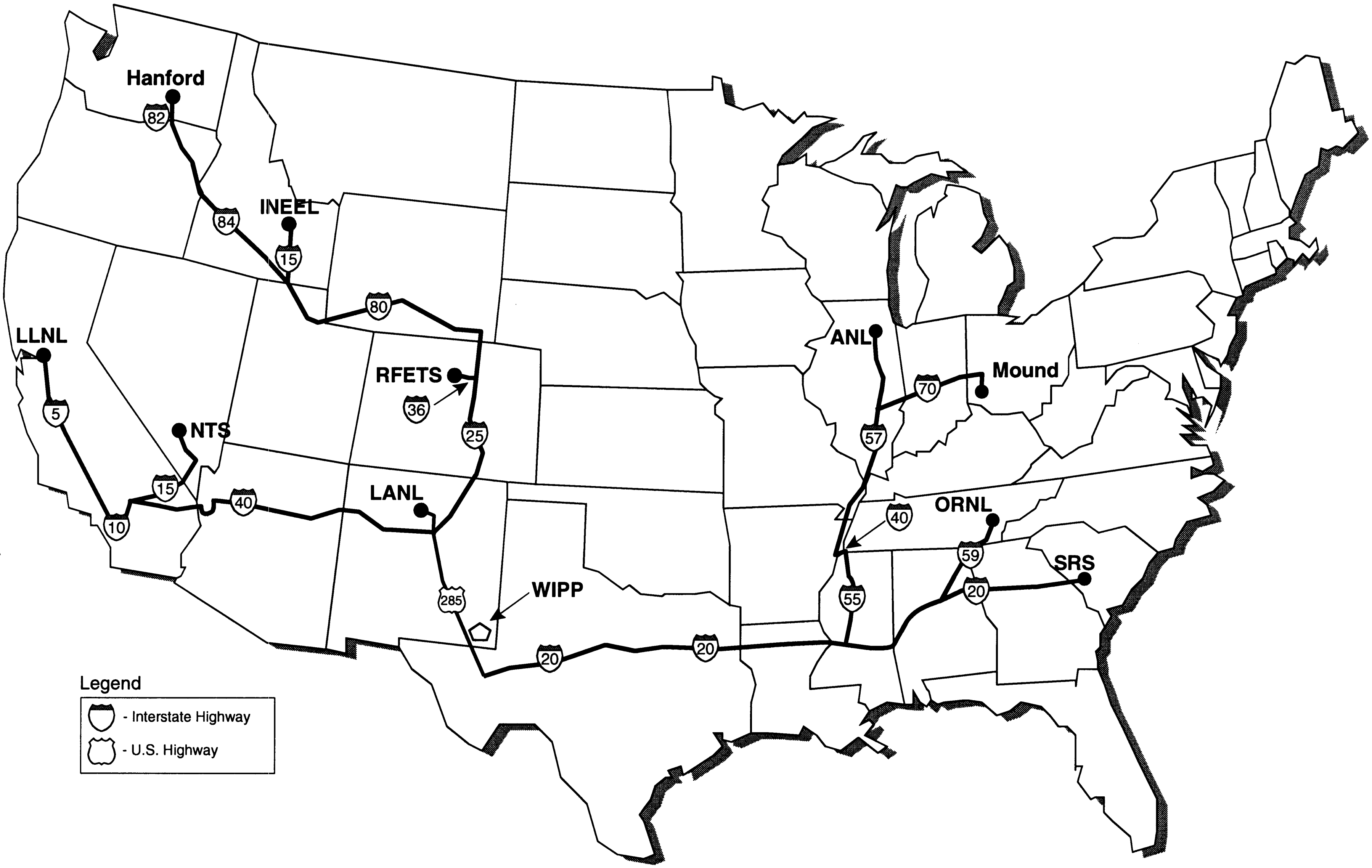

Figure S-4
Proposed TRU Waste Truck Transportation Routes from the 10 Major Generator-Storage Sites

Air quality in the Hanford region is well within state and EPA standards for criteria pollutants, except that short-term particulate concentrations occasionally exceed the "particulate matter less than or equal to 10 micrometers in diameter" (PM_{10}) standard. The Columbia River passes through the northern part of Hanford and forms part of the eastern boundary. The water quality of the Columbia River is high, and the river contributes part of the water supply for the site and for nearby cities. Radiological monitoring shows low levels of radionuclides in the river, well below concentration guidelines established by EPA drinking water standards. Groundwater beneath the site is not used for human consumption or food production, except for one well used for drinking water. Levels of radionuclides have been detected in this well; however, the levels are well below EPA drinking water standards. Hanford is included on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) National Priorities List.

Six species of birds that have been listed as endangered or threatened by the state or federal government frequent the Hanford site. One mammal species found there is considered endangered by the state and four plant species are considered threatened or endangered. In addition, there are 12 other species of animals classified as species of concern by the state or federal government. As of 1992, 248 prehistoric archeological sites had been discovered and recorded, 48 of which are on the NRHP. In addition, 11 historic archeological sites and 11 other properties are also listed on the NRHP.

The primary socioeconomic impact area is the tri-cities (Richland, Kennewick, and Pasco) and the counties of Franklin and Benton, in Washington State. The environmental justice ROI, which is the area within an 80-kilometer (50-mile) radius from the site, contains about 380,000 people.

This ROI includes a 20 percent minority, 18 percent low-income, and 19 percent Hispanic population. The site employs about 14,200 people, accounting for almost 25 percent of the nonagricultural employment in Benton and Franklin Counties.

DOE has entered into agreements with the tribal governments representing the Yakama Indian Nation, Nez Perce Tribe, and the Confederated Tribes of the Umatilla Indian Reservation. These agreements pertain to the core environmental programs and the emergency preparedness and response program.

The annual radiation dose to the population residing within 80 kilometers (50 miles) of the site from normal accident-free operations during 1994 would result in 2×10^{-4} LCF. The population within this area was 380,000. The annual dose from airborne radionuclides to the MEI during 1994 would result in a 3×10^{-9} probability of an LCF. The corresponding dose is far below the NESHAP limit.

Idaho National Engineering and Environmental Laboratory (INEEL)

INEEL encompasses 230,000 hectares (568,000 acres) within five counties in southeastern Idaho. The site is about 44 kilometers (27 miles) west of Idaho Falls, Idaho. About 2 percent of the total INEEL site area (4,600 hectares [11,400 acres]) is used for facilities and operations.

Concentrations of criteria pollutants at the site are below the National Ambient Air Quality Standards (NAAQS) and below state standards and PSD limits. INEEL overlies the Snake River Plain Aquifer, a sole-source aquifer and the largest aquifer in Idaho. This aquifer is also the source of all water used at INEEL. Inside the site boundary, several radionuclide concentrations have exceeded the EPA maximum contaminant limits for drinking water. Outside the site boundary, all contaminant levels measured have been below the EPA limits. INEEL is included on the CERCLA National Priorities List.

Two species considered endangered by the federal government and nine species considered species of concern potentially frequent the site.

The socioeconomic ROI is the seven-county area where more than 95 percent of INEEL's approximately 6,400 employees reside. About 2.5 percent of the ROI population (104,654 in 1991) was Native American and 5.5 percent was Hispanic. Approximately 14 percent of this population was low-income.

DOE has entered into an agreement with the tribal governments representing the Shoshone-Bannock Tribes of the Fort Hall Indian Reservation. This agreement is designed to enhance Tribal technical and scientific capability in the areas of environmental restoration, emergency preparedness and response, and management of cultural resources.

The annual radiation dose from normal operation of the site would have resulted in 2×10^{-4} LCF to the population within 80 kilometers (50 miles) of the site in 1994. The population within this area was 120,000. The annual dose from airborne radionuclides to the MEI during 1994 would result in a 2×10^{-9} probability of an LCF. The corresponding dose is below the NESHAP limit.

Lawrence Livermore National Laboratory (LLNL)

LLNL includes the Livermore site, the adjoining Sandia National Laboratories, California (SNL-CA) site and the LLNL experimental test site (Site 300). The Livermore site is approximately 64 kilometers (40 miles) east of San Francisco, California, and about 5 kilometers (3 miles) east of Livermore, California.

The Livermore site is in the San Francisco Bay Area Interstate Air Quality Control Region. This region has been classified as a nonattainment area for two criteria pollutants: carbon monoxide (CO) and ozone (O_3). Site 300 is located within the San Joaquin Valley Unified Air Pollution Control District. This area is classified as a nonattainment area for O_3 and PM_{10}.

The San Andreas fault system, the Sur-Nacimiento fault system, and the Coast Range thrust fault system are the major fault systems in the area. These major regional faults along with local faults are potential sources of ground motion at LLNL. In January 1980, an earthquake sequence on a local fault produced two earthquakes of magnitudes 5.5 and 5.6. These earthquakes caused structural damage at the Livermore and SNL-CA sites. Larger earthquakes on more distant faults, such as the San Andreas, do not substantially affect the hazard estimation for LLNL.

LLNL is investigating and identifying characteristics of groundwater contamination at Site 300. Several plumes of VOCs and tritium have been identified in shallow and deeper bedrock aquifers in this area and several adjacent off-site areas. LLNL is working with the EPA and the State of California to remediate these plumes. LLNL is included on the CERCLA National Priorities List.

Fifty-nine species considered by the federal or state government to be threatened or endangered or that have other special status are found on and in the vicinity of the Livermore site. Ten of these species have been observed on the site, including the bald eagle. Since 1974, several archaeological investigations have taken place at the Livermore site and Site 300. No prehistoric sites have ever been located at the Livermore site. Cultural resource investigations at Site 300 have resulted in the discovery of seven prehistoric sites, 21 historic sites, and one site with elements of each.

Four counties comprise the socioeconomic ROI in which 97.2 percent of the approximately 7,850 Livermore site and Site 300 employees reside. In 1990, the population in the ROI was 2,952,000. This population was predominantly White (69 percent). Approximately 8.4 percent of the families were living below the poverty level in 1989.

The annual radiation dose during normal operations in 1994 would have resulted in 4×10^{-4} LCF to the population residing within 80 kilometers (50 miles) of the site. The population within this area was 6,300,000. The annual dose from airborne radionuclides to the MEI during 1994 would result in a 3×10^{-8} probability of an LCF. The corresponding dose is far below the NESHAP limit.

Los Alamos National Laboratory (LANL)

LANL is located in north-central New Mexico, 97 kilometers (60 miles) north-northeast of Albuquerque, New Mexico, and 40 kilometers (25 miles) northwest of Santa Fe, New Mexico. The 11,300-hectare (28,000-acre) LANL site and adjacent communities are situated on the Pajarito Plateau.

LANL and its surrounding counties are considered attainment areas with respect to applicable NAAQS. All surface water drainages and groundwater from the Pajarito Plateau flow toward the Rio Grande. Groundwater in the LANL area occurs in four modes: shallow alluvium in canyons, perched water, the unsaturated zone between the surface and the main aquifer, and the main aquifer. LANL and the nearby communities are entirely dependent on groundwater for their water supply. The primary, secondary, and radiochemical groundwater quality, as measured from wells and springs in the main aquifer, are below DOE-derived concentration guides and the New Mexico standards applicable to a DOE drinking water system.

LANL is located on the Pajarito Plateau, which lies between the Jemez Mountains on the west and the Rio Grande on the east. Deep southeast-trending canyons, separated by long, narrow mesas, dissect the surface of the plateau. Studies have determined the area has three active faults. The strongest earthquake in the past 100 years within a 80-kilometer (50-mile) radius had an estimated magnitude of 5.5 to 6 measured on the Richter scale and a Modified Mercalli Intensity of VII.

Thirty-four federal- or state-listed threatened, endangered, or other special status species may be found in the vicinity of LANL. Five of these species have been observed at LANL. Approximately 75 percent of LANL has been inventoried for cultural resources. More than 1,000 prehistoric sites have been recorded, and approximately 95 percent of these sites are considered eligible or potentially eligible for inclusion on the NRHP. More than 40 historic resources have been recorded at LANL, and about 90 percent of the resources are considered eligible or potentially eligible for the NRHP, based on their association with the broad historic theme of the Manhattan Project and initial nuclear production.

Three counties comprise the socioeconomic ROI in which 94.7 percent of LANL's 9,700 employees reside. In 1990, the ROI population was 152,300. The population in the ROI is predominantly White (79.8 percent) and 12.1 percent of the families are below the poverty level.

DOE has entered into an agreement with Tribal governments representing the Pueblos of Santa Clara, Cochiti, Jemez, and San Ildefonso. This agreement is designed to build Tribal technical and scientific capability in environmental restoration and waste management and to assist the Tribes in participating in DOE decision making.

The radiation dose from normal operations in 1994 would result 2×10^{-3} LCF to the population residing within 80 kilometers (50 miles) of the site. The population within this area was 220,000. The annual dose from airborne radionuclides to the MEI during 1994 would result in a 4×10^{-6} probability of an LCF. The corresponding dose is below the NESHAP limit.

Mound Plant (Mound)

Mound is located in west-central Ohio within the city limits of Miamisburg, Ohio, about 16 kilometers (10 miles) south-southwest of Dayton, Ohio. Mound occupies about 124 hectares (306 acres) and is situated on the highlands overlooking the Great Miami River.

The Air Quality Control Region comprising the facility has been classified as attainment of the NAAQS for nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead. However, Montgomery County has been classified as nonattainment for O_3 and total suspended particulates. The major aquifer in the area, the Buried Valley Aquifer (also called the Great Miami Aquifer), is the major source of the area's potable water. Typically, groundwater occurs 6 to 8 meters (20 to 25 feet) below ground surface in the valley. There has been minor contamination of the groundwater by Mound activities. Tritium and plutonium have been detected in the Miamisburg water supply at levels far below regulatory limits. Some VOCs in on-site groundwater exceed EPA levels; however, off-site concentrations are far lower and none exceed EPA levels.

The site lies within the range of one federally-listed bat species and contains a single individual of a state-listed endangered plant species. The only historic landmark in the vicinity of the site is the Miamisburg Mound, an ancient mound located 120 meters (390 feet) east-southeast of the site. It is believed to be a burial place of a member of the Adena culture of Mound Builders which inhabited the Ohio region in prehistoric times. The site itself does not contain any properties listed or eligible for the NRHP.

Miamisburg is largely residential, with limited regular rail and industrial development. The 1990 population of the city was 17,770. The facility employs about 1,200 people, the majority of whom live either in Miamisburg or in immediately adjacent areas.

The radiation dose from normal operations in 1994 would have resulted in 1×10^{-3} LCF to the population residing within 80 kilometers (50 miles) of the site. The population within this area was 3 million. The annual dose from airborne radionuclides to the MEI during 1994 would result in a 2×10^{-8} probability of an LCF. The corresponding dose is far below the NESHAP limit.

Nevada Test Site (NTS)

NTS occupies 3,500 square kilometers (1,350 square miles) of desert valley and Great Basin mountain terrain in southern Nevada, 105 kilometers (65 miles) northwest of Las Vegas, Nevada. NTS is designated as an attainment or unclassified area with respect to all applicable NAAQS. Since promulgation of regulations, no PSD permits have been required for any emissions source at NTS. There are no continuously flowing streams at NTS, but there are permanent on-site water bodies, including natural springs and water-well overflow ponds, that are not associated with wastewater disposal. Groundwater is the only source of drinking water in the NTS area. Only three locations evidenced detectable tritium levels on a consistent basis. In all three cases, the tritium activity has been less than 2 percent of the primary maximum contaminant limit for tritium (20,000 picocuries per liter).

Thirteen federal- and state-listed threatened, endangered, and other special status species are present in the vicinity of NTS. The peregrine falcon is the only known species at NTS that is on the federal endangered species list. Approximately 6 percent of NTS has been inventoried for cultural resources, and more than 1,200 prehistoric sites have been found and recorded. Many of these sites may be eligible for listing on the NRHP.

Two counties comprise the economic ROI; 97 percent of the 1,600 NTS employees live within these two counties. The ROI population totaled 865,144 in 1992. The population in the ROI is predominantly White (81.5 percent), and in 1989, 7.5 percent of the population was below the poverty level.

DOE has entered into two separate agreements with the Consolidated Group of Tribes and Organizations, which is composed of 17 tribes representing three ethnic groups (Western Shoshone, Owens Valley Paiute, and Southern Paiute) with cultural or historic ties to NTS. These agreements were intended to foster a government-to-government relationship and to encourage involvement in programs associated with NTS operations.

The radiation dose from normal operations in 1994 would result in 0.3 LCF to the population residing within 80 kilometers (50 miles) of the site. The population within this area was 33,000 that year. The annual dose from airborne radionuclides to the MEI during 1994 would result in a 8×10^{-8} probability of an LCF. The corresponding dose is below the NESHAP limit.

Oak Ridge National Laboratory (ORNL)

ORNL is part of the Oak Ridge Reservation (ORR), which is located about 32 kilometers (20 miles) west of Knoxville, Tennessee, in the rolling terrain between the Cumberland Mountains and Great Smoky Mountains.

As of 1991, the area within the Air Quality Control Region was designated as an attainment area with respect to all NAAQS for criteria pollutants.

Substantial cleanup activities are required both on-site and off-site. Background groundwater quality is generally good in the near surface aquifer zones and poor in the bedrock aquifer below 305 meters (1,000 feet) due to high total dissolved solids. The contaminated sites include past waste disposal sites, waste storage tanks, spill sites, and contaminated inactive facilities. ORR is included on the CERCLA National Priorities List.

There are 88 federal- and state-listed threatened, endangered, and other special status species that have been identified on or in the vicinity of ORR. More than 20 cultural resource surveys have been conducted on ORR. Over 45 prehistoric sites have been identified and recorded. One site has been included in the NRHP, and several more are considered potentially eligible. More than 240 historic resources have been identified and recorded, and 50 of those sites may be eligible for the NRHP. The Graphite Reactor, located on the site, is a National Historic Landmark.

Four counties comprise the economic ROI; about 92 percent of ORR employees live in these four counties. The 1990 population of this ROI was about 489,000. Minorities comprised 8.4 percent of this population, and 10.6 percent of this population was below the poverty level.

The radiation dose from normal operations in 1994 would result in 2 x 10^{-2} LCF to the population residing within 80 kilometers (50 miles) of the site. The population within this area was 940,000. The annual dose from airborne radionuclides to the MEI during 1994 would result in a 9 x 10^{-7} probability of an LCF. The corresponding dose is below the NESHAP limit.

Rocky Flats Environmental Technology Site (RFETS)

RFETS covers almost 17 square kilometers (7 square miles) in northern Jefferson County, Colorado. The site is located east of the foothills of the Rocky Mountains, approximately 25 kilometers (16 miles) northwest of Denver, Colorado.

RFETS is located in an Air Quality Control Region that is a nonattainment area for the NAAQS criteria pollutants CO, O_3, and PM_{10}.

There are five ephemeral streams at RFETS that form a west-to-east surface drainage pattern. The primary source of flood potential is from flash flooding in these streams; however, most facilities are located outside the 500-year flood plain. No aquifers in the area are sole source aquifers under the Safe Drinking Water Act regulations. The results of 1992 groundwater quality monitoring indicate that the groundwater in the area contains elevated levels of several VOCs, several radionuclides, and other contaminants.

There are 40 federal- and state-listed threatened, endangered, candidate, and other special status species that are known to occur or may occur at RFETS. In addition, the Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*) was recently proposed for federal listing. RFETS has no properties designated as National Historic Landmarks or listed on the NRHP. According to the Colorado Historic Society, portions of the site have been the subject of at least three cultural resource investigations. The historic cultural resources in the area are archaeological sites or standing structures associated with homesteads and ranching.

Five counties comprise the economic ROI; 92.5 percent of the site's 3,500 employees reside in these five counties. In 1990, the ROI population was 1,790,600. The population was predominantly White (86.2 percent) with 7.2 percent of the total population living below the poverty level.

The radiation dose from normal operations in 1994 would have resulted in 1 x 10^{-4} LCF to the population residing within 80 kilometers (50 miles) of the site. The population within this area was 2,100,000. The annual dose from airborne radionuclides to the MEI during 1994 would result in a 1 x 10^{-9} probability of an LCF. The corresponding dose is far below the NESHAP limit.

Savannah River Site (SRS)

SRS is located approximately 20 kilometers (12 miles) south of Aiken, South Carolina, bordering the State of Georgia at the Savannah River. Land use at SRS, which comprises 80,200 hectares (198,000 acres), is generally categorized as forest, water, or developed facility locations. A total 77,400 hectares (191,000 acres) of SRS are undeveloped, of which 72 percent are forested.

SRS is located near the center of the Augusta-Aiken Interstate Air Quality Control Region. The areas within SRS and its surrounding counties are classified by the EPA as attainment areas with respect to the NAAQS for criteria pollutants.

The site lies within an area where earthquakes capable of producing structural damage are not likely to occur. Probabilistic seismic hazard curves were developed for all DOE sites in the 1980s, and the results for SRS indicated that a peak acceleration of 0.19 gravity was associated with a probability of 2×10^{-4} per year (5,000-year return period). Since 1985, three earthquakes, all of Richter magnitude 3.0 or less, have occurred in the immediate area of SRS.

The primary surface water feature is the Savannah River, which borders the site for approximately 32 kilometers (20 miles) to the southwest. There are six major streams that flow through SRS into the Savannah River. There are approximately 190 Carolina bays scattered throughout the site. Carolina bays are naturally occurring land depressions that can hold water. The Savannah River and on-site streams are classified as fresh water suitable for primary and secondary contact recreation, as a source for drinking water supply following conventional treatment, fishing, and industrial and agricultural uses. Groundwater quality ranges from excellent (soft and slightly acidic) to poor (exceeding EPA drinking water standards for several constituents) in the vicinity of some waste sites. SRS is included on the CERCLA National Priorities List.

Sixty-one species have been identified at SRS that are listed as threatened, endangered, or having other special status by the state and federal government. There is potential habitat in some areas for the Red Cockaded Woodpecker. More than 800 prehistoric sites have been identified, although fewer than 8 percent have been evaluated for eligibility to the NRHP. Approximately 400 historic sites have been identified within SRS. Ten of these sites are eligible for the NRHP.

The SRS economic ROI is composed of four counties in which 87 percent of all SRS employees reside. SRS employees in those counties comprise 4.6 percent of the total employment in the regional economic area. The total population in the ROI in 1990 was 460,028. Approximately 37 percent were minorities; 14 percent were below the poverty level.

The radiation dose from normal operations in 1994 would result in 8×10^{-3} LCF to the population residing within 80 kilometers (50 miles) of the site. The population within this area was 620,000. The annual dose from airborne radionuclides to the MEI during 1994 would result in a 8×10^{-8} probability of an LCF. The corresponding dose is below the NESHAP limit.

ENVIRONMENTAL CONSEQUENCES

The potential environmental consequences of the Proposed Action, three action alternatives, and two no action alternatives are described below. They also are presented in a table at the end of this Summary.

Land Use and Management

Under the Proposed Action, DOE would occupy the land at WIPP transferred to it by the LWA. The Department also would lease selected land outside the WIPP withdrawal area for such uses as groundwater surveillance pads, signs, and transportation and utility corridors. No substantial impacts would occur to established local land use patterns under the Proposed Action. However, the WIPP site would continue to limit drilling and mining activities, and grazing and public access to the site would be controlled. Pursuant to Public Law 104-201, DOE may acquire two oil and gas leases. As part of the decommissioning of the facility, an earthen berm would be constructed above the repository to delimit the 70-hectare (173-acre) disposal area. There would be no impacts to established local land use patterns beyond the site from decommissioning.

For the action alternatives, the area within the earthen berm would be larger and vary from 360 to 395 hectares (890 to 976 acres); otherwise, land use impacts would be similar to the Proposed Action. For the no action alternatives, impacts on the WIPP site would be minimal because there would be no disposal of waste; thus, decommissioning would be limited to the removal of buildings and the sealing of shafts. The disturbed area would not exceed 20 hectares (50 acres).

Construction and operation of TRU waste treatment and storage facilities are expected to have negligible impacts on land uses at DOE treatment and storage sites and are not expected to conflict with site development plans for the following reasons: land requirements for these facilities would be relatively low (less than 11 hectares); the facilities would be located in developed areas or areas appropriate for development; and the facilities would not be located in sensitive areas (such as known cultural resource areas, sensitive habitats, wetlands, and flood plains). The analysis shows that the TRU waste facilities would require less than 1 percent of the land available for waste operations at any DOE site proposed. This would give DOE considerable flexibility in locating the treatment facilities.

Air Quality

Under the Proposed Action and the action alternatives, WIPP disposal operations would result in small increases in the annual average concentrations of PM_{10}, NO_2, and SO_2. In each case, the increase would be less than 2 percent of the respective annual regulatory limit. Releases of the criteria pollutants O_3 and lead from the operation of WIPP would be negligible. Ten years of decommissioning would result in some small increases in annual concentrations of some pollutants but would result in no long-term impacts.

Emissions from WIPP disposal operations could reach higher percentages of the short-term (24-hour) emission limits. These higher percentages, though, were based on conservative modeling assumptions. Emissions of NO_2 for the Proposed Action and for each of the action alternatives could be as high as 65 percent of the 24-hour limit if underground and surface diesel equipment and both backup diesel generators were operating concurrently. The PM_{10} emissions could be as high as 57 percent of the 24-hour limit, due mainly to very conservative assumptions of salt pile fugitive dust emissions.

Except at RFETS, LLNL, and ANL-E, which are in nonattainment areas for some pollutants, most levels of criteria pollutants would be less than 10 percent of applicable regulatory criteria pollutant standards under each alternative. However, during treatment under Action Alternative 2A, radionuclide releases could potentially reach 134 percent of the regulatory standards at RFETS, and under Action Alternative 2B, treatment-related releases could reach 10 percent of the standard at INEEL. Under Action Alternative 2C, treatment-related releases could reach 137 percent of the regulatory standards at WIPP.

Releases above the regulatory standard would require mitigation measures, such as additional HEPA (High Efficiency Particulate Air) filtration, to ensure releases remained below the allowable limit. Treatment under the other action alternatives or the Proposed Action would not result in releases of radionuclides or other hazardous or toxic air pollutants in excess of regulatory standards.

Biological Resources

DOE recently conducted surveys at the WIPP site for federally or state-listed threatened or endangered species and habitats. No such species were identified. Therefore, disposal operations at WIPP under the Proposed Action are not expected to impact endangered, threatened, proposed, or candidate plant and animal species listed by the federal government or endangered, threatened, or rare and sensitive species listed by New Mexico. No critical habitat for endangered or threatened species is known to occur on the WIPP site. WIPP site activities are not expected to affect long-term ecosystem balance or biodiversity, although negligible impacts to the overall plant and animal communities near the WIPP site would occur from WIPP operations. Decommissioning and closure of the WIPP site, which would include reclamation of the salt pile area, would affect a total of 70 hectares (173 acres). These activities would result in the short-term loss of much of the plant community and avian and small mammal habitat within and near the area. DOE would return decommissioned WIPP land to a stable ecological condition and maintain or enhance the condition of wildlife habitat within the WIPP Land Withdrawal Area.

Biological resource impacts for the action alternatives would be similar to those for the Proposed Action, except for an increase in the land that would be disturbed by construction of a berm around the perimeter of, and permanent markers over, the disposal area. The area disturbed by decommissioning under the action alternatives would range from 360 to 395 hectares (890 to 976 acres). Under the no action alternatives, the impacts would be less than those under the Proposed Action because the area disturbed at WIPP would be limited to 20 hectares (50 acres).

Construction and operation of treatment facilities for TRU waste should not affect regional populations of nonsensitive plant and animal species because no more than 11 hectares (28 acres) would be disturbed at any site and because the habitats for these species are well established regionally near the proposed treatment sites. Threatened and endangered species appear at most of the DOE sites considered for waste management and treatment facilities. Such species, therefore, could potentially be impacted. Because relatively little land would be required for the waste management and treatment facilities, DOE should be able to locate the new facilities to avoid impacts to such species and sensitive habitat areas. When specific facility locations are proposed, DOE will contact the U.S. Fish and Wildlife Service and state agencies and enter into formal consultation under the Endangered Species Act, where required.

Cultural Resources

Under the Proposed Action, no impacts to cultural resources would occur as part of the WIPP waste handling or emplacement operations. However, those activities that disturb the land in conjunction with closure and decommissioning may have potentially adverse impacts on two archaeological sites that are located within the surface closure area. Both of these sites are eligible for inclusion on the NRHP. One of these sites may require further testing, avoidance, and mitigation, in accordance with the Joint Powers Agreement between DOE and the State of New Mexico under the National Historic Preservation Act and other statutes.

Under the action alternatives, shipping and disposal operations at WIPP would not impact the cultural resources of the area. However, decommissioning activities could disturb 11 prehistoric archaeological sites that are potentially eligible for inclusion in the NRHP. These prehistoric archaeological sites are located in a 10-square-kilometer (4-square-mile) area that is centrally located within the WIPP site. Under the no action alternatives, no impacts to known cultural resource properties at WIPP would occur.

Construction and operation of TRU waste management and treatment facilities could adversely affect cultural resources, but because the acreage requirements of these facilities remain relatively low at any one site, the adverse affects can probably be avoided for all alternatives. Site-level cultural resource surveys would be conducted, and protection measures established, where necessary, when specific facility construction locations are proposed.

Noise

Truck transport of waste through Carlsbad under the Proposed Action would result in a negligible increase in background noise levels from normal automobile and truck traffic. Transportation noise impacts were based on a maximum of eight trucks per day, which would correspond to the WIPP throughput rate of 50 TRUPACT-IIs and eight RH-72B casks per week. Most of the waste would enter Carlsbad from the north on Highway 285. Trucks would travel through Carlsbad at random times throughout the day.

Under the action alternatives, noise impacts from trucks would be similar to those of the Proposed Action. If the waste were transported by rail and truck (with rail service used as much as is practical), railroad noise impacts in Carlsbad would increase slightly. The impacts would correspond to the time needed for an additional 13 to 16 fully loaded railroad cars per week to pass through the area. All waste destined for WIPP would travel through Carlsbad to Loving where it would be diverted to WIPP via a dedicated rail spur. For No Action Alternatives 1A and 1B, noise impacts would be negligible from truck or rail transportation during transportation to treatment facilities. For No Action Alternative 2, there would be no transportation and thus no impacts.

Because treatment facilities would probably be placed at industrial-type sites along high traffic volume corridors, construction and operation of those facilities should not substantially increase ambient noise levels. There is a potential for sensitive receptors to be impacted. Impacts to sensitive species or habitats would be mitigated when planning the treatment facilities.

Water Resources and Infrastructure

Annual incremental increases in water, wastewater, or power usage would be negligible and within existing capacity under the Proposed Action and all action alternatives. The WIPP facility has been designed to handle emplacement of the waste volumes proposed and its current or planned infrastructure capacity would not be exceeded. Current roadways and planned traffic volumes due to disposal operations also would be compatible. Under the no action alternatives, use of infrastructure resources would gradually decrease until WIPP were closed. No resources would be used following closure.

Impacts from treatment of the waste were assessed for water, power, wastewater, and on-site transportation needs. Treatment operations under the Proposed Action and Action Alternative 1 would result in a 5.9 percent increase in wastewater at Hanford and minor on-site transportation impacts at Hanford, INEEL, and LANL. Action Alternative 2A would result in a 6.6 percent increase in power usage at INEEL, a 7.8 percent increase in wastewater usage at Hanford, and minor on-site transportation impacts at Hanford, INEEL, and LANL. Action Alternative 2B would result in a 6.6 percent increase in power usage at INEEL, a 7.8 percent increase in wastewater at Hanford and minor on-site transportation impacts at Hanford and INEEL. Action Alternative 2C would result in a 6.6 percent increase in power usage at INEEL and a 50 percent increase in power usage at WIPP. It also would result in 80 percent more wastewater at WIPP. Under Action Alternative 2C, a 162 percent increase in employment would result in minor impacts to on-site transportation resources at WIPP, and minor on-site transportation impacts at Hanford would result from a 6 percent increase in employment. At WIPP under Action Alternative 2C, increases in the volume of wastewater and road usage would be expected to require new or modified facilities. Action Alternative 3 would result in a 6.4 percent increase in power usage at INEEL, a 7 percent increase in wastewater at Hanford, and minor on-site transportation impacts at Hanford, INEEL, and LANL. No Action Alternative 1A would result in a 6.6 percent increase in power usage at INEEL, a 7.8 percent increase in wastewater at Hanford, and minor on-site transportation impacts at Hanford, INEEL, and LANL. No Action Alternative 1B would result in a 6.6 percent increase in power usage at INEEL, a 7.8 percent increase in wastewater at Hanford, and minor on-site transportation impacts to Hanford and INEEL. There would be only minor infrastructure treatment impacts from No Action Alternative 2 because only newly generated waste would be treated.

Socioeconomics

Financial figures used throughout SEIS-II in describing life-cycle costs are presented in terms of 1994 dollars and discounted costs; economic impacts are presented in terms of 1994 dollars. Life-cycle costs for the Proposed Action and the alternatives are presented in Table S-5. The total life-cycle cost (in 1994 dollars) of the Proposed Action would be $19.03 billion, which includes costs for waste management facilities at 10 assumed treatment sites, waste transport, and WIPP operations. It also includes the storage costs for RH-TRU waste in the Basic Inventory that is in excess of the 7,080 cubic meter (250,000 cubic feet) limit. (Updated volume estimates, under which there would not be such excess RH-TRU waste, and the impacts on cost, transportation, and other impacts are discussed later in this Summary and in Appendix J.)

For the Proposed Action, the total life-cycle waste treatment would include construction, operation and maintenance, and decontamination and decommissioning at the assumed treatment sites. The waste management facilities would process, treat, and package waste inventories to meet WAC treatment standards over 35 years. All costs presented below are in 1994 dollars; discounted costs are presented in Table S-5.

The cost of storing the excess RH-TRU waste in the Basic Inventory would be $310 million. Overall, waste treatment and storage costs would be $12.14 billion ($11.80 billion waste treatment plus $310 million excess RH-TRU waste storage). The total cost of waste transportation ($1.59 billion) would include consolidation of the waste volumes at the 10 treatment sites and shipment of the treated waste to WIPP over a 35-year period for emplacement. The total budget at WIPP over the life of the project would be $5.3 billion. Life-cycle costs for the action alternatives are based on longer operation times, as outlined in Table S-4. When truck transportation is proposed, total life-cycle costs would range from $30.28 billion for No Action Alternative 1A to $59.67 billion for Action Alternative 3. Of the three transportation modes, regular rail was found to be the least costly and dedicated rail the most costly.

Table S-5
Life-Cycle Costs (in billions of 1994 dollars with discounted dollars in parentheses)

Life-Cycle Cost Information	Proposed Action (Preferred Alternative)	Action Alternative 1	Action Alternative 2A	Action Alternative 2B	Action Alternative 2C	Action Alternative 3	No Action Alternative 1A	No Action Alternative 1B	No Action Alternative 2
Total Waste Treatment and Storage Facility Cost	12.14 (6.56)	21.39 (11.86)	27.69 (15.36)	30.55 (16.94)	28.70 (15.92)	24.34 (13.50)	29.36 (16.28)	31.76 (17.61)	1.64 (0.91)
Total Waste Transportation Cost by Truck	1.59 (0.88)	4.91 (0.78)	2.99 (0.51)	3.30 (0.56)	2.91 (0.49)	6.84 (0.91)	0.07 (0.04)	0.24 (0.13)	---
Total Waste Transportation Cost by Regular Rail	---[a]	1.64 (0.26)	1.01 (0.17)	1.14 (0.19)	0.91 (0.15)	2.34 (0.31)	0.03 (0.02)	0.16 (0.89)	---
Total Waste Transportation Cost by Dedicated Rail	---	11.32 (1.79)	6.86 (1.16)	7.48 (1.26)	6.54 (1.10)	15.69 (2.10)	0.25 (0.14)	1.18 (0.65)	---
Total WIPP Budget	5.30 (2.52)	24.65 (3.68)	23.33 (3.70)	23.33 (3.70)	23.33 (3.70)	28.49 (3.61)	0.85 (0.77)	0.85 (0.77)	0.85 (0.77)
Total Life-Cycle Cost (Truck Transportation)	19.03 (10.13)	50.95 (16.32)	54.01 (19.56)	57.18 (21.19)	54.94 (20.10)	59.67 (18.03)	30.28 (17.09)	32.85 (18.52)	2.49 (1.68) [b]
Total Life-Cycle Cost (Regular Train)	---[a]	47.68 (15.80)	52.03 (19.22)	55.02 (20.83)	52.94 (19.76)	55.17 (17.42)	30.24 (17.07)	32.77 (18.47)	---
Total Life-Cycle Cost (Dedicated Train)	---	57.36 (17.33)	57.88 (20.21)	61.36 (21.90)	58.57 (20.72)	68.52 (19.21)	30.46 (17.19)	33.79 (19.04)	---

[a] Under the SEIS-II Preferred Alternative, regular rail transportation is reserved as a future possibility. Such rail transportation would be less costly than truck transportation.
[b] Life-cycle cost does not include transportation.

Note: The methods and assumptions used to estimate the various life-cycle cost components are described in Appendix D. Actual totals may differ due to rounding and to miscellaneous costs, such as facility decontamination and decommissioning. Discounted costs are presented in parentheses.

Economic impacts in the WIPP region (region of influence, or ROI) under the Proposed Action and action alternatives are presented in Table S-6. Overall, the Proposed Action would have a stabilizing influence on the regional economy near WIPP. Similarly, WIPP would remain a stable federal employer under the other action alternatives, providing direct employment for 1,095 project personnel. The continued operation of WIPP would provide annual direct and indirect production of $317 million of goods and services, provide $126 million of annual labor income, and support 3,538 jobs (including the 1,095 project personnel) in the ROI. These economic impacts are based on an assumed average annual project budget of $180 million per year over a 35-year waste emplacement period extending from 1998 through 2033.

The Carlsbad area would receive approximately 85 percent of the ROI economic impacts associated with WIPP.

TRU waste treatment and associated waste management activities would support direct, indirect, and induced jobs. The Proposed Action would support about 11,900 jobs in the ROIs of the 10 potential treatment sites (ANL-E, Hanford, INEEL, LANL, LLNL, Mound, NTS, ORNL, RFETS, SRS). Action Alternative 1 would support about 22,500 jobs in the ROIs; Action Alternative 2 would support approximately 28,000, 28,500, and 7,200 jobs for subalternatives 2A, 2B, and 2C, respectively; and Action Alternative 3 would support about 24,900 jobs. No Action Alternative 1 would support about 29,300 and 29,800 jobs for subalternatives 2A and 2B, respectively; No Action Alternative 2 would support about 2,300 jobs.

Table S-6
Economic Impacts in the WIPP ROI [a]

SEIS-II Alternative	Duration of WIPP Operations	Average Annual Output of Goods and Services ($Millions, 1994)	Average Annual Total Employment	Average Annual Labor Income ($Millions, 1994)
Proposed Action (Preferred Alternative)	35 years	317	3,538	126
Action Alternative 1	160 years	317	3,538	126
Action Alternatives 2A and 2B	150 years	317	3,538	126
Action Alternative 2C	150 years	616	6,876	245
Action Alternative 3	190 years	317	3,538	126
No Action Alternative 1 [a]	10 years	143	1,592	57
No Action Alternative 2 [a]	10 years	143	1,592	57

[a] Annual impacts under the no action alternatives would occur throughout the decommissioning period. Decommissioning would occur over a 10-year period.

Transportation

The following are among the analyses conducted to estimate impacts from transporting TRU waste.

- The overall number of traffic accidents and the number of resulting fatalities and injuries were estimated. These impacts are dependent upon the number of additional trucks that transportation of TRU waste would place on the nation's highways and not on the radioactive or hazardous materials being transported. These impacts, therefore, are "nonradiological impacts."

- Accident-free radiological impacts were estimated. These impacts are associated with the external radiation present around a TRUPACT-II or RH-72B as it is being shipped. The general public and transportation workers would be exposed to very low levels of radiation both during transportation and while a shipment is stopped. These impacts are "accident-free radiological impacts."

- The impacts from specific accident scenarios in which a TRU waste package is breached and releases radioactive or hazardous materials were estimated. These impacts are "radiological impacts from transportation accidents."

The following subsections discuss the results of these analyses.

Nonradiological Impacts

Under the Proposed Action, during the 35 years of transportation, 56 accidents, 39 injuries, and five fatalities were estimated for transportation of TRU waste by truck. (Though rail transportation was not analyzed under the Proposed Action, use of rail transportation is reserved for future consideration under the Preferred Alternative; if rail transportation were used, impacts are expected to be lower.) The greatest potential impacts would occur under Action Alternative 3, with 239 accidents, 165 injuries, and 22 fatalities during 190 years of transportation by truck. The impacts from truck transportation of TRU waste under Action Alternative 1 would be 171 accidents, 119 injuries, and 16 fatalities during the 160 years of transportation. The impacts for the three subalternatives of Action Alternative 2 indicate that the number of accidents during the 150 years of transportation would range from 105 to 123, the number of injuries would range from 74 to 86, and the number of fatalities would range from 10 to 11. Under No Action Alternative 1A, the impacts from truck transportation would be five accidents, four injuries, and no fatalities during the 35 years of transportation. The impacts from truck transportation of TRU waste under No Action Alternative 1B would be 13 accidents, 12 injuries, and 1 fatality during 35 years of transportation. There would be no transportation proposed under No Action Alternative 2.

If regular rail service were used as much as practical, with trucks transporting the remainder of the waste for the action alternatives or No Action Alternative 1, the number of fatalities overall would be approximately half those estimated for truck transportation alone. This is because the number of fatalities per rail-car mile and per truck are about the same and because twice as many TRUPACT-IIs or RH-72B casks can be shipped on each rail car; the number of shipments (and fatalities), therefore, is reduced by half.

If dedicated rail service were used for the action alternatives or No Action Alternative 1 with rail cars shipping TRU waste exclusively, approximately 14 times the number of fatalities from regular rail service for each alternative would be expected as a result. This is largely from the increase in the number of trains when dedicated rail service is used.

Accident-Free Radiological Impacts

Two types of accident-free radiological impacts were independently estimated. The first type was the nonoccupational impact: the impact to the general public living along the highways or traveling on the highways at the same time as the TRU waste shipments. The conservative nature (i.e., tendency to overestimate impacts) of the assessment methods for accident-free transportation impacts is discussed in Section 5.1.8.3 and Appendix E. Actual impacts are likely to be smaller than estimated. The second type of accident-free radiological impact was the occupational impact: the impact to inspectors and others whose jobs would expose them to the radiation from TRUPACT-IIs and RH-72B casks.

ESTIMATING RADIOLOGICAL IMPACTS

Estimation of potential human health impacts involves a series of calculations that indicate the potential health consequence of a particular action or accident, and the probability that the action or accident would occur. Impacts can be calculated both for individuals and for a population. The probability of occurrence for routine actions is 1.0, meaning the action (e.g., chronic release from a permitted exhaust point) will occur at regular intervals, typically daily, over a year of operations. The probability of occurrence for accidents, therefore, is between zero and 1.0, indicating the chance that the nonroutine event might occur sometime during the entire operations period.

The health effect of concern from low levels of radiation exposure is a radiation-induced cancer fatality. To quantify the radiological impact, the radiation dose must be calculated. The dose is a function of the exposure pathway (external, inhalation, or ingestion) and the type and quantity of radionuclides involved. After the dose is estimated, the health impact is calculated from current internationally recognized risk factors. For this document, potential radiological impacts are based on a scenario that includes prudently conservative release, exposure, and risk factor estimates. Because of the use of conservative assumptions, the impact estimates bound any that would be expected.

The unit of radiation dose for an individual is the rem. A millirem (mrem) is 1/1,000 of a rem. The unit of dose for a population is person-rem and is determined by summing the individual doses of an exposed population. Dividing the person-rem estimate by the number of people in the population would indicate the average dose to a single individual. The impacts from a small dose to a large number of people can be estimated from population (i.e., collective) dose estimates.

To estimate the human health impact from radiation dose, a dose-to-risk factor that indicates the potential for a latent cancer fatality, or LCF, is used. An LCF is a fatality resulting from a cancer that was originally induced by radiation, but which may occur years after the exposure. The dose-to-risk factor for low (less than 20 rem) annual doses is 0.0005 LCF per person-rem for the general public, which includes the very young and the very old, and 0.0004 for the worker population. For example, a population dose of 2,000 person-rem is estimated to result in one additional cancer fatality (0.0005 x 2,000 = 1) in the general public. The dose-to-risk factor for an individual is doubled if the individual dose rate is greater than 20 rem/year (20,000 mrem per year).

The average individual in the United States receives a dose of 0.3 rem (300 mrem) each year from background radiation. Background radiation sources include radon that has concentrated in homes from foundation soil sources, uranium found in rocks used as building materials, and cosmic radiation from the earth's atmosphere. The average lifetime chance or probability of cancer to a member of the public from a 70-year exposure due to background radiation is about 0.01 (i.e., 70 x 0.3 x 0.0005). That is, the best current radiation risk estimates are that one in 100 people will die from cancer due to background radiation.

During the 35 years of transportation under the Proposed Action, nonoccupational impacts could result in 3 LCFs. (Though rail transportation was not analyzed under the Proposed Action, use of rail transportation is reserved for future consideration under the Preferred Alternative; if rail transportation were used, impacts are expected to be lower.) Among the alternatives, Action Alternative 3 would have the greatest nonoccupational, accident-free radiological impact from 190 years of truck transportation (15 latent cancer fatalities or LCFs). No Action Alternative 1A would have the least nonoccupational radiological impact (less than 1 LCF). (No transportation is proposed for No Action Alternative 2.) Action Alternatives 2A and 2B would have nonoccupational impacts estimated at 6 and 7 LCFs respectively during 150 years of transportation, Action Alternative 2C would have 6 LCFs during 150 years of transportation, and Action Alternative 1 would have 11 LCFs during 160 years of transportation.

Nonoccupational, accident-free exposure impacts from rail transportation are generally ten times lower than those impacts from truck transportation, due to additional shielding during stops. Action Alternative 3 would have the maximum potential impact for accident-free rail transportation (2.0 LCFs).

Under the Proposed Action, accident-free occupational impacts from truck transportation would result in 0.3 LCF. (Though rail transportation was not analyzed under the Proposed Action, use of rail transportation is reserved for future consideration under the Preferred Alternative; if rail transportation were used, impacts are expected to be lower.) Action Alternative 3 would have the greatest occupational impacts, resulting in 1 LCF from accident-free transportation. Accident-free transportation under Action Alternatives 2A and 2B would result in 0.5 and 0.7 LCF each, and 0.5 LCF would result from Action Alternative 2C. Under Action Alternative 1 and No Action Alternatives 1A and 1B, the occupational impacts would result in 0.7, 0.02, and 0.07 LCF, respectively.

Occupational accident-free doses from rail transportation could be up to 100 times lower than from truck transportation, due to the lower number of shipments (half as many) and the increased distance between the shipping containers or casks and the crews. Also, no impacts would be expected from the release of hazardous chemicals in TRU mixed waste during accident-free transportation, because the containers used to transport the waste are not vented and, therefore, no releases would occur.

Radiological Impacts From Transportation Accidents

Two types of analyses were conducted to determine the radiological impacts associated with transportation accidents. The first estimated the aggregate radiological impacts during transportation from each of the 10 major potential treatment sites to WIPP. For this analysis, a conservative radionuclide inventory was used that assumed every TRU waste package would be filled with waste containing the highest level of radionuclides and hazardous material allowed by the planning-basis WAC. The probabilities of occurrence for each of eight severity categories, the distance from each site, and the number of shipments were considered for this first analysis. The total accident impact from each of the 10 potential sites was obtained by summing the impacts calculated for each severity category.

For each alternative except Action Alternative 3, the total LCFs were estimated to be less than 1. For Action Alternative 3, the estimate was 1.2 LCFs.

The second type of analysis assessed bounding accident scenarios. Two scenarios involved the breach of a TRUPACT-II and two involved the breach of an RH-72B. The accidents were assumed to occur under conditions that would maximize, within reasonable bounds, the impacts to exposed population groups. Results for this second analysis are summarized below:

- *Breach of a TRUPACT-II with a maximum radionuclide inventory*: The inventory considered for this analysis was a shipment of three TRUPACT-IIs, each with the maximum number of drums, and each drum containing the maximum level of radionuclides permitted under the planning-basis WAC. The accident scenario considered the breach of one of the three TRUPACT-IIs in an urban area under weather conditions that would maximize the radiation dose to the population. The analyses indicated that for the Proposed Action, Action Alternative 1, Action Alternative 2C, Action Alternative 3, and No Action Alternatives 1A and 1B, the radiation dose to the population would result in 16 LCFs, and the dose to a hypothetical MEI would result in a 0.06 probability of an LCF. For Action Alternatives 2A and 2B, the dose to the population would result in less than 1 LCF and that to the MEI would result in a 3×10^{-4} probability of an LCF. The reduced impacts are due to thermal treatment before shipment to WIPP. Impacts to a transportation crew member would not be expected to exceed those to the MEI.

- *Breach of an RH-72B with a maximum radionuclide inventory*: The inventory considered for this analysis was a shipment of one RH-72B cask containing the maximum level of radionuclides permitted under the planning-basis WAC. The accident scenario considered the breach of the RH-72B cask in an urban area under weather conditions that would maximize the radiation dose to the population. The analyses indicated that for the Proposed Action, Action Alternatives 1 and 3, and No Action Alternatives 1A and 1B, the radiation dose to the population would result in 16 LCFs, and the dose to the MEI would result in a 0.06 probability of an LCF. For Action Alternatives 2A, 2B, and 2C, the dose would result in less than 1 LCF and that to the MEI would result in a 3×10^{-4} probability of an LCF. The reduced impacts are due to thermal treatment before shipment to WIPP. Impacts to a transportation crew member would not be expected to exceed the MEI.

- *Breach of a TRUPACT-II with average concentrations of radionuclides*: The inventory considered for this analysis was a shipment of three TRUPACT-IIs containing the average concentration of radionuclides found at SRS, which had the highest average concentration. The accident scenario was otherwise identical to that above. The analyses indicated that for the Proposed Action, Action Alternative 1, Action Alternative 2C, Action Alternative 3, and No Action Alternatives 1A and 1B, the radiation dose to the population would result in 3 LCFs, and the dose to the MEI would result in a 0.04 probability of an LCF. For Action Alternatives 2A and 2B, the dose to the population would result in less than 1 LCF and that to the MEI would result in a 2×10^{-4} probability of an LCF. The reduced impacts are again due to thermal treatment before shipment to WIPP. Impacts to a transportation crew member would not be expected to exceed those to the MEI.

- *Breach of an RH-72B with average concentrations of radionuclides*: The inventory considered for this analysis was a shipment of an RH-72B cask containing the average concentration of radionuclides found at Hanford, which had the highest average concentration. The accident was otherwise identical to that above. The analyses indicated that for the Proposed Action, Action Alternative 1, Action Alternative 2C, Action

UNDERSTANDING SCIENTIFIC AND EXPONENTIAL NOTATION

Scientific notation is used in this document to express numbers that are so large or so small that they can be difficult to read or write. Scientific notation is based on the use of positive and negative powers (or exponents) of 10. A number written in scientific notation is expressed as the product of a number between 1 and 10 and a positive or negative power of 10. Examples include the following:

Positive Powers of 10
10^1 = 10 x 1 = 10
10^2 = 10 x 10 = 100
and so on, therefore,
10^6 = 1,000,000 (or 1 million)

Negative Powers of 10
10^{-1} = 1/10 = 0.1
10^{-2} = 1/100 = 0.01
and so on, therefore,
10^{-6} = 0.000001 (or 1 in 1 million)

A power of 10 is also commonly expressed as "E", where "E" means "x 10". For example, 3 x 10^5 can also be written as 3E+5, and 3 x 10^{-5} is equivalent to 3E-5. Therefore, 3E+5=300,000 and 3E-5 = 0.00003. This is called exponential notation.

The data tables in this section use exponential notation for numbers that are either very large or very small. The text uses scientific notation to convey these numbers.

Probability is expressed as a number between 0 and 1 (0 to 100 percent likelihood of the occurrence of an event). The notation 3E-6 can be read 0.000003, which means that there are three chances in 1,000,000 that the associated result (e.g., fatal cancer) will occur in the period covered by the analysis.

Alternative 3, and No Action Alternatives 1A and 1B, the dose to the population would result in 0.04 LCF, and the dose to the MEI would result in a 7 x 10^{-4} probability of an LCF. For Action Alternatives 2A, 2B and 2C, the dose to the population would result in less than 1 LCF and that to the MEI would result in a 4 x 10^{-6} probability of a LCF. The reduced impacts are again due to thermal treatment of the waste before shipment to WIPP. Impacts to a transportation crew member would not be expected to exceed those to the MEI.

The severe rail transportation accident analyses assumed the breach of two RH-72B casks or two TRUPACT-IIs; thus, the impacts for a rail accident would double those calculated for a truck accident.

In an effort to reduce the impacts estimated in the transportation analysis, the carrier selected by DOE would provide tractors and drivers who would not work on other contracts. The drivers would be technically qualified and experienced and would be required to complete training in 28 categories, including hazardous and radioactive material transportation. Drivers would carry instructions regarding protocol in the event of an accident and would be trained in package recovery operations. The DOE Carlsbad Area Office has completed and made available an emergency-response plan involving TRU material transport.

Human Health (During Accident-Free Operations)

Potential human health impacts estimated in SEIS-II analyses include the impacts from waste treatment (for all alternatives), waste storage (for all alternatives), and waste disposal at WIPP (for the Proposed Action and the action alternatives). The impacts presented include exposure to radiation and hazardous chemicals for members of the public, workers not directly involved in handling containers of TRU waste (called noninvolved workers), and workers who would directly handle containers of TRU waste (called involved workers). The findings included the following:

- No incidence of cancer or noncarcinogenic health effects from exposure to the hazardous chemicals in TRU mixed waste would be anticipated to the public or workers under any alternative.

- Thermal treatment of waste under Action Alternatives 2A, 2B, and 2C, and under No Action Alternatives 1A and 1B could result in 1 to 2 radiation-related LCFs, depending on the alternative and the treatment site, to members of the public at the treatment sites due to the thermal treatment. No LCFs from treatment for members of the public would occur under any other alternative, including the Proposed Action. Waste treatment could result in 1 to 2 LCFs in involved worker populations under Action Alternatives 1, 2A, 2B, 2C, 3 and No Action Alternatives 1A and 1B. Waste treatment (to meet planning-basis WAC) could result in 1 LCF to involved worker populations under the Proposed Action. Under Action Alternatives 1 and 3, 1.5 LCFs could result for involved worker populations.

- Waste storage operations could result in 1 LCF to involved worker populations under No Action Alternative 1 and 3 LCFs under No Action Alternative 2. The other alternatives would have no LCFs for involved workers at lag storage or long-term storage sites.

- Waste disposal operations at WIPP could result in 1 LCF to involved worker populations under the Proposed Action and Action Alternative 1. The other action alternatives would have no LCFs for the involved workers.

- No radiation-related LCFs would be anticipated among the noninvolved worker population under any alternative.

The impacts of each alternative are summarized below. The quantitative impacts refer to those impacts resulting from the treatment of the maximum inventory potentially included under each alternative.

Proposed Action

For members of the public, treatment of CH-TRU and RH-TRU waste to meet the planning-basis WAC would result in radiological impacts of 2×10^{-4} LCFs for the total population within 80 kilometers (50 miles) of all treatment facilities. For the MEI, the radiological impacts would be a 2×10^{-9} probability of an LCF. Hazardous chemical impacts would include a cancer incidence of 4×10^{-7} in the population within 80 kilometers (50 miles) of the treatment facilities. The impact to the MEI would be a 2×10^{-11} probability of cancer.

Storage of the excess RH-TRU waste inventory at Hanford and ORNL, should it be necessary, would result in radiological impacts to the public of 2×10^{-5} LCF in the population and a

THE WM PEIS PREFERRED ALTERNATIVE

For the purposes of analysis in the Draft SEIS-II Proposed Action, the Department assumed that TRU waste treatment would be partially consolidated in accordance with the Decentralized Alternative of the WM PEIS. Since publication of the Draft SEIS-II, the Final WM PEIS identified a preferred alternative which was a combination of the WM PEIS Alternatives. If TRU waste were treated at the locations identified in the WM PEIS preferred alternative, there would be a slight impact on the analysis set forth in SEIS-II, although there would be no changes in health and other impacts. The modifications to impacts, should the Department select the WM PEIS preferred alternative, are shown below.

RH-TRU waste from SRS would be consolidated at ORNL before disposal at WIPP.

For purposes of analysis of this potential consolidation, the waste volumes used for the WM PEIS have been used. The inventory used for other SEIS-II analyses shows no RH-TRU waste at SRS. The WM PEIS inventory includes up to 21 cubic meters [700 cubic feet] of RH-TRU waste, nearly all of it to be generated during the next 20 years. The number of shipments of RH-TRU waste involved would be approximately 23. The additional miles would also be small because SRS is east of ORNL (the waste would travel west, then south to WIPP). The overall additional impacts (when added to the impacts of the 7,957 shipments in the Basic Inventory) would be small (0.03 additional accidents, 0.03 additional injuries, and 0.004 additional fatalities). Radiological impacts to the occupational population would be 1×10^{-4} LCFs and for nonoccupational populations would be 3×10^{-3} LCFs. (If this waste went directly to WIPP, the impacts would be the same as those presented for the Proposed Action.)

The CH-TRU waste at ORNL would be consolidated at SRS before disposal at WIPP.

A total of 1,700 cubic meters (60,000 cubic feet) or 251 shipments of waste would be transported. The additional transportation would result in 0.1 additional accidents, 0.1 additional injuries, and no additional fatalities. Additional radiological impacts to the occupational population would be 4×10^{-4} LCFs. The radiological impacts to the public would decrease slightly (by 5×10^{-5} LCFs) because of a difference in accident rates along the roadways. The number of shipments would be spread over 35 years, averaging less than 10 shipments per year. Because CH-TRU waste at SRS would be transported to WIPP during the same 35-year period, only small additional impacts to the cost and risk from storage would occur.

Some RFETS CH-TRU waste would be shipped to INEEL for treatment before shipment to WIPP.

Recent estimates are that about 1,000 cubic meters (35,000 cubic feet) of RH-TRU waste would be shipped to INEEL for treatment before shipment to WIPP. For purposes of analysis, the number of shipments was conservatively estimated at 250, though would probably be lower. Additional impacts from this transportation would be 0.25 additional accidents, 0.06 additional injuries, and 0.1 additional fatalities.

Waste from small generator sites (with the exception of SNL) would be shipped directly to WIPP instead of being consolidated before shipment to WIPP. Waste from SNL would be consolidated at LANL.

Approximately 25 shipments of CH-TRU waste at the small generator sites would be directly shipped to WIPP under either the WM PEIS preferred alternative or scenarios where there is no consolidation, and the number of shipments from the potential consolidation sites would probably be reduced. Although routes from the small generator sites have not been proposed, impacts from the additional miles, if any, to be traveled by so few shipments (when compared to the 29,766 shipments for the total campaign) would be so small that the results from the total shipping campaign would not change. For RH-TRU waste, 958 shipments (931 of them from Battelle Columbus Laboratory) would transport waste directly to WIPP, and there would be a one for one reduction in the number of RH-TRU waste shipments from the consolidation sites (because RH-TRU waste would not be repackaged at the potential consolidation sites). The mileage when shipping directly to WIPP would be nearly the same as when first consolidating that waste. Therefore, it is unlikely that there would be additional impacts during the shipping campaign.

1×10^{-9} probability of an LCF for the MEI (at ORNL only). (Updated estimates indicate there would be no excess RH-TRU waste; see Appendix J.) Hazardous chemical impacts include a cancer incidence of 3×10^{-4} in the total population and a 4×10^{-8} probability of an LCF for the MEI (at ORNL)[1].

Disposal operations at WIPP would result in the radiological impacts to the public of 3×10^{-4} LCF in the population and a 3×10^{-7} probability of an LCF for the MEI. Hazardous chemical impacts would include a cancer incidence of 2×10^{-5} in the population and a 3×10^{-8} probability of cancer for the MEI.

For noninvolved workers (those who would not directly handle TRU waste), the radiological impacts from treatment of CH-TRU and RH-TRU waste would be 7×10^{-6} LCF to the total noninvolved worker population of all treatment facilities. The impacts to the maximally exposed noninvolved worker would be a 3×10^{-9} probability of an LCF. Hazardous chemical impacts would include a cancer incidence of 1×10^{-7} in the total noninvolved worker population of all the treatment facilities and a 1×10^{-10} probability of cancer for the maximally exposed noninvolved worker.

Should it be necessary, storage of the excess RH-TRU inventory at Hanford and ORNL would result in radiological impacts to the noninvolved worker populations of 4×10^{-5} LCF and a 1×10^{-8} probability of an LCF for the MEI (at ORNL). Hazardous chemical impacts would include a cancer incidence of 6×10^{-4} in the total noninvolved worker population and a 4×10^{-8} probability of cancer incidence for the maximally exposed noninvolved worker (at Hanford).

Radiological impacts to the noninvolved worker from disposal operations at WIPP could result in 4×10^{-4} LCF in the noninvolved worker population and a 4×10^{-7} probability of an LCF for the maximally exposed noninvolved worker. Hazardous chemical impacts would include a cancer incidence of 1×10^{-4} in the noninvolved population and a 1×10^{-7} probability of cancer for the maximally exposed noninvolved worker.

For involved workers (those who would handle TRU waste directly), the radiological impacts from treatment of CH-TRU and RH-TRU waste could be 1 LCF to the total involved worker population of all treatment facilities. Hazardous chemical impacts would include a cancer incidence of 2×10^{-5} in the total involved worker population of all the treatment facilities.

From disposal operations at WIPP, radiological impacts would result in 1.0 LCF or less in the involved worker population. Hazardous chemical impacts would result in a cancer incidence of 0.01 in the involved worker population.

Action Alternative 1

For members of the public, treatment to planning-basis WAC of CH-TRU and RH-TRU waste would result in radiological impacts of 2×10^{-4} LCF for the total population within 80 kilometers (50 miles) of all treatment facilities. For the MEI, the radiological impacts would be a 1×10^{-9} probability of an LCF. Hazardous chemical impacts would include a cancer incidence of 6×10^{-7} in the population within 80 kilometers (50 miles) of the treatment facilities and a

[1] Hazardous chemical impacts are relatively high compared to radiological impacts because TRU waste containers are vented through carbon filters which filter out radioactive particulates. The gases that vent through the filters are relatively high in hazardous constituents while few gaseous radionuclides are emitted.

3×10^{-11} probability of cancer to the MEI. Lag storage at treatment sites would result in radiological impacts to the public of 1×10^{-2} LCF in the population and a 2×10^{-6} probability of an LCF for the MEI (ORNL). Hazardous chemical impacts would include a cancer incidence of 3×10^{-3} in the population and a 1×10^{-7} probability of an LCF for the MEI (LANL).

Disposal operations at WIPP would result in radiological impacts to the public of 3×10^{-4} LCF in the population and a 5×10^{-7} probability of an LCF for the MEI. Hazardous chemical impacts would include a cancer incidence of 2×10^{-5} in the population and a 2×10^{-8} probability of cancer for the MEI.

For noninvolved workers (those not handling TRU waste directly), the radiological impacts from the treatment of CH-TRU and RH-TRU waste would be 8×10^{-6} LCF in the total noninvolved worker population of all treatment facilities and an 8×10^{-9} probability of an LCF to the maximally exposed noninvolved worker. Hazardous chemical impacts would include a cancer incidence of 2×10^{-7} in the total noninvolved worker population of all treatment facilities and a 2×10^{-10} probability of cancer for the maximally exposed noninvolved worker. Lag storage at the treatment sites would result in radiological impacts at 4×10^{-2} LCF in the population and an 8×10^{-6} probability of an LCF for the maximally exposed noninvolved worker (ORNL). Hazardous chemical impacts would include cancer incidence of 5×10^{-3} in the population and a 5×10^{-7} probability of an LCF for the maximally exposed noninvolved worker (INEEL).

Disposal operations at WIPP would result in radiological impacts at 4×10^{-4} LCF in the noninvolved worker population and a 4×10^{-7} probability of an LCF for the maximally exposed noninvolved worker. Hazardous chemical impacts would include a cancer incidence of 1×10^{-4} in the noninvolved population and a 9×10^{-8} probability of cancer for the maximally exposed noninvolved worker.

For involved workers (those handling TRU waste directly), the radiological impacts from treatment of CH-TRU and RH-TRU waste would be 2 LCFs in the total involved worker population of all the treatment facilities. Hazardous chemical impacts would include a cancer incidence of 3×10^{-5} in the total involved worker population of all the treatment facilities.

Lag storage at treatment sites would result in radiological impacts of 1 LCF or less in the involved worker population. Hazardous chemical impacts would include a cancer incidence of 0.04 or less in the involved worker population.

Disposal operations at WIPP would result in radiological impacts of 1 LCF or less in the involved worker population. Hazardous chemical impacts would include a cancer incidence of 0.03 or less in the involved worker population.

The entire disposal operations period under Action Alternative 1 is estimated to be 42 years for CH-TRU waste and 160 years for RH-TRU waste. The aggregate impacts to the public over the 160 years within 80 kilometers (50 miles) of WIPP and lag storage sites are estimated to be 0.01 LCF from radiation exposure and a cancer incidence of 5×10^{-3} from hazardous chemical exposure. The aggregate impacts over the 160 years to the noninvolved worker populations at WIPP and lag storage sites are estimated to be 0.05 LCF from radiation exposure and a cancer incidence of 0.01 from hazardous chemical exposure. The aggregate impacts to the involved worker populations at WIPP and lag storage sites are estimated to be 2 LCFs or less from radiation exposure and a cancer incidence of 0.1 or less from hazardous chemical exposure.

Action Alternative 2

For members of the public, treatment of CH-TRU and RH-TRU waste under Action Alternatives 2A, 2B, and 2C would result in radiological impacts of 2, 2, and 1 LCFs, respectively, in the total population within 80 kilometers (50 miles) of all treatment facilities and a 3×10^{-5}, 5×10^{-5}, and 2×10^{-4} probability of an LCF, respectively, to the MEI. Hazardous chemical impacts would include a probability of cancer incidence of 3×10^{-7} under each option in the population within 80 kilometers (50 miles) of the treatment facilities and a 2×10^{-11} probability of cancer to the MEI.

Lag storage at treatment sites under Action Alternatives 2A, 2B, and 2C would result in radiological impacts to the public of 1×10^{-3}, 6×10^{-4}, and 1×10^{-4} LCF, respectively, in the population, and 2×10^{-7} (at LANL), 1×10^{-8} (at SRS), and 1×10^{-7} (at WIPP) probability of an LCF, respectively, for the MEI. There would be no hazardous chemical impacts because thermal treatment would remove most hazardous constituents.

Disposal operations at WIPP under each Alternative 2 subalternative would result in radiological impacts to the public of 5×10^{-5} LCF in the population and a 1×10^{-7} probability of an LCF for the MEI. For each subalternative, there would be no hazardous chemical impacts.

For noninvolved workers (those not handling TRU waste directly), the radiological impacts from treatment of TRU waste under Action Alternatives 2A, 2B, and 2C would be 0.1, 0.1, and 0.06 LCF, respectively, in the total noninvolved worker population of all the treatment facilities and a 5×10^{-5} (at RFETS), 2×10^{-4} (at Hanford), and 2×10^{-4} (at WIPP) probability of an LCF to the maximally exposed noninvolved worker. Hazardous chemical impacts would include a cancer incidence of 1×10^{-7} in the total noninvolved worker population of all the treatment facilities and a 1×10^{-10} probability of cancer for the maximally exposed noninvolved worker.

Lag storage at the treatment sites would result in radiological impacts of 2×10^{-2} , 2×10^{-2}, and 4×10^{-4} LCF in the noninvolved worker population and a 1×10^{-6} (SRS), 1×10^{-6} (SRS), and 1×10^{-7} (WIPP) probability of an LCF for the maximally exposed noninvolved worker. There would be no hazardous chemical impacts because thermal treatment would remove most hazardous constituents.

Disposal operations at WIPP would result in radiological impacts of 2×10^{-4} LCF in the noninvolved worker population and a 2×10^{-7} probability of an LCF for the maximally exposed noninvolved worker for all subalternatives. There would be no hazardous chemical impacts because thermal treatment would remove most hazardous constituents.

For involved workers (those handling TRU waste directly), the radiological impacts from treatment of CH-TRU and RH-TRU waste would be 2, 1, and 1 LCFs in the total involved worker population at all the treatment facilities. Hazardous chemical impacts would include a probability of cancer incidence of 6×10^{-5}, 9×10^{-5}, 8×10^{-5} in the total involved worker population of all the treatment facilities.

Lag storage at treatment sites would result in radiological impacts of 0.4 LCF or less in the involved worker population. There would be no hazardous chemical impacts.

Disposal operations at WIPP would result in radiological impacts of 0.4 LCF or less in the involved worker population. There would be no hazardous chemical impacts.

The entire disposal operations period under Action Alternative 2 is estimated to be 22 years for CH-TRU waste and 150 years for RH-TRU waste. The aggregate impacts during the 150 years to the public within 80 kilometers (50 miles) of WIPP and lag storage sites expected are estimated to be a maximum of 1 x 10^{-3} LCFs from radiation exposure. The aggregate impacts during that period to the noninvolved worker populations at WIPP and lag storage sites are estimated to be a maximum of 0.02 LCFs from radiation exposure. The aggregate impacts during the 150 years to the involved worker populations at WIPP and lag storage sites are estimated to be no more than 0.4 LCF from radiation exposure.

Action Alternative 3

For members of the public, treatment of CH-TRU and RH-TRU waste would result in radiological impacts of 4 x 10^{-3} LCF in the total population within 80 kilometers (50 miles) of all the treatment facilities and a 4 x 10^{-7} probability of an LCF to the MEI. Hazardous chemical impacts would include a cancer incidence of 4 x 10^{-7} in the population within 80 kilometers (50 miles) of the treatment facilities and a 2 x 10^{-11} probability of cancer to the MEI.

Lag storage at treatment sites would result in radiological impacts of 2 x 10^{-3} LCF in the population and a 3 x 10^{-7} probability of an LCF for the MEI (at LANL). Hazardous chemical impacts would include a cancer incidence of 2 x 10^{-3} in the population and a 3 x 10^{-7} probability of an LCF for the MEI (at Hanford).

Disposal operations at WIPP would result in radiological impacts of 2 x 10^{-4} LCF in the population and a 3 x 10^{-7} probability of an LCF for the MEI. Hazardous chemical impacts would include a cancer incidence of 1 x 10^{-5} in the population and a 1 x 10^{-8} probability of cancer for the MEI.

For noninvolved workers (those not handling TRU waste directly), the radiological impacts from the treatment of TRU waste would be 7 x 10^{-4} LCF in the total noninvolved worker population of all treatment facilities and a 2 x 10^{-7} (LANL) probability of an LCF to the maximally exposed noninvolved worker. Hazardous chemical impacts would include a cancer incidence of 2 x 10^{-7} in the total noninvolved worker population at all the treatment facilities and a 1 x 10^{-10} (ORNL) probability of cancer for the maximally exposed noninvolved worker.

Lag storage at treatment sites would result in radiological impacts of 4 x 10^{-2} LCF in the population and a 2 x 10^{-6} probability of an LCF for the maximally exposed noninvolved worker (SRS). Hazardous chemical impacts would include a cancer incidence of 9 x 10^{-3} in the population and a 4 x 10^{-7} probability of an LCF for the maximally exposed noninvolved worker (Hanford).

Disposal operations at WIPP would result in radiological impacts of 3 x 10^{-4} LCF in the noninvolved worker population and a 3 x 10^{-7} probability of an LCF for the maximally exposed noninvolved worker. Hazardous chemical impacts would include a cancer incidence of 5 x 10^{-5} in the noninvolved worker population and a 5 x 10^{-8} probability of cancer for the maximally exposed noninvolved worker.

For involved workers (those handling TRU waste directly), the radiological impacts from treatment of CH-TRU and RH-TRU waste would be 2 LCFs in the total involved worker population at all the treatment facilities. Hazardous chemical impacts would include a cancer incidence of 4×10^{-5} in the total involved worker population at all the treatment facilities.

Lag storage at treatment sites would result in radiological impacts of 0.6 LCF or less in the involved worker population. Hazardous chemical impacts would include a cancer incidence of 0.1 or less in the involved worker population.

Disposal operations at WIPP would result in radiological impacts of 0.2 LCF or less in the involved worker population. Hazardous chemical impacts would include a cancer incidence of 7×10^{-3} or less in the involved worker population.

The entire disposal operations period under Action Alternative 3 is estimated to be 57 years for CH-TRU waste and 190 years for RH-TRU waste. The aggregate impacts to the public within 80 kilometers (50 miles) of WIPP and lag storage sites expected over the entire disposal operations period are estimated to be 3×10^{-3} LCFs from radiation exposure and a cancer incidence of 4×10^{-3} from hazardous chemical exposure. The aggregate impacts to the noninvolved worker populations at WIPP and lag storage sites are estimated to be 0.07 LCF from radiation exposure and a cancer incidence of 0.02 from hazardous chemical exposure. The aggregate impacts to the involved worker populations at WIPP and lag storage sites are estimated to be 0.6 and 0.3 LCF, respectively, from radiation exposure and a cancer incidence of 0.4 from hazardous chemical exposure.

No Action Alternative 1

For members of the public, treatment of TRU waste under No Action Alternatives 1A and 1B would result in radiological impacts of 2 LCFs under each alternative in the total population within 80 kilometers (50 miles) of all treatment facilities and a 3×10^{-5} (RFETS) and 5×10^{-5} (Hanford) probability of an LCF, respectively, to the MEI. Hazardous chemical impacts would include a cancer incidence of 3×10^{-7} for both subalternatives in the population within 80 kilometers (50 miles) of the treatment facilities and a 2×10^{-11} (ORNL) probability of cancer to the MEI under both subalternatives.

Storage operations at the treatment sites would result in radiological impacts of 1×10^{-3} and 7×10^{-4} in the population and a 2×10^{-7} (LANL) and 2×10^{-9} (ORNL) probability of an LCF for the MEI. There would be no hazardous chemical impacts.

For noninvolved workers (those not handling TRU waste directly), the radiological impacts from treatment of TRU waste under No Action Alternatives 1A and 1B would be 0.1 LCF in the total noninvolved worker population of all the treatment facilities and a 5×10^{-5} (RFETS) and 2×10^{-4} (Hanford) probability of an LCF to the maximally exposed noninvolved worker. Hazardous chemical impacts would include a cancer incidence of 1×10^{-7} in the total noninvolved worker population of all the treatment facilities and a 1×10^{-10} probability of cancer for the maximally exposed noninvolved worker under both subalternatives.

Storage operations at treatment sites would result in radiological impacts of 0.02 LCF in the population and a 1×10^{-6} (SRS) probability of an LCF for the maximally exposed noninvolved worker. There would be no hazardous chemical impacts.

For involved workers (those handling TRU waste directly), treatment of CH-TRU and RH-TRU waste would result in radiological impacts of 2 and 1 LCFs, respectively, for each subalternative in the total involved worker population of all the treatment facilities. Hazardous chemical impacts would include a cancer incidence of 6×10^{-5} and 9×10^{-5} in the total involved worker population of all the treatment facilities.

Storage operations at consolidation sites would result in radiological impacts of 0.4 LCF in the involved worker population.

During the initial 100-year operations period under No Action Alternative 1, the aggregate impacts to the public within 80 kilometers (50 miles) of the storage sites are estimated to be a maximum of 3×10^{-3} LCF from radiation exposure. The aggregate impacts to the noninvolved worker populations at the storage sites are estimated to be a maximum of 0.06 LCF from radiation exposure. The aggregate impacts to the involved worker populations at the storage sites are estimated to be 1 LCF from radiation exposure.

No Action Alternative 2

For members of the public, treatment of TRU waste under No Action Alternative 2 would result in radiological impacts of 1×10^{-3} LCF in the total population within 80 kilometers (50 miles) of all treatment facilities and an 8×10^{-8} probability of an LCF (at LANL) to the MEI. Hazardous chemical impacts would include a cancer incidence of 4×10^{-7} in the population within 80 kilometers (50 miles) of the treatment facilities and 2×10^{-11} probability of cancer (at ORNL) to the MEI.

Storage operations at generator sites would result in radiological impacts of 0.01 LCF in the population and 2×10^{-6} (ORNL) probability of an LCF for the MEI. Hazardous chemical impacts would include a cancer incidence of 2×10^{-3} in the population and 4×10^{-8} (LANL) probability of cancer to the MEI.

For noninvolved workers (those not handling TRU waste directly), the radiological impacts from the treatment of TRU waste would be 8×10^{-5} LCF in the total noninvolved worker population of all the treatment facilities and a 4×10^{-8} probability of an LCF (at LANL) to the maximally exposed noninvolved worker. Hazardous chemical impacts would include a cancer incidence of 1×10^{-7} in the total noninvolved worker population of all the treatment facilities and a 1×10^{-10} probability of cancer (ORNL) for the maximally exposed noninvolved worker.

Storage operations at generator sites would result in radiological impacts of 0.04 LCF in the population and a 4×10^{-5} (ORNL) probability of an LCF for the maximally exposed noninvolved worker. Hazardous chemical impacts would include a cancer incidence of 2×10^{-3} LCF in the population and 2×10^{-7} (INEEL) probability of cancer to the maximally exposed noninvolved worker.

For involved workers (those handling TRU waste directly), the radiological impacts from the treatment of TRU waste would be 0.4 LCF in the total involved worker population at all the treatment facilities. Hazardous chemical impacts would include a cancer incidence of 8×10^{-6} in the total involved worker population at all the treatment facilities.

Storage operations at generator sites would result in radiological impacts of 1 LCF or less in the involved worker population. Hazardous chemical impacts would include a cancer incidence of 0.04 or less in the involved worker population.

During a 35-year period (operations and institutional control) under No Action Alternative 2, the aggregate impacts to the public within 80 kilometers (50 miles) of the storage sites are estimated to be 0.03 LCF from radiation exposure and a cancer incidence of 6 x 10^{-3} from hazardous chemical exposure. The aggregate impacts to the noninvolved worker populations at the storage sites are estimated to be 0.1 LCF from radiation exposure and a cancer incidence of 6 x 10^{-3} from hazardous chemical exposure. The aggregate impacts to the involved worker populations at the storage sites are estimated to be 3 LCFs or less from radiation exposure and a cancer incidence of 0.1 or less from hazardous chemical exposure.

Facility Accidents

Potential radiological impacts from treatment, storage, and disposal facility accidents were analyzed and are presented in this discussion. Although the initiating events of the accidents vary for the three stages (treatment, storage, and disposal), the general approach was to evaluate: (1) a high-frequency/low-consequence accident for each of the three stages; (2) a low-frequency/ high-consequence operational accident for each of the three stages; and (3) an accident that would be beyond-design-basis of and involve the collapse of the applicable treatment or storage facility. However, a broader suite of accidents was evaluated for the WIPP facility. A potential beyond-design-basis accident could be triggered by a number of initiating events, such as an earthquake, tornado, or plane crash, depending on the site. For the purposes of analysis in SEIS-II, an earthquake is assumed to initiate the beyond-design-basis accident for treatment and storage facilities. While the annual frequency of a design-basis earthquake varies for DOE sites across the country (1 x 10^{-3} or less), the frequency of a beyond-design-basis earthquake that would result in a loss of confinement and a collapse of the building has been estimated at 1 x 10^{-5} for purposes of these analyses. The analyses were conducted to estimate the difference in impacts among the types of waste treatment and not to make a decisions regarding specific treatment sites.

The results presented below are those for the high-frequency/low-consequence accident (with estimated annual occurrence frequencies of 0.1 to 0.01), the beyond-design-basis earthquake accident and the hoist failure accident, which provide the range of consequences for the accidents evaluated.

The analyses were conducted in such a manner as to indicate the differences between the types of waste treatment and not to make a decision regarding specific treatment sites. The impacts were calculated for specific sites based on TRU waste inventory, population, and types of treatment. Only Action Alternative 2 and No Action Alternative 1 would destroy the PCBs in the TRU waste commingled with PCBs.

Treatment Facility Accidents

<u>High-Frequency/Low-Consequence Accident (Waste Spill/Waste Drum Failure)</u>

The maximum radiological impact to the public from a high-frequency/low-consequence accident during the treatment of CH-TRU waste to meet the planning-basis WAC would be at RFETS where

3 x 10^{-4} LCFs were estimated. The highest thermal treatment impact would be at RFETS where 1 x 10^{-3} LCFs were estimated. Treatment by shred and grout would have a maximum impact of 1 x 10^{-4} LCFs at RFETS.

Maximum radiological impacts to the MEI would range from a 1 x 10^{-7} probability of an LCF at LANL for the treatment of TRU waste to the planning-basis WAC, to a 5 x 10^{-7} probability of an LCF at LANL for thermally treated waste. The maximum radiological impact to the MEI for shred and grout treatment was estimated to be a 6 x 10^{-8} probability of an LCF at LANL.

For the alternatives that consider treatment of CH-TRU waste to the planning-basis WAC, the maximum radiological impacts to the maximally exposed noninvolved worker was estimated to be a 4 x 10^{-7} probability of an LCF at Hanford. For alternatives that include thermally treating waste, the maximum impact to the maximally exposed noninvolved worker would be at Hanford for which a 1 x 10^{-6} probability of an LCF was estimated. For the alternative that considers treating TRU waste using a shred and grout process, the maximum impact to the maximally exposed noninvolved worker was estimated to be a 2 x 10^{-7} probability of an LCF at Hanford.

The potential radiological impacts from RH-TRU waste treatment accidents are greatest at the ORNL site for all accident scenarios and receptors; however, they are four to five orders of magnitude less than the impacts from CH-TRU waste treatment accidents.

Beyond-Design-Basis Accident (Collapse of Building Due to Earthquake)

The population impact from a beyond-design-basis accident during the treatment of CH-TRU waste to meet planning-basis WAC would be 3 LCFs at RFETS and Hanford (Proposed Action, Action Alternative 1, and No Action Alternative 2). Treatment by shred and grout (Action Alternative 3) would have a maximum impact of 6 LCFs at Hanford and RFETS. Thermal treatment (Action Alternatives 2A and 2B and No Action Alternative 1) would have an impact of 480 LCFs at RFETS, 440 LCFs at Hanford, 180 LCFs at LANL, and 28 LCFs at WIPP under Action Alternative 2C.

Maximum impacts to the MEI would result in a 0.6 probability of an LCF at LANL for the thermal treatment of TRU waste (Action Alternatives 2A and 2B and No Action Alternative 1) and a 2 x 10^{-3} probability of an LCF at LANL (Proposed Action, Action Alternative 1, No Action Alternative 2). Under Action Alternative 3, the maximum radiological impact to the MEI would be a 5 x 10^{-3} probability of an LCF at LANL. Maximum radiological impacts to the MEI for Action Alternative 2C would be a 1.0 probability of an LCF at WIPP.

Impacts to the maximally exposed noninvolved worker would range from a 0.01 probability of an LCF at INEEL for treatment to meet planning-basis WAC (Proposed Action, Action Alternative 1, and No Action Alternative 2) to a 1.0 probability of an LCF at all sites for thermal treatment (Action Alternatives 2A and 2B and No Action Alternative 1). Thermal treatment at WIPP under Action Alternative 2C would have an impact of a 1.0 probability of an LCF to the maximally exposed noninvolved worker. Treatment by shred and grout (Action Alternative 3) would have a 0.02 probability of an LCF at Hanford, INEEL, and LANL.

The potential radiological impacts from RH-TRU waste treatment accidents are greatest at the ORNL site for all accident scenarios and receptors; however, they are four to five orders of magnitude less than the impacts from CH-TRU waste treatment accidents.

Waste Storage Accidents

High-Frequency/Low-Consequence Accident (Container Drop, Puncture, and Lid Failure)

Maximum radiological impacts to the population from a high-frequency/low-consequence accident (a drum spill) for TRU waste treated to planning-basis WAC would be 5×10^{-4} LCFs at RFETS. (The annual frequency of occurrence of this accident would be 1×10^{-2}.) Maximum impacts due to thermally treated TRU waste and TRU waste treated by shred and grout are estimated to be 3×10^{-5} LCFs at RFETS.

Maximum radiological impacts to the MEI would be highest when storing TRU waste treated to the planning-basis WAC, with a 3×10^{-7} probability of an LCF at ORNL. Maximum impacts to the MEI under shred and grout treatment would be at LANL where an 8×10^{-9} probability of an LCF was estimated. Under thermal treatment, impacts to the MEI at WIPP under Action Alternative 2C are estimated to be a 1×10^{-8} probability of an LCF.

Maximum radiological impacts to a maximally exposed noninvolved worker are estimated to be a 4×10^{-7} probability of an LCF at Hanford when storing TRU waste treated to the planning-basis WAC. Maximum impacts to the maximally exposed noninvolved worker would be the same for waste treated thermally or by a shred and grout process with a 2×10^{-8} probability of an LCF at Hanford and LANL.

Beyond-Design-Basis Accident (Collapse of Building Due to Earthquake)

Maximum population impacts from a beyond-design-basis accident for storage of waste treated to the planning-basis WAC would range from 300 LCFs at RFETS (Action Alternative 1 and No Action Alternative 2) to 6 LCFs at INEEL and ORNL. Maximum impacts to the public under both thermal and shred and grout treatment (Action Alternatives 2A, 2B, and 2C, Action Alternative 3, and No Action Alternative 1) would range from 10 LCFs at RFETS to less than 1 LCF at INEEL.

Maximum impacts to the MEI would range from a 5×10^{-4} probability of an LCF at Hanford and LANL (Action Alternative 1) to a 6×10^{-3} probability of an LCF at WIPP. Maximum impacts to the MEI for Action Alternatives 2A, 2B, and 2C and No Action Alternative 1 are estimated to be a 0.08 probability of an LCF at WIPP. Under Action Alternative 3, the maximum impacts to the MEI are estimated to be a 5×10^{-3} probability of an LCF at Hanford. The impacts to the MEI under the Proposed Action were calculated to be a 0.1 probability of an LCF (Hanford).

Maximum impacts for the maximally exposed noninvolved worker would be the greatest under Action Alternative 1, with one LCF expected at Hanford and SRS. There would be a maximum 0.05 probability of an LCF at INEEL for thermal treatment (Action Alternative 2 and No Action Alternative 1) and a 0.04 probability of an LCF at SRS under shred and grout treatment (Action Alternative 3).

WIPP Disposal Accidents

High-Frequency/Low-Consequence Accident (Container Drop, Puncture, and Lid Failure)

The maximum radiological impact to the population from a high-frequency/low-consequence accident (drum puncture and spill), having an annual occurrence frequency of 0.01, would be greatest for TRU waste treated to the planning-basis WAC; the impact was estimated as 0.02 LCFs. Should the TRU waste be treated thermally or by a shred and grout process, the impact from this accident was estimated to be 9 x 10^{-4} LCFs to the population. The radiological impacts to the MEI would be highest when disposing of TRU waste treated to the planning-basis WAC; an impact of 2 x 10^{-4} probability of an LCF was estimated. Should the waste be treated thermally or by a shred and grout process, the impact is estimated to be a 1 x 10^{-5} probability of an LCF. The maximally exposed noninvolved worker would have a 2 x 10^{-4} probability of an LCF and the maximally exposed involved worker would have a 0.06 probability of an LCF for such an accident involving TRU waste treated to the planning-basis WAC. For waste treated by a thermal or shred and grout process, the estimated impact to the maximally exposed worker would be a 1 x 10^{-5} probability of an LCF from the container-drop accident.

Low-Frequency/High-Consequence Accident (Failure of the Waste Shaft Hoist)

The impacts to the population from a hoist failure while fully loaded with CH-TRU waste (maximum consequence accident), having an annual occurrence frequency of $< 1 \times 10^{-6}$, would be greatest under Action Alternatives 2A, 2B, and 2C and Action Alternative 3, with 29 LCFs. The Proposed Action and Action Alternative 1 would have an impact of 5 LCFs. The radiological impacts to the MEI are estimated to be a 0.6 probability of an LCF under Action Alternative 2 and Action Alternative 3, and a 0.08 probability of an LCF under the Proposed Action and Action Alternative 1. The maximally exposed noninvolved worker would have a 0.5 probability of an LCF under Action Alternative 2 and Action Alternative 3, and a 0.06 probability of an LCF under the Proposed Action and Action Alternative 1. Because the no action alternatives do not propose disposal activities, there would be no risk to the public, MEI, or noninvolved worker for these accidents. For involved workers, the impacts could range from negligible (workers not present, or warned of the falling hoist and evacuated) to catastrophic (all workers in the immediate vicinity killed by accident debris).

Industrial Safety

The accident rate at DOE facilities is less than half the national average for industry, which means that DOE and its contractors experience considerably fewer injuries, illnesses, and fatalities than occur in private industry for similar work. For estimating WIPP impacts from operation and decommissioning, salt excavation activities were considered to be equivalent to construction activities which have a higher injury and illness rate than all other labor categories combined. SEIS-II analyses, therefore, are conservative.

During the 45 years of operation and decommissioning at WIPP under the Proposed Action, two fatalities are projected to occur. The largest number of industrial safety fatalities would occur under Action Alternative 3, which would continue for 200 years (190 years for disposal and 10 years for decommissioning) and dispose of a greater amount of waste; it would result in seven fatalities.

Industrial safety fatalities from treatment under the Proposed Action would be four. The largest number of industrial safety fatalities due to treatment would be nine under Action Alternative 2A.

Long-Term Post-Closure Performance

The performance of the WIPP repository was evaluated for the first 10,000 years following the decommissioning of the WIPP site. The performance assessment for WIPP evaluated the potential release of radioactive substances and the probability that such substances would cause LCFs. The assessment also evaluated the probability of excess cancer incidence from releases of hazardous constituents, expressed as a hazard index. The analyses were conducted using median and 75th percentile parameter values selected from statistical distribution of modeling parameters for both undisturbed and disturbed conditions.

The analyses of undisturbed WIPP repository conditions for a period of 10,000 years following decommissioning indicate similar impacts under the Proposed Action and all of the action alternatives. No movement of brine- or gas-phase TRU waste beyond the 5-kilometers (3.1-mile) subsurface lateral boundary was predicted nor would there be any release to the Culebra Dolomite of the Rustler Formation, the principal water-bearing unit overlying WIPP (Figures S-5, S-6, S-7, and S-8). Thus, long-term undisturbed disposal of TRU waste at WIPP is not expected to contribute any impact to human health as long as the repository is not disturbed after decommissioning.

SEIS-II analyses also considered the impacts should a drilling crew drill into the repository. Impacts to a maximally exposed member of the drilling crew and a well geologist who participate in drilling the exploratory borehole were assessed. The maximum numbers of LCFs resulting from acute exposures of an MEI drilling crew member to CH-TRU and RH-TRU waste in drill cuttings were 4×10^{-4} for the Proposed Action; 4×10^{-4} for Action Alternative 1; 1×10^{-4} for Action Alternative 2; and 3×10^{-4} for Action Alternative 3. LCFs resulting from acute exposure of a well site geologist to CH-TRU and RH-TRU wastes in drilling cuttings were 3×10^{-9} for the Proposed Action; 5×10^{-9} for Action Alternative 1; 1×10^{-8} for Action Alternative 2; and 4×10^{-9} for Action Alternative 3.

The impact of an exploratory borehole that penetrates the WIPP repository and a hypothetical pressurized brine reservoir also was evaluated. Analyses evaluated the potential for pressurized brine to enter the repository and move upward to overlying water-bearing units such as the Culebra Dolomite. Under the most conservative SEIS-II scenarios, the brine pressure would be sufficient to transport waste to the overlying water-bearing units (see Figure S-9). Analysis of impacts of such a release, though, found the impacts to be virtually zero (4×10^{-41} LCF).

At the storage sites under No Action Alternative 1, radionuclides and hazardous metals would be incorporated into a more dense and durable waste form that would limit the release of wastes into the accessible environment. VOCs would be removed in the treatment process and would not be present in emplaced waste. Once waste containers degrade, direct release from a thermally-treated waste form (e.g., metal slag or glass) would be controlled by corrosion and dissolution of metal or glass and natural forces responsible for erosion rather than the leaching process that controls radionuclide and metal contaminant releases from less competent waste forms. The number of aggregate LCFs for all sites over 10,000 years was estimated to be less than 8×10^{-4} LCFs for No Action Alternative 1A and 3×10^{-4} LCFs for No Action Alternative 1B for the Total Inventory. Nevertheless, people who might intrude upon the stored waste could receive radiation doses that would greatly exceed current regulatory limits.

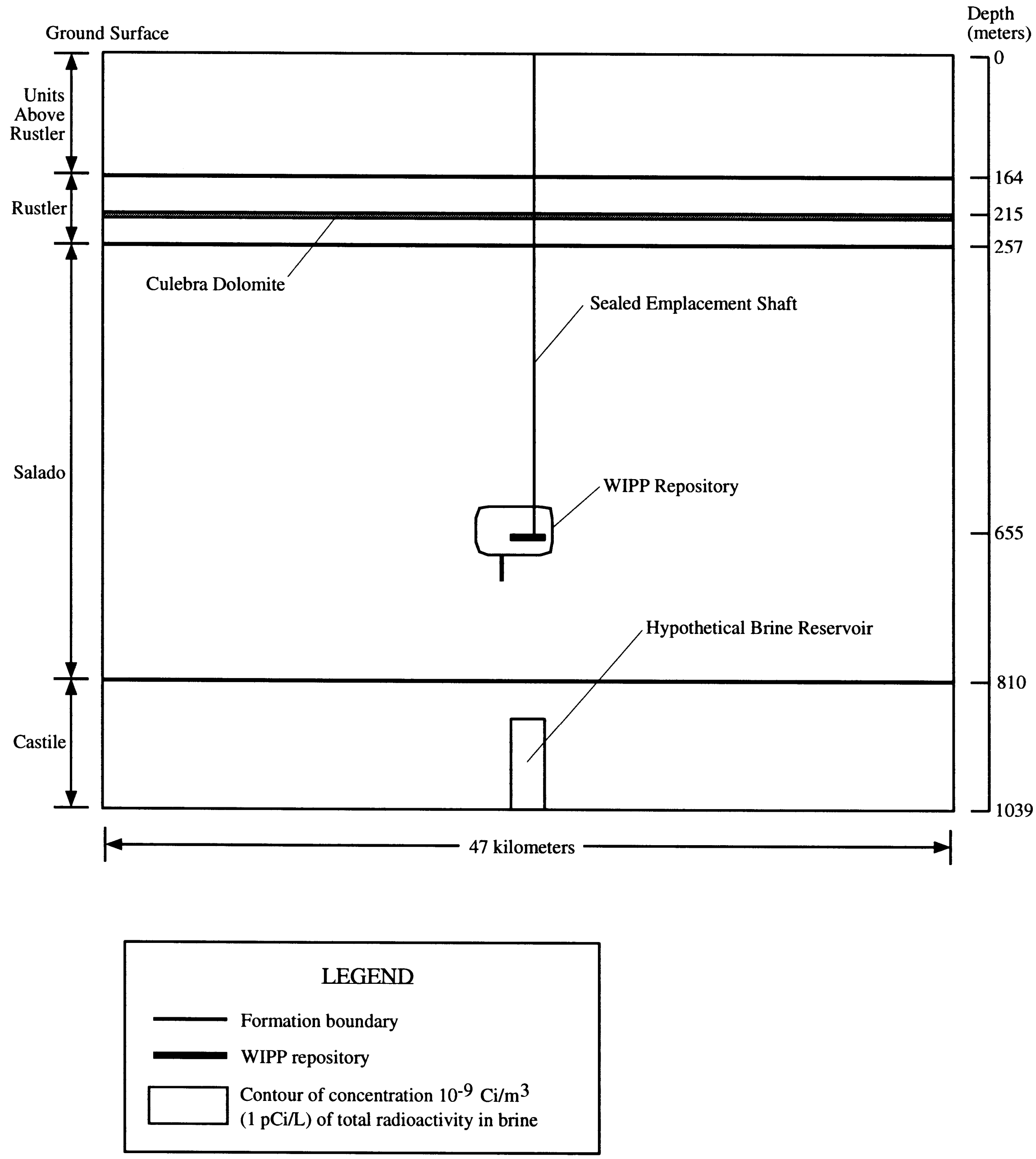

Figure S-5
Extent of Radionuclide Migration at 10,000 Years with Undisturbed Conditions Using 75th Percentile Parameter Values (Case 3) for the Proposed Action

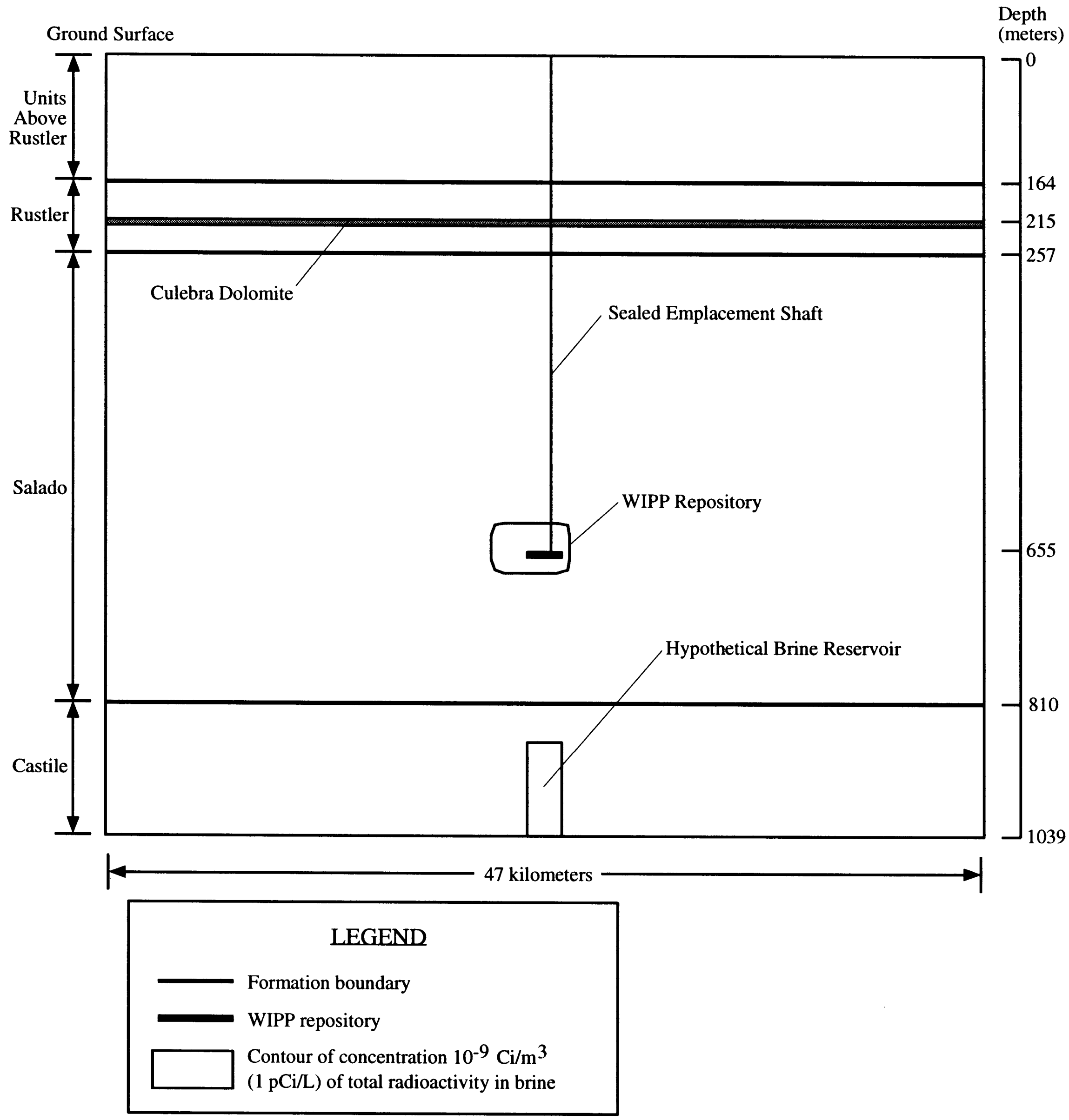

Figure S-6
Extent of Radionuclide Migration at 10,000 Years with Undisturbed Conditions Using 75th Percentile Parameter Values (Case 8) for Action Alternative 1

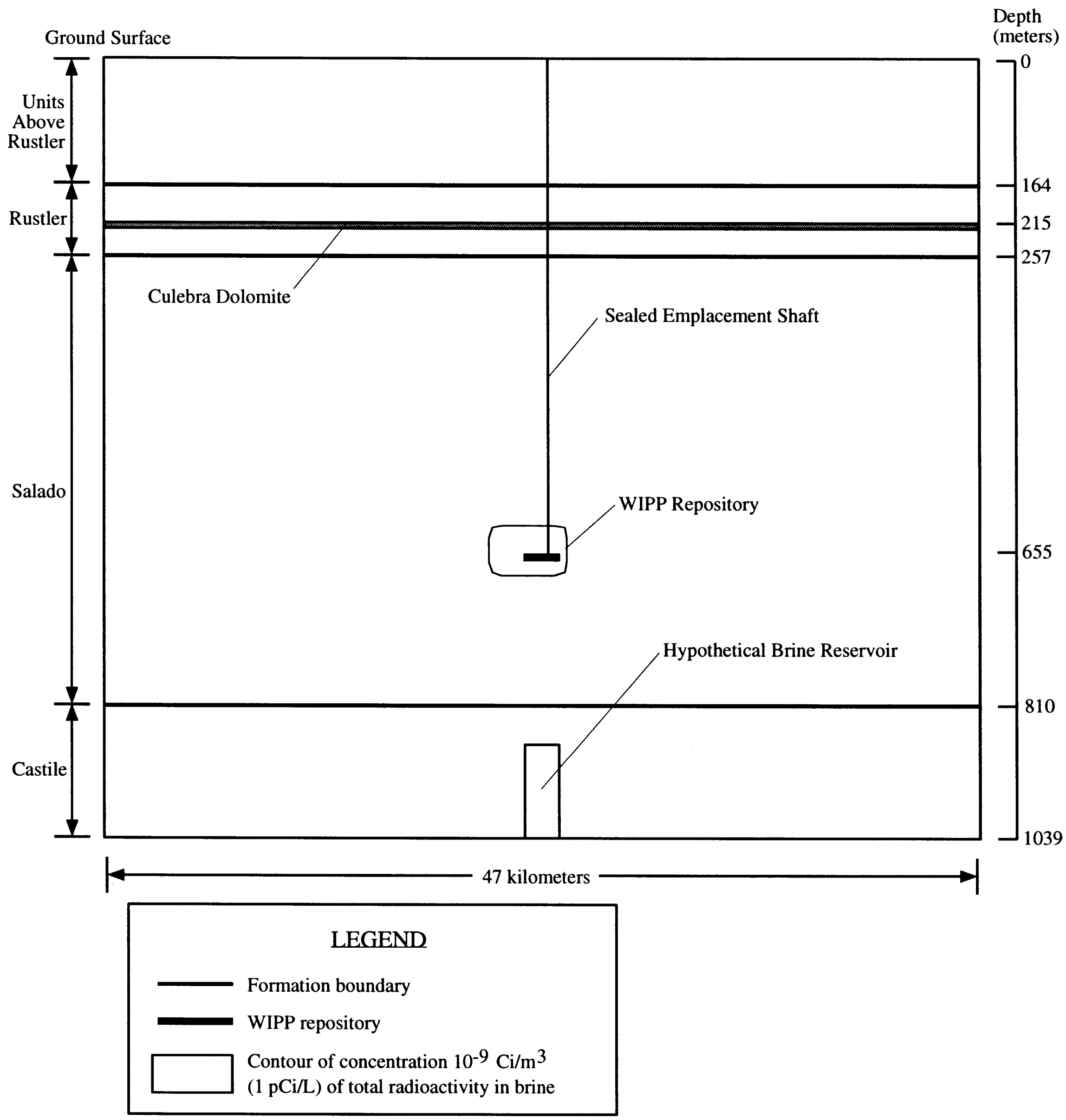

Figure S-7
Extent of Radionuclide Migration at 10,000 Years with Undisturbed Conditions Using 75th Percentile Parameter Values (Case 13) for Action Alternative 2

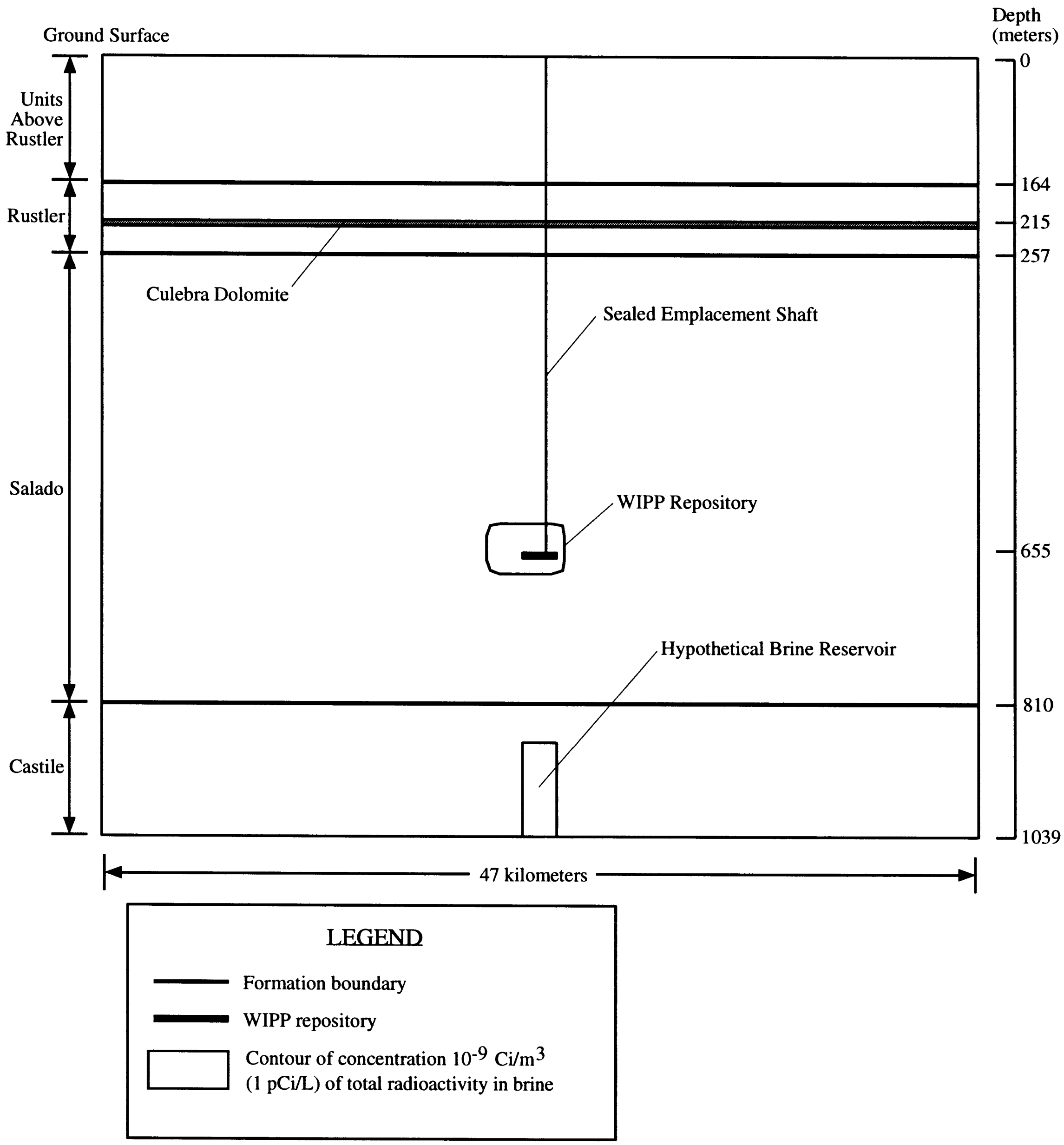

Figure S-8
Extent of Radionuclide Migration at 10,000 Years with Undisturbed Conditions Using 75th Percentile Parameter Values (Case 19) for Action Alternative 3

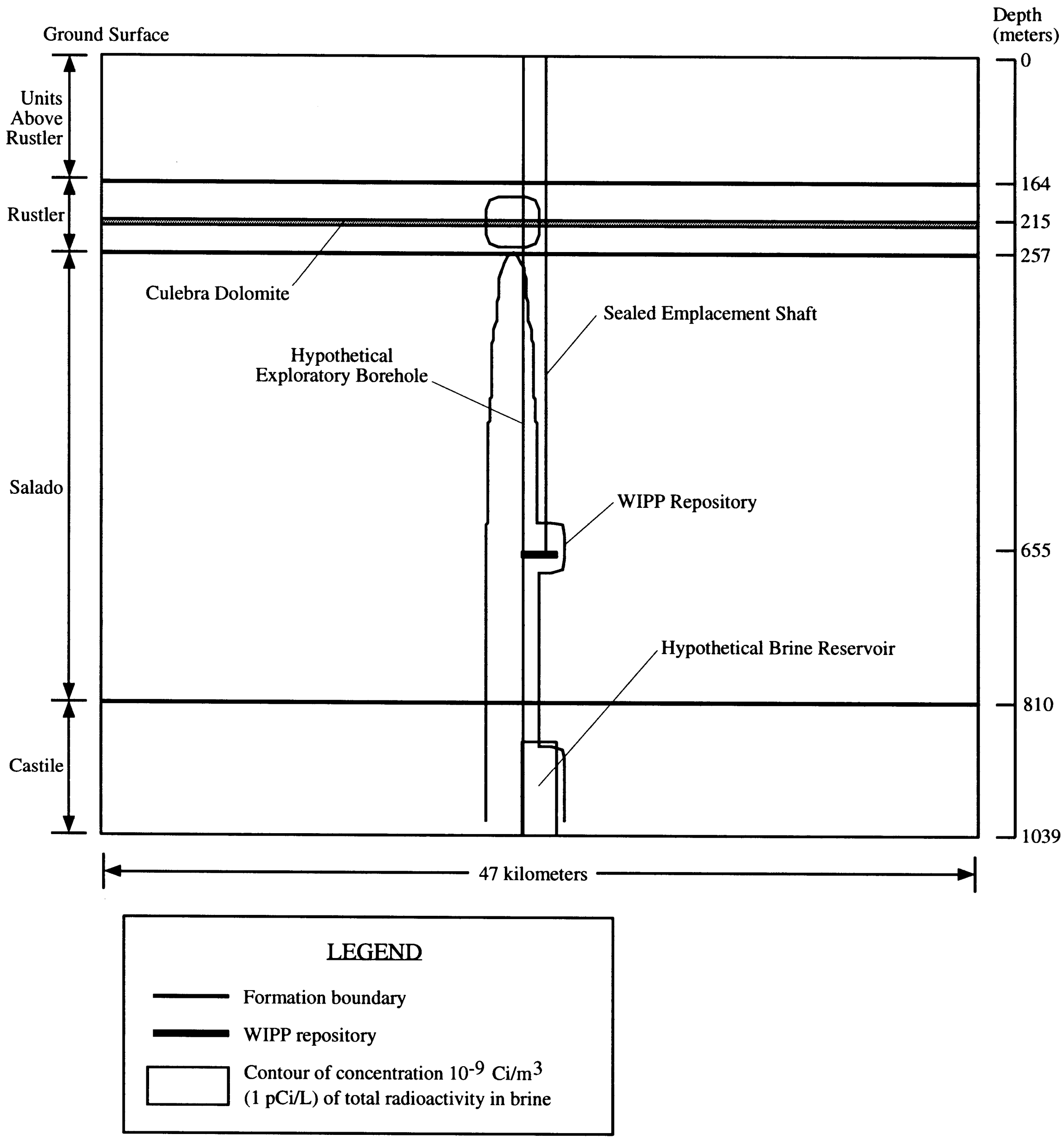

Figure S-9
Extent of Radionuclide Migration at 10,000 Years with Disturbed Conditions Using 75th Percentile Parameter Values (Case 4) for the Proposed Action

Under No Action Alternative 2, the environmental and human health impacts were estimated at seven of the 10 major generator and storage sites. These sites include Hanford, INEEL, LLNL, LANL, ORNL, RFETS, and SRS. The analysis focused on these seven major sites because 99 percent of the estimated waste volume and inventory will be generated and stored at these sites. Other sites considered but not examined in this analysis included ANL-E, Mound, and NTS.

The human health impacts of TRU waste were estimated for two types of exposures: (1) exposure from inadvertent human intrusion into areas of TRU waste storage and previously buried TRU waste, and (2) exposure from long-term source-term releases to surface and subsurface environmental exposure points. Analysis of intrusion for waste stored under the ground surface considered impacts of directly drilling into the wastes and gardening over the exhumed waste cuttings. Analysis of intrusion for waste stored aboveground considered impacts of an individual scavenging into the wastes and a farm family living over the wastes.

LCFs resulting from acute exposures to CH-TRU and RH-TRU wastes in drill cuttings ranged from 7×10^{-6} to 4×10^{-4} for a hypothetical drilling crew member and 2×10^{-4} to 4×10^{-3} for a hypothetical gardener over the seven sites analyzed. LCFs resulting from acute exposures to CH-TRU and RH-TRU wastes also ranged from 6×10^{-4} to 0.02 for a hypothetical scavenger and 0.2 to 1 for a hypothetical family farmer over the seven sites analyzed.

During any period of the 10,000 years, the estimated lifetime probability of an LCF to an MEI from environmental release of contaminants originating from buried and surface-stored wastes at the seven generator-storage sites ranged from 3×10^{-6} to 4×10^{-3}. The highest LCF was estimated for INEEL.

The estimated lifetime population LCFs from exposure to contaminated air or surface water at each site would range from 4×10^{-5} to 7. The highest impact (at the RFETS) was calculated as nearly 100 times higher than any other site. If waste were released from either loss of institutional control or natural disaster, the aggregate impacts from the seven sites over 10,000 years for release of the combined Basic and Additional Inventories would result in about 800 LCFs.

The maximum lifetime cancer incidence for exposed populations from hazardous chemicals was estimated to be less than 1×10^{-3} over the seven sites. The aggregate lifetime cancer incidence from the seven sites over 10,000 years was estimated at 0.002.

Retrieval and Recovery

For the purposes of SEIS-II, retrieval was defined as removing intact TRU waste containers before closure of WIPP. The calculations were based on retrieval of the waste from one full panel. For SEIS-II, recovery was defined as removal of all of the waste from the repository after closure and after the salt would have reconsolidated, breaching the TRU waste containers.

For the analysis of retrieval impacts, it was assumed that 17,560 cubic meters (620,000 cubic feet) of waste would be removed and transported back to its treatment site. The maximum aggregate LCF in the involved worker population was estimated as 0.03. No noncarcinogenic effects would be expected, and impacts to the public and noninvolved workers would be smaller by at least an order of magnitude. Transportation impacts for returning the waste would be the same as for transporting it to WIPP. The total impacts would be about one-tenth the impacts of the Proposed Action.

For the analysis of recovery impacts, it was estimated that 3,370,000 cubic meters (119 million cubic feet) of waste and contaminated material would have to be removed, packaged, and shipped. Involved workers were assumed to be administratively limited to 1 rem per year. Based on 100 workers and a 35-year work period per worker, the total worker-population dose would be 20,000 person-rem over the entire 200-year recovery period. The total LCFs in the involved worker population would be about 8. The total expectation of cancer incidence from exposure to hazardous chemicals would be smaller, on the order of 1×10^{-3}. No noncarcinogenic effects from exposure to hazardous chemicals would be expected. Health impacts to the public and to noninvolved workers would be expected to be three orders of magnitude (1,000 times) larger than the values presented for Alternative 3. For transportation impacts, the maximum radiological impacts have been calculated to occur from nonoccupational exposures resulting in an estimated 15 LCFs. Vehicle-related traffic fatalities have been calculated to increase to 185 due to a proportional increase in waste and transportation miles.

Environmental Justice

DOE is in the process of developing environmental justice guidance, pursuant to Executive Order 12898. This guidance will be finalized after stakeholder comments, concerns, and opinions are received, reviewed, and incorporated, as appropriate.[1] The approach taken in this SEIS-II analysis may depart somewhat from the guidance that is eventually issued or from the approach taken in other documents. Information concerning minority populations for New Mexico as a whole is included in this section in response to public comments.

For purposes of this analysis, a high and adverse human health or environmental impact is a significant deleterious human health or environmental impact. A disproportionate impact to a minority or low-income population is one that substantially exceeds, or is likely to exceed, the same type of impact in the larger community. A disproportionately high and adverse human health or environmental impact would occur when the adverse human health or environmental effects are significant, and the risk or rate to a minority or low-income population from exposure (or multiple exposures) to the environmental or health hazard(s) substantially exceeds, or is likely to exceed, the risk or rate to the general population.

The SEIS-II environmental justice analysis for the vicinity of WIPP addresses the potential for disproportionately high and adverse human health or environmental effects on minority and low-income populations within an 80-kilometer (50-mile) area of the WIPP site. The shaded areas in Figures 4-11 and 4-12 show the percentage of minority populations and low-income populations, respectively, in census blocks around the WIPP site. Minorities comprise about 36.8 percent of the population in the 80-kilometer (50-mile) area around WIPP, and low-income individuals about 21.5 percent of this population.

Approximately 38 percent of New Mexico's population is Hispanic. Approximately 9 percent of New Mexico's population is Native American.

The populations within an 80-kilometer (50-mile) area of the non-WIPP treatment sites are described in Chapter 4 of SEIS-II. SEIS-II also incorporates by reference the maps of the census tracts containing greater than 50 percent minority and low-income populations within the

[1] The Council on Environmental Quality has also developed draft "Guidance for Addressing Environmental Justice Under the National Environmental Policy Act."

80-kilometer (50-mile) area of treatment sites that are included in Appendix C of the WM PEIS. Of note for environmental justice assessments are LANL and SRS, where minorities constitute greater than 55 percent and 35 percent, respectively, of the total populations within the 80-kilometer (50-mile) area.

For treatment, potentially high and adverse human health effects could occur during normal, accident-free treatment operations at some treatment sites as a result of TRU waste management activities under the three Action Alternative 2 subalternatives. Several areas in the vicinity of WIPP contain a greater percentage of minorities than some other areas within the 80-kilometer (50-mile) area of WIPP and the population of the United States as a whole. It is possible, therefore, that adverse health impacts (estimate of 1 fatality) from routine or accident-free thermal treatment of waste at WIPP under Action Alternative 2C would disproportionately affect the minority populations in the vicinity of WIPP. The prevailing winds at both SRS and LANL would direct treatment releases away from the concentrations of minority and low-income populations that exist around those sites.

At all treatment sites, treatment accidents would be unlikely so that accidents would not be expected to impact off-site populations; also, the impacts from treatment accidents would depend on meteorological conditions at the time of the accident. For these reasons, it is not likely that adverse environmental or human health impacts would disproportionately affect the minority or low-income populations at any of the treatment sites.

Potentially high and adverse impacts as defined above may occur as a result of waste transportation activities. Because all TRU waste would travel through New Mexico, residents of the State could be affected by transportation activities, although impacts would be spread throughout the transportation corridors. Routine truck transportation could cause between 3 (under the Proposed Action) and 15 (under Action Alternative 3) public fatalities over the life of the project from radiation exposure. These impacts are likely to be much lower because of conservative assumptions used in the analysis (e.g., assuming more stops than would actually occur). For the Proposed Action, less than 5 percent of the radiological impacts would be to those living along the highways. The ethnic and income distribution of travelers and workers at rest stops, where the impacts would primarily occur, would vary over time and by location. Thus, potential high and adverse impacts from routine transportation would not be likely to disproportionately affect minority or low-income populations.

Under the action alternatives, there could be from 5 (using truck transportation under the Proposed Action) to 264 fatalities (using dedicated rail under Action Alternative 3) from traumatic injuries sustained in accidents involving transportation vehicles. For truck transportation, accidents not involving a release of radioactivity are most likely to affect those traveling along the same route; for rail transportation, such accidents are most likely to affect those traveling near railroad crossings. Accidents would be random events that could occur on any segment of the transportation routes. Whether such travelers are minority or low-income individuals cannot be predicted. Therefore, any high and adverse impacts from transportation accidents are not likely to disproportionately affect minority or low-income populations.

Severe transportation accidents that breach the transport package could result in up to 16 LCFs (from release of radioactive material) under any of the action alternatives. Accidents involving a release of radioactive material are most likely to affect residents and travelers along the transportation corridors, although the probability that an accident would involve a release of radioactive material is low (1.5 x 10^{-5} per accident). As noted above, accidents would be random events that could occur on any segment of the transportation routes. Whether the affected people would be minorities or low-income individuals cannot be predicted. Therefore, any high and adverse impacts from transportation accidents are not likely to disproportionately affect minority or low-income populations.

REDUCING OPERATIONS PERIODS

Stakeholders requested a detailed discussion of the changes in impacts should the Department reduce the operations period for WIPP under Action Alternatives 1, 2, and 3 from 160, 150, and 190 years to 60, 70, and 75 years, respectively. Under Action Alternatives 1 and 3, the operations period could be reduced by constructing an additional WHB for RH-TRU waste, constructing four new shafts, and tripling the number of excavation and emplacement crews; additional costs would total $80 million in capital costs and $165 million in annual operating costs (in 1994 dollars). Under Action Alternative 2, the operational period could be reduced by constructing three new shafts and tripling the number of excavation and emplacement crews; additional costs would total $80 million in capital costs and $165 million in annual operating costs (in 1994 dollars).

No additional economic impacts would be expected at the treatment facilities because the facilities and their periods of operation would be identical to those discussed in SEIS-II for the 160-, 150-, and 190-year scenarios presented in SEIS-II.

The number of years required to ship waste from the treatment facilities to WIPP would also be reduced as the result of the shorter operations period: from 160 to 53 years under Action Alternative 1, from 150 to 58 years under Action Alternative 2, and from 190 to 63 years under Action Alternative 3. The aggregate nonradiological impacts would remain the same, except that they would occur within the shorter time period. The accident-free radiological impacts to occupational and nonoccupational populations were reported as cumulative impacts over the entire shipping campaign; therefore, no increase in impacts would be noted. However, because the MEIs would be exposed to more shipments, the estimated exposure to MEIs would triple. All accident impacts would be identical to those described earlier.

The size of the WIPP underground facility would remain the same; therefore, the land use, biological resource, and cultural resource impacts would be similar to those cited in SEIS-II. Construction of the new building under Action Alternatives 1 and 3 would increase the air quality impacts slightly for the period of construction; however, other air quality impacts would be negligible. Noise impacts would triple as a result of the increased rate of shipments through Carlsbad. Water quality and infrastructure impacts may occur as a result of the new facilities and additional work crews.

Human health impacts associated with lag storage would decrease. The impacts to the public, noninvolved workers, and involved workers at WIPP over the entire operations period would remain the same but would be compressed into one-third of the time. Impacts to the MEI at WIPP would triple because the waste that would be emplaced during a lifetime would triple. Industrial safety impacts would increase by 10 percent because of the increase in the number of workers. There would be no change in long-term performance assessment results.

The greatest change under Action Alternatives 1, 2, and 3 would be in life-cycle costs. Overall, life-cycle costs would decrease by approximately $12 billion to $15 billion in 1994 dollars as a result of reduced operations periods for these alternatives.

For disposal at WIPP, normal accident-free operations would not cause significant adverse human health or environmental impacts, and thus there would be no such impacts that could disproportionately affect minority or low-income populations. For disposal accidents, the most severe accident (the waste hoist failure) could cause up to 4 public fatalities for the Proposed Action and up to 24 fatalities for Action Alternative 3. However, the annual probability of this accident is 4.5×10^{-7}. Therefore, although possible, disproportionately high and adverse effects on minority or low-income populations would not be expected.

SUMMARY OF IMPACTS

Over the life of the campaign, routine operations under the Proposed Action could result in five estimated worker fatalities at waste treatment sites and three worker fatalities at WIPP. Truck transportation under the Proposed Action could result in an estimated additional eight deaths among members of the public and crew. Although highly unlikely, the most severe accident, a severe truck accident with a maximum radionuclide inventory having a frequency of less than 7.5×10^{-7} per accident, could result in an additional 16 deaths. The waste disposed of at WIPP under the Proposed Action would be isolated from the environment for more than 10,000 years unless an intrusion by drilling occurred. If an intrusion occurred, radionuclides could reach the Culebra Dolomite, but impacts would be negligible (4×10^{-41} LCFs) because physical properties of the Culebra Dolomite restrict movement of contamination toward a receptor during 10,000 years. Health impacts due to any released waste at the storage sites could vary depending on the population density in the vicinity at the time the waste was released. The Proposed Action would be the least expensive of the action alternatives ($19.03 billion in 1994 dollars, $10.13 billion when the costs are discounted).

Action Alternative 1 could result in an estimated six worker fatalities at the waste treatment sites and seven worker fatalities at WIPP. Truck transportation under Action Alternative 1 could result in an estimated additional 29 deaths (28 among members of the public). The most severe accident under this alternative would be the destruction of a storage facility as a result of a beyond-design-basis earthquake (with an annual frequency of 1×10^{-5} or less) and could result in an additional 300 deaths. The waste disposed of at WIPP under Action Alternative 1 would be isolated from the environment for more than 10,000 years, and Action Alternative 1 would effectively isolate all DOE TRU waste generated and expected to be generated over 35 years (except for a small quantity of PCB-commingled waste) unless an intrusion by drilling occurred. If an intrusion occurred, radionuclides could reach the Culebra Dolomite, but impacts would be negligible (2×10^{-27} LCFs). Action Alternative 1 costs would be $50.95 billion in 1994 dollars ($16.32 billion when discounted), assuming truck transportation (to be comparable to the Proposed Action).

Action Alternative 2 could result in an estimated seven to twelve worker fatalities at the waste treatment sites and one to two fatalities to the populations in the vicinity of the treatment sites (with subalternatives 2A and 2B having higher impacts than subalternative 2C). An estimated six worker fatalities would result from disposal operations at WIPP under all subalternatives. Truck transportation under Action Alternative 2 could result in an estimated additional 17 to 20 deaths (16 to 19 among members of the public). The most severe accident under this alternative would be the destruction of a storage facility as a result of a beyond-design-basis earthquake (with an annual frequency of 1×10^{-5} or less) and could result in an additional 480 deaths. The waste disposed of at WIPP under Action Alternative 2 would be isolated from the environment for more than 10,000 years, and Action Alternative 2 would effectively isolate all DOE TRU waste generated and expected to be generated over 35 years unless an intrusion by drilling occurred. If an intrusion occurred, radionuclides could reach the Culebra Dolomite, but impacts would be negligible (7 x 10^{-28} LCFs). Action Alternative 2 costs would range from $54.01 billion to $57.18 billion ($19.56 billion to $21.19 billion when discounted), depending on the subalternative and assuming truck transportation (to be comparable to the Proposed Action).

Action Alternative 3 could result in an estimated seven worker fatalities at the waste treatment sites and seven worker fatalities at WIPP. Truck transportation under Action Alternative 3 could result in an estimated additional 39 deaths (38 among members of the public). The most severe accident under this alternative would be the failure of the WIPP waste hoist (with an annual frequency of 4.5 x 10^{-7} or less) and could result in an additional 29 deaths. The waste disposed of at WIPP under Action Alternative 3 would be isolated from the environment for more than 10,000 years, and Action Alternative 3 would effectively isolate all DOE TRU waste generated and expected to be generated over 35 years (except for a small quantity of PCB-commingled waste) unless an intrusion by drilling occurred. If an intrusion occurred, radionuclides could reach the Culebra Dolomite, but impacts would be negligible (2 x 10^{-27} LCFs). Action Alternative 3 costs would be $59.67 billion ($18.03 billion when discounted), assuming truck transportation (to be comparable to the Proposed Action).

No Action Alternative 1 could result in an estimated 10 to 11 worker fatalities at the waste treatment sites and 2 fatalities to the populations in the vicinity of the treatment sites (depending on the subalternative). No worker deaths would be estimated to result from closure activities at WIPP. Truck transportation under No Action Alternative 1 could result in an estimated zero deaths to workers and one death to members of the public. The most severe accident under this alternative would be the destruction of a storage facility as a result of a beyond-design-basis earthquake (with an annual frequency of 1 x 10^{-5} or less) and could result in an additional 480 deaths. No Action Alternative 1 would restrict access for 100 years to all DOE TRU waste generated and expected to be generated over 35 years, at which time the waste would either have to be disposed of or a decision would have to be made to continue storage. If the waste were released, either by loss of institutional control or by natural disaster, the thermally treated waste form would restrict migration of the waste initially, but the waste would eventually become more mobile as the vitrified waste form eroded. If the waste were released, deaths to the public over 10,000 years would depend in part on population densities and distributions, but no deaths would be expected based on current densities and distributions under No Action Alternative 1. Future increases in population densities near TRU waste storage sites could increase the number of estimated deaths that could result from releases of TRU waste. No Action Alternative 1 costs would range from $30.28 to $32.85 billion ($17.09 to $18.52 billion when discounted), assuming truck transportation (to be comparable to the Proposed Action).

No Action Alternative 2 could result in an estimated two worker fatalities at the waste storage sites and no worker deaths from closure activities at the WIPP site. No transportation is assumed under No Action Alternative 2, and no deaths would result. The most severe accident under this alternative would be the destruction of a storage facility as a result of a beyond-design-basis earthquake (with an annual frequency of 1 x 10^{-5} or less) and could result in an additional 300 deaths. No Action Alternative 2 would restrict access to the currently stored and newly generated portion of DOE TRU waste for 100 years, at which time the waste would either have to be disposed of or a decision would have to be made to continue storage. If the waste were released, either by loss of institutional control or by natural disaster, estimated deaths would total

800 for the Total Inventory over 10,000 years given current population densities and distributions. Future increases in population densities near TRU waste storage sites could increase the number of estimated deaths that could result from releases of TRU waste. No Action Alternative 2 costs would be $2.49 billion ($1.68 billion when discounted).

Table S-7 summarizes the results of SEIS-II analyses.

CHANGES DUE TO OTHER TRU WASTE VOLUME ESTIMATES

Since the completion of the analyses in the Draft SEIS-II, DOE has continued to update the estimates of stored and to-be-generated TRU waste volumes at the various generator sites. In particular, T*he National Transuranic Waste Management Plan* includes updated estimates of the stored and projected volumes of TRU waste at the generator sites. SEIS-II analyses are based on the TRU waste volumes published in BIR-3, although the updated *National Transuranic Waste Management Plan* estimates and associated impacts are also presented in SEIS-II (see Apendix J).

Overall, *The National Transuranic Waste Management Plan* has 5,662 cubic meters (199,951 cubic feet) more CH-TRU waste than the SEIS-II Basic Inventory (before adjustment to the 168,500 cubic meters [5,950,000 cubic feet] allowed by the LWA). This is an increase of 4 percent. *The National Transuranic Waste Management Plan* reports more than 30,000 cubic meters (1,059,000 cubic feet) less of RH-TRU waste than the SEIS-II Basic Inventory. This is a decrease of 86 percent.

The SEIS-II Proposed Action (the Preferred Alternative) presents impacts adjusted to the treatment and disposal of 168,500 cubic meters (5,950,000 cubic feet) of CH-TRU waste (the maximum allowed under the Land Withdrawal Act) and 7,080 cubic meters (250,000 cubic feet) of RH-TRU waste (the maximum allowed under the C & C Agreement with the State of New Mexico). Using T*he National Transuranic Waste Management Plan* in the same manner, no change would occur in the impacts for the Proposed Action except for the elimination of impacts related to storage of excess RH-TRU waste. (No excess RH-TRU waste would be left at ORNL and Hanford.)

For the generator-storage sites with significant changes in waste volumes, individual site impacts could vary to a greater extent than indicated by the differences in the total volumes noted above. Under Action Alternatives 1, 2, and 3 and for the individual sites, the following changes would be expected:

- Negligible changes to the impacts would be anticipated in areas of land use and management, biological resources, cultural resources, noise, water resources and infrastructure, long-term performance, or consequences of lag storage accidents. No change would be expected in consequences from treatment accidents or WIPP disposal accidents.

- Changes in the estimated impacts for human health, life-cycle costs (except transportation costs), air quality, industrial safety, and economics would be directly related to changes in CH-TRU and RH-TRU waste volumes. Site impacts would change, as presented in the "percent difference" columns of Table J-1 for CH-TRU waste and Table J-2 for RH-TRU waste. Unlike most other impact areas, CH-TRU waste is a much higher contributor to impacts for involved workers than is RH-TRU waste; therefore, large decreases in RH-TRU waste volumes would have little impact for involved workers. However, at

Table S-7
Summary of SEIS-II Environmental Impacts

Consequence Category	Proposed Action/ Preferred Alternative	Action Alternative 1	Action Alternative 2A	Action Alternative 2B	Action Alternative 2C	Action Alternative 3	No Action Alternative 1A	No Action Alternative 1B	No Action Alternative 2
Land Use and Management									
Treatment Facility Sites	No substantial impacts identified beyond the treatment facilities. Treatment facilities would require no more than 11 hectares, less than 1% of land available at each site for each alternative. Treatment facilities, therefore, could be located in developed areas or areas appropriate for development. Sensitive areas, including wetlands, flood plains, sensitive habitats, and cultural resource areas would be avoided.								No substantial impacts. Only newly generated waste would be treated.
WIPP (during operations)	DOE would occupy the land transferred by the LWA and lease some other land. WIPP would continue to limit drilling and mining activities, and grazing and public access to the site and may acquire oil and gas leases. No other impacts would occur to local land use beyond the site.						Impacts would be minimal because no waste would be emplaced.		
WIPP (area impacted by closure)	70 hectares	360 hectares	395 hectares	395 hectares	395 hectares	375 hectares	20 hectares	20 hectares	20 hectares
Air Quality									
Treatment Facility Sites (As a percentage of the most stringent applicable regulatory standard. Emissions for sites and pollutants not specifically noted would be less than 10% of the most stringent applicable regulatory standard).	RFETS, CO, 17%.		LANL, radionuclides, 134%. RFETS, CO, 24%. INEEL, PM_{10} 10%.	INEEL, radionuclides, 10%. INEEL, PM_{10}, 10%.	WIPP, radionuclides, 137%. WIPP, SO_2, 12%. WIPP, PM_{10}, 25%.	RFETS, CO, 20%.	LANL, radionuclides, 134%. RFETS, CO, 24%, INEEL, PM_{10}, 10%.	INEEL, radionuclides, 10%. SRS, radionuclides, 48%. INEEL, PM_{10}, 10%.	RFETS, CO, 17%.
WIPP Operations (percent of applicable EPA or state standard)	Annual average: negligible increases of O_3 and lead; less than 2% increases in PM_{10}, NO_2, and SO_2. Short-term (24-hour) emission limits: PM_{10} - 57%, NO_2 - 65%, SO_2 - 7%, CO - 3% of standards, releases of lead and ozone would be minimal.						WIPP would not be operated. WIPP would be dismantled.		
Biological Resources									
Treatment Facility Sites	Threatened and endangered species appear at many of the proposed treatment sites and could potentially be impacted. Such species and their critical habitats would be avoided through appropriate consultation, site selection, monitoring, and mitigation measures. Because the treatment sites would require less than 1% of the land available at any site, critical habitats could be avoided at most sites.								No impacts because only minimal treatment would occur.
WIPP (disturbed land area)	Federally- or state-listed or protected, threatened, endangered, and proposed species occur in Eddy County and potentially at the WIPP site, although there have been no threatened, endangered, or proposed species or critical habitats recently observed at the WIPP site by DOE during completion of its recent biennial environmental compliance reports. DOE recently conducted biological surveys at the WIPP site and identified no endangered or threatened species. No impacts to biodiversity or ecosystem balance would be expected. Impacts to other plant and animal species may occur during closure and construction of a berm around the WIPP site. The affected area would differ based on the areas listed above under land use.						Minimal impacts during closure of current facility.		

Table S-7
Summary of SEIS-II Environmental Impacts — Continued

Consequence Category	Proposed Action/ Preferred Alternative	Action Alternative 1	Action Alternative 2A	Action Alternative 2B	Action Alternative 2C	Action Alternative 3	No Action Alternative 1A	No Action Alternative 1B	No Action Alternative 2
Cultural Resources									
Treatment Facility Sites	Although cultural resources are present at many sites, specific treatment facility locations are unknown. Acreage need at any one site is 11 hectares or less. Potential impacts will be avoided or mitigated based on site-specific cultural resource surveys.								No impacts. Treatment would be minimal.
WIPP Resource Sites Potentially Impacted (during operations)	None.						No impacts. WIPP would not be operated.		
WIPP Resource Sites Potentially Impacted (during closure)	Two. Potential impacts would be avoided or mitigated in accordance with the Joint Powers Agreement.	Eleven due to larger surface closure area. Potential impacts would be avoided or mitigated in accordance with the Joint Powers Agreement.					No impacts for the no action alternatives. Closure would only involve the 20 acres on which current facilities have been built.		
Noise									
Treatment Sites	Negligible increase in noise due to waste transportation or treatment facility operation because treatment facilities would probably be placed at industrial-type sites along high-traffic volume corridors. Project-specific impacts to sensitive receptors could occur. Assessment of potential impacts would be conducted in site-wide or project-specific NEPA documentation.								No impacts because transportation would not occur and treatment would be minimal.
WIPP	Negligible increase in noise due to additional daily truck or train traffic. Only 8 trucks per day would travel to WIPP if trucks are used; only 13 to 16 rail cars per week if trains are used.						Not applicable to the no action alternatives. No transportation to WIPP would occur and WIPP would not be operated.		
Water Resources and Infrastructure									
Treatment Sites 1. Water 2. Power 3. Wastewater 4. On-site Transportation	3. Hanford - 5.9% 4. Hanford, INEEL, and LANL - minor impacts		2. INEEL - 6.6% 3. Hanford - 7.8% 4. Hanford, INEEL, and LANL – minor impacts	2. INEEL – 6.6% 3. Hanford - 7.8% 4. Hanford, and INEEL - minor impacts	2. INEEL – 6.6%; WIPP - 50% 3. WIPP - 80% 4. WIPP - 162%; Hanford - minor impacts	2. INEEL - 6.4% 3. Hanford - 7% 4. Hanford, INEEL, and LANL - minor impacts	2. INEEL – 6.6% 3. Hanford - 7.8% 4. Hanford, INEEL, and LANL - minor impacts	2. INEEL – 6.6% 3. Hanford - 7.8% 4. Hanford, and INEEL – minor impacts	No impacts.
Disposal Operations at WIPP	Annual incremental infrastructure impacts at WIPP would be negligible and within capacity for disposal operations.						Decreasing use of resources, none after decommissioning of WIPP.		

Table S-7
Summary of SEIS-II Environmental Impacts — Continued

Consequence Category	Proposed Action/ Preferred Alternative	Action Alternative 1	Action Alternative 2A	Action Alternative 2B	Action Alternative 2C	Action Alternative 3	No Action Alternative 1A	No Action Alternative 1B	No Action Alternative 2
Socioeconomics									
Treatment/Storage Sites									
Life-Cycle Costs (millions of 1994 dollars)	12,140	21,390	27,690	30,550	28,700	24,340	29,360	31,760	1,640
Annual Employment (supported jobs)	11,900	22,500	28,000	28,500	7,200	24,900	29,300	29,800	2,300
Disposal Operations at WIPP									
Life-Cycle Costs (millions of 1994 dollars)	5,300	24,650	23,330	23,330	23,330	28,490	850	850	850
Annual Goods & Services (millions of 1994 dollars)	317	317	317	317	616	317	-317	-317	-317
Annual Employment (supported jobs)	3,538	3,538	3,538	3,538	6,876	3,538	-3,538	-3,538	-3,538
Annual Labor Income (millions of 1994 dollars)	126	126	126	126	245	126	-126	-126	-126
Total Life-Cycle Cost by Mode of Transportation (millions of 1994 dollars); discounted totals using a 4.1 percent annual inflation rate are presented in parentheses									
Total Life-Cycle Costs--Truck	19,030 (10,130)	50,950 (16,320)	54,010 (19,560)	57,180 (21,190)	54,940 (20,100)	59,670 (18,030)	30,280 (17,090)	32,850 (18,520)	No shipments of TRU waste would occur under this alternative. Total life-cycle cost without transportation is 2,490 (1,680).
Total Life-Cycle Costs--Regular Rail	No rail transportation analyzed under Propsed Action; rail transportation reserved under Preferred Alternative.	47,680 (15,800)	52,030 (19,220)	55,020 (20,830)	52,940 (19,760)	55,170 (17,420)	30,240 (17,070)	32,770 (18,470)	
Total Life-Cycle Costs--Dedicated Rail		57,360 (17,330)	57,880 (20,210)	61,360 (21,900)	58,570 (20,720)	68,520 (19,210)	30,460 (17,190)	33,790 (19,040)	
Transportation									
Truck									
Number of Truck Shipments to Consolidation Sites and WIPP	CH - 29,793 RH - 8,915	CH - 41,056 RH - 66,012	CH - 43,313 RH - 30,149	CH - 51,240 RH - 30,149	CH - 41,151 RH - 30,149	CH - 67,844 RH - 82,860	CH - 538 RH - 8,254	CH - 8,466 RH - 8,254	No shipments of TRU waste would occur under this alternative.
Nonradiological Truck Impacts									
Truck Accidents	56	171	109	123	105	239	5	13	
Truck Injuries	39	119	76	86	74	165	4	12	
Truck Fatalities	5	16	10	11	11	22	0.3	1	
Truck Pollution Fatalities	0.1	0.5	0.4	0.5	0.4	0.7	0.03	0.07	

Table S-7
Summary of SEIS-II Environmental Impacts — Continued

Consequence Category	Proposed Action/ Preferred Alternative	Action Alternative 1	Action Alternative 2A	Action Alternative 2B	Action Alternative 2C	Action Alternative 3	No Action Alternative 1A	No Action Alternative 1B	No Action Alternative 2
Radiological Truck Impacts									No shipments of TRU waste would occur under this alternative.
Accident-Free Population Impacts to Crews (LCFs)	0.3	0.7	0.5	0.7	0.5	1.0	0.02	0.07	
Accident-Free Population Impacts to the Public (LCFs)	3.0	11	6	7	6	15	0.4	0.9	
Highest Lifetime Accident-Free Impact to MEIs (probability of an LCF)	8.5E-3	8.6E-3	4.6E-3	4.9E-3	4.5E-3	9.9E-3	Not Analyzed.	Not Analyzed.	
Rail									
Nonradiological Rail Impacts	Transportation by rail not anaylzed under the Proposed Action; rail transportation is reserved under the Preferred Alternative.								
Fatalities Using Regular Rail Service		8	5	6	6	11	0.2	0.5	
Fatalities Using Dedicated Rail Service		112	70	84	84	154	2.8	7	
Radiological Rail Impacts									
Accident-Free Population Impacts to Crews (Regular and Dedicated) (LCFs)		0.03	0.03	0.03	0.03	0.05	8.6E-4	3.7E-3	
Accident-Free Population Impacts to the Public (Regular and Dedicated) (LCFs)		1.5	0.9	1	0.9	2.0	0.07	0.1	
Accidents									
Transportation Accidents (Truck)									
Population Impacts with Conservative Inventory (LCFs)	CH - 16 RH - 16	CH - 16 RH - 16	CH - <1 RH - <1	CH - <1 RH - <1	CH - 16 RH - <1	CH - 16 RH - 16	CH - 16 RH - 16	CH - 16 RH - 16	
Population Impacts with Average Inventory (LCFs)	CH - 3 RH - 0.04	CH - 3 RH - 0.04	CH - <1 RH - <1	CH - <1 RH - <1	CH - 3 RH - <1	CH - 3 RH - 0.04	CH - 3 RH - 0.04	CH - 3 RH - 0.04	
MEI Impact with Conservative Inventory (probability of an LCF)	CH - 0.06 RH - 0.06	CH - 0.06 RH - 0.06	CH - 3E-4 RH - 3E-4	CH - 3E-4 RH - 3E-4	CH - 0.06 RH - 3E-4	CH - 0.06 RH - 0.06	CH - 0.06 RH - 0.06	CH - 0.06 RH - 0.06	
MEI Impact with Average Inventory (probability of an LCF)	CH - 0.04 RH - 7E-4	CH - 0.04 RH - 7E-4	CH - 2E-4 RH - 4E-6	CH - 2E-4 RH - 4E-6	CH - 0.04 RH - 4E-6	CH - 0.04 RH - 7E-4	CH - 0.04 RH - 7E-4	CH - 0.04 RH - 7E-4	
Aggregate Potential Truck Accident Impacts to Populations Along All Transportation Routes (LCFs)	0.4	0.8	0.7	0.7	0.7	1.2	6.8E-3	0.02	

Table S-7
Summary of SEIS-II Environmental Impacts — Continued

Consequence Category	Proposed Action/ Preferred Alternative	Action Alternative 1	Action Alternative 2A	Action Alternative 2B	Action Alternative 2C	Action Alternative 3	No Action Alternative 1A	No Action Alternative 1B	No Action Alternative 2
Transportation Accidents (Rail)									No shipments of TRU waste would occur under this alternative.
Population Impacts with Conservative Inventory (LCFs)	No rail transportation is proposed under the Proposed Action; rail transportation is reserved under the Preferred Alternative.	CH - 32 RH - 32	CH - <1 RH - <1	CH - <1 RH - <1	CH - 32 RH - <1	CH - 32 RH - 32	CH - 32 RH - 32	CH - 32 RH - 32	
Population Impacts with Average Inventory (LCFs)		CH - 6 RH - 0.08	CH - <1 RH - <1	CH - <1 RH - <1	CH - 6 RH - <1	CH - 6 RH - 0.08	CH - 6 RH - 0.08	CH - 6 RH - 0.08	
MEI Impact with Conservative Inventory (probability of an LCF)		CH - 0.12 RH - 0.12	CH - 3E-4 RH - 3E-4	CH - 3E-4 RH - 3E-4	CH - 0.12 RH - 3E-4	CH - 0.12 RH - 0.12	CH - 0.12 RH - 0.12	CH - 0.12 RH - 0.12	
MEI Impact with Average Inventory (probability of an LCF)		CH - 0.08 RH - 1E-4	CH - 2E-4 RH - 4E-6	CH - 2E-4 RH - 4E-6	CH - 0.08 RH - 4E-6	CH - 0.08 RH - 1E-4	CH - 0.08 RH - 1E-4	CH - 0.08 RH - 1E-4	
Aggregate Potential Rail Accident Impacts (LCFs) to Populations Along All Rail Routes		0.8	0.7	0.7	0.7	1.2	6.8E-3	0.02	
Human Health									
Routine Radiological Impacts (LCFs) [a]									
Treatment									
Involved Worker Population	0.8	1.5	1.7	1.3	0.6	1.5	1.7	1.3	0.4
Noninvolved Worker Population Maximum Exposed Noninvolved Worker	7E-6 3E-9	8E-6 8E-9	0.1 5E-5	0.1 2E-4	0.06 2E-4	7E-4 2E-7	0.1 5E-5	0.1 2E-4	8E-5 4E-8
Public Population MEI	2E-4 9E-9	2E-4 1E-9	2.4 3E-5	2.3 5E-5	0.9 2E-4	4E-3 4E-7	2.4 3E-5	2.3 5E-5	1E-3 8E-8
***WIPP Operations* [b] (LCFs) [a]**							**Storage Impacts at Treatment Sites Only - No WIPP Operations**		
Involved Worker Population	≤1	≤1	<0.4	<0.4	<0.4	0.3	≤1.1	≤1.1	≤3
Noninvolved Worker Population Maximum Exposed Noninvolved Worker	4E-4 4E-7	5E-4 4E-7	2E-4 2E-7	2E-4 2E-7	2E-4 2E-7	5E-4 3E-7	0.06 1E-6	0.06 1E-6	0.1 4E-5
Public Population MEI	3E-4 3E-7	4E-4 5E-7	5E-5 1E-7	5E-5 1E-7	5E-5 1E-7	3E-4 3E-7	3E-3 2E-7	2E-3 2E-9	0.03 2E-6
Lag Storage[c] Public Population Impacts Lag Storage Noninvolved Worker Population	No lag storage for the Proposed Action.	1E-2 0.05	1E-3 2E-2	8E-4 2E-2	3E-4 1E-3	3E-3 0.07	No lag storage for the no action alternatives.		
Excess RH-TRU Waste Storage Public Population Impacts[d] Excess RH-TRU Waste Storage Noninvolved Worker Population[d]	2E-5 4E-5	No excess RH-TRU waste is considered in these alternatives; such RH-TRU waste is reflected in the inventory/waste volumes for these alternatives.							

Table S-7
Summary of SEIS-II Environmental Impacts — Continued

Consequence Category	Proposed Action/ Preferred Alternative	Action Alternative 1	Action Alternative 2A	Action Alternative 2B	Action Alternative 2C	Action Alternative 3	No Action Alternative 1A	No Action Alternative 1B	No Action Alternative 2
Routine Hazardous Chemical Impacts (Cancer Incidence)									
Treatment at Treatment Sites									
Involved Worker Population	2E-5	3E-5	6E-5	9E-5	8E-5	4E-5	6E-5	9E-5	8E-6
Noninvolved Worker Population	1E-7	2E-7	1E-7	1E-7	1E-7	2E-7	1E-7	1E-7	1E-7
Maximum Exposed Noninvolved Worker	1E-10	2E-10	1E-10	1E-10	1E-10	1E-10	1E-10	1E-10	1E-10
Public Population	4E-7	6E-7	3E-7	3E-7	3E-7	4E-7	3E-7	3E-7	4E-7
Maximum Exposed Individual	2E-11	3E-11	2E-11	2E-11	2E-11	2E-11	2E-11	2E-11	2E-11
WIPP Operations [a]							**Storage Impacts at Treatment Sites Only - No WIPP Operations**		
Involved Worker Population	0.01	0.04	No impacts because the TRU waste would be thermally treated.			≤0.01	None because TRU waste would be thermally treated.		≤0.1
Noninvolved Worker Population	1E-4	1E-4				9E-5			6E-3
Maximum Exposed Noninvolved Worker	1E-7	9E-8				5E-8			2E-7
Public Population	2E-5	3E-5				2E-5			6E-3
Maximum Exposed Individual	3E-8	2E-8				1E-8			4E-8
Lag Storage[c] Public Population	No lag storage for the Proposed Action.	5E-3				4E-3	None because there is no lag storage for the no action alternatives.		
Lag Storage Noninvolved Worker Population		0.01				0.02			
Excess RH-TRU Waste Storage Public Population Impacts[d]	3E-4	No excess RH-TRU waste is considered in these alternatives; such RH-TRU waste is reflected in the inventory/waste volumes for these alternatives.							
Excess RH-TRU Waste Storage Noninvolved Worker Population[d]	6E-4								
Selected Facility Accidents [a]									
Treatment Facility Sites (Earthquake) LCFs									
Maximally Exposed Noninvolved Worker	0.01	0.01	1	1	1	0.02	1	1	0.01
Maximally Exposed Individual	2E-3	2E-3	1	1	1	5E-3	1	1	2E-3
Public Population	3	3	480	480	28	6	480	480	3
Storage Facility Sites (Earthquake) LCFs									
Maximally Exposed Noninvolved Worker	3E-3	1.0	0.05	0.05	0.1	0.04	0.02	0.02	0.7
Maximally Exposed Individual	5E-4	0.1	5E-3	5E-3	0.08	5E-3	0.08	0.08	0.1
Public Population	0.9	300	10	9	2	10	10	10	300
WIPP Disposal (Hoist Failure, frequency of 4.5E-7) LCFs									
Maximally Exposed Noninvolved Worker	0.06	0.06	0.5	0.5	0.5	0.5	No impacts because disposal does not occur under the no action alternatives.		
Maximally Exposed Individual	0.08	0.08	0.6	0.6	0.6	0.6			
Public Population	5	5	29	29	29	29			

Table S-7
Summary of SEIS-II Environmental Impacts — Continued

Consequence Category	Proposed Action/ Preferred Alternative	Action Alternative 1	Action Alternative 2A	Action Alternative 2B	Action Alternative 2C	Action Alternative 3	No Action Alternative 1A	No Action Alternative 1B	No Action Alternative 2
Industrial Safety									
Waste Treatment (fatalities)	4	4	9	7	6	5	9	7	0.7
Construction and Operations (fatalities)	2	6	6	6	6	7	0.8	0.8	0.6
Performance Assessment of Treatment Sites and WIPP									
Treatment Sites - Human Intrusion [e]									
Radiological Impacts (probability of an LCF)									
Driller	4E-4 [f]	Does not apply to these alternatives because there is no waste at the treatment sites under the action alternatives, and TRU waste is managed indefinitely under No Action Alternatives 1A and 1B.							1E-6 to 3E-5
Gardener	3E-3 [f]								4E-3 to 0.06
Scavenger	0.01 [f]								6E-4 to 0.02
Family Farm	1 [f]								0.2 to 1
Treatment Sites - Environmental Release									
Radiological Impacts (probability of an LCF)									
MEI (probability of an LCF)	5E-5 [f]	Does not apply to these alternatives because there is no waste at the treatment sites under the Proposed Action and the action alternatives. For No Action Alternatives 1A and 1B, it was assumed the waste would be managed indefinitely.							3E-6 to 4E-3
Population (LCFs)	3E-4 [f]								4E-5 to 7
Aggregate Population Impacts over 10,000 years	4E-3 [f]	Does not apply to these alternatives because there is no waste at the treatment sites.					8E-4	3E-4	807
Hazardous Chemical Impacts (Cancer Incidence)									
MEI	9E-7 [f]	Does not apply to these alternatives because there is no waste at the treatment sites under the action alternatives, and TRU waste is managed indefinitely under No Action Alternative 1.							1E-7 to 5E-3
Population	5E-6 [f]								5E-7 to 3E-4
WIPP - Human Intrusion (based on the intrusion in the repository scenario)									
Maximum Radiological Impacts Drilling Crew Member (probability of an LCF; dashes indicate no analyses were performed because scenarios are inapplicable)									
CH-TRU Waste Panel	---	4E-4	1E-4	1E-4	1E-4	3E-4	Does not apply to these alternatives. No waste would be disposed of at WIPP.		
RH-TRU Waste Panel	---	1E-5	2E-6	2E-6	2E-6	1E-5			
Mixed CH-TRU and RH-TRU Panel	4E-4	4E-4	---	---	---	3E-4			
Maximum Radiological Impacts Site Geologist (probability of an LCF)									
CH-TRU Waste Panel	3E-9	3E-9	7E-9	7E-9	7E-9	2E-9	Does not apply to these alternatives. No waste would be disposed of at WIPP.		
RH-TRU Waste Panel	3E-9	5E-9	1E-8	1E-8	1E-8	4E-9			
Environmental Justice									
Treatment sites and WIPP	Although possible, disproportionately high and adverse effects on minority or low-income populations are not expected.				Impacts are possible at WIPP during treatment.	Although possible, disproportionately high and adverse effects on minority or low-income populations are not expected.			

Table S-7
Summary of SEIS-II Environmental Impacts — Continued

Consequence Category	Proposed Action/ Preferred Alternative	Action Alternative 1	Action Alternative 2A	Action Alternative 2B	Action Alternative 2C	Action Alternative 3	No Action Alternative 1A	No Action Alternative 1B	No Action Alternative 2
TRU Waste Retrieval (of one panel of waste before repository closure)									
Population Exposures (LCFs)									
Involved Worker Population	0.03	0.03	0.03	0.03	0.03	0.03	Does not apply to these alternatives. No waste would be disposed of at WIPP.		
Noninvolved Worker Population	4E-5	4E-5	4E-5	4E-5	4E-5	4E-5			
Public Population	3E-5	3E-5	3E-5	3E-5	3E-5	3E-5			
Transportation									
Accident-Free Population Impacts to Crews (LCFs)	0.03	0.03	0.03	0.03	0.03	0.03	Does not apply to these alternatives. No waste would be disposed of at WIPP.		
Accident-Free Population Impacts to the Public (LCFs)	0.3	0.3	0.3	0.3	0.3	0.3			
Traffic-Related Fatalities	0.5	0.5	0.5	0.5	0.5	0.5			
TRU Waste Recovery (of all waste after repository closure)									
Population Exposures (LCFs)									
Involved Worker Population	8	8	8	8	8	8	Does not apply to these alternatives. No waste would be disposed of at WIPP.		
Noninvolved Worker Population	0.3	0.3	0.3	0.3	0.3	0.3			
Public Population	0.2	0.2	0.2	0.2	0.2	0.2			
Transportation									
Accident-Free Population Impacts to Crews (LCFs)	1	1	1	1	1	1	Does not apply to these alternatives. No waste would be disposed of at WIPP.		
Accident-Free Population Impacts to the Public (LCFs)	15	15	15	15	15	15			
Vehicle Emission Effects Fatalities	7	7	7	7	7	7			
Traffic-Related Fatalities	185	185	185	185	185	185			

[a] The probability of an LCF occurring to the MEI or maximum exposed noninvolved worker, and the number of LCFs to the populations.
[b] Under the no action alternatives, this category represents impacts from storage.
[c] Lag storage is storage pending shipment to WIPP. Lag storage does not include long-term storage of waste (such as any excess RH-TRU waste under the Proposed Action) that will not be shipped to WIPP.
[d] Recent estimates in the *National Transuranic Waste Management Plan* indicate there would be no excess RH TRU waste; see Appendix J and information later in this summary.
[e] People who might intrude upon the stored waste could receive radiation doses that would greatly exceed current regulatory limits.
[f] Impacts from any excess RH-TRU waste. Scaled from No Action Alternative 2.

Note: For details on impacts due to the Additional Inventory (for the Proposed Action) see the text box "The Additional Inventory and the Proposed Action" in this summary. For information on how impacts would change should WIPP's operations period be reduced to 175 years or less, see the text box "Reducing Operations Periods" in this summary.

WIPP, large decreases in the amount of RH-TRU waste volumes would reduce the operations time needed for excavation and emplacement, reducing industrial safety and economics impacts.

- Changes in transportation impacts, including costs, are directly related to the number of shipments, which is dependent upon the type of waste treatment. Tables J-4 and J-5 present detailed CH-TRU and RH-TRU waste shipment information for all sites under all alternatives using *The National Transuranic Waste Management Plan* volumes. Table J-6 (and Table S-8 presented here) summarize the differences in shipments and the percentages of the total inventories between *The National Transuranic Waste Management Plan* and the Basic Inventory.

Overall, impacts would be slightly lower using data from *The National Transuranic Waste Management Plan* because, although CH-TRU waste volumes are slightly higher, the RH-TRU waste volumes are markedly lower (except for the impacts to the involved workers, as noted above). The difference is quite marked for transportation impacts because of the reduction of nearly 61,000 shipments of RH-TRU waste under Action Alternative 3 (see Table S-8).

Table S-8
Comparison of Shipments Between Alternatives Using
***The National Transuranic Waste Management Plan* and Basic Inventory**

	Number of Shipments to WIPP for the Total Inventory			
Alternatives	**NTRUWM Plan**	**BIR-3**	**Difference**	**Percentage of BIR-3 Shipments (NTRUWM/BIR-3)**
Proposed Action				
CH-TRU Waste	27,988	29,766 [a]	-1,778	94%
RH-TRU Waste	7,626	7,957	-331	96%
Action Alternative 1				
CH-TRU Waste	41,027	41,003	24	100%
RH-TRU Waste	11,509	62,162	-50,653	19%
Action Alternative 2A				
CH-TRU Waste	43,749	42,775	974	102%
RH-TRU Waste	4,028	21,895	-17,867	18%
Action Alternative 2B				
CH-TRU Waste	43,750	42,774	976	102%
RH-TRU Waste	4,028	21,895	-17,867	18%
Action Alternative 2C				
CH-TRU Waste	43,431	41,206	2,225	105%
RH-TRU Waste	11,507	62,160	-50,653	19%
Action Alternative 3				
CH-TRU Waste	65,922	67,309	-1,387	98%
RH-TRU Waste	13,808	74,606	-60,798	19%

[a] RH-TRU waste volumes are adjusted to the limits of the C&C Agreement. CH-TRU waste volumes are adjusted to reflect the capacity allowed under the LWA taking into account the RH-TRU waste limits of the C&C Agreement.

Changes in volume-dependent impacts (for example, human health impacts) would be expected at some sites. The changes in impacts would be greatest at INEEL, a major generator, treatment, and potential consolidation site under all alternatives, where volume-dependent impacts could increase by about 124 percent. Impacts at RFETS would increase by about 50 percent and at SRS by less than 10 percent. Impacts at Hanford would decrease dramatically: approximately 50 percent from

CH-TRU waste and 90 percent from RH-TRU waste. ORNL impacts, mainly from RH-TRU waste, would be about 60 percent lower. Impacts at LANL, the other key generator site, would also decrease by about 15 to 20 percent.

Additional information on how these impacts would change, as well as information on other waste volumes, is presented in Appendix J.

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